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Improvement in Apparatus for Tanning Leather.

It is a well-ascertained fact that the thorough rousing of the liquor in tan vats, during the progress of tanning, greatly accelerates the process and secures uniformity in the product proportionably to the thoroughness with which this detail is attended to. The old method of doing this, technically called "handling," is the most laborious of all the work done in a tannery, and when performed in the best manner possible, often leaves much to be desired in the quality of the leather.

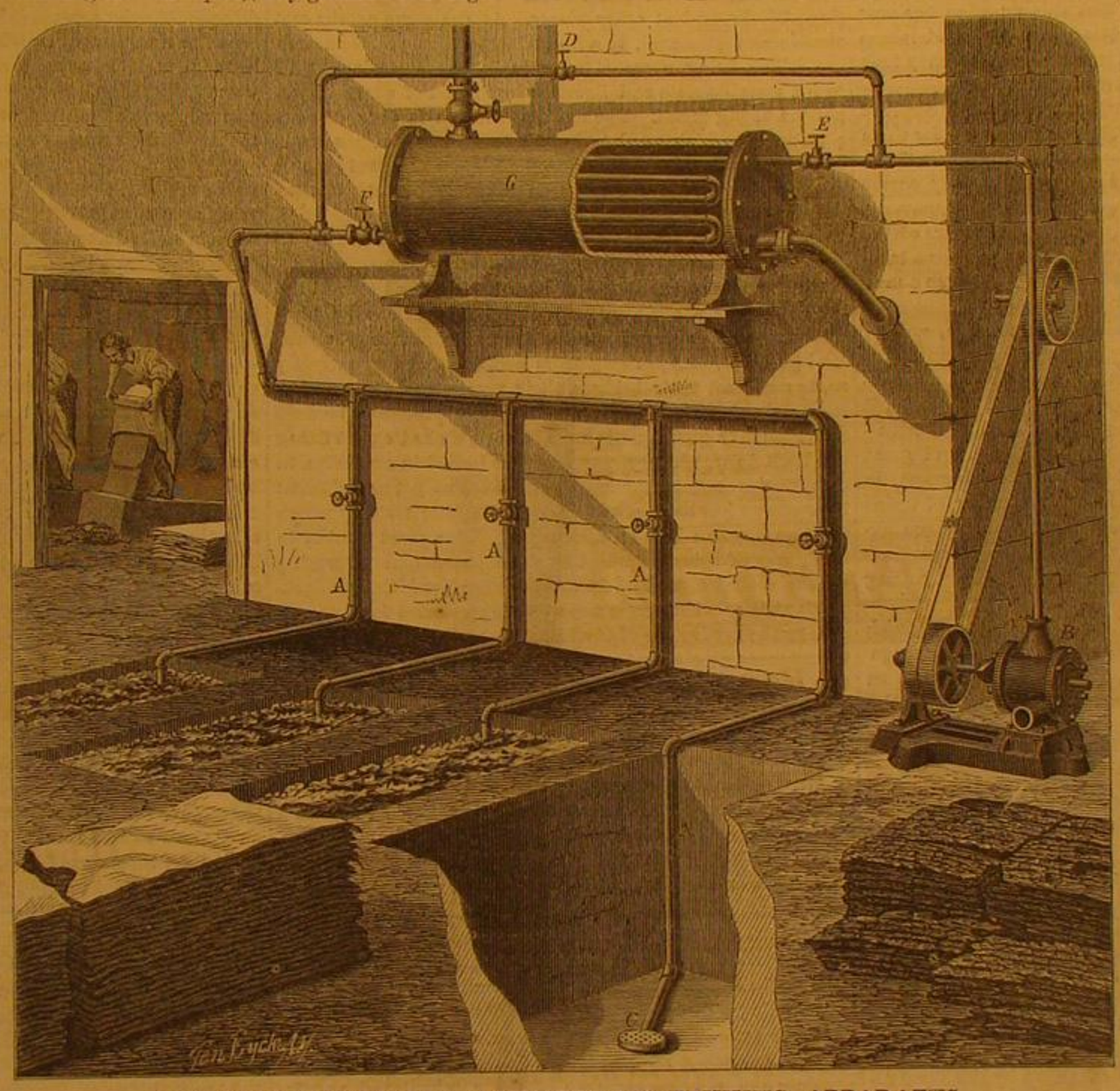
For tanning small hides revolving perforated drums have been employed, rotating in vats containing the tan liquor, and this method, although expensive of power, has answered in the manufacture of inferior qualities of leather from sheepskins, etc., for bookbinding, trunk-making, and other purposes where the best leather is not always required.

The improvement herewith illustrated will not only do the same thing more effectually with a far less expenditure of power, but is of such a nature that it can be advantageously applied to the tanning of any kind of hides, large or small.

The advantages claimed for this invention are, that it will save at least one fourth of the heaviest labor in tanning; that it will produce a more uniform and better quality of leather than any process hitherto employed; that it is equally adapted to liming hides, leaching tan, and other similar processes; and is very effective and economical in all these operations.

The hides are hung on slats, as close together as usual, in the vats containing the tanning liquors. Then the air is forced into the bottoms of the vats through a series of pipes, A, leading from an air pump, B, and there discharged through a distributor, C. Then escaping through the supernatant liquors, it causes therein violent currents and ebullition. This insures a regular tannage of the hides.

The inventor informs us that no spots or traces can be found throughout hides tanned by this method that have not received equal tannage, and that the surfaces of the skins, when the operation is performed, present a perfect, smooth, and unbroken grain hitherto unknown among tanners.



KAUFFELT'S IMPROVED ATMOSPHERIC TANNING APPARATUS.

In winter the air can be warmed by closing the cock, D, and opening the cocks, E and F. The air will then pass through a series of pipes inclosed in the steam cylinder, G, and heated to the temperature required—a process which will greatly accelerate the tanning, while it is totally free from the objections attending the use of hot liquors. In summer the cocks, E and F, being closed, and D being opened, the air does not pass through the heater, G, but enters the vat at the atmospheric temperature.

It will be seen that this adjustment, simple and cheap as it is, insures two very important requisites to speedy and efficient tanning; viz., the regulation of the temperature of the liquor to a nicety, and the thorough rousing of the contents of the vat; and we shall be greatly mistaken if it does not meet with a favorable reception from that very intelligent and enterprising class of men, American leather manufacturers.

Patented through the Scientific American Agency, July 13, 1869, by John E. Kauffelt, Shrewsbury, Pa., to whom communications may be addressed.

Surmounting Inclines.

If the inclines on railways could be so arranged that every ascending gradient should be preceded by a descending one, in other words, that the two should meet at the lower level, the impetus acquired in the descent would materially assist the subsequent ascent. There are, undoubtedly, some instances where this desirable result obtains, but they are, in all probability, occasioned more by accident or necessity, than by design. The steeper the incline, the greater must be the adhesion of the wheels on the rails. Hence the innumerable patents and inventions for accomplishing this purpose, which climaxed in the introduction of the middle rail and extra wheels. In one sense, weight and adhesion are synonymous terms, but to gain the necessary amount of adhesion by simply increasing the weight, would be to employ a remedy worse than the evil, as the difficulty is to get the weight itself up the hill. The experiments at Mont Cenis have quite thrown into the shade anything that has been done at home in the way of surmounting inclines, although we have, in latter days, distinguished ourselves in the art of making steep railway gradients to a degree that would have appalled our predecessors in that particular branch of engineering. A trial is to be made on the French side of Mont Cenis of the system of an Italian engineer, M. Agudio, for working sharp inclines on mountain summits. This principle has been employed for some years upon the Turin and Gênes Railway, and the experience gained during its application there has enabled the inventor to remedy the imperfections, correct the errors, and introduce those modifications and improvements which are indispensable to the success of every newly-tried mechanical invention.

Steep gradients are essential to the system of M. Agudio. He reconciles the differences of level by inclines of 1 in 10, and presses into his service the resources that nature has placed at his disposal, instead of employing means wholly artificial for accomplishing his purpose. The natural forces or motive power to be found in mountainous districts is utilized by hydraulic machines placed one at the summit, and the other at the bottom of the incline. From these the power is transmitted by the agency of steel telodynamical cables, working at a high velocity, to a locomotive, or, rather, locomotor, which is placed at the head of the train. As no boiler is required, the weight is very small in comparison with that of an ordinary locomotive, being restricted solely to that necessary to provide for the moving parts. At the same time, a certain amount of adhesion is absolutely indispensable, especially on inclines of the steepness already mentioned. In order to effect this, there is, first of all, the weight of the engine. Secondly, this weight is rendered more serviceable by being carried on eight wheels; and, thirdly, there are six horizontal wheels introduced, which, by means of springs, are caused to press against a central rail, similarly to the well-known Fell system. Powerful brakes are supplied to guard against contingencies in descending the inclines. A grant has been made by the Imperial Government of nearly £10,000 for carrying out this principle at Mont Cenis, and a similar subvention of the same amount has been given by the Italian Government. The particular section of the Mont Cenis Railway, to which this system is to be applied, commences at Lanslebourg, a station on the Fell road, crosses the river Arcq, and ascends the sides of the hill by nearly the same route as that occupied by the lines of telegraph. A succession of sharp curves from 450ft. to 900ft. radii, and an equal number of heavy gradients, bring the new section to the summit, where it rejoins the line of Fell. This route has been adopted by M. Agudio in order to demonstrate the great advantage of his system over others in use in similar arduous localities. The total difference of level between the starting point and the summit level is 2,296ft., and this is accomplished in a distance of 2·2 miles, whereas 7·5 miles is the distance required by Mr. Fell to rise the same hight. The length of line, and, *cæteris paribus*, the cost is, therefore, in the latter instance, about three and a half times that in the former. One of Fontaine's turbines constitutes the prime motor. It is fed by the waters of the Arcq, which are collected and stored in a reservoir containing 900,000 gallons of that fluid, the whole of which is capable of being run off and replenished six times a day, thus affording six ascents and six descents in the twenty-four hours. Each ascent will occupy about a quarter of an hour, and will of course be made without any interruption *en route*. The load taken up, will, in round numbers, equal sixty tuns. It is stated that the Fell locomotive requires an hour to perform the same journey, that is, so far as the difference of level is concerned, and conveys only one fourth of the load between the same termini. M. Agudio calculates that the ordinary passenger trains, which will weigh considerably less than sixty tuns, will "do" the journey in ten minutes. At the present day, when engineers have exchanged the old principle of adapting the road to the locomotive for the more modern practice of suiting the locomotive to the road, any proposed improvement in that direction is deserving of careful and impartial consideration.

THE LATEST ACHIEVEMENTS OF ENGINEERING SCIENCE.

Extract from the address of C. W. Siemens, F.R.S., before the British Association.

In viewing the latest achievements in engineering science, two works strike the imagination chiefly by their exceeding magnitude, and by the influence they are likely to exercise upon the traffic of the world. The first of these is the great Pacific Railway, which, in passing through vast regions hitherto inaccessible to civilized man, and over formidable mountain chains, joins California with the Atlantic States of the great American republic. The second is the Suez shipping canal, which, notwithstanding adverse prognostications and serious difficulties, will be opened very shortly to the commerce of the world. These works must greatly extend the range of commercial enterprise in the North Pacific and the Indian seas. The new waterway to India will, owing to the difficult navigation of the Red Sea, be in effect only available for ships propelled by steam, and will give a stimulus to that branch of engineering.

Telegraph communication with America has been rendered more secure against interruption by the successful submersion of the French Transatlantic cable. On the other hand, telegraphic communication with India still remains in a very unsatisfactory condition, owing to imperfect lines and divided administration. To supply a remedy for this public evil the Indo-European Telegraph Company will shortly open its special lines for Indian correspondence. In northern Russia the construction of a land line is far advanced to connect St. Petersburg with the mouth of the Amoor river, on completion

of which only a submarine link between the Amoor and San Francisco will be wanting to complete the telegraphic girdle round the earth.

With these great highways of speech once established, a network of submarine and aerial wires will soon follow to bind all inhabited portions of our globe together into a closer community of interests, which if followed up by steam communication by land and by sea, will open out a great and meritorious field for the activity of the civil and mechanical engineer.

But while great works have to be carried out in distant parts, still more remains to be accomplished nearer home. The railway of to-day has not only taken the place of high roads and canals for the transmission of goods and passengers between our great centers of industry and population, but is superseding by-roads leading to places of inferior importance; it competes with the mule in carrying minerals over mountain passes, and with the omnibuses in our great cities. If a river cannot be spanned by a bridge without hindering navigation, a tunnel is forthwith in contemplation, or, if that should not be practicable, the transit of trains is yet accomplished by the establishment of a large steam ferry.

It is one of the questions of the day to decide by which plan the British Channel should be crossed, to relieve the unfortunate traveler to the Continent of the exceeding discomfort and delay inseparable from the existing most imperfect arrangements. Considering that this question has now been taken up by some of our leading engineers, and is also entertained by the two interested governments, we may look forward to its speedy and satisfactory solution.

So long as the attention of railway engineers was confined to the construction of main lines, it was necessary for them to provide for heavy traffic and high speeds, and these desiderata are best met by a level permanent way, by easy curves and heavy rails of the strongest possible materials, namely, cast steel; but, in extending the system to the corners of the earth, cheapness of construction and maintenance, for a moderate speed and a moderate amount of traffic, become a matter of necessity.

Instead of plunging through hill and mountain, and of crossing and recrossing rivers by a series of monumental works, the modern railway passes in zigzag up the steep incline, and conforms to the windings of the narrow gorge; it can only be worked by light rolling stock of flexible construction, furnished with increased power of adhesion and great brake power. Yet by the aid of the electric telegraph, in regulating the progress of each train, the number of trains may be so increased as to produce, nevertheless, a large aggregate of traffic; and it is held by some that our trunk lines even would be worked more advantageously by light rolling stock.

The brake power on several of the French and Spanish railways has been greatly increased by an ingenious arrangement conceived by M. Lechatelier, of applying what has been termed "Contre vapor" to the engine, converting it for the time being into a pump, forcing steam and water into the boiler.

While the extension of communication occupies the attention of, perhaps, the greater number of our engineers, others are engaged upon weapons of offensive and defensive warfare. We have scarcely recovered our wonder at the terriffic destruction dealt by the Armstrong gun, the Whitworth bolt, or the steel barrel consolidated under Krupp's gigantic steam hammer, when we hear of a shield of such solidity and toughness as to bid defiance to them all. A larger gun or a hard bolt by Palliser or Grūson is the successful answer to this challenge; when again defensive plating, of greater tenacity to absorb the power residing in the shot, or of such imposing weight and hardness combined as to resist the projectile absolutely (causing it to be broken up by the force residing within itself) is brought forward.

The ram of war, with heavy iron sides, which a few years since was thought the most formidable, as it certainly was the most costly weapon ever devised, is already being superseded by vessels of the Captain type, as designed by Captain Coles, and ably carried out by Laird Brothers, with turrets (armed with guns of gigantic power) that resist the heaviest firing, both on account of their extraordinary thickness, and of the angular direction in which the shot is likely to strike.

By an ingenious device, Captain Moncrieff lowers his gun upon its rocking carriage after firing, and thereby does away with embrasures (the weak places in protecting works), while at the same time he gains the advantage of re-loading his gun in comparative safety.

It is presumed that in thus raising formidable engines of offensive and defensive warfare the civilized nations of the earth will pause before putting them into earnest operation, but if they should do so it is consolatory to think that they could not work them for long without effecting the total exhaustion of their treasuries, already drained to the utmost in their construction.

While science and mechanical skill combine to produce these wondrous results, the germs of further and still greater achievements are matured in our mechanical workshops, in our forges, and in our metallurgical smelting works; it is there that the materials of construction are prepared, refined, and put into such forms as to render greater and still greater ends attainable. Here a great revolution of our constructive art has been prepared by the production, in large quantities and at moderate cost, of a material of more than twice the strength of iron, which, instead of being fibrous, has its full strength in every direction, and which can be modulated to every degree of ductility, approaching the hardness of the diamond on the one hand and the proverbial toughness of leather on the other. To call this material cast steel seems to attribute to it brittleness and uncertainty of temper, which, however, are by no means its necessary characteristics. This new material, as prepared for constructive purposes, may indeed be both hard and tough, as is illustrated by the hard steel rope that has so materially contributed to the practical success of steam plowing.

Machinery steel has gradually come into use since about 1850, when Krupp, of Essen, commenced to supply large ingots that were shaped into railway tires, axles, cannon, etc., by melting steel in halls containing hundreds of melting crucibles.

The Bessemer process, in dispensing with the process of puddling, and in utilizing the carbon contained in the pig iron to effect the fusion of the final metal, has given a vast extension to the application of cast steel for railway bars, tires, boiler plates, etc.

This process is limited, however, in its application to superior brands of pig iron, containing much carbon and no sulphur or phosphorus, which latter impurities are so destructive to the quality of steel. The puddling process has still, unless the process of decarburization of Mr. Heaton takes its place, to be resorted to, to purify these inferior pig irons, which constitute the bulk of our productions; and the puddled iron cannot be brought to the condition of cast steel except through the process of fusion. This is accomplished successfully in masses of from three to five tuns on the open bed of a regenerative gas furnace at the Landore Siemens Steel Works, and at other places. At the same works cast steel is also produced, to a limited extent as yet, from iron ore, which, being operated upon in large masses, is reduced to the metallic state and liquefied by the aid of a certain proportion of pig metal. The regenerative gas furnace—the application of which to glass houses, to forges, etc., has made considerable progress—is unquestionably well suited for this operation, because it combines an intensity of heat, limited only by the point of fusion of the most refractory material, with extreme mildness of draft and chemical neutrality of flame.

These and other processes of recent origin tend toward the production, at a comparatively cheap rate, of a very high class material that must shortly supersede iron for all structural purposes. As yet engineers hesitate, and very properly so, to construct their bridges, their vessels, and their rolling stock of the material produced by these processes, because no exhaustive experiments have been published as yet fixing the limit to which they may safely be loaded in extension, in compression, and in torsion, and because as yet no sufficient information has been obtained regarding the tests by which their quality can best be ascertained. This great want is in a fair way of being supplied by the experimental researches that have been carried on for some time at her Majesty's dockyards at Woolwich, under a committee appointed for that purpose by the Institution of Civil Engineers. I have also pleasure to announce an elaborate report by Mr. William Fairbairn on this subject. In the meantime excellent service has been rendered by Mr. Kirkaldy in giving us, in a perfectly reliable manner, the resisting power and ductility of any sample of material which we wish to submit to his tests. The results of Mr. Whitworth's experiments tending to render the hammer and the rolls obsolete by forcing cast steel, while in a semi-fluid state, into strong iron molds by hydraulic pressure are looked upon with great interest. But, assuming that the new building material has been reduced to the utmost degree of uniformity and cheapness, and that its limits of strength are fully ascertained, there remains still the task for the civil and mechanical engineer to prepare designs suitable for the development of its peculiar qualities. If, in constructing a girder, for example, a design were to be adopted that had been worked out for iron, and if all the scantlings were simply reduced in the inverse proportion of the absolute and relative strength of the new material, as compared with iron, such a girder would assuredly collapse when the test weight was applied, for the simple reason that the reduced sectional area of each part, in proportion to its length, would be insufficient to give stiffness. You might as well almost take a design for a wooden structure, and carry it out in iron by simply reducing the section of each part. The advantages of using the stronger material become most apparent if applied, for instance, to large bridges where the principal strain upon each part is produced by the weight of the structure itself, for, supposing that the new material can be safely weighted to double the bearing strain of iron, and that the weight of the structure were reduced by one half accordingly, there would still remain a large excess of available strength in consequence of the reduced total weight, and this would justify a further reduction of the amount of the material employed. In constructing works in foreign parts the reduced cost of carriage furnishes also a powerful argument in favor of the stronger material, although its first cost per tun might largely exceed that of iron.

Cider and the Cider Manufacture.

The season for the manufacture of cider is at hand. As it is an important product, and many a good crop of apples is wasted in making an inferior quality, simply from want of a little practical knowledge, the following hints from the *Working Farmer* will be found seasonable and sound:

"In general, we may say that the same principles that govern the manufacture of wine hold good in making cider; for cider is merely wine made from apples instead of grapes, and deserves the name of wine certainly as much as the fermented juice of currants, raspberries, and other fruits that we dignify with this name. To be more particular, no good cider can be made from unripe fruit. We should laugh at the man who should undertake to make wine from green grapes. It is just as foolish to make cider from green apples. Sugar is essential in all fermentation. As fruit matures, the starch is converted into sugar; and only when mature is the fruit fit for eating and conversion into wine. Providence has made all unripe fruit unpalatable, so that neither man nor beast should be tempted to eat it in its green state. In unpropitious seasons the vine grower adds sugar to the expressed juice of his grapes in order to supply the deficiency of saccharine matter and perfect the fermentation; and few if any of the grapes of New England contain enough sugar to make good wine without this addition. Cane sugar, however, never gives a flavor equal to that naturally produced in the fruit. The nearer to perfect ripeness, therefore, we can bring our apples, the better will be our cider. We have tried adding sugar to the juice of apples, and find that it improves the quality of the cider as much as it does wine. If sugar is added to the juice of any fruit, it should be of the purest kind. It is a common mistake to suppose that the flavor of Muscovado sugar will work off during the vinous fermentation; it is continued even into the acetous fermentation, and deteriorates the quality of the vinegar.

"As a second rule, no rotten apples, nor bitter leaves, nor stems, nor filth of any kind, should be ground for cider. The winemaker who seeks a reputation for a superior article looks well to the condition of his grapes before he allows the juice to be expressed. We do not like to eat rotten apples; and they are no better for drink than for food. No wonder that a prejudice should exist against cider in the minds of those who have seen the careless way in which it is sometimes made. We have heard it called, and not inaptly, the expressed juice of worms and rotten apples. Perhaps, if we could see the process of manufacturing cheap wines, our prejudices against them would be equally strong. There is no economy in such carelessness. If cider is worth making, it is worth making well; and then with a good conscience we can ask a good price, and be sure of getting it too; for a good article is always in better demand than a poor one.

"Much cider is injured by being pressed with musty straw. In this respect, the little hand mills have the advantage, for they require no straw; and there is little straw so bright and and clean as to be totally free from dust and an unpleasant odor. We very much question whether straw is of any advantage in the large power mills. It doubtless aids in conducting the juice, but it also absorbs not a little; and the danger of a bad flavor from it is so great that we should discard it altogether. The press can be made small, and of birch or some other hard timber, that will not contaminate the cider. Two presses are really necessary for each mill, so that the pomace can be exposed to the air in the one while it is being pressed in the other, and thus acquire a deeper color

"Perhaps the most essential requisite for good cider is the cask in which it is to be preserved. Few old cider barrels can be cleansed so as to be fit for use again. We have seen them soaked in running water for days and still retain the seeds of putrefaction. Fresh slacked lime we have found one of the best disinfectants; but we prefer a new oak barrel or one in which whisky or alcohol has been kept. We have heard linseed-oil barrels recommended, as the oil will rise to the surface and prevent rapid fermentation. They are good for those who like them. We prefer to shut off the air at the right time with a good tight bung.

"If it is desired to keep the cider in a state of must it can easily be effected by boiling it a little, and then bunging up the cask tightly. This is the canning principle; and if the cask is tight, the cider will be found as sweet at the end of the year as when first put up. We doubt whether the medicinal effect of such cider is as good as when it is allowed to ferment for a few days, and a little alcohol, and not a little carbonic acid, are generated. Whenever the cider arrives at the proper stage of fermentation—and the time for this will vary from a week to a fortnight, as the temperature of the weather may vary—the cask should be closed tightly, and all air excluded. Some say that a pound of mustard seed or a pint of horse-radish should be added to each barrel when the bung is driven, and claim that this prevents further fermentation. They may add a little pungency to the cider, but we do not see how they act to prevent fermentation; nor do we know how fermentation can proceed without air. Prof. Horsford, a few years since, suggested sulphate of lime to keep cider sweet. It certainly has this effect, but, at the same time, neutralizes the peculiar acid, on which much of the good effect of the cider depends. If, at the proper time, the cask is made air tight, or the cider is securely bottled, we much doubt whether any of these artificial ingredients are an improvement. If more color and richer body are desired, a quart or two of boiled cider added to each barrel will impart them.

"Cider, like every other blessing, must be used with moderation. As the sweetest things can become the sourest, so our greatest blessings can be perverted into great curses. We feel bound to speak well of a bridge over which we have crossed safely; and cider has bridged us over a severe attack of jaundice, and we find it an excellent aid to digestion. If the experience of others differs from ours, we shall not quarrel with them, but only agree to differ."

MANUFACTURE OF SUGAR.—It is stated that experiments are now in progress in some French colonies to try, on a large scale, Messrs. Rousseau and Bonneterre's plan of converting the saccharine juice of cane or beet-root into a peculiar saccharate of lime, and to transport that salt, instead of raw sugar, for the purpose of refining. It is said that this compound is as hard as sand, and can be transported without the risk of damage and injury sugar is subject to, and be kept for any length of time

OPERATIONS IN CUMBERLAND COAL---TO THE PUBLIC PRESS.

In the discussion which has for some weeks past occupied the public prints respecting the rapid, and, as it is alleged, unreasonable and unnecessary advance in the price of coals, the hardship imposed upon the consumers is ascribed to a monopoly or a combination of coal interests, which, ignoring every element of fairness and justice, seizes upon one of the primary necessaries of life, and speculates upon it, not only to the serious detriment of commerce and manufactures, but to the cruel disregard of the helpless poor.

Upon this *assumption* of facts a wholesale and indiscriminate assault has been made upon the coal interests of the United States, and both in the public papers, and by public meetings a demand has been made for the repeal by the next Congress of the existing tariff upon foreign coal; namely, $1·25 a tun, for the avowed purpose of punishing the capitalists, who, it is claimed, have sought to enrich themselves without regard to the necessities of the people.

The undersigned do not propose to enter upon the consideration of the tariff question, nor to make any appeal for special legislation. The English and Welsh coals cannot pay the freight across the ocean and compete with American anthracite or bituminous. They are now selling by the cargo at the minimum of $16 the tun, and even if the tariff of $1·25, gold, did not exist, their current price would be $14 or $15. They can be used therefore only by the very wealthy who can afford to pay for luxuries, and they in no way affect the question.

The Nova Scotia coals, it is well known, are not suitable for steam generating nor domestic purposes. They do not therefore materially interfere with the bituminous and anthracite coals, being imported mainly for gas manufacture, and if the duty were removed the effect would be not so much to injure the coal interests of the United States as to deprive the Treasury of a considerable revenue for the benefit, not of the public, but of the gas companies.

The coal which principally competes with anthracite, and is used in its stead, for all manufacturing purposes, is known in the market as "Cumberland," or "George's Creek coal."

The undersigned, representing companies mining this coal, whose principal offices are in New York, but with agencies in all the Atlantic cities from Baltimore to Portland, and in behalf of stockholders interested to the extent of upwards of twenty millions of dollars, make the following statement of facts, namely:

1. Out of 852,000 tuns of coal mined and shipped between the 1st of January and the 31st of July, 1869, from all the mines in Allegheny county, Md., the companies they represent have mined and marketed 622,000 tuns.

2. These companies have not, during the present season, entered into any arrangement, or combination, or understanding *of any kind whatever*, in respect to the prices of coal, which at the opening of the season were $5 at Baltimore and $4·75 at Georgetown, per tun of 2,240 lbs., delivered free on board; upon which figure no advance has since been made, notwithstanding the rapid increase in the price of anthracite and its great scarcity in the market. And here we state as a fact of general interest that, at no time within the last two and a half years has Cumberland coal varied from these prices to a greater extent than fifty cents per tun; although during the same period the price of anthracite has fluctuated nearly 100 per cent.

3. There have been no strikes at their mines, no advance in wages, nor any disturbance to the industry of the Cumberland coal region. The business has been conducted with entire regularity and without any complaint from consumers, upon an increased demand and production of about 60 per cent above last year. This healthy condition of business has enabled them to keep their coal in market at the prices named at the shipping ports and to deliver coal in the harbor of New York at any time, since the first day of May, at not exceeding $7·25 the gross tun, when discharged direct from vessel or barge to consignee.

4. While the Pictou or Nova Scotia coals (by the introduction of which after the duty shall have been removed, a millennium of cheap fuel is expected to commence) are unsuited for the uses already mentioned, it is well known that the Cumberland coal can be substituted for anthracite for domestic purposes, and is unequaled by anthracite, Nova Scotia, or English coals for steamship and railway purposes, and for the various manufactures of iron and glass. This fact, well known in this country, is published under sanction of the British Parliament in their Blue Book of 1866, entitled "Reports from Her Majesty's Secretaries of Embassy and Legation respecting Coal," page 151, as follows:

Nearly all American coal is of very excellent quality.

The anthracite gives out a very great, perhaps a somewhat dry heat, but it burns with a bright blue smokeless flame.

The soft bituminous coal is admirably fitted for open fireplaces, such as are used for wood, from its coaking together in a solid mass. In evaporating power Cumberland bituminous coal holds the highest place among American coals, and is highly valued as a generator of steam for ocean steamers.

The Cunard line, for instance, use it exclusively. A curious fact showing this superiority of the Cumberland coal for steam navigation (see Taylor's coal statistics) was elicited some few years back, when the comparative speed of the Collins and Cunard lines was under discussion.

On a comparison of the time required to cross the Atlantic by these two lines of steamers, it came out that the Cunard line, steamers of British build, were swifter on the eastern passage than the Collins line, steamers of American build.

On the western passage quite the reverse took place.

Many sought to explain the difference between these vessels as to their respective superiority in their eastern and western passage by their different powers in going with or against the wind. When these steamers used the same coal (Welsh) the American ships proved themselves the faster, but they could not compete with English ships when these ships used Cumberland coal, for then they surpassed in speed the American ships using the anthracite coal.

In conclusion, the undersigned, feeling their responsibility alike to the owners of the vast interests committed to their care, and to the public—equally interested as the consumer of this product of prime necessity—appeal for the confirmation or criticism of this general statement to the great steamship lines sailing from this port, to the principal railway companies of the Eastern and Middle States, who are entirely familiar with the premises, and to the great manufacturing interests which have used the coal in all parts of the country; and in the consciousness that they have acted fairly, considerately, and forbearingly toward the people, they claim for the Cumberland coal interests the just judgment of an enlightened public opinion, so that, at least, they may not be sacrificed because of alleged misdeeds with which they have no connection and for which they are not directly or indirectly responsible.

BORDEN MINING CO.—By William Borden.
CONSOLIDATION COAL CO.—By C. H. Dalton, President.
CENTRAL COAL MINING AND M'F'G CO.—By Harry Conrad, President.
AMERICAN COAL CO.—By G. P. Lloyd, President.
CUMBERLAND COAL AND IRON CO.—By Wm. M. Richards, President.
HAMPSHIRE AND BALTIMORE COAL CO.—By E. S. Bolles, Vice-President.

New York, August 10, 1869.

Mode of Working the French Cable.

A few of the members of the Scientific Association, which closed its session at Salem last week, have been making a visit to Duxbury, the terminus of the newly laid French Cable. What they saw is pleasantly told by the Boston *Advertiser*, from which we make the following extracts:

"In an old but well preserved clapboard mansion of that quaint old town were found the headquarters of this new and wonderful highway. The visitors were cordially welcomed by the manager, Mr. Brown, and were at once brought into the presence of the flitting, flame-like image which indicated, in symbols, on a graduated screen, the thoughts working at that instant on the other side of the Atlantic. Interpreting the fitful tremor of the image, or line of light, one inch in length, and one eighth of an inch in breadth, the youthful interpreter, who did not look the wizard that he was, calmly read, for transcription by his assistant, a message in which occurred, at intervals, the words 'New Orleans'—'Citizens'—etc., etc. While inspecting the apparatus the members of the party received the following message fresh from France, sent expressly to them:

"'TO DUXBURY, FROM BREST—Time 5:20 P.M., "'[Paris Time.]

"'The company present their compliments to the gentlemen assembled at Boston, and hope to be able to send them news of the great international boat race that will be gratifying to both nations.'

"The usual rate of transmission is about ten or twelve words per minute. Looking for the mechanism by which these wonderful results were obtained, the inquiring visitors observed, on their right, placed on a marble pedestal, a medium-sized spool of silk-covered copper wire, said to consist of several thousand turns or convolutions, in the center of which spool, suspended by a single silkworm fiber, was a minute mirror attached to a little magnet made from a piece of watch spring. From a lamp, properly placed and shaded, a beam of light was thrown upon this mirror, and from the mirror was reflected, two hundred times enlarged, upon the graduated screen in front of the interpreter, the flame-like image already mentioned. In transmitting, from Duxbury to Brest, the operator, with his right hand, makes use of two keys or springs, one of which, being pressed, causes, at Brest, a deflection in a similar mirror, sending the image-flame to the right, while pressing the other key deflects the mirror at Brest in the opposite direction, sending the image to the left. Its indications are thus interpreted; a jerk or flitting once to the left and then once to the right denotes the letter *a*; a flitting once to the right and then three times to the left, denotes the letter *b*; and thus, letter by letter, the words are spelled.

"Passing into an adjoining room, the delicate instruments used for testing the electric conduction of the cable are shown among which are condensers and batteries, rheostats and shunts, bridges, switches, and plugs, and, crowning all, the wonderful astatic galvanometer of Sir William Thompson. But possibly it would weary our readers to tell of ohms and megohms, farads and megafarads, volts and microvolts, and all the terminology of conduction, resistance, electrostatic capacity, and continued electrification. It may, however, gratify them to learn that the insulation of the deep-sea cable, between Brest and St. Pierre, has more than doubled in efficacy during the short month which has elapsed since this cable was first committed to the embraces of Old Ocean—as is evinced by the fact that, soon after it was laid, the insulation resistance rose to 2300 megohms, and has since been gradually increasing until it is now 5000 megohms per nautical mile. This improvement in the insulation of the deep-sea cable is believed to be mainly due to the coldness or diminished temperature to which it is subjected at great ocean depths. The insulation resistance of the portion of the cable connecting Duxbury and St. Pierre is much less, namely, 1500 megohms per nautical mile.

"If one would inquire of a cable electrician—what is a meghom? he might, with propriety, be told that it is a million ohms. Should he still further inquire—but what is an ohm? a suitable reply would be, it is the yardstick of the electrician by which he measures the electric condition of conductors, and which may be represented by a round wire of pure copper one-twentieth of an inch in diameter and 240 feet in length, at the temperature of 60 degrees of the Fahrenheit thermometer; while a megohm, by which he measures the resistance of insulators, is a unit, the length of which is a million times as great."

The Want of Chemical Knowledge Among Druggists Illustrated.

A forcible illustration of the great lack of chemical knowledge among dispensers of medicines is found in the following case, an account of which is given in the *American Journal of Pharmacy*.

A correspondent of that journal informs the editor that a few months since he suffered severe personal injury by the explosion of the ingredients of a prescription composed of the chlorate of potassa, tannic acid, and oil of Gaultheria. The journal referred to says, "it appears that this mixture had been repeatedly dispensed without ignition, but on this occasion the physician called and requested double the quantity to be prepared, and the pharmaceutist accidentally used, on this occasion a new wedgewood mortar, with rough surface, first powdering the chlorate and then adding the other ingredients, and continuing the trituration—when a violent explosion occurred, injuring his hands and burning his face and eyes seriously. Our correspondent believed that the physician was aware of the explosive nature of the mixture, as he is reported to have said immediately afterward, 'that he knew that the mixture as ordered would explode,' he being the first physician called in. If this was true, it leaves an inference of motive in regard to the prescriber not to be envied. It would have been quite right to have given a caution to have saved himself from the charge of ignorance or design. Our correspondent, smarting under the effects, may be warped in his feelings toward the prescriber. With this we have nothing to do, but may embrace the occasion to offer to our readers, who are not posted in such matters, a caution, that any organic substance, having a large equivalent of loosely combined elements, like sugar, tannin, several of the glucosides, and other neutral bodies, should always be mechanically united with chlorate of potassa with great caution, and the chlorate should be powdered alone and then mixed with the other ingredients, separately powdered, on paper. Physicians, where they require such mixtures, and themselves are aware of the danger, are not without culpability if they prescribe at random, without due precaution, on the presumption that every dispenser is a thorough chemist. If, as is more frequently the case, they prescribe in ignorance of the incompatible character of the ingredients, they, of course, are not to blame. When such ingredients can be mixed without damage, every apothecary ought to be able to do it, yet ignorance of particular reactions, in such a case should not necessarily be considered unjustifiable ignorance. We have had this accident to occur under our own supervision, but the operator being aware of the liability, used precautions that enabled him to escape uninjured."

Liquid Glue.

The preparation of liquid glue is based upon the property of the concentrated acid of vinegar and diluted nitric acid to dissolve the gelatin without destroying its cohesive qualities. Dumoulin has given the following recipe. He prepares his "liquid and unalterable glue" by dissolving one pound of the best glue in a pint of water, and then gradually adding three and a half ounces of nitric acid of 36° Baumé. Effervescence takes place under generation of nitrous gas. When all the acid has been added, the liquid is allowed to cool.

Von Fehling has analyzed various kinds of liquid glue, the better kinds of which only became liquid by placing the bottles in tepid water; the more inferior kinds, however, were liquid at the ordinary temperature.

Russian glue—white, opaque, and solid at the common temperature—was found to consist of 35·6 per cent of dry glue; 4·1 per cent of sulphate of lead; 1·4 per cent of hydrated nitric acid; 58·9 per cent of water. Total 100 parts.

It may be prepared by softening one hundred parts of the best glue in one hundred parts of warm water, and then adding slowly from five and a half to six parts of aqua fortis, and finally six parts of powdered sulphate of lead. The latter is used in order to impart to it a white color.

Pale "steam glue" consists of 27 per cent of dry glue; 1·9 per cent of sulphate of lead; 2·5 per cent of hydrated nitric acid; 68·6 per cent of water. Total, 100 parts. It is prepared by dissolving one hundred parts of glue in double its weight of water, and adding twelve parts of aqua fortis.

Dark "steam glue" contained 35·5 per cent of dry glue; 3·5 per cent of hydrated nitric acid; 61 per cent of water, and can be obtained from one hundred parts of glue, one hundred and forty parts water, and sixteen parts of aqua fortis. This liquid glue exhibits a greater cohesive force than that prepared after Dumoulin's recipe. However, still better kinds of liquid glue or mucilage are obtained by dissolving gelatin or dextrin in acetic acid and alcohol.

MUCILAGE FOR LABELS.—Macerate five parts of good glue in eighteen to twenty parts of water for a day, and to the liquid add nine parts of rock candy and three parts of gum arabic. The mixture can be brushed upon paper while lukewarm; it keeps well, does not stick together, and when moistened adheres firmly to bottles. For the labels of soda or seltzer water bottles it is well to prepare a paste of good rye flour and glue to which linseed oil varnish and turpentine have been added in the proportion of half an ounce of each to the pound. Labels prepared in the latter way do not fall off in damp cellars.

The Aero-steam Engine.

We illustrate herewith, from *Engineering*, the arrangements of boiler and air-heating pipe used in connection with Mr. George Warsop's aero-steam engine now being worked at Nottingham, and which was described in the paper read by Mr. Richard Eaton, before the British Association at Exeter, the middle of August, a review of which will be found in another column.

The pipe, A, through which the air is forced into the boiler by the action of the air pump is of iron and is 1 1/16 inches in diameter outside and 1¼-inch bore. On leaving the pump the pipe is first led to the heater, B, shown on the left of the engraving, wherein it is exposed to the exhaust steam. The heater consists, as will be seen, of a cast-iron cylindrical vessel placed in a vertical position and provided with two branches—one near the bottom and the other near the top—through which the exhaust steam respectively enters and escapes from the casing. At the top of the heater is placed a small cylindrical tank, D, exposed at the bottom and sides to the exhaust steam, and perforated around the upper part of the sides, so that in the event of its receiving an excess of water the latter may overflow and fall to the bottom of the heater. Through a stuffing box at the bottom of the tank there passes a tube with a rose, E, at the lower end, this tube being carried by a float, F, which swims in the water at the bottom of the heater, as shown, and, by means of a cord passing from the top of the tube, works a cock, G, which regulates the supply of water to the tank at the top of the heater. The action of this heater will be readily understood without further explanation, and we need merely add that it furnishes a steady supply of hot feed water at a temperature of from about 195° to 200°.

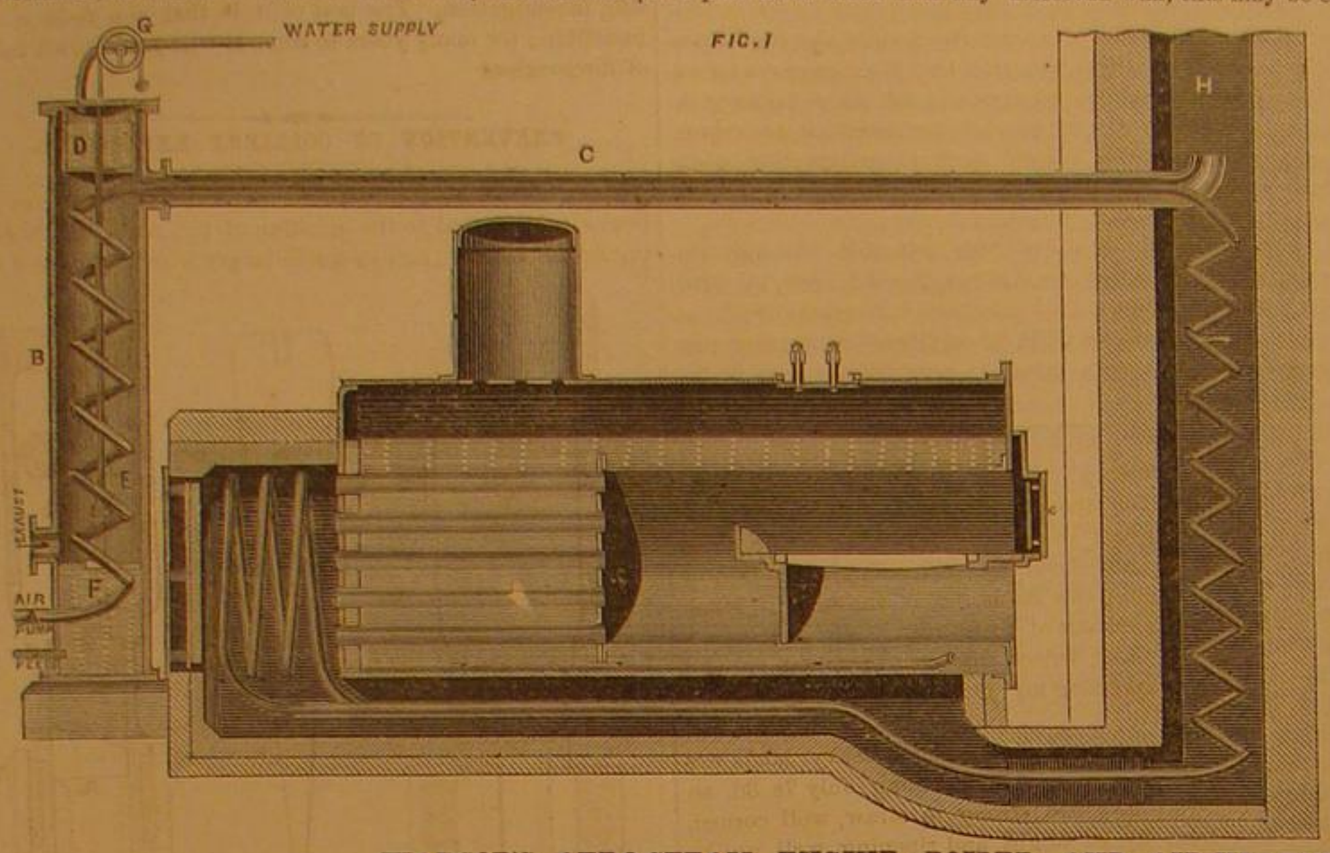
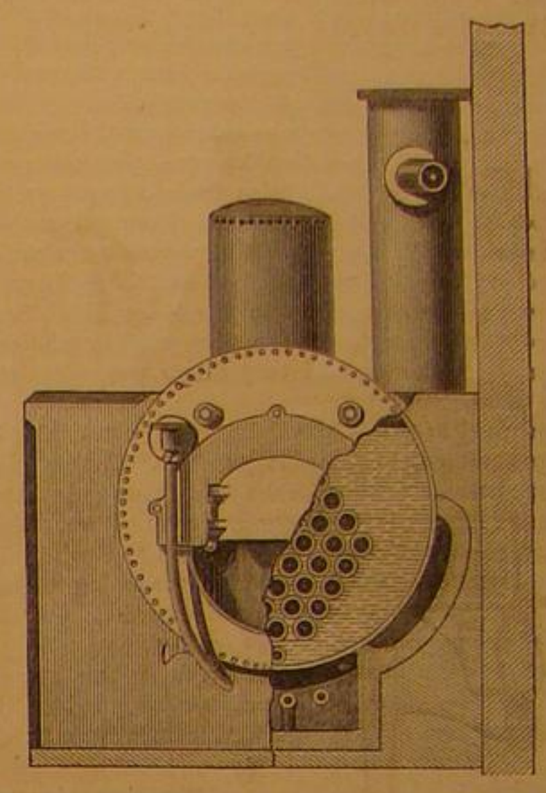


FIG. 1



WARSOP'S AERO-STEAM ENGINE---BOILER AND AIR-HEATING ARRANGEMENT

The air pipe, A, after leaving the heater just described, passes along the exhaust pipe, C, to the chimney, H, and descending the latter spirally, as shown, passes into the flue beneath the boiler. Here it is led backward and forward, as shown in the plan, and after making several convolutions in the smoke box, is led back to the front of the boiler, where it communicates with a valve box, H (Fig. 2), containing an ordinary light clack valve. The object of this valve is to prevent water from entering the air pipe when the engine is stopped. From the valve box a pipe, J, is led down within the boiler to the bottom of the latter, this pipe being perforated at intervals on the upper side. The perforations are placed closer together at the further end of the pipe than they are at the end at which the air enters, and by this means an equable distribution of the air at the different parts of the boiler is insured.

The lengths of the various portions of the air pipe are as follows: In feed-water heater 12 feet; in exhaust pipe 13 feet 6 inches; in chimney and flues, including coils in smoke box and under boiler, 58 feet; total, 83 feet 6 inches. The total external surface exposed by this pipe is thus about 36¾ square feet.

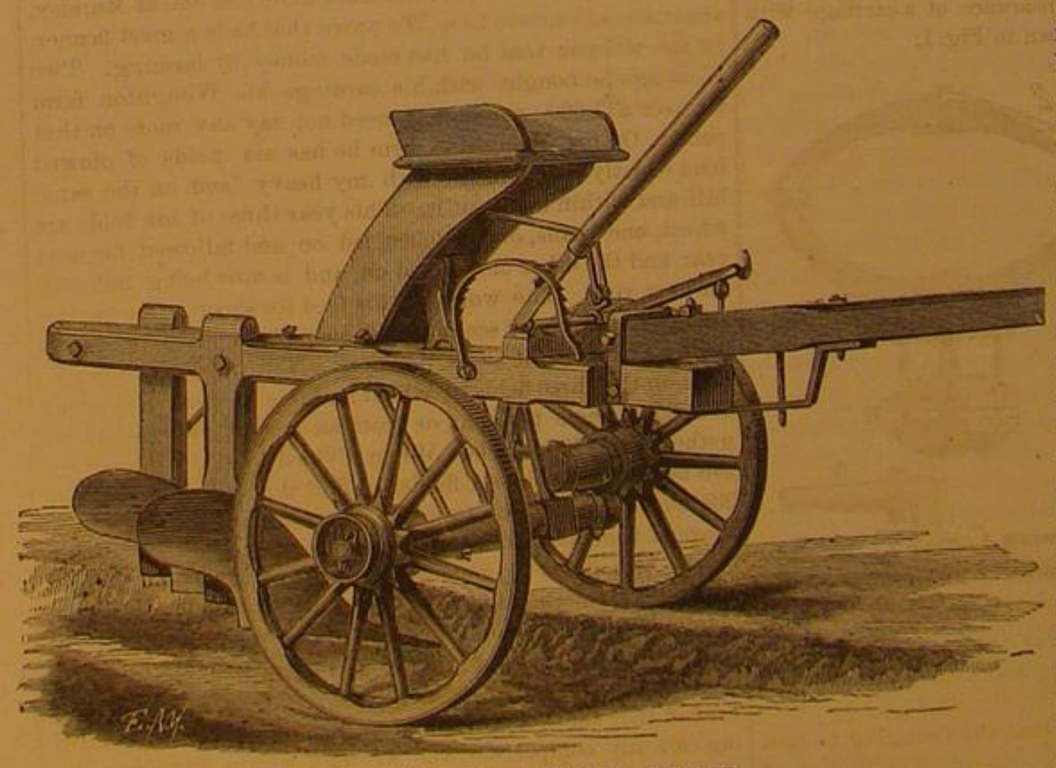
The principal dimensions of the boiler are as follows: Length 8 feet; diameter of shell 3 feet 6 inches; diameter of fire-box flue 2 feet 2 inches; length of fire-box and combustion chamber 5 feet; and length of tubes 3 feet. The tubes are 41 in number, most of them being 2⅜ inches, and some of them 2 5/16 inches diameter. The total effective heating surface exposed by the boiler is about 130 square feet.

Testing Bees'-Wax.

It appears that both yellow and white bees'-wax is met with in the trade largely adulterated with paraffine. In order to detect this, the following process is recommended by the *Chemical News*: 2 grms. of the wax to be experimented upon are placed in a test tube; and there is added a solution consisting of 1·5 grms. of solid caustic potassa in about 5 grms. of distilled water, and the mixture boiled, care being taken to shake the test tube now and then, whereby a thorough though not quite clear mixture is produced. When the fluid has cooled so far down as nearly to reach the point of solidification of the wax, from 6 to 8 grms. of light oil of petroleum is gradually added, and this thoroughly incorporated with the entire mass, so as to form an emulsion, from which, if well made, the light oil does not separate. Next, an excess of an aqueous solution of acetate of lead is added, which is mixed with the mass by stirring with a glass rod. The addition of this lead salt causes the separation of the light oil of petroleum, and in it will be dissolved any paraffine present in the wax. The same operation is twice repeated with the contents of the test tube, that is to say, petroleum is again and again added, and allowed to separate; the separated petroleum is placed into a retort, and the light oil removed by distillation. Pure yellow wax loses, by this process, from 14 to 16 per cent; but wax has been met with which lost 57 per cent in weight; the specific gravity of the residue of adulterated wax was 0·88. When it is desired to obtain the paraffine in a pure state freed from any dissolved wax, this may be effected by cautiously decomposing the wax supposed to be adulterated with paraffine, by means of fuming sulphuric acid, which does not affect paraffine.

Improvement in Truck Plows.

The object of this invention is to provide improvements in trucks of truck plows calculated to facilitate the management of the plows connected with them, in guiding and adjusting them so as to take more or less land, and also not only to regulate the depth of the furrow, but to enable the plows to be elevated entirely out of the ground when desired: also to enable the body of the truck to be leveled either when both wheels are running on the surface in making the first furrow, or in the subsequent running of one of the wheels in the furrow.



MICKELSON'S TRUCK PLOW.

The engraving is a perspective view of this plow from the mold board side.

The tongue is pivoted to the body of the truck by a vertical bolt, and extends rearward into a yoke, having set screws through the sides for swinging up against the sides to hold the tongue at any required angle to the body, so that the lateral draft of the plow may be governed in cutting wide or narrow furrows. These set screws hold the tongue rigidly in the position to which it is adjusted.

Another set screw regulates the hight of the front end of the tongue. The axle is made in two parts, hinged together, so that one part may, so to speak, roll around the other, and bring the parts supported to the same position of level when both wheels rest on the same plane, as when one of them is in the furrow. This movement is accomplished by a lever which is firmly attached to the inner of the two pintles which form the hinge uniting the two parts of the axle. This lever being depressed, the change in position is accomplished and maintained as long as desired by means of a hook which keeps the lever depressed.

The elevation of the plows, to adjust the depth of furrow, is provided for, by attaching the body of the truck to the axle by means of a rod bent so as to form a double link; the ends being connected with the axle, and the portion between the two arms of the link fitting in bearings to the rear and above the axle.

When these arms are made to approach the perpendicular over the axle, the body of the truck is raised, and of course the plows are raised with it. This movement is accomplished by means of a hand and a foot lever both attached to a rock-shaft, which by means of a third lever and a link, draws the frame forward towards the axle and raises it by the radial motion of the arms of the double link above mentioned. The parts are all strong and the implement is inexpensive to manufacture. Patented through the Scientific American Patent Agency, Aug. 10, 1869, by M. Mickelson, Ashland Mills, Jackson Co., Oregon. Address as above for further information

Mending Cast-iron Vessels in China.

The Chinese have a way of mending cast-iron utensils, says the *Journal of Applied Chemistry*, that is worthy of note. They frequently employ, for cooking purposes, round pots or pans of cast iron. Specimens of these have recently been sent to Dr. Percy, Professor of Metallurgy, at the School of Mines, in London. Such vessels are highly prized by the Chinese, on account of their thinness, as they require very little fuel to heat water to boiling. An attempt to manufacture them in Birmingham did not succeed, as they were too thick. The Chinese pots are very liable to crack and break, in consequence of the thin bottoms, and it is frequently found necessary to have them repaired by wandering mechanics, who carry their whole kit of tools on their backs, and call out as they walk the streets, "Any pots to mend! pots to mend."

These mechanics not only mend cracked wares, but also repair such as have holes an inch square knocked in them. The sides of the hole are filed and cleaned with brick dust, the pot is then inverted over a tripod, so that the hands can have full play upon the outside as well as inside. A crucible not larger than a thimble is taken, and a bit of cast iron put into it, and the iron brought to fusion by a charcoal fire in a furnace not larger than a goblet. The melted iron is poured upon ashes on a piece of felt, and introduced under the pot by the left hand, while it is pressed on the top by the right hand, also protected by felt and ashes. The protruding portions of the iron are filed and polished off, and the vessel is tested to see if it is water tight. The price for the job is from six to eight cents.

THE French Astronomer Royal is wisely making arrangements in good time for observing the transits of Venus, which will take place in the years 1874 and 1882. The event is one of considerable interest and value to scientific men, and it is therefore desirable that it should be viewed from those parts of the earth's surface where it can be best observed. The stations fixed upon for 1874 are Oahu (one of the Sandwitch Islands), Kerguelen Island (in the Indian Ocean), Rodriguez (a dependency of the Mauritius), Auckland (New Zealand), and Alexandria. Both the Admiralty and the Treasury have responded with alacrity to the appeal which has been made to them for funds. Mr. Warren De la Rue is of opinion that photography may be used with the utmost advantage in registering the transit.

JACKSON'S PATENT OSCILLATING WAGON.

We not long since hazarded the opinion that there was great room for improvement in all sorts of draft vehicles, and the prediction that ere long such improvements would be at least attempted.

We now present to our readers an improvement which appears to us of value, and is equally applicable, in principle at least, to any kind of draft vehicle. Its application to horse cars, provided no insuperable practical difficulty should be met with in the attempt, would greatly lighten the severe labor of starting the cars, and thus relieve the much overtasked horses.

The object of the improvement is to permit a certain amount of motion in the body of the wagon and its load,

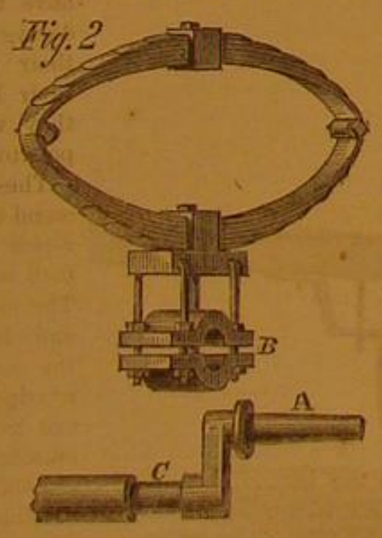
Fig. 1

backward and forward, relatively to the points of the road on which the wheels rest, so as to give greater ease to the horses in drawing and to those riding in it; while, at the same time, it obviates the rigidity of the parts of a wagon constructed in the old style, and thus takes away much of the shock and consequent liability to breakage.

These objects are accomplished by simply giving a crank angle to each end of the axles, and, instead of uniting the springs and boxes to the axles by rigid connections, resting the upper parts on turned journals fitted with boxes, as shown in detail in Fig. 2. The general appearance of a carriage with this improvement attached is shown in Fig. 1.

In Fig. 2, the precise method by which this attachment is made is distinctly shown where the springs are placed at right angles to the axle; but it is necessary to state that the position of the springs may be changed without in any way affecting the principle of the improvement. A is the ordinary journal upon which the wheel runs. B the box attached to the lower part of the spring in the manner shown in the engraving or in any other manner specially applicable to the particular vehicle upon which it is desired to put the improvement; and C the journal working in B.

Fig. 2



At first glance it will be evident that the swinging motion thus secured in the axles, and the consequent oscillation of the body and load, will greatly relieve the structure from the shocks consequent upon the impact of the wheels against obstacles. How it would act to assist the horses in drawing the vehicle may not be so obvious. We will endeavor to make this plain.

The normal position of the cranks of the axles when the vehicle is at rest, is at the lowest point of the arc of oscillation. The draft is applied not to the axle but to the upper spring bar—or where springs are not used—to the parts supported by the box, B, Fig. 2; therefore the moment the horses start, the load is swung forward so that the journals, C, stand forward of the centers of the wheels; the distance to which they will move depending upon the amount of resistance which the wheel has to overcome. Now suppose the wheels to be so "blocked" that a team would be totally unable to start a wagon of ordinary construction, of the same weight and carrying the same load as the wagon under consideration. The team on this wagon is able to move the body and load while the wheels are standing perfectly still. The momentum of this load and the body is added to the strength of the horses when the real tug comes, and the obstacle is at once surmounted.

We are not only sure this is correct in theory, but we have proved it by experiment on the small model from which the acompanying engravings have been executed, by means of a cord and pulley, and observation of the weight necessary to overcome an obstruction, with the axles wired so that they could not oscillate, and also with them free. In the latter case, a given weight will draw the wagon over an obstruction placed a little in front of the wheels, which is wholly unequal to the task when the axles are held rigidly. If the principle is proved sound for large obstructions it must also be true for smaller ones, and therefore we think the inventor justly claims a lighter draft for this wagon than can be obtained with a fixed axle.

Collateral advantages are, diminished noise and the softening of all the motions of the vehicle. For farmers' wagons, trucks, traveling wagons, and specially for all vehicles without springs, we deem this improvement an important advance on the old mode of construction, while to those which employ springs, it will add comfort and durability.

This improvement was patented through the Scientific American Agency, April 6, 1869, by Samuel Jackson, 149 High street, Newark, N. J., at which place he may be addressed for further particulars, and where the improvement may be inspected.

Steam Agriculture.

The following from the letter of a correspondent to an English agricultural paper, is worthy of more than a passing thought. The public does not yet begin to comprehend the part which steam is now performing in the industries of the world. Much less the magnitude of its future.

"It is a fact," writes this correspondent, "that I am now harvesting my *fourteenth crop* under steam culture.

"It is a fact that Nos. 1 and 4 heavy lands are bean-growing on seed beds costing only 7s. 3d. an acre; that they are strong in straw, well corned, free from fly or blight, and ripening well, unlike many a crop now growing upon shallow, horse-worked land, that may be seen to be weak in straw, full of fly, and dying a premature death.

"It is a fact that my Nos. 2 and 3 heavy lands are wheat-growing on seed beds costing only 6s. 9d. an acre; that they are strong in straw, full of corn, and ripen well; together they are the best I ever had on this land in my life.

"It is a fact that these four fields will give me an average of full 40 bushels per acre, and it is a fact that under horse culture (having a dead fallow every fourth year) they did not average over 20 bushels per acre, one year with another.

"The next fact to be looked to is, what do our best farmers on such soils get now-a-days under horse culture? Mr. Whitworth, of Willen, a mile from here, is a good farmer under horse culture. He occupies three farms—one where he lives, one at Woughton, only a mile from here, and one at Mursley, about six miles frem here. To prove that he is a good farmer, let me tell you that he has made money by farming. Two years ago he bought with his earnings his Woughton farm for over £11,000; therefore I need not say any more on that point. On his Woughton farm he has six fields of plowed land exactly in character with my heavy land, on the same hill, and within a mile of it. This year three of his fields are wheat, one beans, one vetches, fed on and fallowed for next year, and the other clover, fed on, and is now being fallowed for next year. The worth of this feed for sheep, after paying all the expenses for seeding and shepherding, is but a mere trifle; I estimate it at 5s. per acre. Now, then, for the produce on the three fields of wheat and one of beans; it is not over 35 bushels per acre, or from an acre of each added together only 140 bushels. When divided by six, to spread the 140 bushels over the six fields, we find the average to be only 23⅓ bushels per acre; to which must be added 1s. 6d. as a share of the value after payment of expenses, for sheep-keep on the two fields of vetches and clover. I do not ask Mr. Whitworth's permission to make this statement, but I state it openly and fearlessly on behalf of steam culture against the best horse culture. Let him or any other man pull me back in the correctness of it if he can. I know that it is true, and I mean that the world shall know it. Had I taken bad farming for my comparison, the average would have been less than 23⅓ bushels, with 1s. 6d. for sheep-keep to be added per acre, against my 40 bushels per acre.

"I ask you to publish these few facts to help me to open the eyes of the landlords and farmers of England as to the use and value of steam power to culture, and in addition to what I have stated above, I will state here that my light land crops are excellent, without troubling you with particulars.

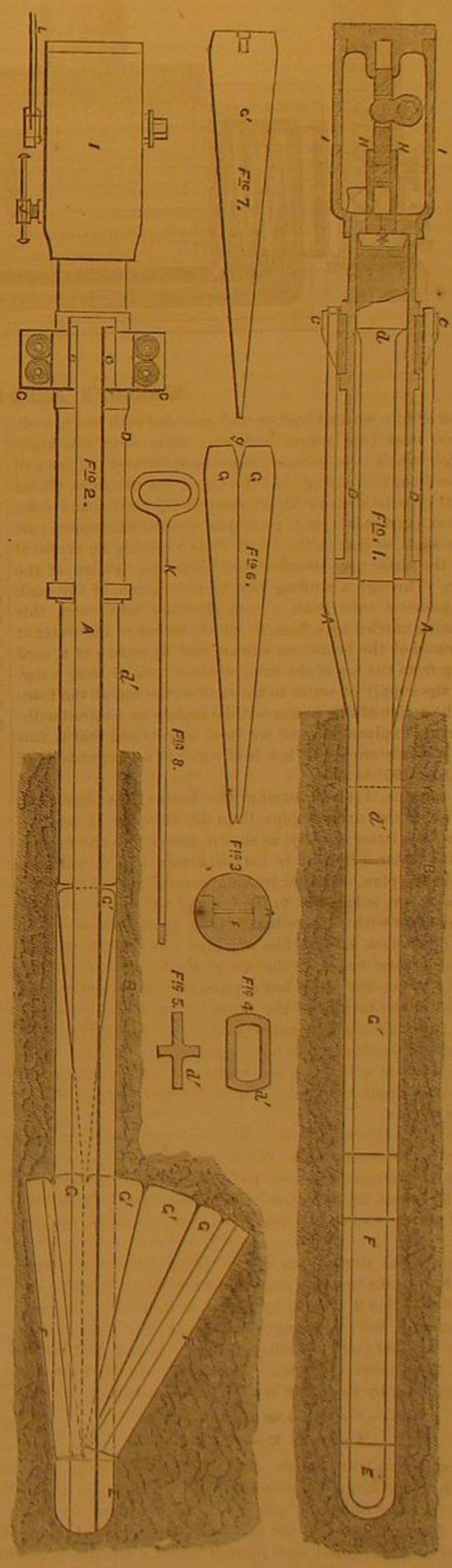
"I might have stated another fact, that this heavy land of mine always needed four good horses to plow it from 5 to 6 inches deep, which cost fully 14s. per acre; whereas by steam power I can now make an average seed bed for 7s. an acre year after year, and keep my land clean for corn crops every year."

Newest Coloring Matters.

A lecture has been given by Mr. W. H. Perkin, at the Royal Institution, "On the Newest Coloring Matters." Among the many interesting facts then put forward was the discovery of a beautiful blue color, by a German chemist, on treating rosaline with sulphuric acid. Unfortunately, it was not a "fast color." A dyer made many trials therewith, in the hope of turning it to account, but all in vain. He happened to mention his difficulty to a photographer, who, knowing that hyposulphite of sodium would fix a photograph, recommended the dyer to try that. The trial was made; when mixed with the hyposulphite, the blue became a beautiful green, and, better still, a "fast color." This was the origin of that brilliant dye commonly known as "Night green," because of its remaining unmistakably green in appearance when seen by artificial light. Let it be remembered that nearly all the new colors are extracted in some way from coal tar, that the first was discovered not more than thirteen years ago, and that the annual value now manufactured is £1,250,000, and it will be seen that in the industry created by these new products there is an admirable example of the results of scientific investigation. The best of it is that the field is inexhaustible; for many years to come it will yield a rich harvest of discoveries.

PREVENTION OF COLLIERY EXPLOSIONS.

Many of the most calamitous explosions in collieries have been clearly traced to the ignition of the fire-damp through the firing of shots; and in a still larger number of cases there has been much presumptive evidence of the same cause having existed, although absolute proof was wanting.



The *Mining Journal* of London, from which we extract the substance of the present article, refers, as a corroboration of this statement, to the Edmunds Main Colliery explosion, which, it will be recollected, resulted in the loss of 60 lives, and which actually occurred through the blasting operations; and at the Oaks colliery, only a few miles from it, where some 324 were killed, and in regard to which little doubt is entertained by practical men that it was to the firing of the

shot at the steps to the back workings, that the fearful casualty was due. Now, that the use of gunpowder does very much facilitate mining operations, is beyond question—the power is easily applied in the desired position, and the amount of work done with a given expenditure of manual labor is sufficiently large to satisfy the workmen. But, valuable as blasting agents are, in ordinary cases, it can be readily understood that, to explode gunpowder in the immediate neighborhood of so explosive a gas as that of fire-damp is, to say the least, anything but a safe operation, more especially when conducted, as it is in coal mining, in a comparatively small and inclosed area, from which escape is practically impossible. It cannot, therefore, be surprising that the desirability of abolishing the use of gunpowder in coal mining should have been acknowledged, or that so competent an authority as Mr. Geo. Elliot, M. P., for Durham, in his excellent address to the North of England Institute of Mining Engineers, should have pointed to the discovery of a means of superseding gunpowder in collieries as one of the most important that could be made.

Messrs. Jones and Bidder, of England, have made an invention, illustrated in the accompanying engraving, intended for breaking down coal, slate, and other minerals, without the use of powder. Instead of the usual blast, two or more wedges are caused to be driven consecutively by hydraulic or screw power between the surfaces of the substances to be broken down. The arrangement of apparatus for this purpose may be variously modified, but by preference they employ apparatus constructed as follows: Two tension-bars or rods, either formed of two separate pieces or of one looped piece, are inserted into the hole cut in the coal or other substance, the outer ends of which bars are connected to the cylinder of a hydraulic ram or press, or to the framing, or screwed nut or boss carrying a screw spindle. Between the tension-bars, at their innermost end, is placed a clearance-box, and then two metal pressing blocks, between which is afterwards forced first a single wedge by the action of the ram of the hydraulic press, or of the screw spindle; the ram or screw spindle is then withdrawn, and a second wedge is inserted, either between the one side of the first wedge and that of one of the pressing blocks, or the first wedge may be made as a split wedge, and the second wedge be driven between the two parts thereof. If requisite, a third wedge may, in like manner, be driven in, and so on until a sufficient wedging action is obtained to effect the breaking down of the mass desired to be removed. The wedges and pressing blocks may be formed either so as to cause the pressing blocks while expanding to retain at first a position parallel to each other by making these with inner inclined surfaces, similar to the inclined surfaces of the wedges, or they may be arranged so as to form from the commencement a gradually increasing angle with each other. The wedges can pass beyond the pressing blocks and into the clearance box, which thus allows them to impart a greater lateral motion to the pressing blocks than would be the case were the clearance box not employed; it may, however, in some cases be dispensed with when no great lateral motion is required. The ends of the tension bars are by preference made detachable from the hydraulic press for introducing the wedges consecutively. When the apparatus is worked by hydraulic power they prefer to construct the hydraulic press with the force-pump formed in one therewith or fixed directly thereto, and it may be constructed either with a closed receptacle containing the requisite charge of water for working it, or the water may be supplied through a suction pipe from a separate reservoir. This arrangement of apparatus may also be employed in some cases with effect with one wedge only, as by forming the pressing blocks parallel—that is, without inclined surfaces corresponding to those of the wedge, as heretofore proposed—they are enabled to obtain an expansion equal to the entire thickness of the wedge, instead of equal only to a small portion thereof, as would otherwise be the case.

The advantages claimed for the improved apparatus, in addition to the absence of the noxious vapors in the mine and the danger resulting from the use of blasting powder are—first, a great saving in the time employed in effecting the breaking down of the coal or other material, owing to the almost unlimited power which is available by their system, enabling them to break down at one operation far greater masses than can be effected by blasting; and, secondly, the avoidance of the great deterioration of the coal or other mineral which takes place when blasting powder is used, owing to the large quantities of small fragments or "slack" which are produced thereby.

In the annexed diagrams, Fig. 1 shows a part sectional side elevation of the apparatus; Fig. 2 shows a plan of the same; and Figs. 3 to 8 show details to an enlarged scale. Similar letters of reference indicate similar parts in each of the figures. A A are the tension bars of wrought iron, steel, or other metal capable of withstanding considerable tensional strain. These bars may either be formed of one piece bent round at *a* so as to form a loop, or they may be two separate bars connected together at *a*. These bars are inserted into a hole cut in the coal or other mineral, B, to be broken down in the manner shown, the ends thereof, which project beyond the face of the mineral, being widened out for the reception of the cylinder, D, of the hydraulic press between them, to which they are connected by T-heads formed at their extremities, being made to catch against lugs, *c c*, on a collar, C, secured to the cylinder. Before the tension bars are placed in the hole a clearance box, E, is first placed between them at the extreme end of the loop, after which the two pressing blocks, F F, are inserted, the sectional form of which blocks is shown more clearly at the enlarged section of Fig. 3; lastly, the two wedges, or the double or split wedge, G G, shown enlarged at Fig. 6, are introduced between the bars, A A, so that their points just enter the small interstice between the pressing blocks. The parts A, E, F, and G thus put together are then inserted into the hole in the material, B, and the hydraulic press, D, is connected to the bars, A A, as above described. The press, D, has a plunger, d d^1, the front part, d^1, of which projects between the tension bars, A A, as shown, and is formed either as shown in enlarged cross section at Fig. 4, or as at Fig. 5. To the back end of the press, D, is fixed the pump, H, worked by means of the handle, L, and inclosed in the reservoir, I, containing the water required for working the press.

The press being put in action the plunger forces the double wedge G forward between the pressing blocks, F, thereby forcing these asunder in an angular direction, and, consequently, causing them to exert a powerful bursting strain upon the sides of the hole. By forming the inner surfaces of the pressing blocks inclined, corresponding more or less with the taper of the wedge, this first expansion of the blocks may be effected in a more or less parallel direction instead of angular. The object of the clearance box is to allow of the points of the wedges being driven past the inner ends of the pressing blocks, so as to effect an increased expansion of these ends; where this is not required the clearance box may be dispensed with. The double wedge, G, having been driven into the required extent, the press is detached from the tension bars, A A, which is effected by first opening a passage of communication between the reservoir, I, and cylinder, D, by means of the screw, J, so as to allow the water to flow from the latter back into the former, after which the press is pushed forward slightly, so as to release the T-heads of the tension bars from the lugs, *c*, whereupon the tension bars are sprung open and the press removed. Another wedge, G^1, shown enlarged at Fig. 7, is now placed between the tension-bars, A A, so that its point fits into the space, *g* (Fig. 6), formed between the two parts of the double wedge, G. To facilitate the correct insertion of the wedge, for this purpose a handle, K (Fig. 8) is screwed into the rear end thereof, which is removed when the wedge is in position. The press is then again attached to the tension bars, and the wedge, G^1, is forced in between the two parts of the double wedge, thereby effecting a still greater expansion of the pressing blocks; and in like manner one or more other wedges may be consecutively forced in, as indicated at Figure 2, until the accumulated pressure thus produced is sufficient to break down the mass of coal or other material operated upon.

The invention can also be modified so as to employ screw instead of hydraulic power. The arrangement of the tension bars and pressing blocks is similar to that used with hydraulic power; but the hydraulic press is replaced by a frame wherein is a slot with a worm wheel in it, fitting with a female screw thread upon a screw spindle formed with flat upper and lower surfaces, and passing through correspondingly-formed holes in the bosses of the frame, so that it can move through but cannot turn in the latter. In gear with the wormwheel is the worm, the spindle of which is carried by brackets on the frame, the ends of the spindle being formed to receive a ratchet lever for rotating the same. The ends of the tension-bars are formed with lugs, which catch behind keys bearing against other lugs formed on the frame, so that the frame is by this means connected to and disconnected from the frame by merely inserting the keys, and without having to spring open the tension bars. As the projecting ends of the tension bar may thus be made considerably shorter than in the previously-described arrangement, this mode of connecting the tension bars might with advantage be employed in that case also. By rotating the worm wheel by means of the worm the screw spindle is advanced, and is caused to force the wedge between the pressing blocks, as in the hydraulic arrangement.

Messrs. Jones and Bidder do not limit themselves to the precise details described, as these may, of course, be variously modified without departing from the nature of the invention. Thus, for instance, where only one wedge requires to be driven in, the arrangement may be reversed—that is, the wedge may be placed at the inner end of the tension bars, with its point facing the pressing blocks situated at the front end, and which are then forced in by the press so as to cause the wedge to enter between them, or the wedge might, in that case, be drawn forward by the press against the pressing blocks; but what they specially claim is—first, the construction and employment of apparatus for breaking down coal, slate, stone, and other minerals, wherein two or more wedges are caused to be driven consecutively by hydraulic or screw power between the surfaces of the material to be broken down, in such manner that the pressure exerted at one and the same point can thereby be increased at will; and, secondly, the arrangement of tension bars connected in a readily detachable manner to an hydraulic press or frame carrying a screw spindle, operating in combination with pressing blocks and one or more wedges.

Singular Case of Poisoning by a Fly.

We learn from the Troy *Press* that Captain Green, of that city, Deputy Inspector of Boilers and Assistant Engineer of the Fire Department, about a fortnight since (August 25), was bitten by a common horse fly, which had been feeding on carrion, and had communicated the poison. The wound was on his right hand, between the thumb and index finger, and he soon experienced considerable pain, which gradually increased. The bite was at first supposed to be from a mosquito, and treated accordingly by a druggist, and afterwards by a physician. The pain and swelling continued to increase, and erysipelas setting in, a surgeon was consulted and pronounced it a bite by a fly. Medical treatment has succeeded in placing Mr. Green out of danger, but it will be a long time before he can recover the use of his arm.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

The Oldest Circular Saw.

MESSRS. EDITORS:—I noticed in your valuable paper of September 11th an article entitled, "First Circular Saw," by Lemuel Read.

I have a circular saw in my possession which I obtained in the year 1827, and have kept it on account of its antiquity, as I was informed that it was the first circular saw ever forged in America. It was made in the year 1792 by Benjamin Bruce, of New Lebanon, N. Y. It is 12¼ inches in diameter, and very different from saws in use at the present time, having an eye in the center 1¼ inch square and six slots in the plate to keep the saw from heating when at work, thus the teeth are three to one inch, and filed about the same angle as a common hand saw. I am informed by an aged person, now living, that he came here in the year 1806, and there was at that time a circular saw in use for edging boards and sawing rims for spinning wheels, and had been in operation 3 or 4 years.

The idea of a circular saw for cutting boards was taken from a small saw first made of tin and used in a turning lathe by Amos Jewett, of New Lebanon, N. Y., a clock-maker; and he made use of it in cutting the teeth of wheels, which were V-shaped, for his clocks. I have conversed with him in my younger days upon the subject, but never ascertained the time to date his first experiment with circular saws. We have a large building standing in our village of which the covering and floors were edged and matched with circular saws in the year 1815 or 1816. So I think friend Read is not at the top in antiquity. GEO. M. WICKERSHAM.

Shaker Village, New Lebanon, N. Y.

[We remember to have seen and examined the Bruce saw a few years ago, when visiting the Shakers at New Lebanon. Friend Wickersham then called our attention to it as being probably the oldest circular saw in the country. If any of our readers can refer to one of earlier date we hope they will write us the particulars.—EDS.

Curious Antique Astronomical Watch.

MESSRS EDITORS:—The very interesting account in your paper of 21st August of the great astronomical clock of the Beauvais Cathedral, and also of the Strasbourg Cathedral clock, reminds me of an astronomical watch that I often delight to look at, which is no less remarkable in its way. A short review of its performances may interest your thousands of readers, as it is a curiosity of science and mechanism.

It is not one of those mere mechanical toys contrived to amuse the monarchs and other grown-up children of luxury of a century or two back, which, besides keeping incorrect time, when running at all, could be made (by touching certain springs or otherwise) to strike a bell or play a few bars of music, or display soldiers moving past a window in its face. On the contrary, this elegant watch, made in the highest finish and good taste, and without a tawdry ornament, is a perfectly reliable time-piece. It performs all its movements with the most accurate punctuality, showing the exact time of day, the hour, minute, and second, the month, the day of the month and of the week, the age of the moon, the moon's phases, the zodiacal and planetary phenomena of the present time, etc

In outward appearance, it is a plain gold watch, with two enameled faces protected by crystals. Each face, with its own features, will be described separately. Its size is two and three eighths inches in diameter and about five eighths of an inch in thickness.

The principal face exhibits three dials, two smaller ones occupying opposite positions in the upper and lower halves of the greater dial. Above this face on the rim of the case, is the legend, in Roman capitals, "INCERTA EST HORA, AETERNA RESPICE," which may be rendered, *The hour is uncertain—look at things eternal.*

The outside edge of this face contains a circle divided into seconds, and traversed by an independent second hand once in every minute; while balanced on the same central point is another similar delicate hand which makes its circuit only once in two years! one end pointing to the months, the other to the twelve signs of the zodiac corresponding with each month in the year. The figures representing these signs are most exquisitely done in miniature, in black on the fine white enamel face, as is also the lettering of the names, in French, of the months.

The divisions and subdivisions of this and every other dial are spaced with geometrical precision, and the works perform their part so accurately that the point of each one of the twelve hands of this watch arrives at the proper instant exactly on or over its marked position, a proof of the superiority of the workmanship.

The upper small dial on this face has three hands pointing severally to the day of the month and the days of the week, in French, and their corresponding celestial bodies in the following order: The sun, the moon; the planets Mars, Mercury, Jupiter, Venus, and Saturn. The lower small dial on this face shows the hours and minutes in the usual manner of watches. Below this face, on the rim of the case, is the inscription, *Tempus rerum imperator*—"Time, the ruler of all things."

The opposite face of this superb watch presents the same general arrangement of three dials, but the larger dial is also divided into equal upper and lower parts, the latter

enameled in black to represent night, with the moon, stars, etc. This dial is figured differently from modern dials, having 24 hours, 12 for the day and 12 for the night, with the subdivisions and hour and minute hands accordingly. On the case around the lower and dark half of this dial is the inscription, *Sapiens insipientibus sicut luna in nocte*—"The wise man to the ignorant is as the moon to the night." On the case around the upper half of the dial is engraved, in Italian, *Non ci son tenebre per chi creo la luce*—"There is no darkness for Him who created the light."

In the dark half of this dial is a smaller dial with hands showing the age of the moon, the moon's phases, and the day of the lunar month. The small dial in the upper half of this face has an index gage and pointing hand for regulating the grand movement, which controls the entire twelve hands and movements. Being also wound up as well as regulated from the outside, the works within are permanently closed from dust as well as excluded from prying and meddlesome curiosity, to which precaution we attribute its present perfect condition, being more than two hundred years old. The durability of watches when well made is very remarkable.

This valuable, complicated, and beautiful piece of mechanism is in perfect running order, and performs with astonishing precision in all its movements. It is a French watch, made by Robert et Courvoisier. It must have occupied many months, perhaps years, of time and labor in its construction, and though it is small and handy enough to be carried in the rich man's pocket, it is well worthy a high place in the cabinet of the gems of science and art. It is now the property of Mr. F. W. Chamberlain, 233 Hanover street, Boston.

F. H. F.

Steam and Hot-Water Pipes.

MESSRS. EDITORS:—In an article on the causes of fires in manufacturing establishments from steam pipes, etc., in your paper of the 4th inst., I notice the terms steam and hot-water pipes, are so commingled that one would suppose that they were so nearly alike as to produce the same results, the only real difference being a few degrees in temperature.

In a steam heater a portion of the water (at least that in the pipes) is converted into *steam* before the fixture operates, while a hot-water heater, properly constructed, is simply a circulation of water, filling boiler and radiators, warmed, but never reaching so high a temperature as to form steam, and working with the same pressure that is sustained by the lead pipes of the plumbing fixtures in our houses, consequently no more liable to explosion, and limited to a temperature of 200° at the boiler there is about as much danger of a plumbing job setting the house on fire as from a properly-constructed hot-water fixture.

My impression is, that in all the cases where hot-water pipes have been reported as producing the effects described they were in reality steam pipes.

To save the material requisite in the radiators for heating at a very low temperature is the inducement to use steam. If specifications for constructing hot-water heaters required that the requisite heat in the rooms warmed, say 70°, should be produced with not exceeding 200° at the boiler, there would be no such chemical action as Mr. Braidwood describes, or consequent danger from fire, not to mention the superior quality of heat obtained from surfaces at such low temperatures.

A SUBSCRIBER.

Baltimore, Md.

New Wall Covering.

MESSRS. EDITORS:—In the concluding remarks of Mr. Wight's paper on "Fire-proof Construction" in your issue of the 28th ult., the following remarks occur: "The stone slabs of Mr. Eidlitz are the only rigid material thus far used successfully with iron beams—they are doubtless the handsomest material that can be used for that purpose, but are open to the objection of being heavy and expensive"—it will be pertinent to our inquiry, therefore, to ask if there are any other rigid materials adaptable to this purpose, and possessing the desired qualities of lightness and cheapness. Further on, he remarks that "the cheapest material for wall covering in natural materials would be slabs of white marble, which would cost $1·50 per foot, and three coat plastering laid on iron lath $1·34 per foot." I would inform Mr. Wight that there is in use by the architects of the Southwest, a composition called by the inventor Lithomailite, produced by a method of hardening and marbleizing plaster of Paris, and giving it a high and durable polish. This, I think, is the desideratum in fire-proof buildings, with the material advantage over marble slabs and plastering, that it does not cost over one seventh the price of either of the above styles of finish. It can be put on walls or ceilings in ashlers to suit, at twenty cents per foot. An office 20x40—16 feet high, finished with marble slabs would cost for the walls alone $2,886, while both ceiling and walls could be finished in Lithomailite for $544. The imitations of precious marbles in it are inimitable. It is hard enough to shiver a door knob or key when slammed against it. It has the hearty indorsement of the leading architects of the South, and is the strongest and most elegant substitute for plastering that I have seen in a building during an experience of over thirty years.

G. W. LINCOLN.

Memphis, Tenn.

Explanation of a Curious Phenomenon.

MESSRS. EDITORS:—You are herewith offered an explanation of your "Curious Phenomenon," published a few weeks ago.

Subject: Jar cracked across the bottom. Jar leaks on hard, unpainted surface; is tight on painted surface.

A painted surface is tenacious; oil makes it more so. An unpainted surface is not tenacious; oil makes it less so. The former holds the jar together. The latter offered no resistance to the outward expansion of the bottom of the jar (caused by its own weight) and consequent opening of the crack.

Z.

Pittsburgh, Pa.

A Night Gun-Sight Wanted.

MESSRS. EDITORS:—Could not some one invent a contrivance for illuminating the sights of guns and rifles at night, so as to enable to shoot with certainty when dark? Everyone knows what difficulty attends taking aim with rifles when dark. Might it not be done by a small electric spark on each sight, produced by a miniature battery, concealed in the stock of the rifle or gun, and led to the proper place by a thin copper wire, covered with silk thread, and which could be removed or put on at pleasure?

I leave this idea to some inventive genius, and I have no doubt, by producing some simple and easy-managed contrivance, a patentee might make a good thing for himself and earn the thanks of many a sportsman and frontiersman, if not a glorious place in history.

FRONTIER.

New Mexico.

Railway Ties.

MESSRS. EDITORS:—In reading a recent answer to a correspondent in your paper, touching the life of oak railroad ties, stone ties, etc., a few practical thoughts, the result of 14 years' experience, suggested themselves.

The lasting of oak ties depends very much upon the manner of putting them down, and the condition of the wood at the time they are laid. Take a red-oak tie from the stump with all the sap in and it will not last *three years*; but if piled up and well seasoned before laying, it will last six years. The same remarks will apply to white oak.

There is often a great deal of carelessness on the part of the foreman of repairs in this particular.

Speaking of stone ties, I think the day is not far distant when wrought iron stringers will be used, broad on the surface, so as not to sink under pressure, and bolted together. There would be sufficient spring on such ties, and the rails can be thoroughly fastened to them. They would not present the rigidity of stone blocks, or fail in durability.

Belvidere, N. J.

JACOB STONE.

Testimony of an Advertiser.

In a recent issue under the head of "Business Hints," we took occasion to speak of the value of the SCIENTIFIC AMERICAN as an advertising medium. We are frequently receiving evidences of the correctness of our statement from advertising patrons, an example of which we present herewith:

You are following my wishes. You may continue to advertise until I notify to the contrary. I have found during the short time I have had the cupola notice in your paper it has called the attention of iron founders to my improvement, and increased my orders and sales more than all the circulars I have ever sent, and I am compelled to believe and free to admit that the SCIENTIFIC AMERICAN is the best paper for mechanics to advertise in I know of.

ABIEL PEVY.

Lowell, Mass.

(For the Scientific American.)

THE MANUFACTURE OF PLATE GLASS IN ENGLAND AND THE UNITED STATES.

BY THOS. LOCKWOODE.

It is curious to note, that while the glass manufacture in most of its forms has prospered in this country, and factories have multiplied almost without number, yet the manufacture of plate glass has been almost quite left out, and there is at present but one rough plate glass works in operation in the United States, and only one in process of erection.

We propose, therefore, to describe the processes connected with its manufacture in England, hoping that our efforts will be of some use, or, at any rate, will be of interest. There are at present six plate glass factories in England; namely, three at St. Helens, Lancashire—the British plate glass factory at Ravenhead, the Sutton Company, and the Union Company—one at Newcastle-upon-Tyne, one at London, and one at Smethwick, near Birmingham. The British company is the oldest established, having been in successful operation nearly 200 years, the manufacture having been introduced from Venice somewhere in the seventeenth century, and established at Ravenhead shortly after. Three of these British factories melt their "metal" in the Siemens furnace, a process which is also used by the works now in existence in Massachusetts. The process of melting and casting the glass may be familiar to some, but it will be new to most of our readers. The mixture was formerly melted for twenty hours in a pot or crucible, and then ladled out into another vessel called a "cuvette," which was placed by its side in the furnace. But this operation is now dispensed with, and the glass is cast direct from the pot after a melt of from fifteen to twenty hours. A description of one factory will necessarily be a description of all, and therefore we will give an account of the Birmingham factory from personal observations made at that establishment.

The casting house is a building of about one hundred yards long by twenty-five wide. The furnaces are in the center of the building and the annealing ovens are arranged along the whole length of the room on both sides. The pot room, mixing room, and coal sheds, are arranged conveniently around the outside of the building. The mixture being placed in the melting pot, by installments—three fillings being the usual number—is gradually melted down into a homogeneous mass; its perfect fusion is tested by dipping an iron rod into the pot, and drawing a portion of the metal out with it. When the metal is ready for casting, it is allowed to cool down for about an hour. The furnace is then opened and a pair of tongs arranged on wheels, is thrust into the furnace and made to clasp the pot, which is drawn out and placed on a carriage running on a railway to the casting table. The contents are skimmed until all the dross is removed, and the pot is then run up to the side of the table where it is lifted by a crane and tilted over on to the casting table, a large mass of cast iron, about twenty feet long, with side ribs to prevent the metal from flowing off. It is then rolled by a massive iron roller, and as soon as the plate is cool enough to admit of its being moved without crushing it, it is slid off into the annealing oven, which is just on the other side of the table. The table is also on rails, so as to admit of being moved from one oven to another. The plates, after being placed in the annealing ovens, are allowed to stay there, from a week to ten days—the longer the better. When taken out they are either taken to the grinding shed to be submitted to the second process or cut into proper sizes and sent away as rough plate, to be used as skylights, pavement, etc. The plate to be finished for lookingglasses, windows, etc., is then laid on a grinding bench, which may be briefly described as follows: The machinery is nearly all under ground, in a vault, which runs the whole length of the room. The driving shaft from the engine runs in this vault, and is supported by bearings between every bench. This shaft is horizontal and drives a vertical shaft by means of bevel gearing. The upright shaft carries a clutch for the purpose of starting and stopping the machine. The vertical shaft is in the center of the machine, the working part of which is ten feet square, and which has four corner shafts; each of the five shafts has a crank which, in turn, supports and moves a fly, which is literally a square of cast iron having long rods extending from it on both ends, which move with an alternate rectilinear motion, and with a kind of lateral swing at the same time. The glass is laid down and fixed with plaster, on firm stone tables, one on each side of this machine, and these connecting rods move runners over them at a rate of sixty revolutions per minute. The runners are composed of a wooden framework, faced with either iron plates, or with another plate of glass, and sand and water are thrown between the two surfaces by a boy until the whole is sufficiently ground. The Birmingham company have in operation twenty-six grinding machines, which turn out a total weekly product of upwards of twelve hundred feet of glass. It should be stated that after the sand grinding, emery of three different degrees of fineness is used before the plate is taken up. When the glass is fully ground it is raised up and taken to the smoothing shop, where it is smoothed. Formerly this operation was performed entirely by hand, the plates of glass being laid one upon another, having courses of emery running from No. 4 to No. 7 between them, and being plentifully supplied with water. This operation is very similar to grinding, but is a great deal finer and slower. It is now almost universally performed by machinery, the machine being on the same principle as the grinder, but with a speed of only fourteen revolutions a minute, whereas the grinder has sixty. When the glass is smoothed it is taken to the polishing shop, where the finishing process for window plate is given. In the polishing room the glass is again laid on tables and the polishing is performed by means of two bars, which run longitudinally over the glass, carrying blocks which are covered with felt; the table on which the glass is fixed by means of plaster, at the same time traveling, alternately from right to left, and *vice versa*. The glass, during the process, is sprinkled plentifully with a mixture of the red oxide of iron and water until sufficient polish is given, when the plate is taken off and taken to the warehouse, or, if required to be silvered, it is carried to the silvering room, where that process is performed. However, this process is so well known that it is needless to describe it. Large quantities of this glass are sold in the country and much of it is also exported. So much for British plate glass.

We will now turn to the American side and see what is the progress of plate glass there. Some fourteen years ago an attempt was made by a New York company, to commence a factory at Williamsburgh, N. Y., and one or two plates, were really cast, but the enterprise failed. A short time after a couple of window glass blowers and a few capitalists made the attempt at Chelsea, Mass., and shortly after at Lenox, in the same State, still in operation there, and the one alluded to above. It was attended with a large measure of success in the casting of rough plate. Some years ago they commenced experiments with a view to polishing, and a gentleman from Chicopee, in conjunction with some of the stockholders of the company, have patented an invention for that purpose, but from some cause or other they do not seem to be making much progress. Last year they commenced using the gas furnace of Siemens, and are still using it. For a long time the Lenox works was the only establishment of its kind in the United States, but now a rival is to appear on the scene. This is situated at New Albany, Ind., and is owned by Capt. J. B. Ford, a gentleman whose public spirit has done much for that city. He has already set in motion several foundries, glass and other factories, and last winter turned his attention to plate glass. He is about to commence its manufacture on a large scale, and the buildings for that purpose are far advanced towards completion. He expects to make glass by the middle of October. Mr. Bankard, one of the original plate-glass makers of Lenox, has been engaged by Capt. Ford to superintend the making of his glass. Capt. Ford intends to commence polishing immediately, on the European plan, and to effect this has ordered several machines from St. Helens, England, and has the services of an experienced glass polisher from that country. The word fail is not in Capt. Ford's dictionary, and this enterprise cannot fail of success.

As soon as this enterprise gets fully under way the readers of the SCIENTIFIC AMERICAN are promised a detailed account of the establishment.

Improvement in Turbine Water Wheels.

It is a well-known fact that whenever the flow of water through the buckets of a turbine wheel has its velocity diminished by the lowering of the head, a better result is obtained by diminishing the spaces between the buckets.

The writer has often descended, in such an emergency, into the wheel pit to adjust the buckets of one of these wheels which were supplied with movable plates at their outer border, held by set screws; a tedious operation and one requiring great judgment to perform with any approximation to accuracy.

The invention herewith illustrated is intended to furnish a simple and ready means whereby the buckets may be adjusted as the head varies, either while the wheel is in motion or at rest, by hand, or by the action of a regulator.

Fig. 1 is a perspective view of a center discharge wheel with portions of some parts broken away to show better the construction of other parts.

The toothed wheel, A, has a female screw cut through the hub, which plays on the male screw, B, elevating it or permitting it to fall as desired, through an oblong opening in the supporting framework, C. The oblong opening fitting over the oblong shank, D, of the screw, B, prevents its turning on its vertical axis, while it is free to move upward or downward as the wheel, A, is rotated one way or the other.

The head of the screw, B, is a rectangular frame, E, through the lower horizontal part of which an opening admits a shaft, F, which descends through the hollow shaft, G, of the water wheel, to the interior of the water wheel. An upper and an under collar, H and I, are fastened to the shaft, F, by set screws, as shown in the engraving, so that F must obey the motion of the screw, B. The water-wheel shaft, G, rests upon the usual step at the bottom of the wheel.

The lower end of the water-wheel shaft, G, is slotted to permit the passage of horizontal arms, J, attached to an enlarged portion, K, of the shaft, F. The arms, J, with the circular frame, L, and slotted brackets, M, attached to L, rise and fall with the shaft, F, as acted upon by the screw, A. The slotted brackets, M, are inclined to the circular frame, L. In the slots of these brackets (one to each bucket) play pins, N, fastened by a screw bolt to the top edge of the buckets, O. The receiving, or outer ends of these buckets are fixed, being cast with the rim of the wheel; the inner, or discharging ends are movable, being pivoted to the fixed ends of the buckets in the manner of a rule joint.

The operation of the parts is as follows: As the wheel, A, is turned to the left or right, the shaft, F, is lifted or depressed, carrying with it the parts, J, K, L, and the brackets, M. The inclined slots of these brackets act upon the pins, N, and these being attached to the movable inner, or discharging ends of the buckets, open them or close them as desired.

The upper part of the rim is recessed to allow the motion of the pins, and at the same time to allow the top of the bucket to move closely to the rim. The pins are thus placed above the current of water and out of its way.

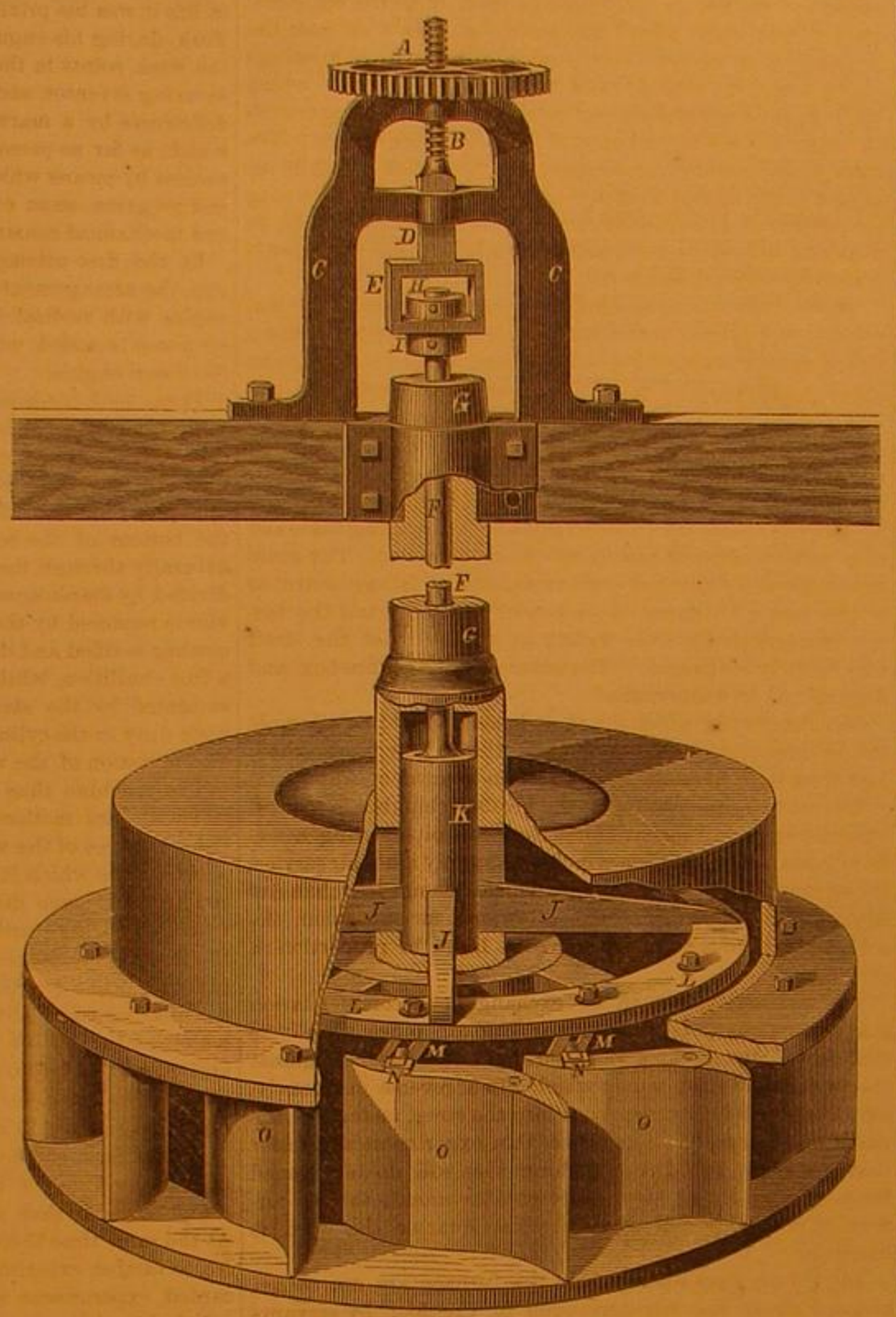
Fig. 2 shows a plan of the buckets, pins, and slotted brackets, when the buckets are pivoted to swing horizontally.

Fig. 2

Fig. 3

Fig. 3 is an elevation of the buckets when pivoted to swing vertically, showing an extension of the principle to wheels of this description. It will thus be seen that the improvement is equally applicable to turbines of all kinds, and not only does away with a great inconvenience but adds to their efficiency.

Patented, March 9, 1869, by Jesse Newlin, whom address for further information, care N. W. Newlin, 2203 Cherry street, Philadelphia, Pa.



NEWLIN'S IMPROVED TURBINE WATER WHEEL.

THE SOIL, THE PLANT, AND THE ANIMAL.

How much stronger at every step becomes the likeness between the soil, the plant, and the animal; how much closer their connection, how much more indissoluble the union that binds them together. When dry bone is burned, the ash that remains behind amounts to two thirds its weight, and consists almost entirely of phosphates of lime and magnesia, which are so abundantly present in the ash of different varieties of grain This bone-earth must exist in the soil. The plant draws it from the earth by its roots, the cow eats it with the herbage she crops from the field, and parts with it again in the milk she produces to feed her young. The calf sucks the milk, and works up the phosphates it contains into the form of living bones, adding daily to their size and weight. Without bone our present races could not exist. It forms the skeleton to which the softer parts are attached and by which they are supported; but the life of the animal being at an end the bone as a living thing is discharged and falls to the earth, new plants taking up its phosphates again to send them forward on a new mission into the stomachs of other living and growing animals.

Improved Gas Process.

The *Evening Post*, of this city, reports that Professors Silliman and Wurtz have discovered a new and cheap method of producing a superior illuminating gas. The first step is to bring very highly heated steam into a clay retort, in which pure anthracite coal is burning. The coal is purely carbon; the steam, of course, consists of the same elements as water—that is, the two gases, oxygen and hydrogen. Now, the oxygen of the steam combines with the coal or carbon, and forms the gas known as oxide of carbon, leaving also the hydrogen gas free. These two gases are thus produced in equal volume. They are both easily combustible, and burn with an intense heat; although they give, when burning, hardly any light.

These gases are then mixed with the common illuminating gas, made by distilling bituminous coal. The mixture, it is found by experiment, forms a brilliantly-burning gas, which is better, in some respects, than the best of that with which our houses are usually lighted; for example, it is more permanent under exposure to severe cold. But the main advantage is in the saving of expense. It is plain that this method turns water, and the whole weight of anthracite coal used, into illuminating gas; while the old process yields in gas only the volatile part of the bituminous coal thrown off in distillation.

"Messrs. Silliman and Wurtz, assures us," says the *Post*, "that they are able practically to add fifty per cent to the amount of illuminating gas obtained from a given expenditure of coal, or, what is the same thing, to save one third of the fuel now used in making gas."

STREET CROSSING.—John Simpson of Cleveland proposes a plan for street crossing by means of a bridge approached by double inclined planes instead of stairs, which are more easy of ascent, but the difficulty is still to be overcome. Property owners object to a bridge fronting their premises, and what is wanted, is some means of crossing that will take the place of a frowning structure above ground.

The Diffusion of Scientific Information.

In an able address delivered before the graduating class of the Cambridge Divinity School at the close of the summer term this year, John Weiss said a great many forcible and brilliant things. Among these, none has struck us as showing so exact an appreciation of the tendencies of the age as the following remarks upon the general diffusion of scientific information in a popular form, and the avidity with which this information is sought by the American mind.

"Human nature is learning to ask very intelligent and embarrassing questions, while its religious exigences are the same that they ever were, and have to be harmonized with knowledge. Here you may have been taught to gage and appreciate past epochs of spiritual development, and to note their connection with various mental states, and you have indulged religious feelings. But now you are about to discern, by contact with men in vital society, what is essential religion, in order that your service may be timely for this race and country. The past may be the soil that holds your roots, but not a ball and chain around the ankle. If you undertake to drag the dogmatic life of nineteen centuries across the face of the country, your traces will be marked by denudation of the fertility that would prefer your bold husbandry. You go forth to quicken the native germs that lie waiting to succeed the old crops, when decay or the ax shall clear the land. "Instead of the thorn shall come up the fir tree, and instead of the brier, shall come up the myrtle tree."

"Cheap publications of every kind spread the moods of the period far and wide. Their range passes through all the speculative forms, and all the emotions which the world at any time has known. The very richness is a cause of the distraction. Thought is unconsciously embarrassed as so many departments throw wide their doors at once, and display their collections. And there is no statement too scientific to resist the intentions of popular treatment. It is macerated, dissected, volatilized, put up in packages for the trapper and emigrant. Every condition of half knowledge appropriates it. People who are troubled with imperfect nutrition will snatch, at every railway station, a gulp of spectrum analysis, primeval man, the correlation of forces, spontaneous generation, social statics, Carl Vogt's impetuous atheism, Mr. Darwin's pangenesis, Professor Huxley's non-committal protoplasm, and the last message from the summer land.

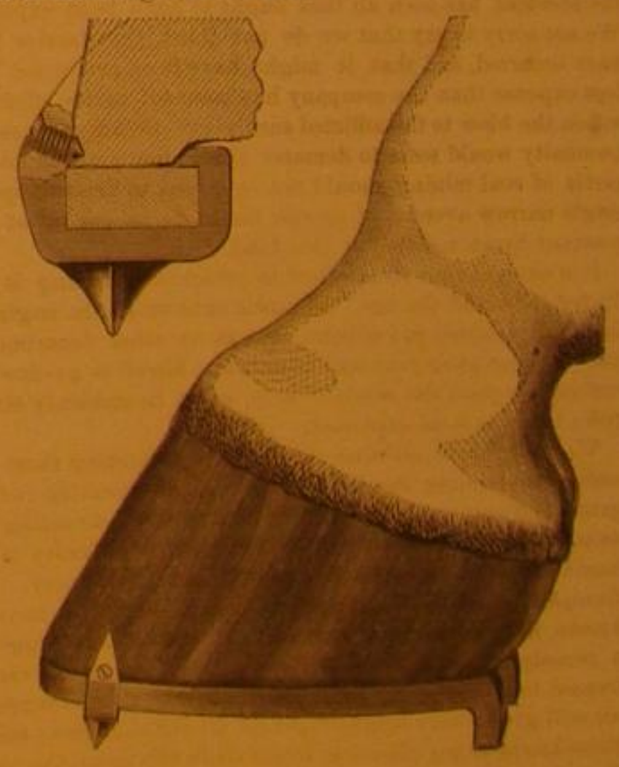
"The scientific mind is making the whole world at once its laboratory and auditorium; and among the hearers there is no distinction of person, color, sex, or previous preparation."

GODDARD'S DETACHABLE CALKS FOR HORSESHOES.

The object of this invention is to furnish a cheap, durable, and efficient calk, easily adjustable, which shall prove a protection against slipping, and shall bear entirely on the shoe, not injure the hoof, or cause discomfort to the horse when shod according to the method proposed.

The inventor claims that it will not cost as much as the blacksmith's charge for calking a shoe as now performed; that it will keep sharp and will prove a great saving of time, as every driver can adjust his own calks as he needs them.

The engraving illustrates the appearance of this calk when fastened to the shoe or the foot of a horse, and also gives a sectional detail showing the construction of the calk and the mode of fastening it to the shoe.



The shoe proper is of the ordinary form, minus the toe calk, in the place of which two of the adjustable calks are used, one on each side of the toe.

The calk is provided with two clasps, as shown in the sectional detail, one of which passes over the inner side of the shoe, and clasps down upon the top of the shoe on the inner side. The other passes upward across the outside of the shoe, and rests not only against the shoe but the outer side of the hoof. It is held in this position by a screw passing obliquely downward through the outer clasp till its point reaches and rests upon the top of the shoe. The calk is made of material best adapted to withstand wear, and of a form best calculated to give a firm hold to the foot in traveling.

This improvement was patented through the Scientific American Patent Agency, May 25, 1869, by Rev. Kingston Goddard, D. D., of Richmond, Richmond county, Staten Island, N. Y., who may be addressed for State, county, or shop rights

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Contents:

(Illustrated articles are marked with an asterisk.)

THE AVONDALE COLLIERY DISASTER.

On the 6th inst. the telegraph wires transmitted news throughout the land that appalled every heart; one hundred and ten men, the dispatch informs us, were buried in a mine at Avondale, Pa., the only source of egress from which was cut off by a merciless conflagration, and there was little, if any hope that a single man would be rescued.

The worst fears have been realized; the bodies of the miners have been found huddled together smothered, after making such futile efforts as lay in their power to isolate themselves from the poisonous gases which filled the mine.

The heart-rending details of this sad catastrophe have been given to the public through the daily press, and we will not dwell upon them. Liberal donations have been made for the relief of the bereaved families of the miners with a hearty promptness which speaks volumes for the philanthropy of the country.

It is due to the Delaware, Lackawana, and Western Railroad Company to say that its action since the occurrence of the accident has been all that ought to have been expected. We are sorry to say that we do not think the disaster need have occurred, and that it might have been prevented at a less expense than the company has incurred in its efforts to soften the blow to the afflicted survivors. Common-sense and humanity would seem to demand that men exposed to the perils of coal mining should not be forced to depend upon a single narrow avenue of escape, liable to be cut off at any moment by an accident of this kind.

It is evident that the method in which coal mining is conducted is behind the age. Gigantic enterprises in engineering are conducted to brilliant success in other departments, and yet year after year coal miners are forced to go down to suffocate beyond the reach of help, or to be suddenly struck down by some fatal explosion.

We are glad to see that the subject of averting these calamities is claiming the earnest attention of scientific investigators and engineers in England, and the heart-rending disaster at Avondale will not be an unmixed calamity if the lesson it teaches be generally heeded in this country. Our European exchanges inform us that Mr. H. Bessemer, the well-known improver of the manufacture of iron, has suggested a remedy which seems likely to avert explosions. Gas in incased burners having combustion supported by compressed air will give a very bright light for a long distance; and by these lamps being placed at intervals in the mine, the use of the "Davy" can be dispensed with. The gas is fed from the ground above the mine, and the great air pressure within the lamp will force out the products of combustion, so that the gases in the mine will not be able to enter and explode. In the talked-of tubular tunnel to connect England and France this idea might also be utilized. All that compressed air can do is as yet uncertain; for if it be without and within a man simultaneously, life is supportable, and the brightest light beneath the waters in diving explorations or the laying of submarine foundations is ever desirable.

One thing should however be insisted upon, that a single avenue of entrance and exit to a coal mine shall no longer be deemed sufficient, and the miners will be sustained by the public press in demanding that more-ample means of escape be provided.

A method for preventing explosions in mines, having their origin in blasting, will be found in another column, with an engraving illustrating the apparatus employed.

THE ADJUSTMENT OF HOT-AIR FURNACES.

We are in receipt of our annual crop of inquiries in regard to the proper adjustment of hot-air furnaces, which we will attempt to answer as briefly, yet comprehensively as possible.

The apparatus for heating buildings with hot air may be divided into seven parts; namely, the fire-box and flues in which combustion is performed; the chamber through which the air passes to be heated; the cold air pipes leading to this chamber; the hot air pipes leading from it to the registers; the registers which admit the air to or close it off from the apartments to be heated; the external registers or openings which admit the cold air; and, lastly, the registers by which the exhausted air is permitted to escape from the apartments to make way for the warmed fresh air which enters. We have here a complicated apparatus, each part of which is essential to the perfect working of the whole; and the wrong adjustment of any may defeat the end sought; namely, to heat and ventilate equally and perfectly all the apartments connected with the apparatus.

The fire box should be cast very thick and heavy, the better to guard against sudden fluctuations of temperature caused by neglect in firing, or an overcharge of coal. The grate should be sufficiently open to admit of a good draft, and the dampers should fit accurately. In many cases the damper communicating directly with the smoke-pipe intended to be opened only in kindling the fire, becomes warped by the heat, so that it can only be imperfectly closed, and much of the heated gases passes through it instead of the heating flues, and thus escapes without having the heat abstracted. The grate should be easily dumped without danger of falling down, as is the case with many ill-constructed furnaces, and the bottom dampers should fit as tightly as possible that the draft may be fully controlled. The outer side of the fire-box and flues should be whitewashed.

The chamber in which the air is heated should be of ample size in proportion to the capacity of the hot-air pipes which lead from it, and should *always* contain a vessel of water.

The cold-air pipe leading to the heating chamber is in most cases too small. We have often seen this pipe having a sectional area of only 72 square inches to supply a hot-air service, the aggregate sectional area of which was not less than 616 square inches; making all due allowance for expansion, the cold air pipe ought to be twice as large in proportion as this.

We have lately seen in an exchange a recommendation that the external openings of the cold-air pipes should be trumpet-mouthed. This was asserted to be a panacea against the effects of varying winds which often reverse currents of air and send the hot current out into the street instead of the parlor or library. We have tried this experiment and know that it will not do. The only thing that will do is a vaned hood, or cowl, which always presents its mouth to the current of wind, no matter from what quarter the wind is blowing.

The hot-air pipes leading from the furnace are apt to get clogged where the registers open in the floor, by servants sweeping all manner of rubbish into them, as dust, bits of rags, etc. This is not only an obstacle to the flow of air but renders the danger that your house may be burned somewhat imminent.

Where, as is often the case, the hot-air registers open out at right angles from the side of a vertical pipe, one over the other, the top room will get the better of the others, unless the supply of hot air be far more than the capacity of the upper register to discharge. The branch register pipes should not join the main pipe at right angles, but at an acute angle, the apex of which is at the junction of the two pipes. Even then it may be necessary to extend a chute or apron from the upper side of the lower end of the branch pipe into the main pipe, so as to partially intercept the ascending current.

Finally, the ventilators should be in the bottom of the room. In this case the hot air which enters the room pure rises to the top, while the foul and effete air settles to the bottom.

AERO-STEAM ENGINES.

Our readers are well informed in the history of the attempts which have been made to substitute air for steam as an expansive agent in engines. With the commencement of these efforts the name of Capt. Ericsson will ever stand as one of the earliest pioneer investigators, and, should the success which is now claimed for the combination of air and steam, applied to the same purpose, be fully realized, that share of the honor attending it will be due to him, justly claimed by those who help to point out the way by which others may mount to success.

To the mechanical engineer the paper bearing the above title, read before the British Association at Exeter, will be one of the most interesting of any of the able and valuable contributions to the transactions of that distinguished body. We can give only a brief review of this paper at this time, but we may perhaps refer to it again at a favorable opportunity.

The first part of the paper was devoted to a review of the data by which it has been satisfactorily established that not more than one tenth of the entire heat of coal is on the average utilized by steam engines.

The author, Mr. Richard Eaton, of Nottingham, England, then discusses the practical difficulties encountered in the effort to substitute heated air for steam, the principal of which is, as our readers are already aware, the effect of highly heated air upon such metals as may be economically employed in the construction of machines.

He then proceeds to give a brief history of the new Aero-steam motor, which avails itself of air expansion, using at the same time steam, which removes the difficulty above mentioned.

Mr. George Warsop, of Nottingham, as the son of an air gun maker there, was born with aerial ideas, and although his only education was received at a Sunday school, and he was sent to work at ten years of age, he turned that education to such good account that before he was twenty he had in leisure moments secretly constructed an air engine. Later in life it was his privilege, while a working mechanic in New York, during his engagement with Mr. Ericsson, to observe the weak points in the system of that highly gifted and persevering inventor, and after years of research to supply the deficiences by a marvelously simple system of mechanism which, as far as present experience goes, promises complete success by means which, happily for the cause of economy and progress, seem compatible alike with physical science and mechanical construction.

In the first attempts at practically carrying out the system, the arrangement adopted was an ordinary high pressure engine with vertical boiler as used where fuel is cheap. An air pump is added, which is put in operation by the action of the steam engine.

Thus, cold air is taken in by the air pump and is forced on in its compressed state through an air pipe, which, in the case before us is conducted first within the exhaust, then in a coiled form down the funnel of the boiler, then past the fire, and finally past a self-acting clack valve at the bottom of the boiler into the boiling water itself, rising naturally through the water, the air is intercepted and subdivided by diaphragms of metal gage. Thus a twofold service is rendered by the contact of the elements, the water becoming aerified and deprived of its cohesion and prompted to a free ebullition, while the air on rising above the water is saturated by the steam, and the two together pass on to their duty in the cylinder where saturation assists lubrication. The agitation of the water prevents scaling.

The machine thus constructed, but having two air pumps, and with cam motions applied to the valves as also to the poppet valves of the working cylinder, gave the following results, results which it must be admitted were sufficiently discouraging to have deterred the inventor and his associates from proceeding further in the matter, but for their faith in the intrinsic soundness of the system, and perseverance in carrying it to a practical issue. The work had to be done under disadvantages of various kinds, on inconvenient premises, which centuries back were a farm house standing within the ancient walls of Nottingham, and until the protection of the patent laws had been obtained, the original apparatus was carefully guarded in an unsuspected attic.

In this form of the apparatus the power obtained by the increased volume of the air forced in by the pump, did not compensate for that consumed in forcing it into the boiler. At the same time there were encouraging indications which led to further experiment. One of the air pumps being discarded, experiments were made with waste holes in the barrel of the other pump, to ascertain what proportion of air admitted to the boiler compensated for compression. It was found that about ten per cent of the effective consumption of fluid in the working cylinder gave much better results. At the same time the cam motions were discarded and the pumps left to their own unaided action. In this form it is claimed that a gain in work done by the combined air and steam engine was made of 42·5 per cent.

Here, although a very remarkable relative economy was apparent, it became obvious on consideration that danger of mistake would arise in assuming this economy as absolute, inasmuch as the duty performed, when contrasted with that obtained from engines of standard types, actuated by steam, was manifestly low, and it seemed probable that, as by judicious improvement in details, the duty was made to approximate more closely to fair steam engine duty, this relative economy might fall off considerably, inasmuch as there would be less margin to economize upon.

With a view of testing this point, and also for the satisfaction of railway engineers, of conducting experiments at locomotive pressures, a thorough remodeling of the whole apparatus was effected. The tappet motions were thrown aside in favor of the usual slide valve arrangement, working with a moderate amount of expansive action. The former wasteful vertical boiler was discarded in favor of a more economical one of the compound or Cornish multi-tubular description, so as to obtain a better evaporative duty from the coal consumed. The radiating surfaces of the cylinder pipes were re-clothed, and the feed water heated by the exhaust steam. Instead of exposing the air pipe to the direct heat of the furnace, as in the former case, the air became thoroughly heated on its passage from the pump to the boiler at a temperature of from 500° to 600° Fah., by being conducted through suitable coils and pipes through the exhaust steam in the heater, and the waste heat in the boiler flues and uptake.

When these changes were made a gain of 47 per cent over steam only, was claimed on an even pressure trial, and a gain of nearly 30 per cent on an open valve trial, a step in advance so huge that it staggers belief.

We shall watch future experiments in this field with the utmost interest in the hope that they may be successful, and that at last some decided progress in the conversion of heat into work has been made. Not that there has been no progress, but what has been made has been slow and painful, compelling, as it were, only a small fraction more of the heat which we know is constantly eluding us, to fall into line and do work. But 30, 40 per cent is something to make an engineer suspend his breath, aye, and his belief too, until the plain proof is before him that the results claimed are really

secured. An illustrated description of this apparatus will be found in another column.

AMMONIA AND ITS USES IN THE ARTS.

Ammonia is, in many respects, a peculiar substance, and much might be said of its composition and chemical relations to other bodies. Our purpose is, however, in the present article, to give only a brief and popular account of its manufacture on an extensive scale, and to say something of its important applications in the arts.

Ammonia has been long known under various names, *aqua caustica*, spirits of hartshorn, sal volatile, and lastly, ammonia, from Amaonium, a district in Africa, taking its name from the Temple of Jupiter Ammon, the salts of ammonia having been formerly obtained there.

The production of ammonia is now very large and necessarily so, as the already large demand for it in the various arts is constantly increasing.

Ammonia has been made by the direct combination of the gases which compose it, namely, nitrogen and hydrogen, but this method has never been made profitable in its manufacture. It is most cheaply and extensively obtained as a collateral product in other manufactures.

It is one of the by-products in the distillation of coal in gas works, and also in the manufacture of boneblack. It has also been made under patent process, which consists in distilling a mixture of two parts of guano with one part of lime, or other caustic alkali, the gaseous ammonia being conducted into water which is thus saturated with it, forming a commercial *aqua ammonia*.

Several other patents have been granted on processes for manufacturing ammonia. One of these is a method for extracting ammonia from gas water. The gas water is put into a retort with slaked lime, and distillation performed as in the guano process.

An improvement was made and patented, 1838, for the production of ammoniacal liquor from gas water, which was a great advance on the old methods, as it enabled the product to be obtained in a concentrated form.

One of the most recent sources of supply has been found in the boracic acid manufactories of Italy, which formerly allowed enormous quantities to be wasted. It is now estimated that over one million pounds of ammoniacal salts are produced by these establishments.

In the beet-root sugar manufacture, large quantities of sulphate of ammonia are allowed to go to waste.

Ammonia has been proposed as a means of generating motive power, but the experiments hitherto tried in this field have not proved very successful, though the liberation of this gas from its salts, in a close vessel, may be made to generate an enormous pressure, and its ready absorption by cold water renders the application of the condenser perfectly easy. One of the obstacles met with in these attempts has been the difficulty of constructing cheap machines out of materials which are not chemically acted upon by this gas, but it still seems to us that the method might be advantageously applied to the generation of motive power under circumstances where steam is not admissible. We do not, however, believe it can be worked as economically as steam for many of the purposes for which it has been proposed.

Machines for manufacturing ice, employing liquid ammonia, have been constructed, on the principle, that when liquids expand into gases, they absorb heat from surrounding bodies. The same principle has, however, been more cheaply applied in the use of volatile hydrocarbons as a substitute for the liquefied ammonia. The details of these different machines are, of course, dissimilar, but the general principle of their operation is the same.

To specify the widely extended and various uses to which this substance is applied in the arts, would compel us to greatly lengthen this article. Suffice it to say, that it is one of those essentials to the present status of the industry of the world, the absence of which would be felt scarcely less than soda or sulphuric acid.

THE EXHIBITION OF THE AMERICAN INSTITUTE.

The fair of the American Institute was duly opened at the Empire Skating Rink, Third avenue, between Sixty-third and Sixty-fourth streets, on the 8th inst., and although things are yet in a somewhat chaotic condition—the department of machinery especially—the signs indicate a brilliant display. The confusion is not due to want of exertion on the part of the managers so much as to the dilatoriness of exhibitors.

None of the machinery was running at the time of our going to press, though there will be no long delay.

None of the departments was complete at the time of our visit; the art department being specially meager. There are one or two crayon portraits worthy of special notice, but beyond this and some excellent photographs, there was very little worth seeing.

The exhibition of the American Association of Wool Manufacturers is undoubtedly destined to be one of the most interesting and attractive features of this fair. The following mills are already represented: The Lawrence and Pacific Mills, Lawrence, Mass.; Hamilton Woolen Co., Lowell, Mass.; Wm. Duncan & Son's Mills, Franklin, N. J.; Eddy & Son's Mills, Fall River, Mass.; Lawrenceburg Woolen Mills, Lawrenceburg, Ind.; Hockanum Company, Rockville, Conn.; Harris Woolen Mills, Woonsocket, R. I.; Weybosset Woolen Mills, Providence, R. I.; Central Woolen Mills, Uxbridge, Mass.; Elba Woolen Mills, Providence, R. I.; Rock and New England Manufacturing Companies, Rockville, Conn.; American Mills, also of Rockville, Conn., Kernan and Helm, Utica, N.Y., and others whose goods were not yet displayed, and the names of which we could not learn. The goods in this department already on exhibition are such as to excite the pride of every one who has the prosperity of American industry at heart.

In the machinery department the only things which were arranged were two fine cases of saws, one from Hoe & Co., New York city, and the other from the American Saw Co., also of this city.

Passing from this department we observed a fine collection of agricultural machinery, which we will notice more in detail hereafter. Near this collection stands a beautiful show table of paints, exhibited by Devoe & Co., 117 Fulton street, New York. A great deal of taste is displayed in the arrangement of this table, and the samples of colors exhibited are very fine.

The soda-water fountain exhibited by John Matthews, of this city, is one of the most beautiful designs we have ever seen.

The silk department will attract much attention. Although necessarily much smaller than the exhibition of woolen goods, it is, considering the comparatively recent period since the silk manufacture could be ranked as an American industry, a very remarkable display. Among the establishments represented here we notice P. G. Gimraud, Paterson, N. J.; Frederick Bane, Schoharie, N. Y.; Dale Manufacturing Co., Paterson, N. J.; Cheeney Bros., Hartford, Conn.; W. H. Horstmann & Sons, Philadelphia, Pa.; J. S. Shafter, Paterson, N. J.; and the Oneida Community, of Oneida, N. Y.

We shall give more detailed attention to the various departments in future issues, and we congratulate the managers of the fair on their prospects of success. The exhibition will, undoubtedly, be one of the best ever held under the auspices of the American Institute.

On Friday evening the fair was honored by a visit from President Grant, who was escorted through the several departments by the Hon. Orestes Cleveland, Chairman of the Board of Managers. He spent considerable time in the woolen department, and he was apparently well pleased with the numerous beautiful products of American industry to be seen both there and in all the other departments of the fair. His presence created a great deal of enthusiasm among the large assemblage, and he was repeatedly cheered, while the band played "Hail to the Chief," and other appropriate airs.

AN EXAMPLE FOR YOUNG MEN.

The career of Gen. John A. Rawlins, the late Secretary of War, who paid the forfeit of life in the service of his country, is a striking illustration of the fact that honor and fame are open to all in this country who unite ability with ambition and integrity. Gen. Rawlins was the son of a poor charcoal burner, who resided at Guilford, Ill., and was compelled to follow his father's trade. In the mean time he was ambitious to rise above his humble position, and earnestly applied himself to the study of books, and was finally admitted to the bar at Galena, where he not only gained an honorable practice, but won a good name, and a host of true friends.

At the outbreak of the war, Grant discovered the sterling merits of this man Rawlins, and from that time they became inseparable friends and co-laborers in the nation's cause. Grant became President, and Rawlins was made Secretary of War—fulfilling all duty assigned to him ably and well.

He died poor, and the keen instincts of our people at once appreciate the character and services of such a man. He could have made himself rich through the many opportunities that came in his way as chief of Gen. Grant's staff, but, like his illustrious superior, he was above the temptation to abuse the confidence of a sacred trust—a rare thing in these days.

The widow and children of the noble Rawlins are left poor by his death, but a purse of $50,000 has been subscribed, or nearly so, in this city to relieve them from want. If republics are ungrateful the people are not.

RAINLESS DISTRICTS---FREAKS OF THE WEATHER.

In several parts of the world there is no rain at all. In the Old World there are two districts of this kind: the Desert of Sahara in Africa, and in Asia part of Arabia, Syria, and Persia; the other district lies between north latitude 30° and 50°, and between 75° and 118° of east longitude, including Thibet, Gobiar, Shama, and Mongolia. In the New World the rainless districts are of much less magnitude, occupying two narrow strips on the shores of Peru and Bolivia, and on the coast of Mexico and Guatemala, with a small district between Trinidad and Panama on the coast of Venezuela.

Per contra—the climate of the Khasia Mountains, which lie northeast from Calcutta, is most remarkable for the excessive fall of rain. An English traveler established the fact that in the month of August, 1841, there fell 264 inches of rain. This great rain fall is attributed to the abruptness of the mountains that face the Bay of Bengal and the intervening flat swamp 200 miles in extent. It is not easy always to account for the erratic conduct of the weather upon any established scientific theory, for it is asserted that there is a district in Siberia in which, during winter, the sky is constantly clear, and where a particle of snow never falls.

THE ROOT STEAM ENGINE COMPANY are placing in the Fair of the American Institute, one of their 120-horse power boilers, which is exciting considerable interest among steam engineers. For safety and economy of fuel, large claims are made by the manufacturers. The Company is now composed of some of our shrewdest business men, who have placed sufficient capital at their disposal to enable them to fill extensive orders.

THE HUMBOLDT CENTENNIAL CELEBRATION.

Alexander von Humboldt was born in the city of Berlin on the 14th September, 1769. The occurrence of the centennial anniversary of the birth of this great man was commemorated in his native city by the dedication of a national monument with appropriate ceremonies. In New York city also, a colossal bronze, representing him in the prime of life, was unveiled. Professor Francis Lieber delivered an appropriate address in German, followed by one in English by Professor Doremus. Numerous German singing societies took part in the celebration, and a banquet was given at Irving Hall.

It was generally supposed that Humboldt was little known and not much appreciated by the people at large on account of the fact that his works are so learnedly written that they can only be perused by one who is already in possession of a considerable amount of scientific knowledge. No supposition can be more erroneous than this. In the winter of 1827-8 Humboldt delivered in his native city, Berlin, a course of sixty-one lectures, commencing November 3d and concluding on the 26th of April. These lectures formed, as it were, the first sketch of the "Cosmos," published subsequently, and were especially arranged for the people at large, those that had not enjoyed the advantages of higher education.

Some scientists of an inferior rank would perhaps have considered it beneath their dignity to appear as teachers. Humboldt did not, though he was then Baron, Chamberlain, Councilor, and confidential adviser of the king.

The inhabitants of Berlin and Potsdam all knew him personally, and showed him as much honor as to a king. With a slow but firm step, the head slightly bent forward, one arm at his back, holding a pamphlet, he was often seen passing through the streets. Wherever he appeared he was received by tokens of reverent esteem, the passers-by stepping aside through fear of disturbing him in his thoughts, and one was often heard saying to his neighbor, "There goes Humboldt."

The following instance goes to prove what reverence even the lowest classes paid him. During the time of the revolution, in 1848, a troop of bristly fellows stormed his house, ignorant of the fact that they were in the residence of the great *savant*: "I have no weapons, my boys; I am an unpretending philosopher, and my name is Humboldt"—uttered a small, bowed, and white-haired figure. "Back!" called the commander of the troop, "this is our great citizen Humboldt; four men remain before his house to watch that no wrong is done to him."

The following sketch of this great man is from the pen of Dr. Francis Lieber:

Who has not enjoyed the pleasure of finding the spots on the chart of human progress where you put down your finger and say, here is Aristotle, and here again; here is Hildebrandt, here is the conquest of Constantinople traced even in the discovery of our continent, even in Descartes and Bacon; here are the causes and the effects of the University; and to trace the lines of civilization radiating in different directions, from point to point? And this delight we may enjoy when meditating on the period of which Humboldt was one of the most distinct exponents. We enjoy it even now, although he has left us but yesterday; for God allowed to him days so long that he passed into history before he passed away from among us. Humboldt died as old as Sophocles.

Humboldt received the living traditions of the great circumnavigator, Cook, through Foster, Cook's companion, and lived to gather facts for his Cosmos from the latest reports of the geological surveys of our States. He lived when Voltaire died, and must have grown up with many French ideas floating around him, for Humboldt was a nobleman whose family lived within the atmosphere of the Berlin court; and he lived to witness the great revolutions in literature as well in Germany as in France and England. He lived when Rousseau died (the same year that Voltaire deceased), and must have remembered, from personal observation, that homage, which even monarchs paid (at a distance, it is true) to the Contrat Sociale, and he outlived, by some weeks, De Tocqueville. He lived through the period of the American Revolution, was a cotemporary of Washington and Adams, and a friend of Jefferson. He lived through the French Revolution and the age of the classic orators of Britain. He lived through the Napoleonic era and the resuscitation of Prussia and of all Germany. He studied under Werner, with whom mineralogy begins, and knew Houy. He knew La Place, survived Arago and Gauss, and worked with Enke. He lived with Kant, and knew Schelling and Hegel. He knew Goethe and read Heine. He read "Gibbon's Decline" as a work of a living author, and perused Niebuhr, and later still praised Prescott. He grew up in the Prussian monarchy according to the type of Frederic the Great, and with the fresh reminiscences of the Seven Year's War, and left it changed in army, school, government—in everything. He saw the beginning of the Institute of France, and lived to be considered by its associates as one of its most brilliant ornaments at its most brilliant period. He lived through the periods which distinctly mark the science of chemistry, from Lavoisier to Rose and Liebig. Humboldt was seventeen years old when the great king, perhaps the most illustrious despot of history, died so tired by the genius of his own absolutism that we cannot forget the words of the dying king: "I am weary of ruling over slaves;" and he lived through the whole period of growing popular sentiments and habits, of constitutional demands, and revolutionary, fearful conflicts. He wore the lace and ruffle of the last century, and the more practical dress of our times. Yet no one ever heard from him any useless regret for what had passed and was gone. I have heard him speak with warmth of noble things and men that he had known, but not with gloomy despair of the present or the future.

What an amount of thinking, observing, writing, travel-

ng, and discovering he has performed, from that juvenile essay of his on the textile fabrics of the ancients to the last line of his "Cosmos," which reminds us of Copernicus reading the last proof-sheet on his death-bed, shortly before his departure; or of Mozart, who, in his darkened room, directed with dying looks the singing of a portion of that requiem which he had in part composed, conscious that his ears would never hear its pealing sounds of resurrection. Let us, one and all, young and old, symbolize by the name of Humboldt the fact that, however untrue assuredly the saying is that genius is labor, it *is* true that the necessary co-efficient of genius and of any talent is incessant diligence. We are ordained not only to eat the bread of our mouth in the sweat of our brow, but to earn in the same way the nourishing bread of the mind. This is no world of trifling; it is a world of work; and Humboldt, like the Greeks whose intellectuality he loved to honor—whose Socrates loved to say: "Arduous are all noble things"—was a hard-working man—far harder-working than most of those who arrogate the name to themselves. He ceased to work, and to work hard, only when he laid himself down on that couch from which he rose no more.

I visited Humboldt at Potsdam in the year 1844, when he had reached, therefore, the age of seventy-five; for you know that he was born in that remarkable year of 1769, in which Cuvier was born, and Wellington, and Chateaubriand, and Napoleon—just ten years after Schiller, just twenty after Goethe. Humboldt told me at that time that he was engaged on a work which he intended to call "Cosmos."

I desire to show what interest he took in everything connected with progress. I have reason to believe that it was chiefly owing to him that the King of Prussia offered to me, not long after my visit, a chair to be created in the University of Berlin, exclusively dedicated to the Science and Art of Punishment, or to Poenology, as I had already called this branch. I had conversed with the monarch on the superiority of solitary confinement at labor over all the other prison systems, when he concluded the interview with these words: "I wish you would convince Mr. von Humboldt of your views. He does not entirely agree with them. I shall let him know that you will see him."

Humboldt and prison discipline sounded strange to my ears. I went, and found that he loved truth better than his own opinion or bias, and my suggestion that so comprehensive a university as that of Berlin, our common native city, ought to be honored with having the first chair of Poenology, for which it was high time to carve out a distinct branch, treating of the convict in all his phases after the act of conviction, was seized upon at once by his liberal mind.

Many of my young friends have asked me, as their teacher, and, indeed, many other friends have repeated the question—Was he not the greatest man of the century? I do not believe it is fit for man to seat himself on the bench in the chancery of humanity, and there to pronounce this one or that one the greatest man. If all men were counted together, each one of whom has been called in his turn the greatest of all, there would be a crowd of greatest men. Mortals ourselves, we should call no one the greatest. History is abstemious even in attributing simple greatness. But if it is an attribute of greatness to impress an indelible stamp on the collective mind of a race, and to give a new impulse to its intellect; if greatness, in part, consists in devising that which is good, large, and noble, and in perseveringly executing it by means which, in the hands of others, would have been insufficient, and against obstacles which would have been insurmountable to others; if it is great to graft new branches on the trees of science and culture, leading the sap to form henceforth choicer fruit; if the daring solitude of lofty thought and loyal adhesion to its own royalty is a constituent of greatness; if lucid common sense—the health and rectitude of our intelligence which avoids, in all direction, the Too-Much—is a requisite of greatness; if rare and varied gifts, such as mark distinction when singly granted, showered by Providence on one man—if this makes up or proves greatness, then indeed we may say, without presumption, that one of the great men has been our own.

That period has arrived to which Crœsus alluded in the memorable exclamation, "Oh! Solon, Solon, Solon!" And we are now allowed to say that Humboldt was one of the most gifted, most fortunate, and most favored mortals—favored even with comeliness, with a brow so exquisitely chiseled that, irrespective of its being the symbol of lofty thought, is pleasant to look upon in his busts as a mere beautiful thing; favored even in his name, so easily uttered by all the nations which were destined to pronounce it.

When we pray not only for the kindly fruits of the earth, but also, as we ought to do, for the kindly fruits of the mind, let us always gratefully remember that He who gives all blessed things has given to our age and to all posterity such a man as Humboldt.

The Cedars of Lebanon.

Mr. Jessup, an American missionary, has recently discovered several extensive groves of cedars in Lebanon. Of these there are three of great extent in Southern Lebanon. This grove lately contained 10,000 trees, and had been purchased by a barbarous Sheikh, from the Turkish Government, for the purpose of trying to extract pitch from the wood. The experiment of course failed, and the Sheikh was ruined, but several thousand trees were destroyed in the attempt. One of the trees measured fifteen feet in diameter, and the forest is full of young trees, springing up with great vigor. He also found two small groves on the eastern slope of Lebanon, overlooking the Buka'a, above El Medeuk; and two other large groves containing many thousand trees, one above El Baruk, and another near Ma'asiv, where the trees are very large and equal to any others; all are being destroyed for firewood.

New Style of Photographs.

The process is due to Mr. Charles Durand.

Put into a small mortar a teaspoonful of kaolin, add thereto about a quarter of an ounce of sensitive collodio-chloride, and well stir with the pestle until it becomes a smooth paste. Add to this three fourths of an ounce more of the collodion, and again stir, and pour the whole into a bottle with one or two drops of castor oil. Well shake, and place it aside until the coarse particles have subsided.

Edge a piece of talc or glass for about a quarter of an inch all round with dilute albumen, afterwards coat with the kaolin collodion, and dry by gentle heat, when the talc or glass, if placed upon a piece of white paper, will have the appearance of alabaster.

If the film splits, it should have a trifle more castor oil in the collodion; but the best remedy is to choose a more powdery collodion.

If the film is upon glass, the progress of printing may be examined from the back; but if talc be the medium used, it may be turned back in the same manner as when printing upon paper.

Tone, fix, and wash in the same manner as with an ordinary collodio-chloride print upon opal glass, and mount in a frame or case, to protect the picture from being scratched. It must not be varnished.

After three years' trial, the film has been found not to crack or leave the talc or glass after the picture has been once finished.

Many pretty effects may be produced by putting different colored papers behind vignettes produced in this way, as whatever color is placed behind the picture gives a delicate tinge of that color to the picture.

I may add that I have tried oxide of zinc in place of kaolin, and that it also gives a good effect, but not better than the latter. There is another point worth naming. For those skilled in the use of powder colors, here is the most delightful surface which can possibly be worked on. The surface has a tooth which *bites* the color most perfectly, and the purity of the white gives a rare delicacy and brilliancy to the applied colors. By skillful manipulation and some knowledge of flesh painting, an effect resembling a highly-finished miniature can be obtained. A good print produced in this way on mica, and backed, to give warmth, with cream or buff-tinted paper, makes one of the prettiest, cheapest, and most easily produced portraits for a locket which can be desired.—*Philadelphia Photographer.*

Editorial Summary.

TO REMOVE RUST.—A lady writing from Vermont to the *Hearth and Home* says that she accidentally discovered an easy way of removing rust from steel. She put a number of badly-rusted forks in a tumbler of kerosene oil, and after leaving them there some time, found that the rust had become so much loosened that it rubbed off readily. She says that she has since then used the oil to clean her knives and sewing machine. We suppose that many of our readers have already learned of the beneficial effects of oil on steel, but we give the correspondent's experience for the benefit of those who have never used it for such a purpose.

WONDERS OF SCIENCE.—Wonders of science never cease! Some years ago the opinion was expressed by a distinguished astronomer of Cambridge, England, that if the earth's atmosphere were but increased thirteen thousand yards in hight, so as to have an increased power of retaining the warmth poured upon it from outer space, we might do without the sun altogether, so far as our heat supply is concerned. More recently, by means of an instrument called the galvanometer, used in connection with a refracting telescope, it has not only been proved that the stars actually give heat to the earth, but the comparative amount of heat received from different stars has been, as it were measured.

DECAY OF IRON RAILINGS.—Every one must have noticed the destructive combination of lead and iron, from railings being fixed in stone with the former metal. The reason for this is, that the oxygen of the atmosphere keeps up a galvanic action between the two metals. This waste may be prevented by substituting zinc for lead, in which case the galvanic influence would be inverted; the whole of its action would fall on the zinc; the one remaining uninjured, the other nearly so. Paint formed of the oxide of zinc, for the same reason preserves iron exposed to the atmosphere infinitely better than the ordinary paint composed of the oxide of lead.

A CORRESPONDENT from Plymouth, Mass., kindly refers us to an article supposed to be the one alluded to by several correspondents lately, deprecating the use of night soil. It is on page 103, Volume III. of the New Series of SCIENTIFIC AMERICAN. Referring to the article, we find it to be a short extract from an exchange on the use of artificial manure called *poudrette*, made from night soil, and was so credited. It was copied by some other journal and improperly credited to the SCIENTIFIC AMERICAN. Having got started in that way, it has gone the rounds.

A BLIND man in Chicago has invented a tin lunch box, with a receptacle for cold coffee inside of it, and the whole thing is only 4½ inches wide and 9 inches long. The box is so constructed that when empty it can be conveniently folded together, like a thin book, and carried in the pocket.

M. JANSSEN, in a letter dated from Darjeeling, Sikim, British India, 23d May last, says that the spectra of some stars, which are rather ruddy colored when not disclosing the presence of hydrogen, do positively disclose the presence of aqueous vapor.

THE month so far has brought us a series of accidents and casualties, by land and sea, which will make it memorable. The damage done by the recent gale in New England, and the Avondale disaster, are the two most remarkable occurrences of this kind, but the number of minor accidents has also been very numerous.

THE *American Horological Journal* says that rings with settings likely to be damaged by heat may be soldered without injury if the part liable to injury be buried in a piece of raw potato.

SALE OF MACHINERY.—We call the attention of our readers to the Auction Sale of machinery of the Spencer Repeating Rifle Co., advertised in another column. It is to be sold in Boston on the 28th of September.

THE loss of weight experienced by a rower through perspiration in a prolonged contest like that of the Harvards with the Oxfords is from four to eight pounds.

THE metal sodium is stated not to take fire on cold water, but this is incorrect. A small piece of the metal will not do so, but a piece the size of a nut will frequently ignite.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

At Ottawa, Canada, there is great activity in the sawed lumber trade Nearly 40,000,000 feet are now piled up at the mills there.

The nickel ore at the Litchfield, Conn., mines will be worked as soon as workmen arrive from Germany. A furnace capable of reducing ten tuns of ore daily is just completed, and two others are building.

A dispatch from Central City, Colorado, states that the bullion shipments in the month of August amounted to $225,000. One company sold 20 tuns of gold ore for $100 per tun, to be shipped to England.

A trial has lately been made of a "steam omnibus" in Edinburgh, Scotland, and the experiment, as far as can be judged by the details given, appears to have been successful. As to the construction of the new vehicle nothing as yet is said.

An Atchison, Kansas, telegram says that the contract for the Nemeha Valley Railroad has been let, and ten miles will be completed by February 15, 1870, and the road will be finished to Pawnee City in eighteen months. This is an outrun of the Quincy and Keesville road, and diverts the business of Southern Nebraska to Chicago instead of St. Louis.

The receipts of internal revenue for July and August, this year, were $36,794,031·75, against $30,890,028·62 same months last year—an increase of $5,704,003·13. The receipts for the fiscal quarter ending September 30, 1868 were $38,735,863·08, and it is estimated that for the corresponding quarter this year they will reach $48,000,000.

It has recently been decided in this city that "Shipping articles" are invalid unless a five cent stamp is affixed for the signature of each sailor. The ground of the decision is, that the agreement is made between the master and each man individually, and that, therefore, one five cent stamp which was affixed to the articles under consideration, was insufficient.

The number of mechanics and laborers employed in the arsenal works on Rock Island at present is greater than ever before. They are classified as follows: Laborers, 600; stone-cutters and masons, 150; carpenters, 50; teamsters, 100; total number, 900. Until this month 700 was the largest number on the island. The August pay-roll will not fall short of $100,000.

The freight on wines from San Francisco to Chicago has been reduced to $4 50 per hundred pounds—one half of the old charge. It is said that this reduction was procured by the efforts of a committee of California wine-growers, who represented to the General Freight Agent of the Central Pacific Railroad that the previously charged rates had the effect of absolutely prohibiting trade in wines.

By the completion of the Western Pacific Railroad on Monday the cars travel continuously from the harbors of New York, Boston, and Philadelphia, to the harbor of San Francisco. Arrangements have been made for carrying through passengers and mails between Sacramento and San Francisco without transhipment inside of four hours. The earnings of the Central Pacific Railroad for August were $572,000, showing a steady increase in passengers and freight.

Professor Hitchcock says that the legislature of New Hampshire has recently inaugurated an examination of the rocks and minerals of New Hampshire in a manner reflecting great credit upon them. During its progress the bounds of the new gold field have been carefully traced out, extending in a narrow belt from Bellows Falls northwardly along the Connecticut river into the dividing ridge between Canada and Maine. The principal New Hampshire gold mine is at Lyman. The vein is fourteen feet wide composed chiefly of quartz, containing galena, sakerite and pyrites.

The British Consul at Chee-foo, China, reports that the wild silkworm is bred in large quantities by the country people of Shan-tung, and a great deal of wild silk is produced annually in the central part of the province, and in the vicinity of Tsi-nan-foo. The silk cloth made from this wild silk is used by the Chinese for summer clothing, is very strong, and wears extremely well. It is thought probable that the wild silkworm may be acclimatized in Europe, and attention has been drawn to it both in Italy and France. Chee-foo can furnish the eggs of both the wild and the domestic silkworms.

Feathers of ostriches and other birds, though naturally black, or dark gray colored, may be bleached by the following process newly discovered by M. Deflot. The feathers are placed for three or four hours in a tepid, dilute solution of bichromate of potassa, to which some nitric acid has been cautiously added. The feathers will then be found to present a greenish hue, owing to the oxide of chromium precipitated on the substance, and to remove this the feathers are placed in a dilute solution of sulphurous acid in water, whereby the feathers become perfectly white and bleached. Care is to be taken that the solution of bichromate be not made too strong; and that not too much acid be used, which would cause an irremovable yellow color.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

☞ All reference to back numbers should be by volume and page.

T. E. K., of La.—Timber may be rapidly seasoned by steaming, but it is unnecessary to do it under enormous pressure; in fact, high pressure, and, consequently, high temperature, are injurious to the wood. Sufficient vent should be allowed to keep the steam down to 212 degrees, which is hot enough. The steaming is carried far enough when the sap has been converted into steam and driven out of the wood. A few days exposure to the air after taking the timber from the steam box will render the wood fit to work. If the operation is performed according to these directions the steaming box need not be very strong; it should, however, be tight enough to hold the steam, which should, at least the greater part of it, escape as steam, not as water through the vent.

W. D., of N. Y.—The first complete electric telegraph of which we have any knowledge, was established in the year 1798, between Madrid and Aranguez, in Spain, by an electrician named Betancourt. This was, however, not at all on the principle of the modern telegraph, as electro-magnetism was not discovered till 1819. Wheatstone's telegraph was patented in England in June, 1837, and Morse filed his first caveat in October of the same year. To Morse is undoubtedly due, however, the credit of inventing a telegraphic alphabet which has ever since been universally used.

J. H., of N. Y.—To japan castings, clean them well from the sand, either in a "tumbler" or by other convenient means, then dip them in or paint them over with good boiled linseed oil. When the oil has become moderately dry, put them in an oven and heat them to such a temperature as will turn the oil black without burning. The stove should not be too hot at first, and the heat should be raised gradually to avoid blistering. The slower the change in the oil is effected the better will be the result. The castings, if smooth at first, will receive a fine black and polished surface by this method.

L. B., of Ohio.—You do not inform us whether you wish to construct your cistern above or below ground. If above ground, a wooden cistern made of good pine answers a good purpose; if below, brick laid in good hydraulic cement, and smoothly plastered with the same on the inside, answers a good purpose. Of all the filters we have tried, we like the working of none better than that of gravel and charcoal, effected by passing the water through two casks, one filled with fine gravel and the other with coarse charcoal powder.

T. B. McC., of Del.—The mineral you send is a poor specimen of graphite, or plumbago. It is composed chiefly of carbon, with which impurities, consisting of earthy matters, are mixed. Plumbago is principally used in the manufacture of crucibles and lead pencils, also for electro-plating, polishing stoves, castings, etc. The refining and preparing of the article for use is attended with considerable labor.

R. C., of Del.—We do not wish to open our columns to the discussion you propose.

J. B. C., of Mich.—You can set two 60-horse power boilers to run with a single furnace and grate, but the plan would not, in our opinion, be economical. To blow off one of two boilers thus set while the fire was maintained to keep up steam in the other, would be likely to lead to overheating the boiler. We advise building a separate furnace for each. This can easily be done so as to have the boilers stand side by side as you desire.

A. H. S., of Hayti.—The action of the sour cane juice upon iron pipes in scaling them, is a difficulty met with on all plantations. An old plantation engineer informs us that he used, when in Cuba, to scale the pipes by letting cold water into them while hot. We do not know that this would answer with you. Should it fail we are not aware of anything better than the old practice.

R. W. of Pa.—The depth of the artesian well of Grenelle, at Paris, is 1,794½ feet. Respecting the water, it was ascertained that it does not contain the least trace of air, and was for that reason considered unfit for use. To obviate this defect, the water descends from the top of a tower in innumerable threads, which exposes it to the air.

S. C., of Colorado.—Malachite is brought chiefly from a single mine in the Ural Mountains in Russia, and indicates the near presence of copper. Its value is estimated in weight at about one fourth that of silver. It is not at all probable that you have found malachite in your section.

H. T., of Mich.—So far as we are aware, the Norwegian cooking apparatus is not made in this country. It is sold in England to some extent, and appears to be a useful apparatus for the purpose.

E. H. S., of Mass.—Will forcing a cold blast into a chimney above the fire box increase the draft to the same extent and aid in combustion as much as though forced directly into the fire box below the fuel? —Answer, No.

W. P., of Oregon.—Patents have been obtained for sheep-shearing machines, but we are not aware that any of them have yet come into use. The field appears still to be open.

S. A. K., of Ohio.—We know of no cement that is generally and economically applicable to all cases where iron and stone are to be united.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

CHURN.—Miles Fisk, Adrian, Mich.—This invention relates to an improvement in churns, and has for its object to provide a dasher which shall, by one simple movement, throw the cream in different directions, the current produced by one set of radial wings being brought in conflict with the one next above, and so on successively.

CLOTHES RACK.—Andrew Harbison, New Castle, Pa.—The object of this invention is to provide for public use a neat, simple, cheap, and convenient clothes rack, so constructed and operating that it can be opened or expanded into different shapes to adapt it to different positions in the room, such as standing in a corner, near the stove, in an open room, etc.

ANIMAL TRAP.—C. Polley, Shelbyville, Tenn.—The object of this invention is to provide for public use a simple, cheap, convenient, and effective trap which, being set near the holes of burrowing animals, will destroy them with certainty.

PARLOR STOVE.—John H. Goodfellow, Troy, N. Y.—This invention relates to that class of coal stoves in which the gas is consumed by the introduction of external air.

PLOW.—W. F. Pagett, Springfield, Ohio.—In this invention the plow is constructed in a peculiar manner, and so attached to the standard and beam that it can readily and easily be detached and removed, and a simple cultivator tooth, scraper, shovel, or other form of plow, be attached and used in its place.

COTTON AND HAY PRESS.—J. J. Hines, Evergreen, Ala.—This invention is an improvement upon those presses in which toggle joint levers are employed to raise and lower the platen; and it consists in a novel and simple application of such levers in combination with the means for actuating them.

SEEDING MACHINE.—D. C. and G. W. Van Brunt and H. Barber, Horicon, Wis.—In this invention the construction of the frame is greatly simplified and better adapted for its purpose, and a novel method of holding the teeth is employed, whereby they retain their proper position when working in tillable soil, but yield to immovable obstacles.

WAGON BRAKE.—John Ludeke, Griffin's Corners, N. Y.—This invention relates to a new wagon brake, which is so arranged that the driver can, when he applies the brake, let go the lever without thereby releasing the brake.

MORDANT FOR DYEING AND PRINTING.—F. S. Dumont, New York city.—This invention relates to a new mordant for all kinds of dyeing and printing processes, which is made from the serum of the blood.

MODE OF FASTENING ARTIFICIAL TEETH.—E. C. Stone, Galesburg, Ill.—This invention relates to a new and useful improvement in the method of fastening artificial teeth to the plate when metal and rubber or vulcanite are used in combination; and consists in the use of staples passing through the plate and fastened without soldering.

EDGING TOOL.—O. W. Morley, Tarrytown, N. Y.—This invention relates to new and useful improvements in tools for "edging" or "scarfing" leather in the process of making harness, and for similar purposes, whereby accuracy in the width and depth of cut, as well as a great saving of time, is secured.

TABLE.—A. Belchambers, Ripley, Ohio.—This invention relates to a new and useful improvement in tables with folding leaves, and consists in the mechanical arrangement for supporting the leaf.

EXTENSION TABLE.—Charles P. Lentz, Poughkeepsie, N. Y.—This invention relates to new and useful improvements in extension tables, whereby that description of table is greatly simplified.

CULTIVATOR.—Job McNamee Baker, Fayetteville, Texas.—This invention relates to new and useful improvements in machines for planting and cultivating the soil, and consists in such a construction and arrangement of parts that the machine is adapted to all the purposes for which planting, cultivating, and ridging machines are usually employed.

SOFA BEDSTEAD.—Adam Schwaab, New York city.—This invention consists of an arrangement, whereby the upholstered part of the back may be swung forward out of the frame, on hinged arms, and arranged alongside and in the same horizontal plane with the seat, to form a bed.

VEGETABLE CUTTER.—R. Hemenway, New Cassel, Wis.—This invention consists in the application, on a suitable bench, and between the table thereof, and a hopper above the table having transverse fixed knives across a passage through it, of a slide provided with a lateral two-edged knife cutting both ways, and a series of knives below the said double-edged cutter which receive the slices therefrom, cutting them into smaller pieces which are again cut by the fixed knives in the table below; the said slide is arranged to be worked either by one or two persons.

PLOW.—A. C. Judson, Grand Rapids, Ohio.—This invention relates to improvements in plows, and has for its object to provide a detachable cutter at the junction of the mold board and landside to facilitate removal for sharpening, also to provide an improved construction of beam-wheel attachment and drawing attachments.

WINDOW AND OTHER BLINDS.—Stephen Hebron, Buffalo, N. Y.—This invention relates to improvements in blinds for windows, doors, etc., whether for outside or inside use, and consists in an improved construction of the same for the adaptation thereto of mosquito bars.

LIFTING FLATS IN SELF-STRIPPING CARDING MACHINE.—Benjamin Dobson and W. Slater, Bolton, England.—This invention consists in lifting the top flats by a bowl on the lifting wheel, acting on a curved surface on the slides, which are drawn down by springs as soon as the bowls have passed. By this means the top flats are rapidly raised and lowered again into their proper working place, and thereby better work is produced and time saved. Another part of this invention consists in the application of a ratchet wheel to the cross-driving shaft, and a catch to the radial arm, to prevent the said shaft from moving in the wrong direction.

CONE WHEELS AND CROSSINGS FOR RAILWAYS.—Hugh Baines, Lancaster, England.—This invention consists in forming car wheels with more than one tread so as to adapt them to tracks of different gages and in providing crossings adapted thereto.

STEAM GENERATOR.—James Stuart, San Francisco, Cal.—The object of this invention is to provide an improved arrangement for marine steam generating boilers, calculated to make a better application of the heat and to afford better facilities for working within the boiler, for repairing, etc,

WASHBOARD.—Wm. Bellus and C. Bowers, Fredonia, Ohio.—This invention consists in forming the metallic rubbing surfaces by placing a sheet of zinc, or other suitable metal, on a wood base and driving large round headed tacks through the same into the board, so that the round or oval heads, together with the sheet metal plate, form the rubbing surfaces.

TWEER.—J. W. Barron, Hillsborough, Ill.—This invention relates to improvements in tweers, and has for its object to provide an arrangement to simplify the labor of removing the slag and cinder from the fire, and for stirring the fire to enliven it, as is required, and which is now commonly done with a hand poker at considerable labor. The invention also comprises a weighted valve arrangement for opening, in case of explosion of gas in the air chamber to prevent damage to the same.

MULEY SAW MILL.—R. F. Wolcott, Claremont, N. H.—This invention relates to improvements in muley saw mills, and has for its object to provide an improved arrangement of the guides for the cross heads, to give the saw a forward oscillatory movement at the same time that the downward cutting action takes place; also, certain improvements in the adjustable guides for the sides of the saw; also, certain improvements in the 'giging back and feeding devices, and, also certain improvements in the friction feed apparatus calculated to facilitate the regulation of the friction.

CAR BODY ELEVATOR.—Reuben Wells, Jeffersonville, Ind.—This invention relates to an improved apparatus for elevating car bodies off the trucks for transferring them from one truck to another, as a means of transferring freight to roads of different gages, instead of unloading it from the cars of one road to those of another, the bodies being adapted to trucks of various gages; and tracks of various gages are placed over the apparatus, so that a car of one gage may be run upon the apparatus and have the body lifted off and suspended, until the truck may be run away and truck of another gage run under the body and the latter lowered upon it. The apparatus consists of elevating tables, preferably four in number, suitably adjusted to take under the four corners of the trucks, and resting upon four levers having fixed rests at one end, with their moving ends converging upon the vertical moving table of a hydraulic elevator, located centrally between the first-mentioned elevating tables, by which the latter are elevated or depressed to raise or lower the car bodies.

HAND TRUCK.—B. W. Tuthill, Oregon City, Oregon.—The object of this invention is to construct the frame-work of hand trucks of metal tubes, preferably of gas tubing, to be joined together in a cheap, simple, and inexpensive way, by which they can be readily made tight and taken apart for repairs.

MILL STONE DRIVERS.—D. B. Ritter, Glasgow, Ky.—The object of this invention is to provide improvements in the drivers used on the mill stone, spindles for imparting rotary motion, whereby they are adapted for applying the power more evenly on both sides of the spindle than can be done by the driver as now arranged.

CHEESE PRESSING APPARATUS.—James L. Sprague, Hermon, N. Y.—This invention relates to improvements in cheese hoops, and the followers for the same, and in the arrangement for connecting the screws of cheese presses with the followers.

PROPELLING WHEELS.—James S. Cunningham, New York city.—This invention consists in an improved arrangement of the buckets for governing their position while dipping and escaping from the water, and also for holding them against the resistance of the water.

WATER ELEVATOR.—D. A. Dunham, Pilatka, Fla.—This invention relates to improvements in devices used for raising or injecting water by a jet of steam, the object of which is to provide a more simple device than any now in use, and adapted for drawing water from the bottom of the vessels containing it, and it consists in a peculiar arrangement of steam and water conducting pipes with throat and water-receiving passage.

MILK HOUSE.—Fritz Schaller, Mattoon, Ill.—This invention consists in an arrangement, on a brick or stone base, of A-shaped sides and vertical ends, the sides being hinged at the base to swing open in a vertical plane, and the triangular ends being divided at the center and hinged to swing horizontally; the walls are made double, with spaces between, and provided with ventilating passages.

CYLINDRICAL HULLING MILL.—Charles S. Bailey, New York city.—This invention has for its object to furnish a simple, convenient, and effective hulling mill, designed especially for hulling cotton seed, but equally applicable to hulling other seeds, and which, while doing its work thoroughly, shall be so constructed that the knives may be easily, quickly, and conveniently taken out and adjusted.

DITCHING MACHINE.—James S. Anderson and James B. Cooley, Clark's Hill, Ind.—This invention has for its object to furnish a simple, convenient, and effective ditching machine, which shall be so constructed and arranged that it may be easily adjusted to cut a straight ditch for laying tiles, or a tapering open ditch, as may be desired.

PLOW.—Moses Tessler, Cairo, Ill.—This invention has for its object to improve the construction of plows, so as to make them more convenient, effective and durable, enabling them to be readily adjusted to run at a greater or less depth in the ground or to cut a wider or narrower furrow.

PLOW.—Henry Nolte, Lincoln, Ill.—This invention has for its object to furnish an improved plow, simple in construction, and effective in operation, for plowing and cultivating plants planted in rows, when of such a character or size as to require to have the soil turned about the said plants

SAFETY ATTACHMENT FOR STREET RAILROAD CARS.—John Fogarty, Brooklyn, N. Y.—This invention has for its object to furnish an improved attachment for street railroad cars, which shall be so constructed and arranged as to prevent any person or thing that may be upon the track from being run over by the wheels, or from throwing the cars from the track.

FURNITURE CASTER.—C. G. Wilson, Brooklyn, N. Y.—This invention has for its object to furnish an improved furniture caster, which shall be so constructed and arranged that it will allow the table, or other article to which it may be attached, to be moved freely in any direction, and which shall, at the same time, be simple in construction, strong, durable, and not liable to get out of order.

CORN HARVESTER.—G. W. S. Bell, Talulla, Ill.—This invention has for its object to furnish an improved corn harvester, which shall be so constructed and arranged as to cut two rows at a time and deposit it in bundles upon the ground, and which shall be simple in construction, effective in operation, and easily guided when at work.

PLOW.—A. Boles, Kinder, Ind.—This invention has for its object to furnish an improved plow, simple in construction, strong, and durable, which may be readily adjusted for use as a single or double plow, and which may be attached to the framework of a buggy for use as a gang plow or cultivator.

CORN PLANTER.—Henry Baughman, Columbus, Ohio.—The object of this nvention is to provide for public use a simple, and convenient corn planter which can be worked by hand or other power.

WATER WHEEL.—P. H. Lamey and A. J. Beachell, Port Treverton, Pa.—This invention consists in making the outer part of each of the buckets of a water wheel a swinging gate hinged to the inner rigid part.

FLOATING VELOCIPEDE.—L. D. Bunn, Morristown, N. J.—This invention relates to a new floating velocipede, which consists of two floats or vessels, that carry a platform on which the axle of the propelling paddle wheel, that fits between the two floats has its bearings, and that carry each a rudder at the stern end. The two rudders are connected with each other, and by means of ropes or chains with the steering lever, so that they will be moved in the same direction, thereby insuring greater certainty of action.

DEVICE FOR PUMPING BY THE MOTION OF THE OARS.—Robert R. Spedden and E. Clifford Spedden, Astoria, Oregon.—This invention has for its object to pump a boat by the motion communicated to the oars in the operation of rowing.

CLOTHES DRYER.—T. C. Collins, Little Hocking, Ohio.—This invention relates to a new and useful improvement in apparatus for drying clothes, and consists in the construction and arrangement and combination of parts whereby the facilities usually afforded by clothes dryers are greatly increased.

IRONING BOARD.—D. E. Crosby, South Vineland, N. J.—This invention relates to a new and useful improvement in ironing boards for laundry use, and consists in so constructing the board that it may be adjusted to any ordinary table, and it also consists in attaching an additional ironing board o the main board.

OVEN.—Mrs. Clarissa Preston, Wheeling, W. Va.—This invention consists, first, in supporting the grates upon the doors of the ovens, whereby they may be withdrawn from the ovens when the doors are opened, and restored thereto when the doors are closed; secondly, in an arrangement of sliding grate, whereby it is prevented from falling from its supports when drawn out for the reception of the articles to be baked; and, thirdly, in certain arrangements of devices for handling the hot plates and pans.

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94,463.—PROPELLER FOR VESSELS.—Adolphe Aubert, Nogent-Le-Rotrou, France.

94,464.—ANIMAL TRAP.—F. P. Baker (assignor to himself and J. R. Lowe), Boston, Mass. Antedated Sept. 4, 1869.

94,465.—COMPOSITION FOR WHITEWASHING.—James Baker, Ijamsville, Md.

94,466.—STOMACH BITTERS.—Moses Becker, Philadelphia, Pa.

94,467.—SEWING MACHINE.—N. P. Bradish, Jerseyville, Ill.

94,468.—SPOKE-TENONING MACHINE.—F. H. Brinkkotter, Callahan's Ranch, Cal.

94,469.—HAND CAR FOR RAILROADS.—H. L. Brown, Adrian, Mich.

94,470.—MECHANISM FOR HOLDING BOLSTERS IN SPINNING MACHINES.—E. S. Burlingame, Uxbridge, Mass.

94,471.—MANUFACTURE OF PIG IRON.—John Burt, Detroit, Mich.

94,472.—WEATHER STRIP.—H. W. Carew, Norwich, Conn.

94,473.—SCHOOL-DESK AND SEAT.—Aaron Chandler, Davenport, Iowa.

94,474.—STOVEPIPE THIMBLE.—E. C. Chapman, Lacon, Ill.

94,475.—APPARATUS FOR EMPTYING SUGAR KETTLES.—C. H. Collins and W. B. McClure, Alexandria, Va.

94,476.—GAS BURNER.—J. W. Cremin, New York city.

94,477.—STOVE-POLISHING BRUSH.—L. C. Crowell, West Dennis, Mass. Antedated Aug. 25, 1869.

94,478.—SEEDING MACHINE.—N. C. Dawson, Steele's Post-Office, Ind.

94,479.—PROCESS OF PREPARING GRAIN FOR MASHING.—F. W. De Spessbourg, Province of Normandy, France.

94,480.—HAY SPREADERS.—Norman Eaton, Woburn, Mass. Antedated April 14, 1869.

94,481.—COTTON CULTIVATOR.—Emile Enete, Catahoula, parish, La.

94,482.—REVOLVING CULTIVATOR.—W. A. Estes, South China, Me.

94,483.—DUMPING TUB.—J. S. Evans, Berkeley, Mass.

94,484.—WRENCHES FOR ELEVATING PUMP TUBES.—J. A. Fleming, Shamberg, Pa.

94,485.—DUMPING WAGON.—D. S. Gardner, Bristol, Md.

94,486.—EXTENSION-TABLE SLIDE.—S. J. Genung, Waterloo, N. Y.

94,487.—FOLDING BAGGAGE CHECK.—E. H. Graves, Chicago, Ill.

94,488.—COTTON GIN.—B. D. Gullett, Amite City, La.

94,489.—CORN PLOW.—Lewis Guthrie, Waterloo, Ind.

94,490.—DOUBLE CORN PLOW.—Lewis Guthrie, Waterloo, Ind.

94,491.—GANG PLOW.—F. A. Hill, Marysville, Cal.

94,492.—COATING IRON OR STEEL WITH COPPER OR BRASS, OR OTHER ALLOYS OF COPPER.—G. J. Hinde, Wolverhampton, England. Patented Feb. 26, 1869.

94,493.—ROOFING MATERIAL.—Benjamin Hinkley, Troy, N. Y.

94,494.—CAR VENTILATOR.—Robert Hitchcock, Springfield, Mass.

94,495.—PLASTIC CEMENT.—George E. Hopkins, Harwich, Mass.

94,496.—ANIMAL TRAP.—John Hughson, Buffalo, N. Y.

94,497.—CULTIVATOR.—John Lueth, Kankakee, Ill.

94,498.—STEAMER FOR AGRICULTURAL AND OTHER PURPOSES.—A. T. Manly, Buffalo, N. Y.

94,499.—WASHING MACHINE.—M. S. Marshall, Somerville, assignor to J. T. and J. S. Folsom, Boston, Mass.

94,500.—SAW FRAME.—Daniel Moore and Edwin Moore, Brooklyn, E. D., N. Y.

94,501.—WASH TUB.—Bernard Morahan, Brooklyn, N. Y.

94,502.—ANIMAL TEDDER.—Daniel Newton, Southington, Conn.

94,503.—RASP.—W. S. Nicholson (assignor to the Nicholson File Co.), Providence, R. I.

94,504.—HAND WEEDER.—A. F. Noyes and N. D. Beecroft, Bangor, Me.

94,505.—SLEIGH SHOE.—H. C. Overman (assignor to himself J. Q. A. Crossby), Chicago, Ill.

94,506.—CHURN.—R. D. Ozburn, Lena, Ill.

94,507.—PUMP.—Joel Patrick, Pitt county, N. C.

94,508.—APPARATUS FOR ASSAYING AND TESTING ORES AND METALS.—J. S. Phillips, San Francisco, Cal.

94,509.—PROCESS OF CONCENTRATING AND GRANULATING SACCHARINE LIQUIDS.—John Pickles, Wigan, England.

94,510.—CONSTRUCTION OF SHIPS.—David Pierce, Woodstock, Vt.

94,511.—PAPER-BAG MACHINE.—J. P. Pultz, Plantsville, Conn. Antedated Sept. 1, 1869.

94,512.—DEVICE FOR AIDING COMBUSTION IN STEAM GENERATORS.—G. W. Rawson, Cambridgeport, assignor to himself and M. Hittinger, Somerville, Mass.

94,513.—BRICK KILN.—James V. B. Remsen, New York city. Antedated Aug. 27, 1869.

94,514.—PRUNING SHEARS.—Wm. Richard, Clyde, Ohio.

94,515.—WASHING MACHINE.—M. A. Richardson, Sherman, N. Y.

94,516.—RAILWAY RAIL SPLICE.—B. Robinson, Boston, Mass. Antedated Aug. 21, 1869.

94,517.—PLATFORM SCALE.—Lyman M. Severance, Dixon, Ill.

94,518.—TREADLES FOR MACHINERY.—Jasper H. Singer, New York city.

94,519.—STAY AND GUIDE BAR FOR ELLIPTIC SPRINGS FOR VEHICLES.—J. E. Siegel and Eli Siegel, Reading, assignors to themselves and J. K. Herts, Lancaster county, Pa.

94,520.—BRAD SETTER.—C. E. Smith, Columbus, Ohio.

94,521.—CARRIAGE WHEEL.—T. R. Smith, San Francisco, Cal.

94,522.—TRUSS.—Henry Spillmann, New Orleans, La.

94,523.—GOVERNING DEVICE FOR STEAM ENGINES.—Peter A. Stewart, Lucesco, Pa.

94,524.—COMBINED KNOB LATCH AND LOCK.—W. H. Sullenberger, Harrisburgh, Pa. Antedated Aug. 25, 1869.

94,525.—RAILWAY CAR BRAKE.—J. W. Swales, San Francisco, Cal.

94,526.—MAIL BAG.—Z. T. Sweet, Davisville, Cal.

94,527.—CLOTHES DRYER.—A. L. Taylor, Springfield, Vt.

94,528.—RAILWAY RAIL CHAIR.—A. B. Thompson, Owego, N. Y.

94,529.—BRIDGE.—W. P. Trowbridge, Newtown, N. Y.

94,530.—RAILWAY CAR BRAKE.—Inglis Walker (assignor to himself and W. R. Barnard), Lynn, Mass.

94,531.—OVERSHOE.—A. G. Waterhouse, San Francisco, Cal.

94,532.—METALLIC ALLOY FOR FILTERING OILS, AND FOR THE MANUFACTURE OF PAINTS, CEMENTS, ETC.—James Webster, Birmingham, Great Britain.

94,533.—LAMP BURNER.—J. H. Weeden, Waterbury, Conn., assignor to Scoville Manufacturing Co.

94,534.—BRIDGE GATE.—Alexander Weide, Chicago, Ill.

94,535.—LANTERN.—Wm. Westlake, Chicago, Ill.

94,536.—LANTERN.—Wm. Westlake, Chicago, Ill.

94,537.—ATTACHMENT FOR COOKING STOVES.—D. N. Allard, Chester Hill, Ohio.

94,538.—GAS HEATER.—Boyd Allen (assignor to himself and S. C. Pratt), Boston, Mass.

94,539.—DITCHING MACHINE.—J. S. Anderson and James B. Cooley, Clark's Hill, Ind.

94,540.—HULLING MILL.—C. S. Bailey, New York city.

94,541.—RAILWAY CROSSING FOR CONE WHEELS.—Hugh Baines, Manchester, England.

94,542.—CULTIVATOR.—Job McNamee Baker, Fayetteville, Texas.

94,543.—TWEER.—J. W. Barron, Hillsborough, Ill.

94,544.—MACHINE FOR MAKING RAILROAD SPIKES.—John W. Bartlett and David P. Bosworth, Harmar, Ohio.

94,545.—APPARATUS FOR LIGHTING GAS BY ELECTRICITY.—Wm. W. Batchelder, Boston, Mass.

94,546.—CORN PLANTER.—Henry Baughman, Columbus, Ohio.

94,547.—RAILWAY CAR COUPLING.—R. W. Baylor, Norfolk, Va.

94,548.—TABLE LEAF SUPPORT.—A. Belchambers, Ripley, Ohio.

94,549.—CORN HARVESTER.—G. W. S. Bell (assignor to himself and H. C. Bell), Talulla, Ill.

94,550.—ICE PITCHER.—Wm. Bellamy, Newark, N. J.

94,551.—WASHBOARD.—Wm. Bellus and C. Bowers, Fredonia, Ohio.

94,552.—BLANK BOOT HEELS.—H. H. Bigelow, Worcester, Mass.

94,553.—CHAIR SEAT.—Osmore A. Bingham, Gardner, Mass.

94,554.—PLOW.—Abram Boles, Kinder, Ind.

94,555.—MACHINE FOR BREAKING THE LEAVES AND STEMS OF TOBACCO.—Nicholas H. Borgfeldt, New York city.

94,556.—SELF-CLOSING TELEGRAPH KEYS.—W. Clay Bowers, Wheatland, Iowa.

94,557.—CLAMP.—M. V. Brigham, Mannsville, N. Y.

94,558.—MODE OF CLOSING PAPER BAGS.—Morgan W. Brown, New York city.

94,559.—FLOATING VELOCIPEDE.—Lewis D. Bunn, Morristown, N. J.

94,560.—WARDROBE BEDSTEAD.—Sanford S. Burr, Dedham, and Levi Pierce, Charlestown, Mass.

94,561.—GRATE BAR FOR BOILERS.—David Byard, Sharon, Pa.

94,562.—CLOTHES DRYER.—Edward Carter, Rensselaer, N. Y.

94,563.—STOP COCK.—John C. Chapman, Cambridgeport, Mass.

94,564.—OIL CAN.—Charles Chinnock, Brooklyn, N. Y., assignor to I. Little Hyde, New York city. Antedated August 27, 1869.

94,565.—VELOCIPEDE.—Wm. B. Clark, Whitefield, Me.

94,566.—BALANCED VALVES.—Daniel Collins, Girard, Ala.

94,567.—CLOTHES DRYER.—T. C. Collins, Little Hocking, Ohio.

94,568.—MACHINE FOR PRESSING TOBACCO.—Thomas Cope and George Cope, Liverpool, England.

94,569.—FLY TRAP.—J. J. Craig, Knoxville, Tenn.

94,570.—REFLECTOR FOR STREET LAMPS.—Joseph W. Cremen, New York city.

94,571.—LOOM.—George Crompton, Worcester, Mass.

94,572.—IRONING BOARD.—D. E. Crosby, South Vineland, N. J.

94,573.—PROPELLING APPARATUS.—James S. Cunningham (assignor to himself and George Le Cronier), New York city.

94,574.—MEAL AND FLOUR DRYER.—Henry Cutler (assignor to S. N. Cutler & Co.), Ashland, Mass.

94,575.—KNITTED STOCKING.—Anthony G. Davis and Charles W. Blakeslee, Watertown, and Ebenezer B. Beecher, New Haven, Conn.

94,576.—JACK SPOOL.—Daniel R. Day, Rindge, N. H., and John G. Folsom, Winchendon, Mass.

94,577.—BREECH-LOADING FIRE-ARM.—Faustino Valdes Diaz, New York city.

94,578.—WEED GATHERER FOR PLOWS.—Loyal M. Doddridge, New Mount Pleasant, Ind.

94,579.—RAILWAY CAR COUPLING.—Thomas B. Dora, Mattoon, Ill.

94,580.—PROGRESSIVE KILN.—Helmuth Dueberg, Baltimore, Md.

94,581.—COMPOUND TO BE USED AS A MORDANT IN DYEING AND PRINTING.—F. S. Dumont, New York city.

94,582.—WATER ELEVATOR.—D. A. Dunham, Pilatka, Fla.

94,583.—BEEHIVE.—Homer M. Dunham and Bishop Addington, Centreville, Ind.

94,584.—STILL.—Charles K. Dutton, New Berne, N. C.

94,585.—LOCK NUT.—W. P. Ewing and Isaac S. De Ford, Elkton, Md.

94,586.—CHURN DASHER.—Miles Fisk, Arian, Mich.

94,587.—SAFETY ATTACHMENT FOR STREET RAILWAY CARS.—John Fogarty, Brooklyn, N. Y.

94,588.—FLOATING VELOCIPEDE.—Wm. Frankel, Springfield Ohio.

94,589.—SULKY HARROW.—W. H. H. Frye, North Fryeburg, Me.

94,590.—CUTTER HEAD.—John Gage, Henniker, N. H.

94,591.—MACHINE FOR FORMING SHELLS FOR DRY MEASURES.—John Gage, Henniker, N. H.

94,592.—SAWING MACHINE.—Peter Geiser, Waynesborough, Pa.

94,593.—PARLOR STOVE.—John H. Goodfellow, Troy, N. Y.

94,594.—COMPRESSED AIR ENGINE.—Edwin H. Grant, Washington, D. C.

94,595.—CLOTHES DRYER.—Andrew Harbison (assignor to himself and Esli N. Houk), Newcastle, Pa.

94,596.—MANUFACTURE OF ILLUMINATING GAS.—George W. Harris, Elizabeth, N. J., and Henry Holdrege, New York city.

94,597.—BREAST LOOP FOR HAMES.—William B. Hayden, Columbus, Ohio.

94,598.—CLOTHES RACK.—V. M. Heath, Morristown, Vt.

94,599.—WINDOW BLIND.—Stephen Hebron, Buffalo, N. Y.

94,600.—VEGETABLE CUTTER.—R. Hemenway, New Cassel, Wis.

94,601.—RAILWAY SPIKE.—C. L. Heywood, Boston, Mass.

94,602.—COTTON AND HAY PRESS.—J. J. Hines, Evergreen, Ala.

94,603.—SPRING.—George Hopson and Joseph H. Mason, Bridgeport, Conn.

94,604.—BURGLAR ALARM.—James J. Jackson, Curwinsville, Pa.

94,605.—COMPOSITION FLUX FOR MANUFACTURE OF IRON AND STEEL.—Jacob Jameson, Philadelphia, Pa.

94,606.—HINGE.—Wm. Johnson, Cincinnati, Ohio.

94,607.—RAILWAY RAIL JOINT.—William Johnston, Havelock, Pa.

94,608.—HARVESTER GUARD.—J. Herva Jones and Miles S. Prentice, Rockford, Ill.

94,609.—PLOW.—A. C. Judson (assignor to himself and E. O. Judson), Grand Rapids, Ohio.

94,610.—FORCE PUMP HAVING CONCENTRIC PISTONS.—Peter M. Kafer, Trenton, N. J.

94,611.—APPARATUS FOR DISTILLING AND RECTIFYING SPIRITS.—Gottlob Kaiser, New York city.

94,612.—JOINT STANDARD SLED.—Isaiah Kingman, Waltham, Me.

94,613.—PERMUTATION LOCK.—W. F. Kistler (assignor to himself and Joseph L. Hall), Cincinnati, Ohio.

94,614.—TURBINE WATER WHEEL.—P. H. Lamey and A. J. Beachell, Port Treverton, Pa; P. H. Lamey assigns to George Kuhn and P. K. Knights.

94,615.—EXTENSION CHAIR.—Frederick William Lange, Chicago, Ill.

94,616.—MEDICAL COMPOUND.—David Langell, Apple Creek, Ohio.

94,617.—EXTENSION TABLE.—Charles Ph. Lenz, Poughkeepsie, N. Y.

94,618.—APPARATUS FOR PROPELLING MACHINERY.—E. J Leyburn, Lexington, Va.

94,619.—CHURN.—A. Lloyd, Millersburg, Ill.

94,620.—SYRINGE.—H. D. Lockwood, Charlestown, Mass.

94,621.—FIRE KINDLER.—Augustus Lodeman and Meyer Desenberg, Kalamazoo, Mich.

94,622.—WAGON BRAKE.—John Ludeke (assignor to himself and Jacob Biehler), Griffin's Corners, N. Y.

94,623.—WALKING CULTIVATOR.—Edward P. Lynch and Henry R. Raff, Davenport, Iowa.

94,624.—WIND WHEEL.—A. I. Maxwell, Morrison, Ill.

94,625.—COAL STOVE.—H. D. McGeorge, Rochester, N. Y.

94,626.—PRESERVING WOOD FROM DECAY AND MILDEW.—A. R. McNair, New York city.

94,627.—STOVE GRATE.—John Moran, Washington, D. C.

94,628.—PLAITING ATTACHMENT FOR SEWING MACHINES.—Aaron Morehouse and A. R. Heath, Danbury, Conn.

94,629.—EDGING TOOL FOR HARNESS MAKERS.—O. W. Morley, Tarrytown, N. Y.

94,630.—DIE FOR FORGING FRENCH CLIPS FOR CARRIAGES.—F. B. Morse, Plantsville, Conn.

94,631—PRINTERS' INKING ROLLER FROM RUBBER SPONGE.—Stephen Moulton, Bradford-on-Avon, England. Patented in England May 9, 1868.

94,632.—PICTURE FRAME.—A. A. Murfey, Montville, assignor to himself and N. D. Morgan, Norwich, Conn.

94,633.—FAN.—O. R. Nitsch, New York city.

94,634.—PLOW.—Henry Nolte, Lincoln, Ill.

94,635.—GRAIN MILL.—James Norman, New Orleans, La.

94,636.—PLOW.—O. Osborn, Trumansburg, N. Y.

94,637.—PLOW.—W. F. Pagett, Springfield, Ohio.

94,638.—CIRCULAR SAW MILL.—Francis Parker, Cato, N. Y.

94,639.—DOOR LOCK.—N. Petre, New York city.

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94,641.—WIND WHEEL.—William M. Piper, Blue Earth City, Minn.

94,642.—ANIMAL TRAP.—Clark Polley, Shelbyville, Tenn.

94,643.—OVEN.—Clarissa Preston, Wheeling, West Va.

94,644.—HORSE HAY FORK.—Emanuel Raber, Roanoke, Ind.

94,645.—CHURN.—J. L. Ressler, Ramsburg, Pa.

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REISSUES.

35,914.—CORN PLANTER.—Dated July 22, 1862; reissue 3,630.—James Armstrong, Jr., Elmira, Ill.
18,156.—MACHINE FOR FORGING NUTS.—Dated Sep. 8, 1857; reissue 3,631.—George Dunham, Unionville, Conn., assignee, by mesne assignments, of Edward Paye and Samuel Hall.
47,938.—APPARATUS FOR OILING WOOL.—Dated May 30, 1865; reissue 3,632.—B. A. Earl, Philadelphia, Pa., assignee of B. A. Earl and Henry Holcroft.
88,216.—ORE CRUSHER.—Dated March 23, 1869; reissue 3,633.—J. W. Rutter, St. Louis, Mo.
76,138.—INKSTAND.—Dated March 31, 1868; reissue 3,634.—H. L. Andrews, Chicago, Ill.
34,413.—SEWING MACHINE FOR BOOT AND SHOE SEWING.—Dated Feb. 18, 1862; reissue 3,635.—Charles Goodyear, Jr., Francis Du Bois, Frederick Renaud, and H. T. Close, New York city, assignees of Augustus Destouy.

DESIGNS.

3,654.—ORNAMENT FOR "WILCOX & GIBBS SEWING MACHINE."—S. P. Crins, Providence, R. I.
3,655.—ROAD SCRAPER.—J. C. Evans, Delaware, Ohio.
3,656.—SPOON OR FORK HANDLE.—Chas. Osborne, Brooklyn, N. Y., assignor to Whiting Manufacturing Co., New York city.
3,657.—GROUP OF SCULPTURE.—John Rogers, New York city.

EXTENSIONS.

INKSTAND.—Barnet L. Solomon, New York city, executor of Myer Phineas, deceased.—Letters Patent No. 1,652, dated Aug. 19, 1862.
MACHINE FOR ENGRAVING CALICO PRINTERS' ROLLERS.—John and Thomas Hope, Providence, R. I.—Letters Patent No. 13,462, dated Aug. 21, 1855.
SEWING MACHINE CASE.—F. A. Ross, New York City.—Letters Patent No. 13,499, dated Aug. 28, 1855.
REAPING AND MOWING MACHINES.—Henry Waterman, Brooklyn, N. Y.—Letters Patent No. 13,512, dated Aug. 28, 1855.
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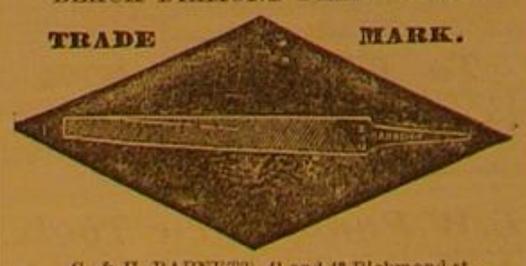

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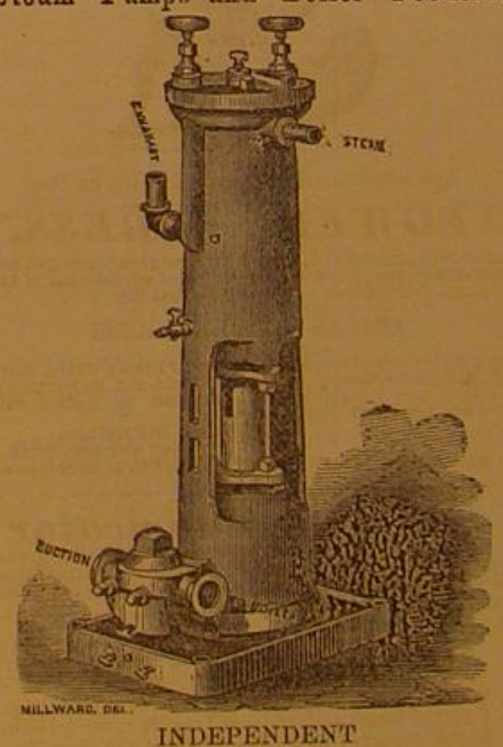

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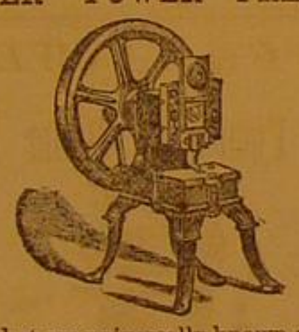

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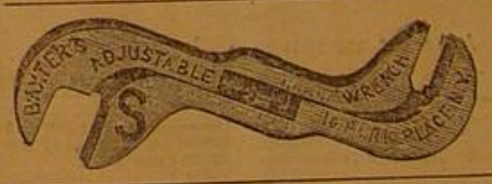

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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXI.—No. 14. [NEW SERIES.]

NEW YORK, OCTOBER 2, 1869.

$3 per Annum [IN ADVANCE.]

The Gerner Steam Boiler.

This boiler was described and illustrated on page 97, Vol. XX., of the SCIENTIFIC AMERICAN. At that time we had no evidence of the power of the boiler to generate steam economically, except an opinion based upon the structure of the boiler, and the testimony of others whose opinions are valuable and trustworthy on such matters, and whose names we gave in full. Since that time we have had the opportunity to observe and test critically a stationary boiler constructed on this plan, now in operation at Paterson, N. J., and also to inspect a marine boiler made on the same principle now in operation at the General Office of the New York and Erie Railroad Company, in this city. We find that the stationary boiler will evaporate 10·65 lbs., of water at 212° into perfectly dry steam for every pound of anthracite coal consumed.

The experiment by which this result was determined was performed in the most approved manner—that adopted in the U. S. Navy experiments.

We are, therefore, now able to speak from actual knowledge of the merits of this boiler, and it is with pleasure that we re-open our columns to discuss an improvement calculated to produce a large saving in the consumption of fuel used for steam generation.

The sources of loss in steam generation may be included in two general classes; namely, imperfect combustion, and radiation. The reader will understand that we make a wide difference between steam produced in a boiler and steam consumption in an engine, and that the sources of loss in the latter are not to be considered, in estimating the power value of a boiler, since good results cannot be expected from the best boiler connected with a defective engine, nor from the best engine supplied with steam from a defective boiler. A boiler must therefore stand alone in any estimate of its worth; its evaporative power, compared with the coal consumed, and its comparative safety, being the principal points which challenge inquiry.

Its evaporative power will depend, of course, upon the extent to which the causes of loss above classed are eliminated, while its comparative safety may be inferred from the nature of the materials used in its construction, the character of the workmanship, and the removal of those faults of construction known to impair the safety of boilers in general.

The skilled constructor will make safety the primary consideration, and economy the second That the reader may comprehend the successive steps by which the present form of the Gerner boiler has been reached, he is referred to Figs. 1 and 2 of the accompanying engravings.

The inventor of the Gerner boiler, starting with the assumption that, so far as safety alone is regarded, no form of boiler is superior to the old-fashioned cylinder, has proceeded step by step to develop its steam-producing power without relinquishing its known elements of safety. The Figs. referred to give, respectively, an end and side view of a plain cylinder boiler, set in brick-work, W L being the water line, and from X to X, around the lower section of the boiler, showing the extent of heating surface.

Figs. 3 and 4 give two views of the same boiler, with its power and economy greatly increased by the application to it of the Gerner Reinforcement, an application that may be made to any plain cylinder or flue boiler. The Gerner Reinforcement consists in placing within a cylindrical boiler another cylinder of just sufficiently smaller size to leave a space (when set a little out of center) of about four inches at the bottom and ends, increasing gradually to about six inches at the top. This cylinder, by displacing the large mass of water as shown in Fig. 2, reduces it to a thin sheet, which fills the space between the two cylinders, and entirely surrounds the inner one; the water line being now near the top instead of the middle of the boiler. The inner cylinder is simply supported at each end by a bracket attached to the outer boiler, and is provided with a dome, open at the top, setting within the dome of the outside cylinder. The steam, as it is generated, rises, as shown by the arrows in Fig. 4, into the outer dome, and thence passes by the inner dome or conducting pipe, into the interior of the inner cylinder, which thus becomes a large steam reservoir entirely filled with dry steam, which is kept in its normal condition by the jacket of hot water which surrounds and protects it from radiation, the temperature which protects being the same that produced it.

The supply pipe, E, conveys the steam as it is required, from the center of the steam reservoir, thus acting as a steam trap to convey only dry steam, were not the essentials to that condition already complied with.

It will be observed that the pressure of the steam within the reservoir equalizes that of the steam in the water outside, thus obviating the necessity for "staying" and the use of heavy iron in its construction.

The water being carried so high in the boiler admits of the brick-work being set off from it, and the fire thus carried entirely around it, throughout its entire length and ends, thereby doubling the extent of heating surface. The brick-work may be thrown in an arch over the boiler or the successive layers of brick "stepped in" like a reverberatory furnace, as shown in Fig. 3.

It is obvious that among the advantages gained by the Gerner Reinforcement are, first, doubling the heating surface; and, second, the thin sheet of water presented to the action of heat instead of a large mass, by which steam is not only generated much more rapid-

Fig. 1

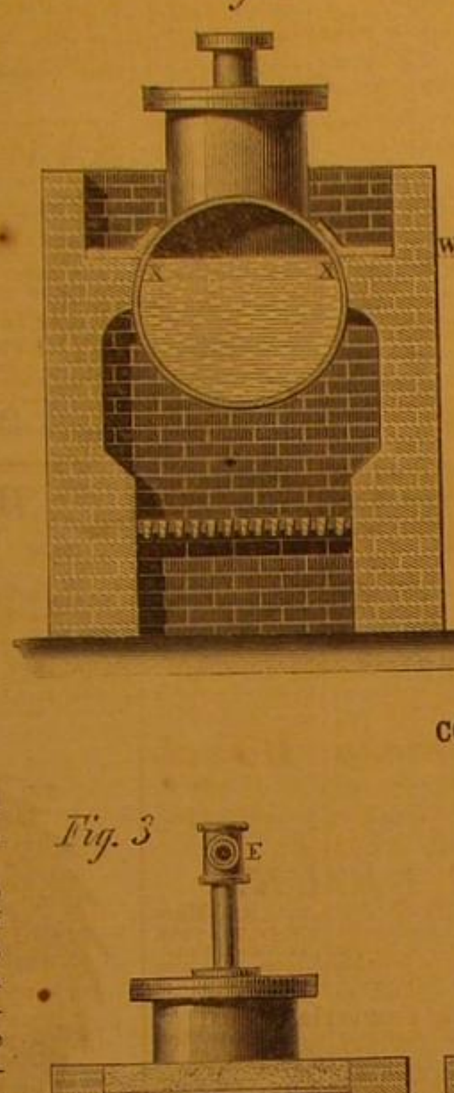


Fig. 1

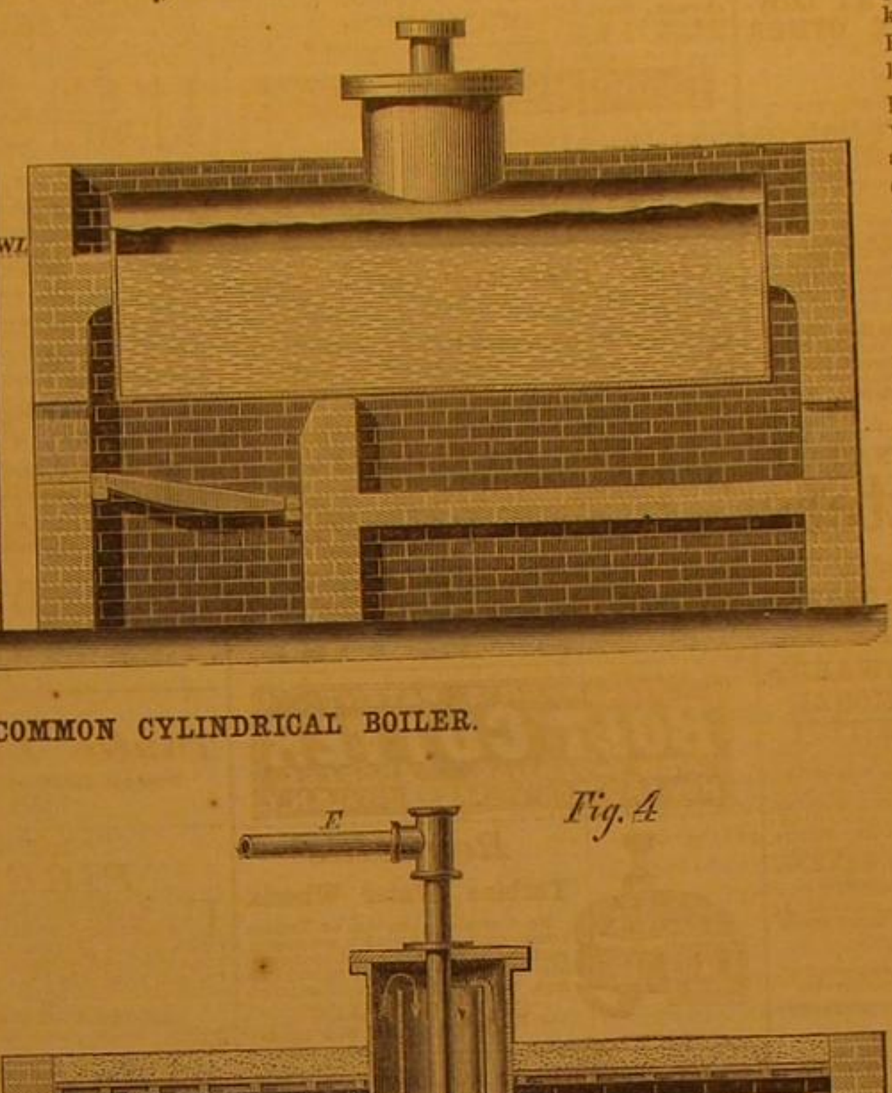


Fig. 2

COMMON CYLINDRICAL BOILER.

Fig. 3

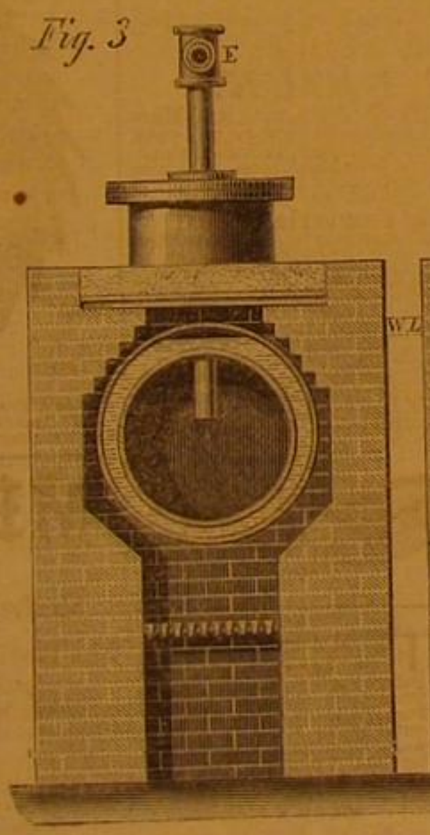
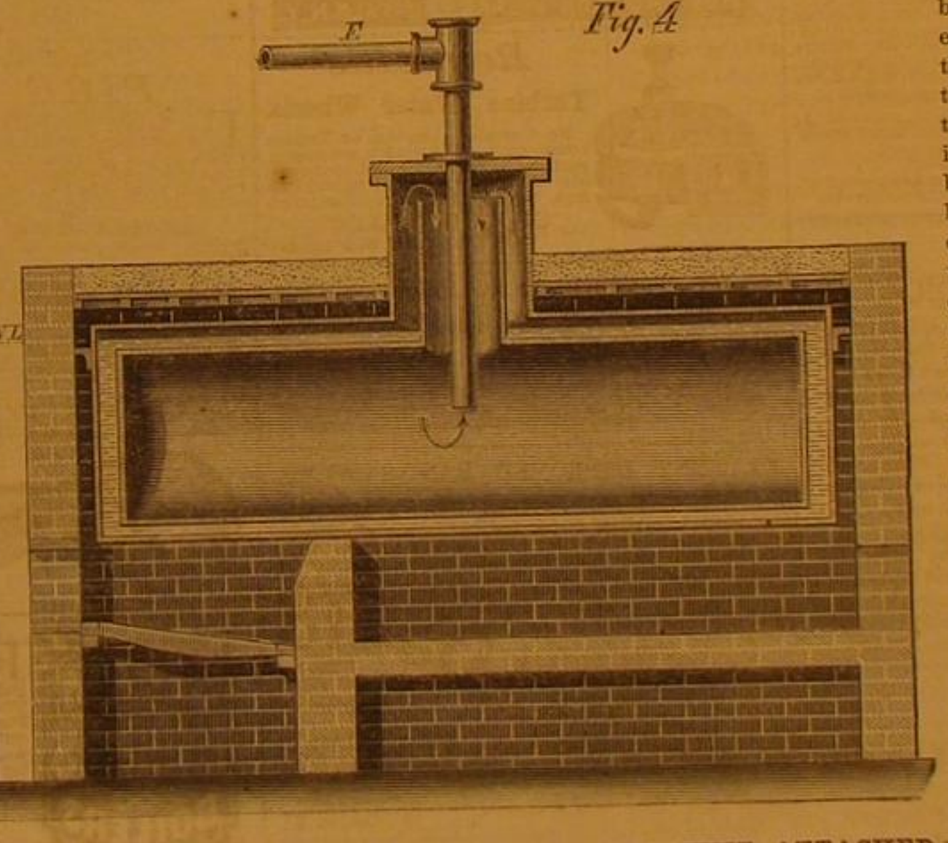


Fig. 4



THE COMMON CYLINDRICAL BOILER WITH THE GERNER REINFORCEMENT ATTACHED.

Fig. 5

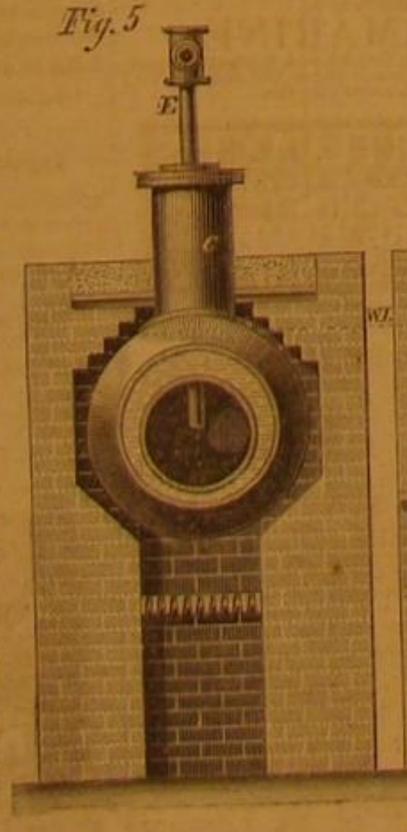
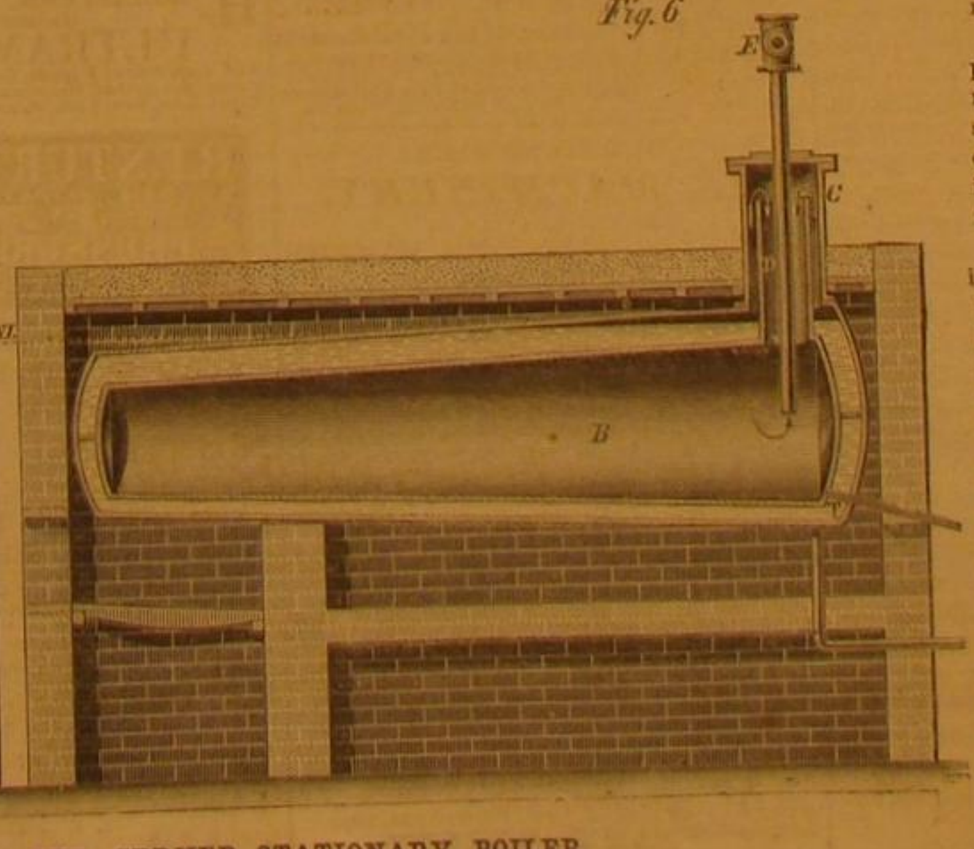


Fig. 6



THE GERNER STATIONARY BOILER.

ly and economically, but the lessened volume of water materially increases the safety of the boiler. If authority for this statement be asked, we refer the reader to C. Wye Williams' able work on "Heat and Steam," page 171, where he asserts that "the risk of explosion is greatly increased by the increase of water in the boiler, every cubic foot of which, beyond what is absolutely necessary for the generation of steam, being an additional source of danger."

A steam reservoir of great capacity is supplied where the steam is constantly protected from all extraneous influences, and its perfect dryness assured.

Figs. 5 and 6 are a cross-sectional end view and a vertical longitudinal section of the Gerner stationary boiler.

The shell consists of a cone-shaped cylinder, so called, its smaller end being over the grate. The boiler's axis is set level. The flame envelopes the boiler, and its escape is checked at the top and sides by a brick partition at the rear, and its exit is through a vent underneath the larger end of the boiler into the flue and chimney. Within the shell is placed a similar cylinder of less dimensions, leaving a water space of about four inches at the bottom, increasing to, say, six inches at the top. This water space surrounds the entire inner cylinder. The steam dome, C, receives the steam, passing it through the pipe, D, into the inner cylinder (steam reservoir), B, whence the steam finds exit to the engine through the pipe, E.

It will be seen by the foregoing description that all of the advantages described in the reinforcement have been maintained in the Gerner stationary boiler proper, and its efficiency and economy still further augmented by its conical shape.

The angle of the heating surface, as here presented to the action of the fire, is best calculated to catch and absorb the heat, impingement being more direct and effective, while the free circulation of the water from the position in which the conical shells retain it, is greatly promoted.

It will also be observed how scientifically this form provides an extensive combustion chamber, wherein the gases of combustion may become thoroughly ignited and the radiation from the fire strike very directly upon all sides of the cone, while the rapidly narrowing passage towards the escape flue, in both the vertical and horizontal direction, so progressively retards the gases in their passage to the outlet that their combustion is perfected and their heat, as far as possible, imparted to the boiler.

There is no lodgment for refuse, ashes, and dirt, of any kind, about the boiler, and all sediment within is naturally deposited at its lowest point, T, whence it is easily blown off.

The advantage derived from setting the boiler without contact with the brick work is great, for when, as is necessary with ordinary boilers, the brick-work and boiler are brought in contact, any water from the top will settle at the point of contact, become decomposed, and very quickly weaken the boiler by oxidizing the iron. The "Society for the prevention of Boiler Explosions," in England, report that fifty per cent of the explosions of stationary boilers are clearly traceable to this cause.

Unequal expansion and contraction are also, doubtless, as much promoted in a boiler but half bricked in, as in a tubular or locomotive boiler with its varying diameters and position of shell and tubes; for the upper half, exposed to the atmosphere, while the lower part is subject to intense heat, must be unequally affected, and soon lead to the rapid destruction of the boiler.

We have given above the results of a test on a stationary boiler of the Gerner construction, 10 feet long, 2 feet front, and 3 feet rear diameter, with a grate surface of $4\frac{44}{100}$ square feet, which show that the boiler is producing 500 lbs. of dry steam per hour for every 50 lbs. of coal consumed, after setting aside the fraction 0·65 of a lb. over 10 lbs of steam produced by the consumption of a pound of anthracite. This margin of 6·5 per cent of the total production, will cover many of the defects of unskillful firing.

Assuming, then, that in practice the boiler will evaporate 500 lbs. of water per hour with a consumption of 50 lbs. of coal, and allowing 33 lbs. of water to be the fair standard of a horse power, this boiler is capable of supplying 15-horse powers.

But it may be asked, how is this gain to be theoretically accounted for? As further answer to this inquiry, already partially met in this article, we may be permitted to make the following extracts from accepted authorities on steam:

"The present construction of the multitubular boiler, as it is called, may be truly stated as a disgrace to the science of this age of progress."—*Page* 29 "*Modern Practice of Boiler Engineering*," *by Robert Armstrong. Revised by John Bourne.*

"Heat, communicated by flame, must depend on its mass."—*Page* 132 "*Treatise on Combustion of Coal*," *by C. Wye Williams.*

"The tubular system is chemically, mechanically, and practically a destroyer of ignition and the sustained existence of flame."—*Ibid, page* 134.

"The result of the adoption of the multitubular system has been a less perfect combustion, a larger development of opaque smoke, a greater waste of fuel and heat, and a more dangerous application of it."—*Ibid, page* 122.

"Any expedient which supersedes the present flue, and multitubular marine boiler, will very considerably accelerate the passage between this country (England) and America.—*Page* 29 "*Modern Practice of Boiler Engineering*," *by Robert Armstrong. Revised by John Bourne.*

It will thus be seen that practice and theory do not conflict, and that the results obtained by the Gerner boiler exactly coincide with what might be expected on purely theoretical considerations. Its structure is such as complies with the principles laid down by the eminent authorities quoted and comprehends them all.

The Gerner principle, as herein described for stationary boilers, is even more effectually applied to portable and marine boilers.

We have already said that a marine boiler (*i.e.*, built upon the same plan as one intended for a steam vessel), is now in successful operation at the New York and Erie Railroad General Offices (Grand Opera House), corner of Eighth avenue and Twenty-third street, New York. It is 16 feet long, 6½ feet in diameter, and has produced, according to the testimony of J. W. Brooks, Superintendent of Machinery and Motive Power, N. Y. and E. R. R., the—so far as we are aware—unparalleled result of 110-horse powers, 3,300 lbs. water evaporated per hour, with an economical result of over 12 lbs. of water to 1 lb., of coal, and at our visit to this establishment we were convinced of the very superior dryness of the steam produced.

We append a comparative statement of dimensions and economical results, a 40-horse power boiler taken as an example:

STYLE OF BOILERS.	Number of boilers.	Length in feet.	Diameter in inches.	Economical result. Pounds of water to 1 of coal.
Locomotive boiler.....	1	24	42	8
Return tubular boiler.....	1	16	43	7
Flue boiler.....	1	40	45	6
Plain cylinder boiler.....	2	40	36	5
Gerner Stationary boiler.	1	22	36x48	10
" Portable boiler...	1	13	56	11

The question of horse power is a very important one to purchasers. The only true test of a boiler is the amount of water it will evaporate per hour into perfectly dry steam. Taking the average of steam engines, as now constructed, it may be fairly stated that the conversion of from 30 to 35 lbs. of water per hour into dry steam, under a pressure of 50 lbs., is a liberal standard for a horse power. The Gerner boilers are built upon that standard, and are guaranteed to produce that result.

The business management of this boiler is now controlled by Kasson & Co., 119 Broadway, New York (P. O. Box 5,195), from whom full descriptive circulars and price list may be obtained on application.

PROF. HUXLEY AS PRESIDENT OF THE BRITISH ASSOCIATION.

There is, perhaps, no one in England, says the *Spectator* (London), outside the domain of politics, with whom we have contended so often or so fiercely as with Prof. Huxley. We usually disagree with his conclusions, always distrust his method, and occasionally, though rarely, cross-examine his testimony as to facts. Nevertheless, we cordially congratulate the British Association on the successful effort to elect him as President for 1870. It is quite clear, even from the reticent accounts which have appeared in the papers, that there was a contest about his election, and a contest in which it was of the last importance to the cause of free inquiry, or rather of scientific inquiry, of any kind, that his friends should be successful. A battle, it is pretty evident, was fought around him, between the obscurantists and the seekers after truth for its own sake, and if the former had won, as it appeared at one time probable they would win, the cause of truth—that is, in our judgment, of supernaturalism as opposed to materialism—would have been thrown back half a century. The fight, as we understand it, was in this wise. Prof. Huxley, as is well known, holds opinions—no, that is an incorrect description—avows a belief, that the processes of scientific inquiry, if strictly pursued, will yield results not consistent with certainty as to the existence of a sentient Final Cause. The Final Cause may be non-sentient, or may not exist—cause being as infinite as effect—or may be—and this is, as we understand him, Mr. Huxley's preferential view—so absolutely beyond human ken, so clearly the Unknowable, that to attempt to trace its character, or wishes, or end in the government of the universe is an attempt to resolve a recurring decimal, a useless and perplexing waste of time. The idea is one very familiar to the scientific world, and would not worry it in the least; but Mr. Huxley is, unfortunately, very "indiscreet,"—thinks it is duty not only to hold his opinions, but to propagate them; is apt to propagate them very forcibly; and, worst of all, is inclined, when propagating them, to talk English. Nobody competent to form an opinion at all can doubt for one moment that Mr. Huxley intends to say that the existence, and, still more, the character, of the Final Cause is an open question, upon which no human being, the Archbishop of Canterbury included, has any right to give an absolute opinion. Consequently, a large section of the association, like a still larger section of the British public, think Mr. Huxley "indiscreet," or dangerous, and though not prepared to affirm that his opinions are disqualifications for scientific office—to affirm that would be to give up investigation altogether—are prepared to say, that "in the existing state of public opinion," and—ah! hum!—"having regard to the prejudices of the mass of English society," it would be expedient to nominate some president less liable to attack. So strong was the opposition upon this ground alone, for nobody questions the Professor's scientific rank, that the council who had nominated Mr. Huxley appear to have given way, and to have informally requested Lord Stanley to accept the Presidency for 1870. A more ignoble piece of Philistine hypocrisy we never remember to have heard of. We must not, of course, with the "Faithfull *vs.* Grant," in our recollection, assert that Lord Stanley agrees with Mr. Huxley, much more than with his opponents; but we may, at least, say that those who invited him knew that he was not "orthodox," knew that he had described Christianity, in the House of Commons, as "the opinion of Europe," knew that he was certain, from the texture of his mind, to push inquiry to any conceivable length. But because they also knew that he would be discreet, that he would say nothing that could "offend" people who did not understand him, that he would hold an esoteric as well as an exoteric creed, that he would, whatever his conclusion, express it in conventional phrase, they resolved to invite him to take the chair of an association whose single object is the diffusion of absolute truth. Lord Stanley, perhaps aware of the reasons for his own nomination—he generally *is* aware of things, despite his talent for silence—perhaps faintly contemptuous or a preference, shown as much to his rank as himself, quietly declined the honor, advising the association to select a man of science instead of a politician. Thereupon, the council fell back upon their original choice, Prof. Huxley, but even in nominating him, their spokesman, Sir Stafford Northcote, felt it necessary to apologize, and separate himself, in the most marked manner, from his own vote, while the *Times* reports and justifies the sort of dismay with which the election is regarded. Its reporter says: "There seems to be a very general feeling, that Prof. Huxley, in the chair of the British Association, will be in as difficult a position as Mr. Bright in the Ministry. He is the champion of views to which large classes of people entertain very strong objections; and however discreet he may be in the absence of opposition, his best friends tremble for him if those views should be impugned. The great object of the British Association is to render science popular, and this object is best promoted by a President whose name is not identified with one side of an unsettled question, and whose declared opinions are not calculated to provoke any kind of antagonism. About the great scientific claims of Prof. Huxley there can be no dispute; and, while we cannot look forward to his presidency quite without misgivings, we none the less cordially hope that it may fulfill all the expectations of his supporters."

The *Times* exactly represents, in this instance, the idea of the majority of Englishmen, and we cannot conceive of any idea at once more unwise and more ignoble. All through England, as through all the Continent, the one grand controversy raging among cultivated men—whose opinion, be it remembered, will be, ten years hence, the opinion of the people—is, whether the Supernatural exists at all; whether everything is not cause and effect; whether the theory of a Sentient First Cause, which is the basis of all we call faith or religion—though it is not the sole possible basis of morals, the dogma that truth is good, falsehood bad, being, for example, as independent of God as it is of man—is not a delusion out of accord with all the facts, which, if human reason is to be accepted as a guide at all—as a guide, that is, which we can trust as we trust our senses—must be accepted as true. A new and sovereign desire to get at the bottom of this, as the only real question, to have certainty about it, to believe or disbelieve it hard, to frame life on it, is manifesting itself in every stratum of society, manifesting itself very often in a sort of blind fury of enthusiasm. At the same moment, and among the same classes, an equally intense desire is displayed to examine the question through science, through close observation and rigid analysis, and unhesitating recombination of the facts revealed by "Nature," to try the whole subject once for all by the scientific test. So strong is this desire, that it pervades those who know nothing of science, till they fancy that if they had but the talisman it would bring water out of the rock, till we see before us a phenomenon absolutely novel, a confidence without reason, leading to an unbelief as absolute as the belief which a similar confidence in religion formerly produced, a positive faith in faithlessness. We ask any one who knows English society at all if we exaggerate when we say that there are hundreds of able men in England, who, knowing nothing of science, disbelieve in God, or, rather, in God's government, because, as they think, science has dispelled that ancient delusion, who refer honestly and confidingly to the "authority" of science exactly as men once referred, and, on the Continent, women still refer, to the "authority" of the Church, who regard Profs. Huxley, Tyndall, and the rest, as "directors" are supposed to be regarded by faithful Ultramontanes. It is in the midst of all this, of a controversy which we can say, as heartily as the *Record* or the *Tablet*, affects "salvation," which, that is, must perceptibly affect the relation of man to God, for generations, that Sir Stafford Northcote and the *Times*, and the thousands who feel with them, advise that the conflict shall become "discreet," that no man, very prominent on either side shall be raised to the chair in the recognized committee of investigation; that the leader of the naturalists shall be silenced so far as may be, that all reports on the progress of inquiry shall evade the main issues; that, in short, everybody shall go on telling decorous little lies till everybody else is dead. We cannot, they say, trust the discretion of Mr. Huxley, if opposed. Discretion! Do they, then, want Mr. Huxley's opinions to prevail? It looks very like it, but we are aware that numbers who do not want it are of the same way of thinking, and we will just tell them what their demand for "discretion" means. It means that the discussion shall go on as fiercely as ever, but in a new and occult language, that a skepticism irresistible, because released from the necessity of defense, shall spread throughout society, shall grow with every year, and every discovery, and every new claim of unopposed "authority," more and more unsparing; shall saturate the young, and paralyze the middle-aged, and shock the old, until at last it breaks out, as every protest against repression breaks out, in a flame of fury, which, for a time, will burn up faith through Britain, as it is burning it up wherever Ultramontanism has power to do what these "discreet" men of science desire to see done here. It means that a caste is to grow up whom the multitude cannot help respecting on account of their knowledge, and who are to transmit through ages an occult faith which all who are ambitious, or inquisitive, or devoted to truth, will seek to know, which they will learn as a mystery, amid all the attractions mystery lends to every science, and which, when they have learned it, will teach them that faith is folly, religion a delusion, its teachers obscurantists, and

the only truth—the truth that truth is undiscoverable. It means that the defenders of supernaturalism, or, as we contend, of true science, shall be paralyzed; that they who can fight only in the light, shall be forced to a combat in the dusk; that they shall have no arms, while their adversaries are invested with the enchanted weapons of the ancient creeds, with the shield of darkness, and the sword of the love of truth, and the jointless armor of an impenetrable faith. It means that we who fight for the existence of the supernatural as a as a scientific fact as capable of demonstration as the fusibility of metals, are never to be permitted to see our enemies; indeed, are never to have any enemies, but to be placed like soldiers in a marsh to shoot arrows against a blight, to disperse miasma with artillery, to make shade brightness with the bayonet, to secure the impossible through conditions which are self-contradictory. We are to avoid all that is not orthodox, to say nothing straight out, to leave the defense, say, of a possible divine destiny in man to the Archdeacon, who says such a destiny must be, because it is clear that the angel who waved the sword at the gate of Eden must have been created after man, and being created after man, proves that man was a creation, and not a development, and thinks rubbish of that sort will stop the progress of infidelity. But, says the *Times*—it is not merely a reporter who says it, though the words appear in a report, for the *Times* does not allow its reporters to lecture in that style—Mr. Huxley is so indiscreet. So much the better, both for truth and for orthodoxy. If there is one thing dangerous to the faith of a people, it is that disbelief should be hinted, should be veiled under sarcastic compliments to faith, should become the secret of the initiated, the *arriere pensee* of the cultivated, should filter down from mind to mind in silence, should drop through, as it were, from the supper table to the basement, and nobody be conscious that it is dropping, till accident reveals the irremediable mischief. That is how Voltarianism was diffused, and that is how English secularism will be, if the able respectables like Sir Stafford Northcote continue so dreadfully afraid of indiscretion in discussion. Discretion, in this case, is simply concealment of the very thing that ought to be known, namely, the gravity of the moral result involved in the scientific inquiry—a gravity which, once realized, makes that inquiry not only much more exact, but much wider. Take, for instance, this discussion about primeval man. It does not really involve any religious point of importance—for, after all, whether man had a lemur for his ancestor or not, he is still man—but it is supposed to do so, and look how that supposition instantly widens the inquiry. Lawrence went into it as if all the data were bones and muscles, Sir John Lubbock includes the history of civilization, Mr. Wallace adds a vast mass of facts as to the moral instincts of savages, till at last, man being fairly treated, as a whole, all the facts being examined under the new pressure, Hr. Huxley, who is so much dreaded, makes what seems to us the greatest conceivable concession to the supernaturalists—that the chasm between man and the brute is beyond measurement—is infinite. There is no point of view except one, from which the reticence now advocated can be logically defended. Of course, the unbeliever is not shocked. Suppose the observer is orthodox, then surely a frank statement that certain appearances seem inconsistent with the being of a God, is a warning not to accept those statements without the inquiry, rendered needful by that tremendous result, is infinitely better than a mere hint apparent only to the initiated, that if it were safe to speak, that is what would be said. For the interests of the orthodox such a conclusion should be stated in its clearest and least discreet form, not in its least "offensive." Nobody is really injured by plainness except that class represented by the *Times'* reporter, which holds, that next to enthusiasm, the one great evil is disturbance; that nothing is worth a fuss; that indifference is the proper state of mind, even if the subject of indifference is the existence of a Creator. This is the true English middle-class state of mind, and the more it is shocked, annoyed, and horrified by indiscretions like Mr. Huxley's, on one hand, and Mr. Stokes' on the other, the sooner will it begin to find a reason for the faith that is in it. If we only had an "indiscreet" Archbishop!—but that being impossible, let us be thankful that we shall next year have an indiscreet President of the British Association.

IRON FOUNDING---UNITING CAST IRON BY "BURNING-ON."

From the "Practical Mechanic's Journal."

Conecting lead with lead, by running a stream of very hot liquid lead, suitably confined, in contact with a surface of solid and cold lead, until the latter had got to its melting point, and then stopping the current, so that the two portions become united when both are solid, has been known to plumbers for ages under the name of "burning together." In fact, by this method some of the earliest lead water pipes were made before drawn pipe was known.

This same method of "burning together" may be also employed by the iron founder, and occasionally with great advantage. The writer, in the course of his early practice, had occasion to cast four of the very ponderous columnar cast-iron frames which, in the earlier days of steam navigation, were to be employed for the side frames of side-lever marine engines of the heaviest class. The frames in question consisted of coupled Roman-Doric columns of considerable diameter, cored out, with cross framing and entablatures, also all cored out, and with sundry projecting pieces like truncated horns. etc., whereby the frames were to be united with other "thwartship" pieces, each frame weighing several tuns and consuming a large amount of wages in molding.

All four were cast sound and without a blemish, except that, upon the top box in which one of these was cast—all being cast in green sand—some one had unluckily dropped a bar or something heavy, or put a foot upon it, and produced "a crush," which rendered one of these horns utterly amorphous. The casting, otherwise perfect, was in that state absolutely useless, and was about to be broken up, when the writer resolved to try and save it by attempting to "burn on" a new and perfect horn. The old and defective mass was carefully cut off, and removed down to absolutely sound metal. "Loam cakes," having the proper form for the horn, were taken from the pattern, the surface of the cut metal was well dusted over with powdered glass of borax, after that the mass of the "frame," in close propinquity with the defective place, had been heated red hot in a coke fire built up around it. The fire was then raked away, the loam cakes secured in place, and several hundred weights of very hot liquid cast iron were for some time kept flowing through the cavity of the loam cake hollow mold. At length the flow was stopped, when the cut surface could be felt, with the point of an iron bar pushed through the running metal, to have become pasty and soft, and the iron was then permitted to set. When finally stripped and "gates" etc., removed, the new horn was found to be perfectly united with the remainder of the casting, and when struck it gave the clear sonorous ring which proves complete metallic continuity.

The success, in fact, was perfect, and somewhat surprised both the writer, to whom so large an instance was new, and the marine engineer responsible for the supervision of the work, who would not pass the casting until he had assured himself of the safety of the horn by striking it heavily with a sledge hammer. This method is capable of being applied not unfrequently with similar ends in view, and may often save the condemnation of a casting and effect a good deal of economy. It can almost always be made effective, if the methods be judicious, for attaching, as in the above case, a heavy piece to a heavy casting; but it is a far more delicate and difficult task to make it succeed with smaller and more delicate work, and there are two generic cases in which it is useless to attempt it.

One of these is where the form or dimensions, or both, of the casting must remain precisely the same after the work as before; as, for example, if a piece be defective in the rim or in one of the arms of a large spur or head gear wheel, there would be no great difficulty in replacing it soundly by casting together as described; but either the wheel would crack somewhere on the setting of the "burnt-in" metal, or during its cooling, or it would have lost its circular form and "truth" when all should be cold.

Again, if the mass of casting be very great, and it is but a hole or cavity, regular or not, that requires to be filled in with metal, which must be perfectly united with the remainder, this can scarcely be accomplished unless at an expense that renders the process worthless; for the whole huge mass must be brought to a strong red heat, with great expenditure of fuel and time and surface injury to it by oxidation, or the union will prove imperfect. Such has been the fate which has always attended attempts thus to restore defectively cast cylinders for hydraulic presses. The writer, however, has little doubt but that a sort of small coke-fed furnace, with a strong blast, delivering from a small brick-lined mouth a jet of flame like like that of a large blow pipe, might be so used as to heat even up to the melting point—and but very locally or partially—any mass of cast iron however huge, so as to admit of "burning on" to it. He once witnessed sufficient proof of this in the method taken to repair a defect which appeared in the neck of a very heavy cranked intermediate shaft for marine engines, at the Thames Iron Works, just before Mr. Mare ceased to direct them. The neck of the crank about eighteen inches in diameter, was rough turned, when a hole was found and cut into in the forging, close to the angle of the neck where joining with the arm or side of the cranked part. Nothing could be more awkward as to position, and the condemnation of the whole forging, and serious loss, seemed imminent. The foreman blacksmith determined upon one trial to save it. He got up just such a coke-fed giant blowpipe as has been described, and drove its flame right into the defect or cavity, having carefully "clayed up" the iron of the rest of the crank adjacent, to save it from oxidation.

In about five hours he had the interior of the cavity at a fine uniform and clear welding heat. A piece of wrought iron, well judged—as to form—to rather more than fill it, had been got ready, and at the right moment was brought, in a forge fire, to a welding heat also; and the blowpipe blast being thrown off, the welding hot plug, preceded by a dust of sand and borax glass, was thrust against the cavity, and a single blow of a "tup," beforehand properly swung ready, sufficed to firmly weld it into place. The superfluity, when cold, was chipped off, and the turning of the neck completed, which the writer witnessed; and he can testify that it was not possible upon the clean cut surface then to discern where was the new iron, and where the surrounding old of the original forging. The work reflected much credit upon the skill of those who conducted it, and in that respect alone deserves to be recorded. The method of heating, however, is quite as applicable to cast as to wrought iron.

The marine-engine framing above referred to was treated about 1833. In the "Annales des Mines" for 1860, M. Mengy gives a circumstantial account of the same method having been applied about the same date at the Tamaris Iron Works, Department of Alais, to "burning on" the broken-off necks of the iron rolls of the rolling mill, and with complete success. Dr. Percy ("Metallurgy," p. 745) states that he has seen a roll thus repaired at the Millwall Iron Works, and that the method has been in occasional use elsewhere.

THE State fairs in progress throughout the country have generally been very successful. Thirty thousand people visited the fair grounds at Elmira in one day

Home-Made Ladders.

In making ladders, says the *American Agriculturist*, we prefer to use red cedar for the poles, and oak for the rounds. White cedar will answer well, and so will white pine or spruce for poles, and the rounds may be made of many different woods. Dogwood is good, cutting stems of the right size, and the bark may be left on. Hickory does well, if the ladder be kept painted, and not exposed to the weather—otherwise it rots at the ends where inserted in the poles. Cut a straight cedar pole of at least six or eight inches in diameter at the butt, and of the desired length, if such a one can be found. Lay up to season six months or a year, and take care that in drying it does not get a bend. With a little painstaking it may be improved in straightness while seasoning, if not straight. Then shave off the bark and branches with a drawing-knife; cut it of the right length; plane down a strip of three inches wide on opposite sides, and mark it and saw it in two in the middle lengthways. If well done, we shall have two long, straight, sound, tough, stiff poles. Mark off the points for holes for the rounds alike in each; fourteen inches is a good distance to have the rounds apart. If the ladder is to be a wide one, the lower rounds should be an inch and a quarter in diameter, and the holes an inch, while the upper rounds need not be more than an inch in diameter. For a ladder fourteen inches between the poles, inch rounds are large enough for the bottom ones, and five eighths inch for the top.

Split and shaved rounds are as good as turned ones, unless one is making a very nice job, when the rounds may be split out and then turned. It is well to make the rounds with a slight shoulder, so that the poles cannot be driven together at all by a fall. This is apt to split them, and if the rounds are simply shaved down to enter the holes, it is imperatively necessary to insert several flat rounds two or two and a half inches wide and three quarters of an inch thick, having tenons at the end, with strong shoulders, and fitting into mortices. When the ladder is put together, dip the ends of the rounds in paint; set all the rounds in one pole first, then put on the other; and, finally, after sawing off the ends of the rounds, drive hard-wood wedges into each alternate round, so as to spread the ends and prevent their drawing out. Wedge the flat ones particularly. With a plane, a drawing knife, and a little sandpaper, the ladder is easily finished, and a good coat of varnish will make it last a long time as good as new.

The Volcanoes of Cotopaxi and Chimborazo.

In January, 1802, Humboldt and his friend Bonpland, reached Quito, and attempted the ascent of the grandest peaks of the Cordilleras but they were defeated by the difficulties of the enterprise. In the eruption of 1739, Cotopaxi vomited red-hot stones 3,000 feet above the crater, and its roaring was heard at a distance of two hundred miles. It is the most terrible volcano in the whole range; its form is a perfect cone, crowned with snow, and its appearance is eminently grand and beautiful. In the attempted ascent of Chimborazo, the explorers were accompanied by a young Spaniard. They started from the south west side, traversing great plains, which rose one above the other, like terraces, until they reached that of Sisgun, 12,400 feet above the level of the sea. They continued to ascend until they reached Yava-Cocha, a circular lake, the highest spot yet reached by other travelers. Here they left their mules, and crossing a plain of tawny grass, they came to a region where the rocks rose in columns, like an enchanted forest of stone. Passing over this district, they arrived at a place where the path became too steep and the snow too dangerous to venture on. All the guides except one refused to proceed any further, and he led them by a route which he called a "knife-blade," sometimes on hands and knees, and always with their poles testing the way before them. For another hour, through increasing mist, they persevered; the barometer showed them an altitude of 18,380 feet; and here they began to suffer from the rarefaction of the air. They breathed with difficulty, their heads swam, and their eyes became suffused with blood. Condors came sweeping down the terrible pass. Once the mists parted, and they beheld the vast dome so near to them that they believed they should certainly reach the summit. They hurried on, but all at once their further progress was stopped by a vast chasm four hundred feet deep and sixty feet wide. They had attained a hight of 19,200 feet. They descended the mountain in a storm of hail and snow.

In another excursion they crossed a bridge one hundred and twenty feet long, formed of ropes, manufactured from the fibrous roots of the Aguava Americana, three or four inches in diameter. It was by a bridge of this kind that a permanent communication was kept open between Lima and Quito. On their way to Cotopaxi they saw the house of the Inca Huayna-Capac. It formed a square of one hundred feet with walls of burnt porphyry, three feet thick, and the stones as regularly wrought as in Roman buildings. The doors were similar to those of the ancient Egyptian temples.

Is the Fifth Avenue Pavement a Failure?

We recently stated, in the SCIENTIFIC AMERICAN, that a covering of asphalt and gravel was in process of being laid over the pavement on the Fifth Avenue. The work is now completed, and it is certainly a great relief from noise to the residents of the avenue, and a luxury to those who ride over it; but we fear that the result will prove unsatisfactory, as already there are many visible signs of injury to the surface. It is still our belief, and we so expressed it to the person in charge of the work, that vehicles were allowed to run over the covering before it had become sufficiently seasoned. The result, we fear, is likely to prove that the experiment, so far as Fifth Avenue is concerned, is a failure.

CHATELARD VIADUCT OF THE LAUSANNE AND FRIBURG RAILROAD.

The line of railroad that unites the two cities of Lausanne and Friburg is one of the most picturesque in Switzerland. One portion of the line on leaving Lausanne rises rapidly on the Vaudois slope of Lake Leman, the waters of which wash the base of gigantic rocks of Savoy and Valais. A sharp curved tunnel suddenly hides this magnificent panorama, perhaps the most unique in Europe, and the traveler is speedily transported into the midst of a display of vigorous nature, hills covered with trees, and fertile valleys.

LAUSANNE AND FRIBURG RAILROAD VIADUCT.

The ancient city of Friburg is one of the most wild and picturesque in Switzerland. It stands partly in a small plain, partly on bold acclivities, on a ridge of rugged rocks, half encircled by the river Sarine, and is so entirely concealed by the surrounding hills that the traveler scarcely catches the smallest glimpse, until he bursts upon a view of the city from the overhanging eminence. There are two fine suspension bridges across the river, one of which hangs 284 feet above the bed. A short distance out of the town is the celebrated railway, Grundfy viaduct, constructed of iron. Indeed the difficulties to be overborne on that line, were very great, and in order to effect a passage over the abrupt ravines, recourse had to be made to works of art, the dimensions of which fill the traveler with feelings of wonder: such are the viaduct of Pandese, constructed of masonry, and the sheet iron viaduct of Ghatelard an illustration of which is given herewith, constructed by Ladet and Alphaise of Paris.

Manufacture of Tigers in India.

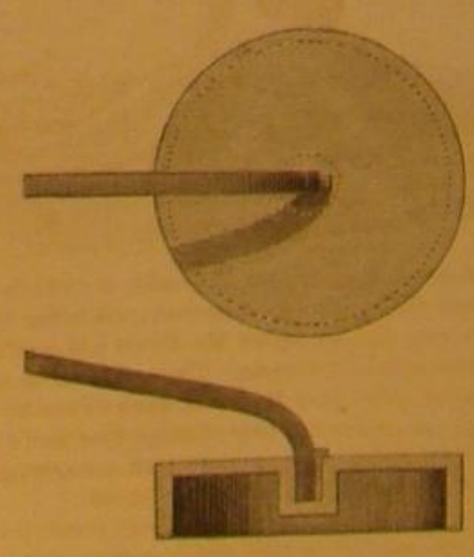
A cotemporary writes as follows: "Sportsmen and taxidermists have much to learn in India. To keep down wild beasts a somewhat liberal scale of rewards are offered for every slain tiger, leopard, and bear. Asiatic ingenuity has so defranded the authorities for a long time that the Bengal Board of Revenue has issued a grave order describing the acts by which districts officers are deceived: 'When a tiger, leopard, or bear has been killed, the skin is split in two. The upper skin, with the hair on, is removed; a manufactured skull is fitted to it, and it is presented with a claim for reward. The real skull of the animal, with some flesh on it, and a complete under skin, but without any hair, is likewise presented as that of an altogether separate animal, both specimens being fresh. The fraud is often successful. In other cases an entire skull is manufactured out of broken bones sined with strong twine. To the bones a filthy compound of putrid flesh, with coloring matter for blood, is glued on, and then covered with skin, slit at the places where the mouth, nose, and ears should have been. When a sufficient supply of tiger skins and skulls is not procurable, skulls of ackals and dogs are often substituted, with tiger's teeth fastened in front with glue, the whole being covered over with pig-skin molded over a genuine tiger's skull.'"

Mineral Lemonade.

When equal parts by weight of strong pure sulphuric acid and strong pure alcohol (85 to 90 per cent) are carefully mixed (the acid being poured into the alcohol and thoroughly mixed therewith), a liquid is obtained which has long been known and used by medical men under the older name of *Elixir acidum halleri*, more recently named *Mixtura sulphurica acida*. This fluid, which, if well prepared, contains essentially sulphovinic acid, is an excellent summer beverage when mixed with water in the proportion of one small teaspoonful to a tumbler of cold water, sweetened with sugar, or, preferably, with some fruit sirup. Above the lemonades made with vegetable acids, this acid mixture has the advantage of not increasing the perspiration, as citric and other vegetable acids do, while it is better borne by the stomach, and has a tonic action upon the vascular system. It is, indeed, a very pleasant drink, often given at the *cafés* of Paris, Berlin, Vienna, and other places, along with some *syrop de groiselles* or *framboises*, and rather exorbitantly charged for. The proportions by bulk are—one of strong sulphuric acid and three of alcohol.—*Hamm's Zeitung.*

JAMES HENDERSON'S IMPROVEMENT IN THE MANUFACTURE OF IRON AND STEEL.

This improvement is designed to enable persons having the old style of iron works with puddling furnaces to compete successfully with the new processes. It consists in applying in a bath of melted cast iron a box or vessel with one open side preferably at the bottom, and composed of any suitable substance, such as cast iron, green wood, or fire clay, in which are placed such substances as are desired to act upon the bath of molten iron in the furnace; this has been found to be a very effective and economical manner of imparting to the bath of iron such properties as are desired to be given to it, and also to remove sulphur, phosphorus, carbon, silica and other impurities from the iron and the oxides in the furnace, and producing a greater yield of iron, and saving about one-third of the time and fuel consumed in puddling, and by means of the alloys used in connection with the fluxing agents, such as nitrates evolving oxygen and forming a flux, at the same time steel of any desired grade or strength.



The *rationale* of this process is, that the substances being applied at the bottom of the bath of cast iron from a vessel open at the bottom must necessarily ascend from the bottom and sides of the vessel when they are melted or set free by the heat of the furnace and such substances as nitrates being used which evolve oxygen also form very effective fluxes by reason of their salts combining with the silica, magnesia, and alumnia, in the iron and oxides covering the bath and lining the furnace, the iron and oxides are thus purified by the action of the gases and salts and alloyed with the proper quantities of the substances introduced into the bath for the purpose by means of the box or vessel; the operation is thus two-fold, the alloying takes place at the same time that the refining or purifying action is performed.

By this process it is possible to obtain from the most inferior grades of pig iron an article of steel having all the welding properties of iron and of uniform quality, and of the tensile strength of 180,000 lbs. to the square inch.

The annexed sketch represents the box with handle attached for convenience of the workmen in moving it about the furnace.

When thus applying two to three per cent of nitrates to the weight of the cast iron in a puddling furnace that was "fixed" with iron ore, a gain of ten per cent of puddled bars was obtained over the weight of the pig iron charged in the furnace, whilst the time of the labor in puddling was shortened fully one third; there was consequently a saving to this extent in labor, time, and fuel.

Wm. Fairbairn, Esq., the eminent English engineer, has recently reported to a scientific association, that nitrate steel, produced from the most inferior grades of pig iron, that of Northamptonshire, England, is superior in quality to the pneumatic process steel made from the best Lancashire pure steel irons.

This process is cheaper than the English nitrate process referred to, or any other process of making iron or steel, and produces more uniform results than any, and of the best quality.

Nitrate of soda is formed in Peru in inexhaustible quantities; the tract of territory covered by it is 120 miles long and several feet deep, and it can be delivered in English or American ports at about £8 10s., per tun or $42 in gold or about two cents per pound, the price here now is quoted at four and a half cents (gold), this is owing to the scarcity at present existing, caused by the derangements of operations in Peru by earthquakes last year.

Patented Aug. 17, 1869, by James Henderson. Further information may be had by addressing Player and Henderson, 30 Broadway, New York

Improvement in Flooring Clamps.

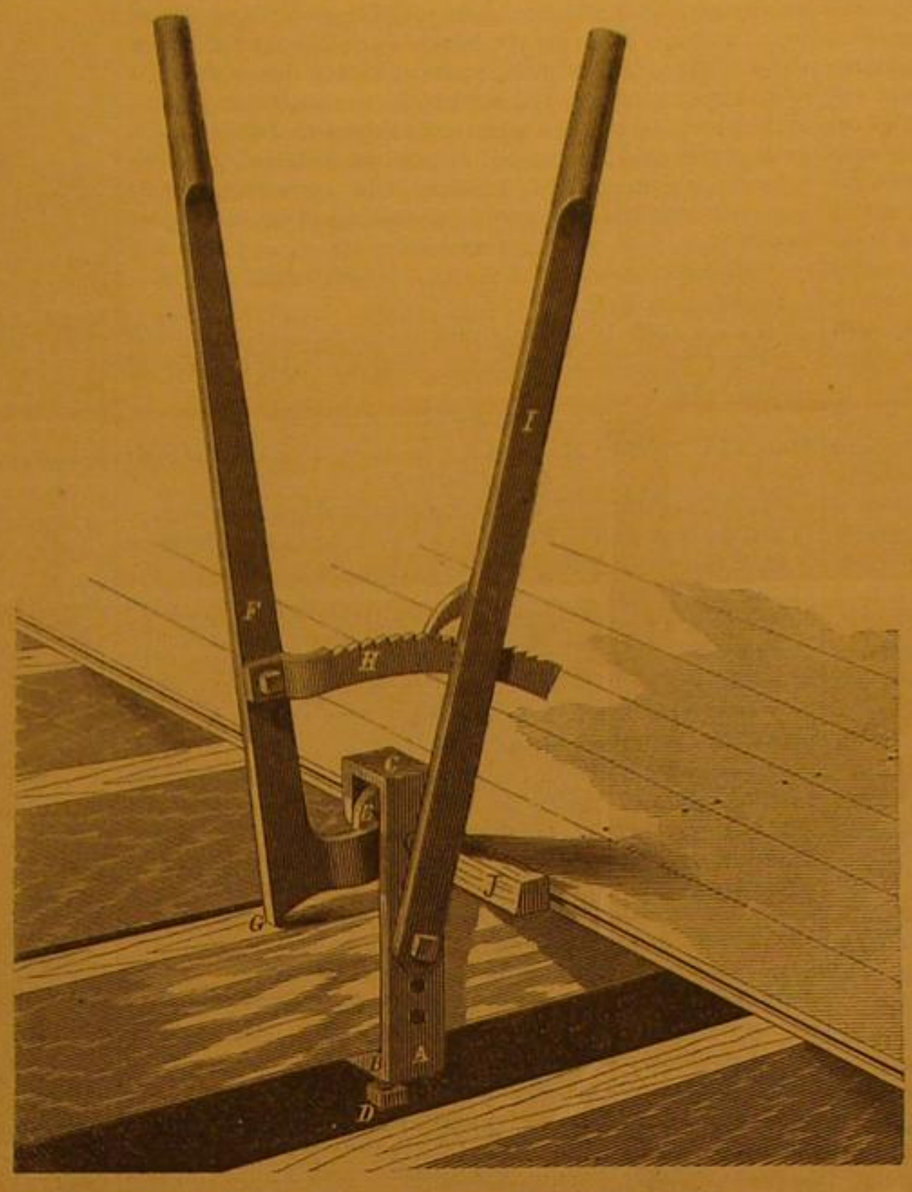
A want has long been felt in laying floors for some device, that could be quickly applied to press the boards together before nailing. The improvement shown in our engraving has been used, and is claimed to answer all the purposes required.

A represents the stock of the clamp, having two right-angled brackets, B and C, which are in use placed over and under the joists. The lower bracket is provided with a set-screw or stud, D, which is designed to bite into the wood to prevent slipping. The upper bracket supports a hinged tongue, E, which may be raised to permit the application of said stock to joists, and swings down again to prevent the stock from falling laterally. Near the top of said stock a cranked lever, F, is pivoted to A, having a sharp heel, G, which, when in use, bites into the top of the joists, to prevent slipping. It is also provided with a segmental rack, H, to hold what is gained by the clamping lever, I, which is provided with a pawl to catch into the rack, H; but the clamp may also be used without the rack.

In operation a clamping block, J, is laid on the joists in front of the board to be clamped, and nailed. The tongue or guard, E, is then raised, and the stock or clamp, A, is placed on the joist in front of said block, letting the tongue, E, swing down. By pulling the levers apart the flooring is effectually clamped.

The lever, F, forces the set-screw or stud, D, into the bottom of the joist, and by the same motion the sharp heel of F is inserted above, thus giving a sure hold to the clamping lever, I.

The inventor claims that this implement will pay its cost in saving of time and labor in a single fortnight. Patented through the Scientific American Agency, Aug. 3, 1869. For further information or for State rights apply to the inventor, David Nevin, Boulder City, Colorado.



NEVIN'S PATENT FLOORING CLAMP.

THE CANADIAN PATENT SYSTEM.

The Ottawa *Times*, in replying to some strictures applied to the recent so-called amendment to the Canadian patent laws, feels compelled to put in a sort of quasi apology. It says:

"The central idea of the commercial policy of England at the present day is free trade; the commercial and manufacturing interests, of which the last are most directly influenced by patent rights and their regulation at home and abroad, will not brook any legislative action interfering with their pet theories, and where they believe that they can bring any pressure on outside communities, as upon these Colonies, by means of Imperial remonstrances they never hesitate to exercise it to the utmost. But in a new country such as ours, where our natural resources are undeveloped, our population sparse and scattered, except in a few large cities, and our manufactures wanting in the large capital necessary to give that stability which they possess in the Mother Country, our policy must be to a certain extent protective, to give any degree of strength to our infant resources, and it is as great folly to complain of that system, as it would be to expect us to adopt in a day the land system, or any of those other peculiar forms of English social or commercial life, which have been the growth of centuries of increasing wealth among a dense and skillful population.

"The new patent law has been complained of for the illiberality of its enactments, but even a casual glance at its provisions will enable any one to see that the residence of one year, which is made compulsory for taking out a patent, is calculated to give more privileges to the foreign inventor than the old system under which patents might be 'introduced' into Canada, without any protection for the original patentee."

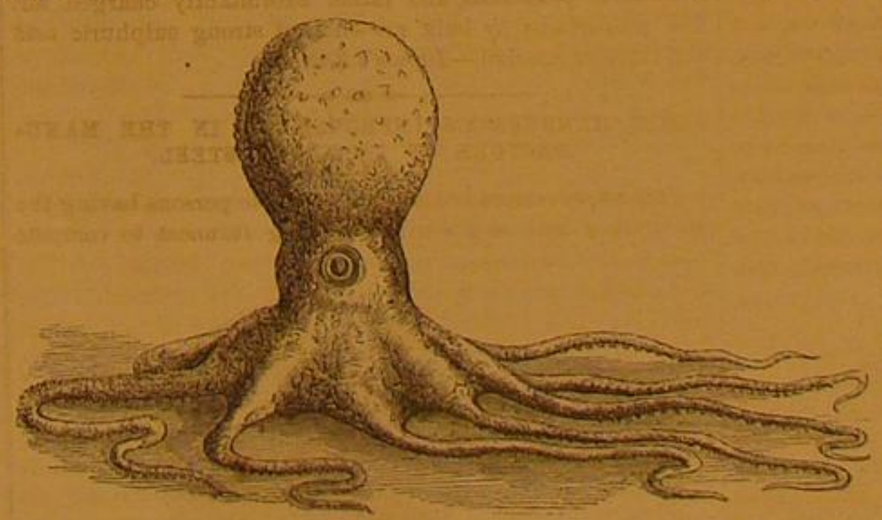
Very true. We admit that the new law is somewhat better than the old one, but why insist that a non-resident inventor shall come into your Dominion, and there reside for one year before he can be allowed to take out a patent for his own invention? Canada, we admit, is a pleasant country to visit at certain seasons of the year; but, independent of the cost of a year's board at some boarding house or hotel, we cannot see what other fair advantages are to be gained by this system.

The truth is that the people of Canada want to get hold of all the valuable inventions made by others and use them without compensation. This is neither fair nor honest.

THE OCTOPOD, OR BRAZILIAN CUTTLE FISH.

BY LUCIE L. HARTT.

It was during my first visit to Brazil, that one day, while busily engaged in examining a reef at a little town on the coast called Guarapary, my eye fell on an object in a shallow tide-pool, packed away in the crevice of the reef, which excited my curiosity. I could see nothing but a pair of very bright eyes; but, concluding that the eyes had an owner, I determined very rashly to secure him. I had been handling corals and seemed to have forgotten that all the inhabitants of the sea were not harmless. I put my hand down very quietly so as not to ruffle the water, when, suddenly, to my surprise, it was seized with a pressure far too ardent to be agreeable, and I was held fast. I tugged hard to get away, but this uncivil individual, whoever he was, evidently had as strong a hold on the rocks as he had on my hand, and was not easily to be persuaded to let go of either. At last, however, he became convinced that he must choose between us, and so let go his hold upon the rocks, and I found clinging to my right hand, by his long arms, a large octopod cuttle fish, resembling the one illustrated in this article, and I began to suspect that I had caught a Tartar. His long arms were wound around my hand, and these arms, by the way, were covered with rows of suckers, somewhat like those with which boys lift stones, and escape from them was almost impossible. I knew that this fellow's sucking propensities were not his worst ones, for these cuttle fishes are furnished with sharp jaws, and they know how to use them too, so I attempted to get rid of him. But the rascal, disengaging one slimy arm, wound it about my left hand also, and I was a helpless prisoner. In vain I struggled to free myself—he only clasped me the tighter. In vain I shouted to my companion—he had wandered out of hearing. I was momentarily expecting to be bitten, when the "bicho" suddenly changed his mind. I was never able to discover whether he was smitten with remorse and retired with amiable intentions, or whether he only yielded to the force of circumstances. At any rate he suddenly relinquished his hold upon my hands and dropped to the sand. Then raising himself on his long limsy arms, he stalked away towards the water, making such a comical figure, that in spite of my fright I indulged in a hearty laugh. He looked like a huge and a very tipsy spider, staggering away on his exceedingly long legs.



The cuttle fish belongs to the Mollusks, a branch of the animal kingdom distinguished for its members being built on the plan of a sac, and to which Mr. Hyatt has applied the more appropriate name of *Saccata*. The cuttle fishes are distinguished from all the other Mollusks, such as snails, clams, etc., by having a large head, a pair of large eyes, and a mouth furnished with a pair of jaws, around which are arranged in a circle, eight or ten arms furnished with suckers.

In the common cuttle fish or squid of our coast, the body, which is long and narrow, is wrapped in a muscular cloak or mantel, like a bag fitting tightly to the back but loose in front. It is closed up to the neck, where it is open like a loosely-fitting overcoat buttoned up to the throat. Attached to its throat, by the middle, is a short tube open at both ends. This tube, or siphon as it is called, is fastened to its throat, and can be moved about in any direction.

The animal breathes by means of gills, which are attached to the front of the body inside the cloak and look like the ruffles of a shirt bosom. By means of these gills the air contained in the water is breathed, and they answer the same purpose for the cuttle fish that our lungs do for us.

In order to swim, the animal swells out the cloak in front so that the water flows in between it and the body. Then it closes the cloak tightly about the neck so that the only way the water can get out is through the siphon. Then it contracts very forcibly its coat, which, it must be remembered, is a part of the animal, and the water is driven out in a jet from the siphon under the throat, and the body is propelled in the opposite direction; that is, backward like a rocket through the water. This siphon is flexible like a water hose, and can be bent so as to direct the stream not only forward, but sidewise and backward, so that the animal can move in almost any direction, or turn somersets with perfect ease, and so rapidly do some cuttle fishes swim that they are able to make long leaps out of the water. Ususally, however, the animal swims backward, with its long arms trailing behind. Our common cuttle fish of this coast has, in addition to its eight arms, two long slender tentacles which may be withdrawn into the body. The tail is pointed and furnished with a fin on each side.

The Octopods, to which the Brazilian cuttle fish belongs, have round purse-like bodies, and eight arms united at the base with a web, and they swim by opening and shutting their arms like an umbrella; in this mode of swimming they resemble the jelly fishes.

The paper Nautilus is nothing in the world but a female cuttle fish that builds a shell. There was a very pretty story told of her habits, by Aristotle, the old Greek naturalist, which every one believed until quite recently. He said that she rode on the top of the waves, seated in her boat-like shell, and spread her broad arms to the winds for sails. But unfortunately the story has no foundation in fact. She either crawls about on the bottom of the sea, or swims quite like any other cuttle fish, shell foremost, only occasionally coming to the surface. Strangely enough she holds the two broad hand-like extremities of the arms against her body, and it is the inside of these arms that secrete the paper-like shell, which is only a sort of cradle for her eggs. Not so with the pearly Nautilus, which is furnished with a beautiful, coiled up, pearly shell, formed on the outside of the animal. This shell is divided into numerous chambers, and the animal living in the outer one builds a partition across the back part of it as the shell grows.

Cuttle fishes are sometimes used for food by the Brazilians and different species may be seen in the markets, where one frequently finds them still alive. Sometimes, as he stoops to examine one, its body is frequently suffused with a deep pinkish glow. Before he has time to recover from his surprise this color fades, and a beautiful blue takes its place as rapidly as a blush some times suffuses a delicate cheek. The blue, perhaps, is succeeded by a green, and then the whole body becomes pink again. One can hardly conceive anything more beautiful than this rapid play of colors, which is produced by the successive distention of sets of little sacks containing fluids of different colors, which are situated under the skin.

The cuttle fish is also furnished with a bag containing an inky fluid, which, when the animal is attacked or pursued, it ejects into the water, thus completely blinding its adversary and effectually covering its retreat. It is from this fluid that the color *sepia* is made. Besides carrying an ink-bottle, some species of cuttle fish are provided with a long, delicate, horny pen, which forms a sort of stiffener to the back. In some species the pen is hard, thick, and broad, and the cuttle fish bone of commerce is a pen of this kind. The species found in our waters is very small, and not at all dangerous, being barely large enough to draw blood from the hand; but in the tropical seas they are very large, powerful, and dangerous.

The cuttle fish is the original of Victor Hugo's devil-fish, so vividly described in the "Toilers of the Sea." If the devil fish were a beneficent creation, I should be sorry to destroy your faith in it; but as it is, I believe it will be rather a relief than otherwise to know that in some important respects, Victor Hugo's story of it is a fable. The Kraken was a mythical cuttle fish of fabulous size.—*American Naturalist.*

Boiler Explosions.—Anti-incrustation Compositions.

At the Manchester (England) Steam Users' Association meeting, held recently, Mr. L. E. Fletcher, chief engineer, referring to one explosion, said the owner of the boiler had adopted a new composition for the prevention of incrustation for six or seven months before the explosion. This composition proved most efficacious for preventing incrustation. It removed the hard cakes adhering to the plates and reduced them to powder; so that when the men entered the boilers for cleaning, instead of finding them coated as before with a tenacious scale requiring hammer and chisel to remove, they found several buckets'ful of flour or dust, which was readily washed out. There must evidently have been a large quantity of this fine floury deposit accumulated in the boilers and floating about in the water when they were at work. The fine floury deposit appears to interfere with that intimate contact between the water and the plates which is necessary to pro-

vent over-heating, while it may be that, from the thickened water, the globules of steam cannot freely escape, and, thus caged within it, linger longer in contact with the plates over the fire than they should do, and thus form a film between the iron and the water, in consequence of which the heat is not carried off rapidly enough and over-heating ensues. It is not intended by this that they are made red hot, but that they are heated sufficiently to so increase their ductility as to lead to the undue compression and the consequent deflection of the over-heated parts. The explosion is, therefore, attributed to over-heating of the furnace crowns, though when covered with an ample supply of water, consequent on the accumulation within the boiler of a large amount of fine floury deposit, caused by the use of an arsenical composition for preventing incrustation, coupled with the suicidal practice of neglecting to open the blow-out taps. This is the first explosion which has ever occurred to a boiler guaranteed by this association; and it will be impossible, without the hearty co-operation of the members, to prevent such, without imposing restrictions upon them with regard to the treatment of their boilers, which the association has at all times been desirous to avoid. But this opportunity may be taken of strongly urging upon the members the advice which has repeatedly been given personally on previous occasions—that they should not experiment on their boilers with anti-incrustation compositions. They will find it a safe, and, in the majority of instances, a very efficacious plan to feed the boilers with two or three pounds of good soda ash daily; the soda not being introduced in heavy charges through the man-hole at cleansing times, but along with the feed, so that the boilers may be constantly fed with weak soda water; while the blow-out taps, both at the bottom of the boiler and surface of the water, should be regularly used. There is a composition now strongly advocated which acts rather mechanically than chemically, by forming a thin film of varnish upon the plates, and thus preventing the adherence of the scale. With some waters this has its dangers; the film or coat of varnish may protect the plate from the water as well as from the incrustation, and thus lead to overheating, and two cases of injury have lately been met with which have arisen from this cause.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

The Avondale Disaster.

Messrs. Editors:—My suggestion will be too late to help the unfortunate miners at Avondale, but may be of use in some future disaster. The plan I suggest is, to have close by each mine two or more complete diver's suits, with all attachments ready for instant use. To enable the miner to drag the necessary air hose along the levels, he would require a hose carriage similar to that used for the compressed air coal cutters in England. For some points, when the hose would be liable to entanglement, small vessels of compressed air, or compressed oxygen, would enable a man to work for a limited time. Some of the suits should be the ordinary deep-sea dress so that assistance could be carried through drowned parts of a level.

The suits used merely to protect against gas could be made almost as light as an ordinary suit of clothes. By this means a few men could be supplied with air and could get at once to points that now require days to reach in safety.

My suggestion may not be practical in its present shape, but the principle of carrying the limited supply of air to the point when it will give its maximum useful effect in cases of disaster will bear working out by those who are practical miners.

J. G. S.

Philadelphia, Pa.

Marks Produced by Lightning Stroke.

Messrs. Editors:—I notice an article on page 170, current volume of the Scientific American, on the subject of marks produced upon the body by lightning stroke.

I wish to state an instance of the kind which occurred in the upper part, or western portion of Washington county, Md., some time in July, 1851, to which I, with several others, was an eye-witness.

In an open lot near the residence of the late Captain John Ressley, about two and a half miles northwest of the town of Hancock, in the county named, stood an oak tree of medium size, under which, during a thunder storm, a sheep had taken shelter from the rain. On a limb or branch of the tree sat a robin, directly over the sheep; a flash of lightning struck the tree, the robin, and the sheep; killing both of the latter. We saw the sheep lying under the tree and went to see if it had been killed. When we arrived, we found the sheep dead, lying upon the left side, and found the dead body of the robin lying upon the right, or upper side of the sheep. Capt. Ressley, who owned the sheep, ordered his servants to skin the sheep, which they did immediately, and when they came to the spot on the right, and which was the upper side, where the body of the robin had fallen and where we had found it, they noticed a strange appearance, and called our attention to it. To our no small astonishment, we found on the inside of the skin of the sheep and also on the flesh of the body of it, a perfect picture of the robin, even to the fine fringes of the feathers of its wings. Now it could not have been the falling of the body of the robin upon the body of the sheep that caused the impression, as the figure or picture thus formed was not that of a dead bird lying sidewise on the sheep as we found it, but it was a perfect picture of the robin while sitting on the limb of the tree above the sheep. This circumstance at the time elicited a good deal of controversy among a small circle of educated gentlemen in the immediate vicinity, and the only conclusion that could be arrived at was, that the current of electricity in the instant of its passage, carried the outline of the figure of the robin down upon the body of the sheep, the sheep having fallen (if it were not already lying) upon its side, before the body of the robin reached it in its downward descent. No doubt the sheep was lying down at the time of the stroke. Now whether the body of the robin absorbed a portion of the electric fluid, and in that way caused the picture (darkened as it was) upon the inside of the skin and upon the flesh of the sheep, I am not able to prove, but that has always been my theory of it. I do not desire to intrude upon your time and patience, but I will say that upon several other occasions I have witnessed effects of electrical action which I regard as totally outside of all information that I have yet been able to gain in regard to electricity, in any and all books written on the subject, or from any other source, having been somewhat of an experimenter myself with it, for the last twenty years. And at some future time when more expedient, I will endeavor to give several instances of strange productions by electrical force or power, which, I believe, will account for certain curious formations in nature in certain localities, which, up to this time, have not been accounted for on any scientific principles.

Thos. J. Logan.

Washington, D. C.

[We certainly hope our correspondent will favor us with any other facts in his possession relative to this interesting subject.—Eds.

Has the Pacific Railroad Changed the Climate of the Plains?

Messrs. Editors:—The scouts, guides, and hunters all agree in stating that on the Plains, as far back as their experience goes, little or no rains have fallen during the summer; but the experience of last summer and this one is, that we have sufficient rain for farming purposes, and the crops of hay and other produce raised here now attest it. The hunters with whom I have conversed all agree in stating that the rains only fall inside of a belt across the Plains of fifty miles in width, of which the railroad track is the center, that when they go beyond that belt the grass is red, crisped, and burnt-looking, while all vegetation inside is luxuriant. Has the iron of the rails or the upturned ground the credit of the change?

John Whitford.

Pond City.

(Pope's Modern Practice of the Telegraph.)

Conducting Powers of Materials.

According to the experiments of Mr. M. G. Farmer, made some years since, the relative electrical resistance of different metals and fluids at ordinary temperatures is as follows, pure copper being taken as 100:

Copper wire	100	Tin wire	6·80
Silver "	·98	Zinc "	3·70
Gold "	1·13	Brass "	3·83
Iron "	5·63	German silver wire	11·30
Lead "	10·76	Nickel "	7·70
Mercury "	50·00	Cadmium "	2·61
Palladium "	5·50	Aluminum "	1·75
Platinum "	6·78		

His experiments with fluids gave the following results:

Pure rain water	40,653,728·00
Water, 12 parts; sulphuric acid, 1 part	1,305,467·00
Sulphate of copper, 1 pound per gallon	18,450,000·00
Saturated solution of common salt	3,173,000·00
" " of sulphate of zinc	17,330,000·00
Nitric acid, 30 B.	1,606,000·00

The following table gives the specific resistance in ohms (an ohm is an amount of resistance equal to that exerted by $\frac{1}{16}$ of a mile of common galvanized iron telegraph wire No. 9) of various metals and alloys, at 32° Fah., according to the most recent determination of Dr. Matthiessen:

Name of Metals.	Resistance of wire 1 foot long weighing 1 grain.	Resistance of wire 1 foot long 1-1,000th inch in diameter.	Approximate per cent variation in resistance per degree temperature at 20 degrees.
Silver annealed	0·2214	9·936	0·377
" hard drawn	0·2421	9·151	.....
Copper annealed	0·2054	9·718	0·388
" hard drawn	0·2106	9·940	.....
Gold annealed	0·5849	12·52	0·365
" hard drawn	0·5950	12·74	.....
Aluminum annealed	0·06822	17·72	.....
Zinc pressed	0·3710	32·22	0·365
Platinum annealed	3·530	55·09	.....
Iron annealed	1·2425	59·10	.....
Nickel annealed	1·0785	75·78	.....
Tin pressed	1·317	80·95	0·365
Lead pressed	3·336	119·39	0·387
Mercury liquid	12·746	600·00	0·072
Platinum silver alloy, hard or annealed, used for standard resistance coils	4·243	148·35	0·031
German silver, hard or annealed, commonly used for resistance coils	2·652	127·32	0·044
Gold silver alloy, 2 parts gold, 1 part silver, hard or annealed	2·391	66·10	0·065

The use of this table is as follows: Suppose it is required to find the resistance at 32° Fah. of a conductor of pure hard copper, weighing 400 lbs. per knot. This is equivalent to 460 grains per foot. The resistance of a wire weighing one grain is found by the table to be 0·2106, therefore the resistance of a foot of wire weighing 460 grains will be $\frac{0{\cdot}2106}{460}$, but the resistance of one knot will be 6,087 times that of one foot, therefore the resistance required will be $\frac{6087 \times 0{\cdot}2106}{460} = 2{\cdot}79$ ohms. If the diameter of the wire be given instead of its weight per knot, the constant is taken from the second column. Thus the resistance at 32° Fah. of a knot of pure hard drawn copper wire 0·1 inch in diameter would be $\frac{6087 \times 9{\cdot}94}{10000} = 6{\cdot}05$. The resistance of wires is materially altered by annealing them, and a rise in temperature increases the resistance of all metals. Dr. Matthiessen found that for all pure metals the increase of resistance between 32° and 212° Fah. is sensibly the same. The resistance of alloys is much greater than the mean of the metals composing them. They are very useful in the construction of resistance coils.

The highest value which has probably been found for the conducting power of pure copper is sixty times that of pure mercury, according to Sabine. Commercial copper may be considered of good quality when its conducting power is over fifty. Different samples of copper vary greatly in their specific conductivity, as may be seen by the following table, which gives the result of careful determinations by Dr. Matthiessen, the conducting power of pure copper at 59·9° Fah. being taken as 100.

Lake Superior, native, not fused	99·8 at 59·9°
" " fused (commercial)	92·6 at 59·6°
Burra Burra	88·7 at 57·2°
Best selected	81·3 at 57·5°
Bright copper wire	77·2 at 60·2°
Tough copper	71·0 at 63·1°
Demidoff	59·3 at 54·8°
Rio Tinto	14·2 at 58·6°

Thus Rio Tinto copper possesses no better conducting power than iron. This shows the great importance of testing the conductivity of the wire used in the manufacture of electro magnets, cables, etc.

Agassiz on Humboldt.

"Referring to Humboldt's career as an embassador at Paris, Professor Agassiz described a personal interview he had with him:

"His official position and his rank in society, as well as his great celebrity made him everywhere a cherished guest, and Humboldt had the gift of making himself ubiquitous. He was as familiar with the gossips of the fashionable and dramatic world as with the higher walks of life and the abstruse researches of science. He had at this time two residences in Paris; his lodging at the Hotel des Princes, where he saw the great world, and his working room in the Rue de la Harpe, where he received with less formality his scientific friends. It is with the latter place I associate him; for there it was my privilege to visit him frequently. There he gave me leave to come and talk with him about my work and consult him in my difficulties. I am unwilling to speak of myself on this occasion, and yet I do not know how else I can do justice to one of the most beautiful sides of Humboldt's character. His sympathy for all young students of Nature was one of the noblest traits of his long life. It may truly be said that towards the close of his career, there was hardly one prominent or aspiring scientific man in the world who was not under some obligation to him. His sympathy touched not only the work of those in whom he was interested, but extended also to their material wants and embarrassments. At this period I was twenty-four; he was sixty-two. I had recently taken my degree as Doctor of Medicine, and was struggling not only for a scientific position, but for the mean of existence also. I have said that he gave me permission to come as often as I pleased to his room, opening to me freely the inestimable advantages which intercourse with such a man gave to a young investigator like myself. But he did far more than this. Occupied and surrounded as he was, he sought me out in my own lodging. The first visit he paid me at my narrow quarters in the Quartier Latin, where I occupied a small room in the Hotel du Jardin des Plantes, was characteristic of the man. After a cordial greeting, he walked straight to what was then my library—a small book shelf containing a few classics, the meanest editions bought for a trifle along the quays, some works on philosophy and history, chemistry and physics, his own 'Views of Nature,' 'Aristotle's Zoölogy,' 'Linnæus' Systema Naturæ,' in several editions; Cuvier's 'Règne Animal,' and quite a number of manuscript quartos, copies which with the assistance of my brother, I had made of works I was too poor to buy, though they cost but a few francs a volume. Most conspicuous of all were twelve volumes of the new German Cyclopedia, presented to me by the publisher. I shall never forget, after his look of mingled interest and surprise at my little collection, his half sarcastic question as he pounced upon the great Encyclopedia: '*Was machen Sie den mit dieser Eselsbrücke.*' What are you doing with this ass's bridge?—the somewhat contemptuous name given in Germany to similar compilations. 'I have not had time,' I said, 'to study the original sources of learning, and I need a prompt and easy answer to a thousand questions I have, as yet no other means of solving.'

"It was no doubt apparent to him that I was not over familiar with the good things of this world, for I shortly afterwards received an invitation to meet him at six o'clock in the '*Gallerie Vitrée*' of the Palais Royal, whence he led me into one of those restaurants, the tempting windows of which I had occasionally passed by. When we were seated, he half laughingly, half inquiringly, asked me if I would order the dinner. I declined the invitation, saying that we should fare better if he would take the trouble. And for three hours, which passed like a dream, I had him all to myself. How he examined me, and how much I learned in that short time! How to work, what to do, and what to avoid; how to live, how to distribute my time; what methods of study to pursue—these were the things of which he talked to me on that delightful evening—I do not mention this trivial incident without feeling that it may seem too familiar for the occasion; nor should I give it at all, except that it shows the sweetness and kindness of Humboldt's nature. It was not enough for him to cheer and stimulate the student; he cared also to give a rare indulgence to a young man who could allow himself few luxuries."

English Telegraphs.—The Postmaster-General of England asks for £6,750,000 to buy up the electric telegraphs of the kingdom, and seems likely to get the money. In return, he not only promises cheap messages, a large increase in the number of offices, and other facilities, but after paying interest on the sum expended, he will have, in the first year, a surplus of £77,000. This surplus will of course increase with the increase in the number of messages dispatched. As regards the scientific part of the question, it is thought that the demand for improvements will be so constant, that invention will be stimulated, and that we shall see a succession of methods for applying the wondrous power of electro-magnetism excelling all hitherto compassed.

THE ARSENIC EATERS OF STYRIA.

Men of science who traversed Styria have long reported the fact that there were people in Styria who consumed arsenic. However, this statement was denied by others, who affirmed that the white mineral they ate was nothing but chalk; and, as there were some quack doctors among the individuals, charged of that usage, it was asserted, that in making people believe that they took ratsbane they would give themselves the appearance of being protected from all diseases by it, in order to favor the sale of their drugs. Rumors and statements with respect to this subject had to remain without significance as long as chemical analysis had not given proof of the presence of that poison in the waste of the body.

Prompted by the importance of this subject, the royal medical counsel, Dr. Von Vest, occasioned the issue of a circular to the physicians of Styria, requesting them to communicate their experiences with regard thereto. Seventeen reports were obtained, from which the following is an extract:

The principal seat of the arsenic eaters—according to these—is the northern and northwestern part, the southern part, however, is free from them. The district of Hartberg in the former counts not less than forty individuals who indulge in that habit. From the various sorts of arsenic, the white arsenic, or ratsbane, is mostly taken, less so the commercial yellow, and still less the natural red arsenic, or orpiment. The arsenic eaters begin with the dose of the size of a millet, and increase this quantity gradually to the dose of the size of a pea, the weight of these quantities being 0·22, 0·56, and 0·62 grains avoirdupois, respectively.

These doses are either taken daily, or every other day, or only once or twice a week. In the district of Hartberg the custom prevails to suspend this unwise usage at the time of the new moon, to commence at the time when she is on her increase with the relative smallest dose, and to increase with it to the time of the full moon. From this period the quantity is diminished, but aloes is taken in increased doses till strong diarrhea is produced. Directly after the administering of arsenic, most people abstain from drinking, and with regard to aliment, some prefer pastry to meat, while others abstain from the taking of fat. However, the majority will take all kinds of food, indulging also considerably in the use of alcoholic beverages. Older persons who have been accustomed to that habit from their boyhood feel a sensation of warmth in the stomach shortly after taking the poison, complaining only of dizziness in the head after excessive use.

The ratsbane eaters belong mostly to the lower classes, wood cleavers, stable grooms, charcoal burners, and wood warts. They fall into that habit at the early age of fifteen, and continue it until the ages of seventy and seventy-six. Although the female sex is not averse to it, the majority belongs to the male sex. They are generally strong and healthy persons, courageous, pugnacious, and of strong sexual dispositions. The reason of this habit is very probably attributable to the fact of its apparent favorable action upon horses. If requested to explain the reason of their indulging in it, they will say that it is to make them strong and healthy.

The taking of arsenic is rarely practiced by sickly persons. Although the indestructible health of the mountaineer forms in the beginning a kind of an armor against the arsenic (the slowly-increased doses preparing the body for the assimilation of larger doses), most arsenic eaters end with an inevitable infirmity of the body.

Dr. Knappe, at Oberzeiring, sent to Professor Schaefer in Graz, who was intrusted with the chemical examinations, the urine of an individual who consumed arsenic for thirty years. He felt in the beginning great exhaustion, which regularly disappeared after a new dose, but never experienced headache, or burning in the throat or stomach. This person was observed from February 21, 1860. On that day he took a took a very small piece of arsenic; on the day after, a piece of 0·56 grains was swallowed by him in the presence of Dr. Knappe. On February 23, he took as much as 0·62 grains. During this time he showed great appetite, indulged considerably in spirituous liquors, and took leave perfectly well, on February 24. He stated that he used to take the respective quantities twice or thrice a week. With regard to the urine, chemical analysis did not fail to detect the presence of the poison with the utmost certainty, still, the traces found were not equivalent to the quantities swallowed. A second portion of urine furnished also but traces of arseniate of magnesia and ammonia. However, if it is considered that arsenic is not soluble, very the larger part leaving the body through other channels, the facts stated are easy explainable.

To the involuntary arsenic eaters in Styria belong the horses. The quantities given to them vary from five to one hundred grains. It is stated that after long-continued use, they get fat and courageous, but that they die shortly after suspending it.

With regard to the mingling of arsenic with the food of cattle and other domestic animals, the reports spoken of contain also remarks which are of interest, as they show how rapidly the organism adapts itself to so violent a poison, that the expulsion through the kidneys is only a small and long-enduring one, that the accumulation in the blood is considerable, and that the larger part is conveyed away through the intestinal passages.

The Sewage Question.

The desirability and the feasibility of applying town sewage to the purpose of fertilizing the soil are every day becoming more patent. We learn from the *Irish Farmer* that the recent attempt to utilize the sewage of the town of Banbury, in England, has proved, from every point of view, most successful. This town contains 11,000 inhabitants, and its sewage was formerly discharged directly into the river Cherwell, which it polluted to such an extent at to ultimately create a perfect *furore* against the nuisance. Law proceedings having been instituted by persons whose health and comfort had been affected by this sewage nuisance, the Lord Chancellor ordered an injunction to be issued, restraining the town authorities from polluting the river. Subsequently to the law proceedings the local Board of Health rented a farm of 137 acres, situated about one mile from the town, and over which there is daily poured about three hundred thousand gallons of the town sewage. Before applying the sewage it is allowed to settle in tanks, and the solid matter which gravitates to the bottom is mixed with the sweepings of the street and the ashes and other solid refuse of the town, and the compound is sold to canal boatmen, by whom it is disposed to the farmers of the locality.

The rent of the Banbury sewage farm is £616 10s. per annum, and last year the sales of its produce amounted to more than £1,300, so that after paying all the expenses of management there was a good profit made on the sewage.

THE USE OF LEAD WATER PIPES.

While the evils attending the use of lead pipes for water are doubtless greatly exaggerated in the articles written upon this subject in the newspapers, no candid investigator has, to our knowledge, denied the existence of such evils or attempted to prove that such pipes are not objectionable in a sanitary point of view.

Though the use of these pipes is very extended, and startling cases of lead poisoning are not common, it must be remembered that lead is one of the most insidious of poisons, accumulating little by little in the system through long periods of time. The results, when produced, may not even in many cases be traced to the action of lead, and there is reason to believe that in certain ailments this cause is often overlooked. There is always a contingency that among a large number who use water contaminated slightly with lead, some one more susceptible than the rest will be injured.

In a recent paper read before the Scientific Club, at Waterbury, Conn., by Dr. C. S. Rodman, the following symptoms of lead poisoning were enumerated, some or all of which may be considered as the forerunners of serious disease:

1. A blue discoloration of the gums at their junction with the teeth. This was observed about the same time by Tanquerel, by Dr. Schilbach of Neustadt, and by Dr. Brinton of London. The discovery of this mark has proved a blessing to thousands. When present it is positive evidence of the poison; it is not, however, developed in every case. M. Brachet (Paris, 1850), states that it is almost always present in patients poisoned by inhalation.

2. A metallic taste and fetid breath. Observed also in slow poisoning from other metals, as mercury and copper.

3. Lead jaundice. Sometimes the complexion assumes an earthen hue; sometimes it becomes transparent and waxy, presenting an appearance of excessive delicacy.

Emaciation is an occasional phenomenon. These primary effects rarely coexist.

The diseases likely to follow are:

1. Colic, or neuralgia, chiefly abdominal. It is common, and well known as lead or painter's colic.

2. "Arthralgia," or neuralgia of the limbs. These are anomalous pains, chiefly in the limbs, and without redness or swelling. The cause being overlooked, rheumatism is generally assigned as the explanation. In true rheumatism the joints are most involved. In ordinary neuralgia, the pain chiefly follows the nerve trunks. In this affection the pain is in the finer branches of nerves distributed to the muscles.

3. Paralysis, or lead-palsy. Any muscles of the body may be involved. The arms, wrists, and fingers are oftenest weakened. Paralysis is usually only partial. Wristdrop is characteristic. Amaurosis, or paralysis of the retina; deafness and loss of voice are occasioned.

4. Cerebral Affections. The most frequent of these are convulsions; they are usually epileptic.

In view of these facts there cannot be two opinions as to the impropriety of using lead pipes for water when their use can be avoided, and pipes are now manufactured and sold, which insulate the lead from the water by a lining of block tin, a harmless material, durable, and not very expensive.

Car Wheels.

From Auchincloss' Report of the Paris Exhibition we extract the following:

"The practice of nations seems much divided on the subject of the proper material for car wheels. The wrought-iron wheel is almost exclusively adhered to in England, France, and Prussia; while Holland and Austria discover features worthy of attention in the cast iron. The general properties of the cast-iron spoke wheel are familiar to all. The Society of Providence (limited), whose office is at 208 Quai Jemmapes, Paris, display specimens of rolled wrought-iron wheel centers, without weld, whose radial section is similar to an I-beam. Upon such centers the tire is held with four seven eighth-inch rivets.

"The Society of Mines and Steel Works, Bochum, Prussia, exhibits a remarkable cast of wheels. It was formed by stacking the flasks twenty-two wheels high, with the hubs in contact, and then pouring in crucible steel through a side runner. Although this cast was made more as a matter of curiosity, it is quite customary with this company to arrange them in tiers of six wheels each, and thus save the numerous side runners required when cast singly. One swinging of the set in the lathe answers for facing up all the treads and flanges. These wheels have a single plate, and are forty inches in diameter. The Austrian exhibitions are by A. Ganz, of Ofen, Hungary, and Mr. Dernö, of the same section of country. The former gentleman is the most extensive manufacturer in Austria, and makes a double-plated wheel similar in design to that known in America as the 'Snow patent.' He exhibited a wheel 38 inches in diameter, cast in 1856, which has served under a 10-ton four-wheeled wagon for the past eleven years. The tread of this wheel appears in excellent condition, the metal close-grained without signs of honey-combing.

"The director-general of the Austrian I. R. P. State Railway Society certifies to the fact of this wheel having run 50,000 miles. The road on which these wheels are used is 419 miles in length, and pursues a southeasterly course from Vienna through Hungary. In respect to climate the trial is most severe. Its merits are certainly appreciated or the shop number would not extend as high as 84,981, which was noticed on a wheel cast during the present year. The wheels, as usual, have three core holes in the back. The only peculiarity about these holes is a V-groove cast near the opening, into which, when the core is removed, an eighth of an inch sheet-iron disk is sprung. This method is employed on wheels designed specially for passenger coaches, and prevents the entrance of stones, which, rattling within a wheel of so large diameter, become a source of much annoyance."

Editorial Summary.

We learn that the Erie railroad are about to adopt the electric, or Drummond plan, for lighting the Bergen tunnel, according to the suggestions in our article on lighting tunnels, published in these columns a few weeks ago. The Bergen tunnel is nearly one mile long and is said to have cost the Erie Railroad four million dollars. A number of railroad companies run their cars over the Erie track through this tunnel, and so great is the traffic that a train is within it nearly all the time. The passenger coaches have now to be lighted with lamps, and thus the passage through is a gloomy one. An oxygen light in the middle of the tunnel, with the use of Frink's patent reflectors, will illuminate the dungeon brilliantly, and the traveling public will hail its adoption with great satisfaction. The railroad companies will probably find that the cost is not greater than the expense attending the oil consumed in the cars, and the liability to accident will be greatly reduced.

Painless Cutting in Surgery.—At a late meeting of the British Medical Association, Dr. B. W. Richardson exhibited a knife consisting of a revolving blade, and which divided with such rapidity that superficial incisions could be made with it without pain. The revolutions were about twenty-five per second, but the speed might be greatly increased. The knife in its action illustrated that an appreciable interval of time is necessary for fixing an impression on the mind, and for the development of consciousness. He hoped he should soon be able to give to the surgeon a small pocket instrument with which to open abscesses, and perform many minor surgical operations painlessly, without having recourse to either general or local anæsthesia.

New Pavement.—The city of Milwaukee is putting down a kind of pavement, which is described as follows: The old pavement having been removed, the earth is cut to the requisite depth to secure the proper guide for the surface. After the ground-work is thus prepared, it is covered with common inch pine board. Upon this foundation Norway pine plank, two by six inches, are laid edge up and spiked together. The planks being green, are readily sprung to the intended curve of the roadway, and then spiked. The pavement, when completed, will be covered with fine gravel, which will fill any remaining crevices in the surface.

How to Make a Velocipede Useful.—Mr. Glimmer has arranged his velocipede with a churn behind and a coffee-mill in front, these useful domestic utensils being driven by the surplus power of the machine, so that when he takes his morning exercise he churns the butter and grinds the coffee, thus displaying his ingenuity and earning his wife's gratitude.

Aero-Steam Motors.—The article on "Aero-Steam Engines," published in our last issue, will recall to the recollection of our readers the experiments of Wm. Mount Storm, made in this city in 1855, in the same field. We intended to give a complete review of these experiments and their results in the present number, but are forced to let the subject lie over for want of space

It is a fact well-known to artists, that the splendidly bright color of vermilion (cinnabar, sulphide of mercury) has a tendency, especially if it has been mixed with white lead, to become blackish brown and very dark colored in a comparatively short time. This tendency of the vermilion is altogether obviated if, previous to being mixed with oil, it is thoroughly mingled with about ⅛th of its weight of flowers of sulphur.

We are glad to chronicle the fact that sixty-eight thousand children were present on the opening day of the public schools in this city. Give all the children a chance to obtain an education, and if need be compel parents to send their children to school.

By the burning of the skate factory of M. T. Sperry, at Syracuse, N. Y., on the 17th inst., twenty-five thousand pairs of skates were destroyed.

Improved Shelving for Stores, Public Libraries, Etc.

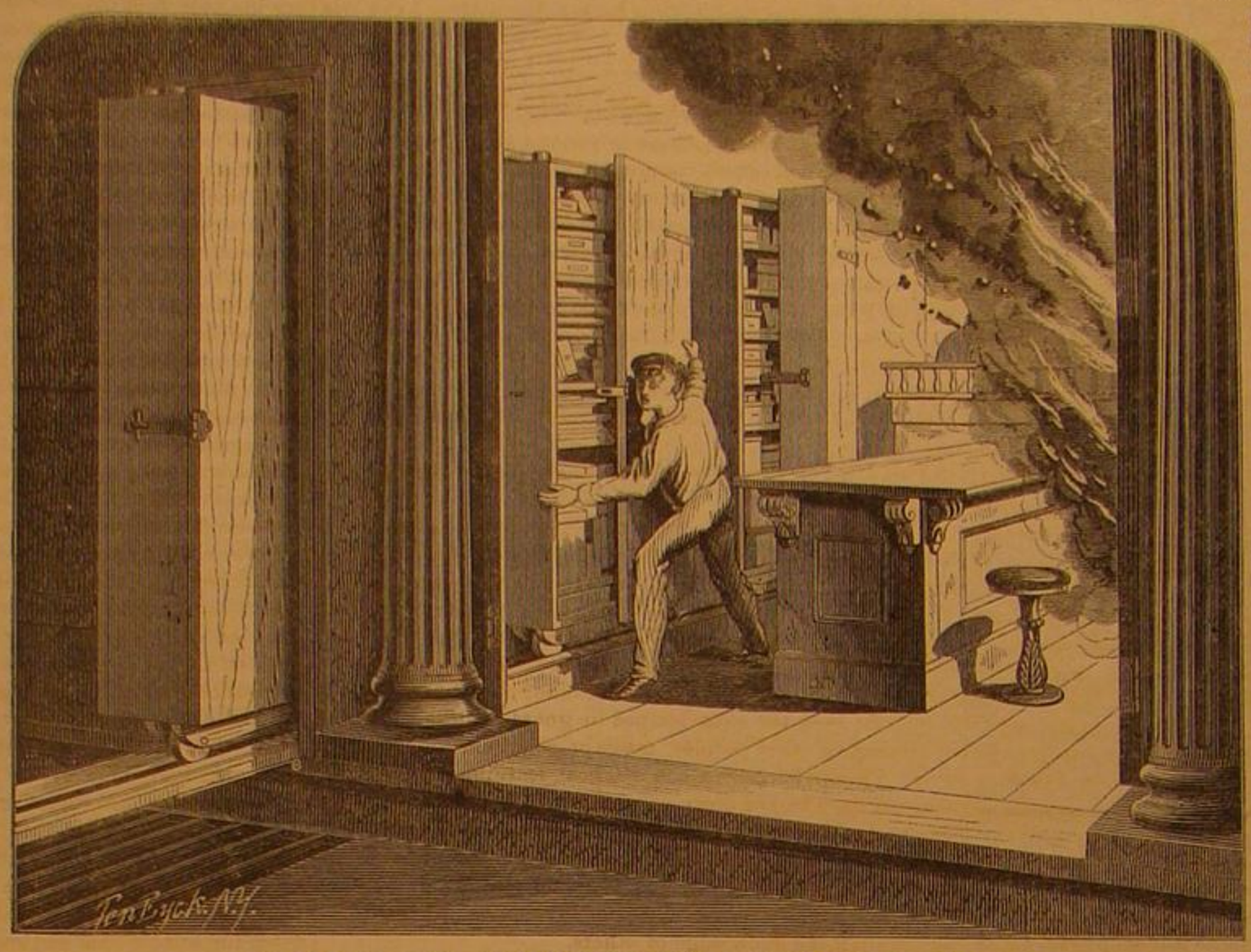
We might have appropriately headed this article "Mechanical Insurance," as it provides means whereby valuable stocks of goods, books in public libraries and cabinets, letter cases in post offices, etc., can be readily rescued in case of fire.

The engraving tells the whole story. The shelving is made in sections which can be closed with great rapidity, and run out of a building without moving goods or books, as the case may be. The sections are provided at the bottom with rollers or wheels which rest upon tracks; and at the tops are friction wheels, which, rolling along a fixed guide, act to steady the sections while they are being moved. In the front of the building doors are formed, hinged at their lower ends, which can be let down outwardly. Vertical rails are fastened to the inside of these doors in such a manner that when thrown down they form a continuation of the track on which the sections of shelving rest.

When the shelves contain only light goods, two or more sections may be hinged together and rolled out together, or so that they may be folded together face to face and fastened, thus protecting the goods, and rendering their removal more speedy.

When the shelves are designed to support heavy goods they are provided with covers hinged in such a manner that they may be turned back along the shelves so as to be entirely out of sight; but so that when needed, in case of emergency, they may be rapidly and securely closed, and the section trundled bodily out of the building.

This improvement merits general consideration, as its adoption would not only increase the safety of valuable property, but would doubtless lessen the rates of insurance.



WILLIAM AND GEORGE KOCH'S PATENT SHELVING.

Patented, July 20, 1869, through the Scientific American Patent Agency, by William and George Koch, of Cass, Pa., who may be addressed for further information.

A Grain Binder---How Farmers are Benefited.

The Davenport (Iowa) *Gazette* states that S. F. Parker, of that city, has recently introduced an improved grain binder, attached to the side of a reaper, the bed of which is traversed by a rake on an endless belt that carries the grain from before the sickle, when cut, and lays it over on the binder. This is a concave of sheet iron in which the grain lies until bound. From a spool the twine unwinds through the tying apparatus, is caught by a nipper, carried around and wrapped tight on the sheaf, is tied into a perfect knot, is cut, and the sheaf drops to the ground securely bound. The making of the knot, never before accomplished in all the numerous attempts at binding by machinery, is completely successful; the mechanism by which this is accomplished being as certain in its operations as the making of a stitch by a perfect sewing machine.

The *Gazette* adds, respecting this improvement, that "once in successful use, they will revolutionize harvest work, and will add millions of dollars to the wealth of the nation, in the immense saving they will effect in the cost of securing the grain crops of the great West."

We entirely agree with our cotemporary respecting the value of a good grain binder to the grain-growing interests, but will these farmers who are to be so greatly benefited, pay the patentee cheerfully for his improvement?

A correspondent writing to the *World* from the State Fair, at Elmira, thus speaks:

"There is not, on the face of the earth, a body of men so easily inspired with a love of improvement and excellence as the rural population of the Empire State. Show them a mold-board, better by the smallest segment of a curve for inverting the sod, and they will honor you. Improve the horse-rake by the lightness or toughness of a single member, and they will discard the old and buy the new. Prove that Bates-Durham is better blood that Booth-Durham, and, presto, we have an English bull at the romantic price of a thousand guineas.

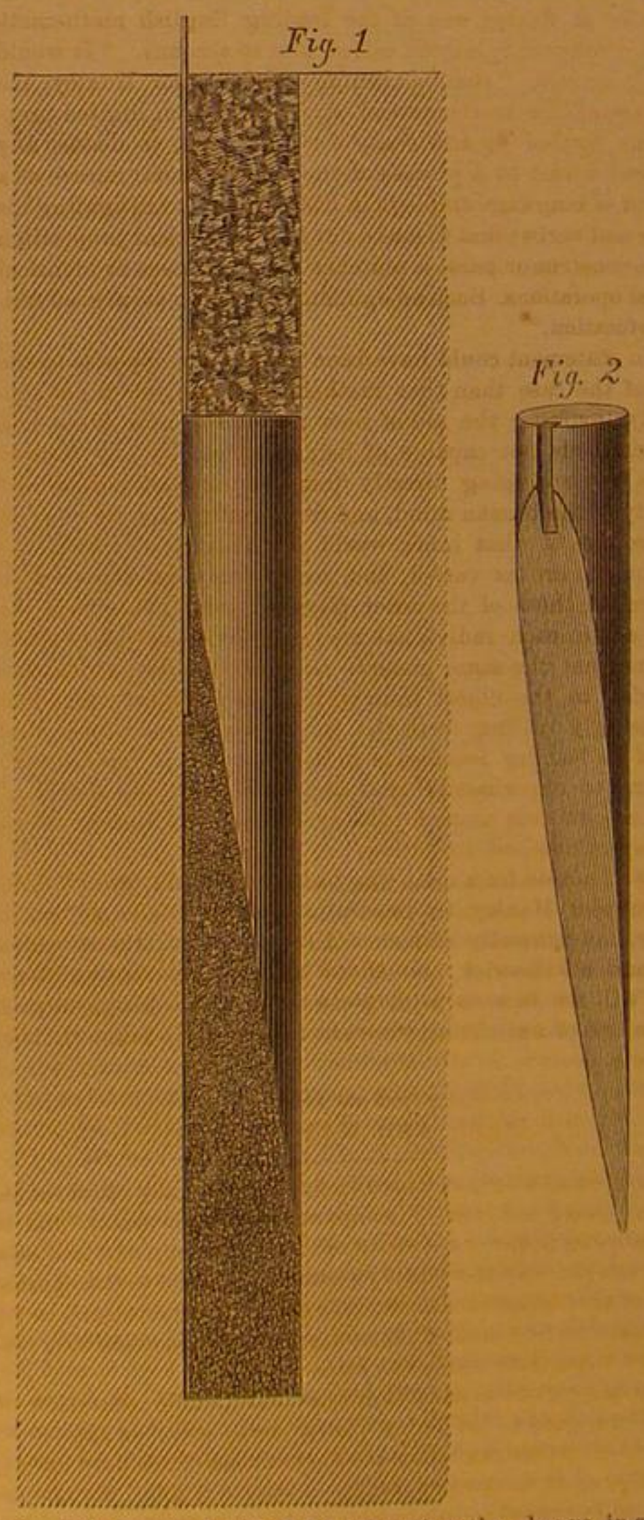
"The people of New York will go to a fair, drawn by the mild and temperate attractions of smooth potatoes, good cheeses, fat cattle, and excellent cooking stoves. They have been educated by the State Board to go for these things, not to see the fierce, enkindling rivalries of a horse race. This homely virtue should be wisely nursed. The board should see to it that they have the noblest of bulls, the best of horse-rakes, and the most cheering display of fruits and flowers to keep the interest alive and growing."

Copper Window Sashes.

These sashes are now manufactured in England under patent. The metal used is drawn copper, and is hard and tough. The sashes, when completed, are submitted to a bronzing process and are not affected by atmospheric influences. The *Building News* says: "They have been experimentally proved to be weather tight, and are thus peculiarly adapted for resisting the attacks of heavy rain in exposed situations. The manner in which the parts are fitted together precludes the possibility of rattling in high winds, an evil too often painfully manifest under ordinary circumstances. Once fixed, these sashes may be designated as everlasting, and they require no painting or other attention. The glass is embedded on an impermeable putty, and fixed in its place by strips of copper attached with screws of the same metal. The first cost of the sashes is slightly beyond that of the ordinary kind, but their unquestionable durability more than compensates for the little extra outlay. In regard to their superior appearance nothing need be said, it is strikingly apparent, and will certainly be appreciated by architects and builders."

IMPROVEMENT IN BLASTING CHARGES.

The object of this improvement is to save powder in blasting. This is accomplished by arranging the charge in such a manner as to get all the explosive power of the powder, much of which is lost in the common way of charging.



The engraving exhibits an improvement consisting of a plug having the form of a half of a diagonally cut cylinder, designed to be arranged in immediate contact with the powder or blasting charge in the drill hole, as shown in the engraving, whereby the charge will be caused to assume the same form, or nearly so, as the plug.

Fig. 1 represents a sectional elevation of a drilled rock showing the charge prepared and the plug inserted. Fig. 2 represents a face view of the plug. The charge is adjusted as follows: The powder is placed in the hole, the fuse fastened to the plug in the groove, Fig. 2, and then the plug is inserted in the hole and pressed down on the side of the powder, as represented in Fig. 1. The hole is then packed in the usual way with sand, brick-dust, or other materials. By this arrangement the inventor claims that part of the force of the explosion usually expended in an upward direction upon the packing, and which does not assist in separating the rock, is delivered laterally against the wall of the hole, as if a wedge were driven up alongside of the tapered face of the wedge (Fig. 2), thereby utilizing the whole force of the powder, and consequently lessening the amount of powder necessary for a charge by about one third.

Any further information may be obtained by addressing Gustavus Werlich, Watertown, Wis., who will send, without charge, samples of the plugs for trial, and who obtained a patent on the device described through the Scientific American Patent Agency, Aug. 3, 1869.

The Patent Office.

The expenses of the Patent Office under the new management are rapidly decreasing. On July 1st there was an unexpended balance of last year's appropriation of $18,000. This sum will suffice for all current expenses until the end of September. There will then be on hand $30,000 of appropriation for this year. Aside from this saving, the entire work of the office has been performed with fifteen less clerks than the law allows. For the first time the Commissioner's desk is entirely cleared of all back business which had accumulated during the previous administration. Besides savings mentioned, the old appropriation was so managed as to pay for the year's expense of photographing and manifolding drawings, which amounts to $25,000.

We are much pleased to hear so good a report of the Patent Office. In reference to the expense of photographing drawings, we regret to say that the work is by no means what it ought to be. The photographs are not artistically done, and we still prefer to prepare for our own clients a good copy of the drawing to be attached to their patents.

Steel Measuring Tapes.

Everybody, of course, is familiar with measuring tapes, but every one is not aware that steel has in this instance, as in others, been made to supersede linen. This has been done by Chesterman and Co., of Sheffield. They have produced a patent steel tape which is about the most unique thing of the kind we have ever seen. It is inclosed in a small metallic case, and acts on a spring as other tapes. Its advantages are portability, neatness, and exact measuring capability. The ordinary linen tape is liable to expand and contract, as heat or cold, dryness or dampness may prevail in the atmosphere, and they are constantly liable to be elongated by wear, in fact, they cannot be relied on at all for exact measurement. It is altogether different with the steel tape. It is not subject to atmospheric influence to any appreciable degree. It does not lengthen by use, and may be called a perfect instrument. It is extensively used by architects, surveyors, and contractors.

A Valuable Extended Patent.

It often happens that inventors are considerably in advance of public opinion in bringing out certain great improvements. Such, in fact, is the history of nearly all the most valuable inventions of the present day. Take, for example, the Nicolson Wood Pavement. The patent for this invention was originally granted on 8th of August, 1854, and through the Scientific American Patent Agency an extension of the patent was secured for seven years. During the first term of the patent very little if anything was made out of it. A ride through the streets of New York at the present time, would convince the most skeptical that the Nicolson extended patent was likely to prove valuable to its owners.

The wide gage, says the *American Railway Times*, is a failure every way, and if the Erie managers will do away with it throughout their line—and by so doing they necessitate the adoption of the common gage on the Atlantic and Great Western, and the Ohio and Mississippi—they will deserve to be forgiven for some of their numerous offenses. All experience here and in other countries, proves the wide gage to be a great mistake, financially and mechanically. By all means let us have a uniform gage from the Atlantic to the Pacific.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE SOLVENT POWER OF WATER.

Of all the properties of that most remarkable and most important, though most common and abundant of liquids, water, none is more remarkable than its solvent power. It is one of the essential conditions to all organic life on the globe. Take away the solvent power of water and the earth would in a very short space of time be barren of vegetable and of animal life.

A simple solvent is a fluid which does not enter into chemical combination with the substance dissolved. Those of the most importance are water, alcohol, ether, chloroform, sulphide of carbon, glycerin, and hydrocarbon oils. All these are artificial except the greatest of all, water, and the hydrocarbons. The solvent power of water is so universal that among the salts known very few exist that it will not, in some measure, dissolve.

The fluids in plants and animals are wholly or in part composed of solutions of solid substances in water. Blood and milk are examples of fluids which hold undissolved organized matter in suspension; but the menstruums in which the organized particles float are found upon examination to be solutions of various saline and organic matters.

So great is the amount of mineral matter taken up by water in flowing over the earth to the sea, that were the process of returning it to the soil any other than that of distillation, all the water on the globe would soon become unfit for use in the animal economy. The circulation of water from sea to sky, from sky to land, and from land back again to the sea, is one of those grand operations of nature, which, when understood, excite the highest feelings of admiration. The sea is a great distilling apparatus, which, under the action of the sun's heat, throws off enormous volumes of vapor into the grandest of all condensers, the atmosphere. Here the vapor is again converted into a liquid, and falls upon the earth; but it has left in the bed of the ocean the burden of lime, magnesia, and other earthy and saline matters it carried to the sea on former journeys. It will return again with another burden, and be again distilled, and so on as long as the earth remains in its present form and condition. There can be no question that this process of abrasion and solution would eventually fill the seas and level all the mountains on the face of the earth, were it not for upheavals of portions by the action of powerful internal forces. In this point of view even earthquakes may have their uses, and act to prevent the world from gradually becoming a vast aqueous desert.

The uses to which the solvent power of water is put in the arts are too extended for enumeration. It finds application in every household in cooking, cleansing of clothing, and almost all domestic employments, and in the industries of the world there could not probably be mentioned one, in which it does not directly or indirectly play an important part.

Nearly all are aware that the solvent power of water is greatly increased by heating it, but few are aware to what an extent this may be carried. In the experiments made by the French chemist, De la Tour, on the effects of high temperatures on liquids inclosed in hermetically sealed tubes, it was found that water heated in a space of four times its bulk, became steam at 773° Fah., and in this state exerted a powerful solvent power upon even such a refractory substance as glass. The decomposition of bones by the aid of superheated steam is a branch of manufacture now carried on to a considerable extent.

In the manufacture of lard on an extensive scale, the bodies of whole hogs are exposed to the action of superheated steam, which shortly reduces them to a mass of fluid fat, the disintegrated bones falling to the bottom in a powdered state.

Thus this universal and most wonderful fluid, more extensive in its applications than any other substance, and upon which the existence of man and beast and vegetable depends, not only drives the ponderous wheels of myriad manufactures, in its ordinary form, but when heated, its mechanical and chemical energies are so vastly increased, that man stands in awe of the mighty power his daring hand has invoked.

PROFESSOR HUXLEY AND SCIENTIFIC EXCLUSIVENESS.

We have ever been admirers of Professor Huxley's genius, but we see signs which lead us to believe that the single-mindedness with which he has devoted himself to scientific study, is producing a state of mind in this investigator for which we can find no word so expressive as exclusiveness. A writer in *Appleton's Journal*, describing the personal peculiarities of Professor Huxley, recently stated that he was not only fond of following, but did follow the standard current literature of the day; yet not long since he is reported to have styled the language of some writers who, not having followed so closely as himself the scientific discussions of the day, cannot be expected to evince so deep an interest in them, and who had expressed some doubts as to their value, "sensuous caterwauling."

This is not the first time the same gentleman has let loose his scientific wrath against those who do not believe the sole end of man is to store his mind with scientific knowledge. We can readily see how one of the high priests of science like Professor Huxley, having entered into the "holy of holies" of her temple, may be impatient of the opinions of those who have not even entered the outer gate; but we think it well for even the most learned to guard against the error of measuring other peoples' tastes or acquirements by their own. Those who have made classical learning the *sine qua non*, and have looked down upon men without Greek scholarship as ignoramuses, no matter how much they knew of geology, have justly been condemned for their intolerance in this respect; and the scientific man, no matter how distinguished in his own field of research, is no more justifiable in depreciating the knowledge of others.

Mr. Huxley is not, however, content with satirizing unscientific literary men, but he sometimes permits himself to drop a remark calculated to show depreciation of those sciences which he has not made his peculiar specialty.

In a recent article in *Macmillan's Magazine*, he let something of this kind escape him with reference to mathematical science. We are glad to see that this has not been allowed to pass unquestioned. At the recent session of the British Association at Exeter, one of the leading English mathematicians, Professor Sylvester, called him to account. "It would seem," he said, "that, according to Professor Huxley, the business of the mathematical student is, from limited propositions, bottled up and ready for future use, to deduce any required result by a process of the same general nature as a student of language employs in declining and conjugating his nouns and verbs; that to make out a mathematical proposition and to construe or parse a sentence are equivalent or identical mental operations. Such an opinion scarcely seems to need serious refutation."

"No statement could have been made more opposite to the facts of the case than that mathematical analysis is not constantly invoking the aid of new principles, new ideas, and new methods not capable of being defined by any form of words, but springing directly from the inherent powers and activity of the human mind, and from continually renewed introspection of that inner world of thought of which the phenomena are as varied, and require as close attention to discern, as those of the outer physical world, to which the inner one in each individual man may be conceived to stand in somewhat the same general relation of correspondence as a shadow to the object from which it is projected; that it is unceasingly calling forth the faculties of observation; that one of its leading features is induction; that it has frequent recourse to experimental trial and verification, and that it affords a boundless scope for the exercise of the highest efforts of imagination and invention."

It will not do for a man who has made as bold speculations as Professor Huxley, to disparage a science which, if not directly, has indirectly furnished him important data on which to found his theories, and there will not be wanting those who will see in such attempts, a want of liberality, surprising in one of such broad views as he generally takes of most subjects.

HARD AND SOFT WATERS.

Those extensively engaged in dyeing, or in any other industry involving the use of comparatively pure water, find it necessary to study the quality of the water they use, and as a rule, are not only thoroughly posted in regard to the characters of the different waters, but as to the proper means to be employed to free them from such substances as materially interfere with their use in the arts.

But among the masses there is considerable confusion of mind in regard to the terms "hard" and "soft," as applied to water, or rather confusion as to what constitutes hard water, and also as to the proper means to render it soft. The popular idea in regard to hard water is that it contains lime; lime being the supposed substance that curdles the soap when the water is used in the washing of clothing. The fact is, however, that the ingredient which renders the water hard is nearly as often magnesia as lime, and quite as often a mixture of both.

These substances are often found in water in the form of carbonates held in solution by carbonic acid. On the contrary, the carbonates of lime and magnesia are insoluble in water free from carbonic acid. It follows that any substance which will combine with the carbonic acid present will precipitate those salts, and the water will thus be rendered soft.

Lime is also found in water in the form of a sulphate and magnesia in the form of a chloride. As the substances named are the ones most objectionable, so far as the laundry is concerned, we will not here enumerate the large list of mineral substances which may be met with in the examination of waters found in various localities.

It is obvious that to act intelligently in removing these substances from water, the exact nature of the impurity should be known. The tests are extremely simple and can be applied easily. The test for the presence of lime is the oxalate of ammonia. A few drops of a solution of this salt poured into water, produces a well-defined milkiness when any of the salts of lime are present.

To determine whether the lime thus indicated is in the form of a sulphate or carbonate (or both may be present), boil down a portion of the water in a glass bottle until a pellicle forms; to the fluid in the bottle add hydrochloric acid, and if effervescence ensues, it indicates the presence of a carbonate of lime or magnesia, or both. If the solution entirely clears up, that indicates absence of sulphate of lime. If it remains turbid sulphate of lime is present. It is not important to distinguish between the carbonates of magnesia and lime, as both can be thrown down by the addition of newly-slaked lime. This should be put in the water, in the form of milk of lime, small quantities at a time, or better, the exact amount of milk of lime necessary may be easily computed. Find by experiment upon small but definite quantities of the water the exact amount of milk of lime of a given strength, that can be added to those definite quantities without rendering the water alkaline. This can be tested by the use of red litmus paper, which is turned blue by the weakest alkaline reaction. The amount of lime that a pint or a quart of the water will thus neutralize being ascertained, the amount necessary for any quantity can be at once determined.

Lime thus added also precipitates organic impurities. In many cases, however, the mere boiling of water will throw down the salts of lime and magnesia, by driving off a portion of the carbonic acid through the agency of heat. When lime is added the carbonic acid instead of escaping with the steam, as when water is boiled, unites with the added lime, to form a carbonate precipitating in common with the mixture of all the carbonates present. The carbonates of soda and potash will produce similar effects, the carbonate of soda (washing soda) being in common use to remove the carbonates of lime and magnesia from water where they are present. An excess of the carbonate of soda, if not too great, will do no harm when used for this purpose. This salt also precipitates the sulphate of lime.

The chlorides of the earthy metals are not often found in the waters commonly used for domestic purposes in quantities sufficient to injure them.

THE EXHIBITION OF THE AMERICAN INSTITUTE.

The most important departments in this exhibition are, or were at the time this article was penned, still incomplete. The only machine running was Baxter's portable engine, illustrated on page 363, last volume of the SCIENTIFIC AMERICAN, which was attracting much observation. In fact it may be set up and put to running with as little trouble as a parlor stove, and needs scarcely more attention.

Owing to the still chaotic state of the machinery department we are obliged to defer a detailed notice of the machinery, of which there will be a much more extended display than has ever before been brought together at a Fair of the American Institute. We are, however, enabled, partly from personal observation and partly through the assistance of Erastus B. Bigelow, Esq., President of the National Association of Wool Manufacturers, also President of the Bigelow Carpet Co., and the inventor of the power carpet looms, and other important improvements in woolen machinery, to furnish some facts relating to the

JOINT EXPOSITION OF THE WOOL INDUSTRY OF THE UNITED STATES,

held by the above Association under the auspices of the American Institute. The object of this exposition, as announced in the *Bulletin* of the Association for January, is to show to the country "the extent, variety, and development of the American wool industry, and the support which it affords to other departments of production—to make known to the American people their dependence upon their own productions, and serve to create that public sentiment in favor of the products of our own soil and labor, which is indispensable to the proper success of our manufactures, and which, at the same time, will, by emulation and example, elevate the standard of this industry and its dependencies." It was desired by the Association to make the exposition eminently national, and to this end they asked for "the co-operation of persons engaged in all the departments of the wool industry North and South, East and West; of those not concerned with the Association, as well as its members; of producers in all the industries and arts, directly auxiliary to the wool industry; of manufacturers of fabrics of every description, composed wholly or in part of wool, and of made-up articles from such fabrics; the growers of raw material; the manufacturers of dyes and chemicals, and furnishers of supplies of all kinds for this industry; and the makers of machinery of every description, used di

rectly in the manufacture of woolen or worsted fabrics;" in fine, the committee hoped "to see displayed at this exposition every natural or artificial product directly contributing to, or resulting from the American wool industry, and all such instruments of production as are applicable thereto."

So f r the exhibition of machinery, raw materials, chemicals, and general supplies for the wool industry, is very meager. Such machines as are present will be noticed hereafter with other machinery when power is supplied to put them in operation. The committee may, however, congratulate themselves on the

DISPLAY OF FABRICS,

which is undoubtedly a finer representation of the present condition of the wool industry in the United States than was hoped for by the most sanguine. We wish the advocates of free trade might ask themselves, while looking at this splendid collection—exhibiting as it does immense success achieved against countless difficulties—whether victory must now be turned into ignominious defeat, by withdrawing from the American manufactures that protection through which they alone can exist? We wish they would ask themselves, even admitting the truth of their repeated assertions that protection is enriching the American capitalist at the expense of the American consumer, whether it is better to enrich

BRITISH CAPITALISTS

at the expense of American consumers, than to keep the profits of this trade in our own commonwealth.

The wool industry in this country is now only fairly prosperous. That is the whole truth in regard to this matter. Money invested in it pays no more profit than would be entirely within the margin considered as perfectly legitimate in other lines of trade. Those who croak about huge monopolies increasing the wealth of the rich at the expense of the poor, are many of them making far larger profits upon capital invested, than woolen or iron manufacturers can average by the exercise of the severest economy, and the use of the most approved appliances in the production of these staples; and a large majority of those croakers are men, who are either immediately engaged in the importation of foreign goods, or are, directly or indirectly, interested in such importations.

We trust this fine display of American woolen goods will convince many hitherto wavering on the tariff question, that such protection as we advocate (not prohibition, as the apostles of free trade would make the public believe, but such protection as permits of fair competition with foreign manufactures) is absolutely necessary for such a development of our national resources as becomes a powerful and independent commonwealth.

This exposition is also of the greatest importance for the reason that the fabrics exhibited are from the regular and general stock of the country. No prizes have been offered and competition has not stimulated the exhibitors to show better goods that they can average. We therefore see here, a genuine sample of the American wool industry with none of its defects covered and none of its merits exaggerated.

One of the most interesting, if not the most important of the fabrics shown in this department is the

AMERICAN BUNTING,

manufactured under patent by the United States Bunting Co., Lowell, Mass. Our readers are well aware that the old style of bunting was made into flags by sewing strips of different colors together, and the stars or other devices were also stitched on, or inserted into material of a different color. The American bunting is first woven like the old, but in dyeing the stripes, stars, or other designs are colored in the piece so that no sewing is necessary. We are informed that flag-makers are universally adopting this bunting, and that no less than 3,000 yards per day are now made at the works of the company.

To within a very short time all our flags were made of English bunting, so that even our national banner was a humiliating witness to our dependence upon the industry of other nations. American genius has, however, triumphed over the disabilities which involved such a necessity. Now the American flag may be made of American wool by American labor, and "long may it wave" over a land independent in deed as well as in name.

Another most important line of goods on exhibition is

AMERICAN CARPETS,

among which the goods manufactured by the Bigelow Carpet Company are conspicuous for beauty of design and color as well as quality of the textures. This company exhibits Brussels and Wilton carpets, and Wilton rugs and mats, the beauty of which will be acknowledged by all who see them. The manufacture of these goods is now well developed and fairly prosperous.

Alexander Smith & Co., of Yonkers, N. Y., exhibit a line of Axminster carpets, which we regard as fully equal to imported goods of the same class.

There were, at the time of the present writing, as yet no tapestry carpets on exhibition, though the superintendent of the department, N. Kingsbury, Esq., informed us that there would be in a few days. This gentleman is an extensive American wool manufacturer, and the success of this exhibition is largely due to his courteous and energetic supervision.

The Hartford Carpet Co. exhibit samples of Brussels, which, however, do not, in our own opinion, properly represent the character and variety of the goods made by this firm, which sustain an excellent reputation. It is, however, due to this company to state that Brussels carpeting is only an incidental branch of manufacture with them, their works being chiefly devoted to the production of ingrains.

The Lowell Manufacturing Co. exhibit a rich and choice display of two-ply and three-ply ingrain carpets, which cannot probably be excelled. They are not only a credit to the company but to the country. The same company exhibit a line of

LASTINGS,

a new and important article of manufacture in this country, and which, through the enterprise and perseverance of the company, has become well established. The same company also exhibit a first-class line of reps. There are only a few manufacturers who make this class of goods in this country, of whom we believe this company ranks first.

The manufacture of lastings may be said to have been literally created by the late tariff. It could not exist before the imposition of that tariff, and it now lives only through such protection. This material enters largely into the shoe manufacture, and is therefore of great importance. Every yard of it used in the country ought to be made in the United States.

The Crossley Co., of Bridgeport, Conn., exhibit

PRINTED WOOLEN GOODS,

consisting of crumb cloths, felt druggets, robes, linings, etc., etc., a fine showy line of goods, and very attractive.

The Lippet Woolen Co., of Woonsocket, R. I., astonished us by the great variety and exquisite quality and finish of the large variety of

FANCY CASSIMERES

they exhibit. The silk mixed goods produced by this firm are specially elegant, the silk used being made by Cheney Bros., of Hartford; these goods owe, therefore, nothing to foreign labor in their manufacture. Good goods of this kind are considered as difficult to produce; though many establishments in America, are, we believe, producing goods that can be ranked with the original textures made at Elbeuf, in France, of which they are perfect imitations. As first class the goods of the Lippet Woolen Co. must be ranked, and nothing but prejudice could induce a preference for imported rather than these silk-mixed cassimeres.

The Pacific Mills, of Lawrence, Mass., have, in our opinion, as fine a show-case of goods, and as tastefully arranged, as any to be met with on the floor, consisting of

MOUSSELINE DE LAINES AND WORSTED GOODS,

a great variety, which we cannot particularly specify. The reputation of these manufacturers, always high, must inevitably gain by this display. If we mistake not this is the largest woolen manufacturing establishment in the United States, and its officers are most active and intelligent supporters of the cause of American industry as opposed to importation of foreign wares.

The Washington Mills, of Lawrence, Mass., exhibit a beautiful line of

WORSTED POPLINS AND TARTANS

in a great variety of styles. They also exhibit a fine class of Thibets, flannels, broadcloths, shawls, table-covers, cassimeres, etc., etc. This is one of the most extensive lines exhibited, and a fine example of American progress in the woolen industry.

These poplins were never made in this country until last year. This company has also succeeded in producing the Scotch cassimeres in great variety and perfection. This is considered as one of the most important of the recent triumphs achieved in the card-wool industry of the United States.

The Salisbury Mills are also represented by a fair line of goods. We were unable to obtain much information as to this company's manufactures, and this was the case also with several other establishments, having goods on exhibition not yet arranged and labeled. This must be our excuse for passing some meritorious displays without notice at this time. If we find it possible to again return to this interesting department we will endeavor to do them full justice.

Scheppers Bros., of Philadelphia, exhibit a beautiful case of

WORSTED DRESS GOODS AND ALPACAS.

which cannot be excelled by any imported goods of the same class. These gentlemen came to this country from Germany, where they formerly conducted the same manufacture, being induced to come through the protection afforded by the tariff on manufactured woolen goods. This alone enables them to compete with foreign manufacturers, and its removal would compel them to abandon their business in this country. So it seems protection not only keeps money at home, but draws it from abroad. Free trade apostles will please take notice of this significant fact.

Upon this point the *Bulletin* of the Association, for July, remarks that "the present exodus of skilled workmen from the manufacturing towns of England to this country, so alarming to British employers, exhibits the European estimate of the rewards for labor offered under our protective system. Under this system we appropriate, not only workmen, but employers and establishments; we import, not merely people, but arts. Such an acquisition is truly, as Fuller styled the immigration of wool-spinners and weavers to England in the reign of Edward III., "a treasury of foreigners." It was thus that England was enriched from France, after the revocation of the Edict of Nantes, and so France was enriched from Holland and Germany, in the time of Louis XV.

The Scheppers Bros., in a letter to the New York *Tribune*, dated June 14, 1869, make the following statement of the reasons which induced them to come to America, which is important as showing the light in which intelligent foreigners view the subject of protection in this country: "Believing that under the American policy of protection the finest silk-finish alpacas and poplins can be manufactured here cheaper and better than they can be imported, we have come here from Belgium to cast in with you—to consume your wool, to employ your labor, and to supply you with home manufactures superior to the finest foreign."

Bauendahl & Co., of New York city, exhibit many different grades of goods, from fine and rich to common and cheap for ordinary use. The cheap goods are of good quality, and are well adapted to the use of those who value durability more than style and finish, though both the style and finish are superior for goods of this class.

The Conshocken Woolen Mills, Benjamin Bullocks' Sons, Philadelphia, exhibit a large assortment of

BROADCLOTHS,

which demonstrate a commendable progress in the manufacture of this class of textures.

The Lawrenceburg Woolen Mills, of Lawrenceburg, Ind., exhibit through their agent, A. T. Stewart, of New York city, a line of excellent cassimeres, for which they have justly acquired a high reputation. Some of these goods, as well as some of the cassimeres noticed above, are of kinds difficult to make, and the success already attained is highly creditable to the ability of their producers.

Wm. Duncan & Sons, of Franklin, N. J., exhibit a case of beautiful goods, consisting of

FLANNELS, TABLE-COVERS, CASSIMERES, AND SILK-EMBROIDERED PIANO-COVERS,

and other goods, which we have not space to name. The character of these goods adds greatly to the interest of this department. The cashmeres and the blankets especially will attract universal attention as a specimen of American manufacturing taste and skill, in which qualities these manufacturers excel. They have also carried the manufacture of printed woolens to a very high point of perfection.

We are very glad this feature of the exhibition has been so well carried out, though, from the known energy and enterprise of the officers of the National Association of Wool Manufacturers, we have felt sure, from the first, it could not fail of proving one of the great attractions of the Fair.

There are many reflections in which we are tempted to indulge at the close of this brief and necessarily imperfect sketch. No one can look through this collection without being impressed with the extent to which the wool industry has been developed in the United States under the present protective system. To secure permanency and further progress it will be necessary to keep the tariff on raw material so adjusted that manufacturers may be placed in the same position as though this material were duty free, while the tariff on manufactured goods should be maintained at just such a standard as will compensate for the difference of wages paid in Europe and in this country. Thus both the fatal alternatives of crushing this industry or of depressing American labor, may be avoided.

DEPARTMENT OF AGRICULTURE AND HORTICULTURE.

The old days when farming was done by "main strength and ignorance," have given way to wiser methods. Year after year inventors have been able to gradually transfer labor from man to beast, and thus lessen the severe work of the farm. But little of the old-time "hard work" remains. Digging potatoes and the loading of hay upon wagons are in a measure unvanquished, although inventors are vigorously attacking them, and the time cannot be far distant when the modern system of farming made easy, will be completed by the addition of perfect machines for the performance of these kinds of work. We shall, in the present article, only review the display of

AGRICULTURAL MACHINERY.

In this department we see no very marked advance since the last exhibition of the American Institute, yet, when we consider the perfection to which agricultural machinery had been carried in 1867, we ought not to expect an advance so great as to supersede, to any very appreciable extent, the improvements then exhibited. There is enough here, however, to command earnest attention. The

MOWERS AND REAPERS

constitute, of course, a conspicuous class. It is safe to say that in these machines the United States can beat the world; and there should have been a better representation of manufacturers throughout the country than is apparent in this exhibition. Quite a number of the most prominent manufacturers, however, exhibit machines, most of them familiar to our readers. Five machines seem to attract more attention than others on the floor, namely, the Wood's Mower, the Wood's Self-raking Reaper, manufactured and exhibited by the Walter A. Wood Mowing and Reaping Machine Co., Hoosick Falls, N. Y., the Perry Mower, made and exhibited by the Ames Plow Co., Boston, Mass., the Columbian Mower and Reaper, made and exhibited by the American Agricultural Works of New York, and the Buckeye Mower and Self-raking Reaper, exhibited by Adriance Platt & Co., of New York. Without any derogation from the special merits of other machines on exhibition, it may be said that the ones mentioned are specially worthy of mention. The Wood's machines took the first premium at the Paris Exposition of 1867, on a competitive trial in the field, and the Perry Mower also took a premium at the same trial. The Buckeye justly meets with favor from a large proportion of American agriculturists, and is preferred by many to any other. All of these machines have, if we mistake not, met with a formidable rival in the Columbian Mower and Reaper, which, although we have never seen it in actual work, we are confident contains every element of a good substantial and easy running machine.

The Nishwitz's Improved Mower and Reaper, made and exhibited by F. Nishwitz, of Williamsburgh, N. Y.; the Climax Mower, which has its gearing entirely inclosed in a cast-iron box about three feet long, one foot high, and one foot broad, made by the Corry Machine Co., Corry, Pa., and the Etna Mower and Reaper, manufactured and exhibited by the Etna Manufacturing Co., of Salem, Ohio, are good machines, and well worthy of public favor. The Walter A. Wood Mowing and Reaping Machine Co. will shortly exhibit the machine exhibited by them at the Paris Exposition, which is probably as highly finished as any machine of this kind ever made. It cost the company fifteen hundred dollars.

We saw no thrashing machine on exhibition except a hand machine adapted for work in a small way. The exhibition of

PLOWS

is also meager, the principal exhibitors being Griffing & Co., of New York; Collins & Co., of Collinsville, Conn., R. H. Allen & Co., of New York, and the American Agricultural Works of New York. Among these the Hartford Cast Cast-steel Turf and Stubble Plow, exhibited by Collins & Co., and the Corn Plow exhibited by the American Agricultural Works are the most noticeable.

Some very peculiarly constructed harrows are also exhibited, some with revolving blades, some with revolving frames, and some the use of which would be hard to guess without an explanation which no one was on hand to give.

An interesting feature of this department is found in the

COTTON AND HAY PRESSES,

of which there are several worthy of special mention. Chapman's Cotton and Hay Press, made and exhibited by Whitney & Co., of Boston, Mass., seems one of the most effective presses for cotton we have met with. The pressure is applied to the follower by means of short links, through a very peculiar and ingenious series of clutches engaging with two upright square bars, one on each side of the press. These clutches are operated by levers, so that a motion, comparable to nothing more nearly than to steps in walking, is imparted to them. No perfect description of this press can be given without diagrams, but it is a most simple and effective machine, one of its advantages being, that when the bale is stitched and banded, the follower may be easily and rapidly raised to the proper hight without reversing the motion which imparts the pressure, as is the case with screw presses.

The Albertson Hay Press, made and exhibited by James M. Albertson, of New London, Conn., a segmental screw press; the Dederich's Parallel Lever Cotton and Hay Press, exhibited by the Whitlock Exposition Co., New York city; a toggle link press, born in Albany, and the Ingersoll Hay Press, made and exhibited by Ingersoll & Dougherty, Greenpoint, N. Y., are also all powerful, convenient, and substantial presses. Among the

MINOR IMPROVEMENTS

may be noticed the potato-digging plow made by R. H. Allen & Co., of New York city, which is a low double mold-board plow with prongs extending rearward to separate the roots from the earth.

The hand cider and wine mills exhibited by Griffing & Co., of New York city, the Hovey's Patent Wine and Cider Mill and Press Combined, and the Daniell's Improved Cider mill are very neat, and, as shown by their practical working at the exhibition, effective, portable machines, occupying very little space, but very well finished, and substantially constructed.

Bendix's Potato Planter, like an expert accountant, operates on two rows at a time, covering them, it is claimed, by the same operation, in a most thorough, satisfactory, and perfect way, with one man and a horse performing an amount of labor executed in the usual manner by twenty men.

Lozier's Hay and Grain Loader is a system of pulleys attached to a swinging arm hinged to an upright standard, so that a rope may raise a horse hay fork with a large mass of hay which may be swung to any part of the wagon. The rope is wound up by the motion of the cart wheels, and by a simple device, may be quickly released to lower the fork when the hay is dropped into the wagon.

There are the usual quantity of straw and root cutters, and other minor implements on exhibition, among which we saw nothing specially new or remarkable.

Among those articles difficult to class in a description of this kind we notice Prindle's Patent Agricultural Steamer, a fine piece of apparatus evidently constructed upon sound scientific principles. All sorts of general cooking and steaming of forage for animals can be economically done in this apparatus without any danger of burning, and it may be used to heat water, or even to perform distillation. This excellent steamer is manufactured and exhibited by R. H. Allen & Co., of New York city.

Also worthy of special mention is the cut hay in bales manufactured and exhibited by the Hudson Hay Cutting and Baling Company, of New York city, a new, and we understand, rapidly increasing branch of business.

The Egg Carrier, Dorn & Seeley's patent, is another Albany invention, and a good thing. It consists of a series of trays with loose canvas bottoms and paper partitions, set one over the other in a sort of crate. The eggs placed in these partitions do not touch each other or any solid material whereby they may become broken, and may be thus transported long distances in perfect safety without the additional weight of the oats in which it has hitherto been the custom to pack them. The exhibition of

SCALES

seems confined solely to the Sampson Scale Company, of New York city, who exhibit hay, iron, and other styles of their celebrated scales. These, though not perhaps strictly belonging to the agricultural and horticultural department, are placed therein as a matter of convenience, and are therefore noticed in this connection.

On the whole there is much of interest and encouragement in this department of the exhibition.

Agricultural Improvements.

The meeting of the Royal Agricultural Society at Manchester, besides showing improvements in live stock and farm and dairy produce, made clear to all beholders that the application of machinery to agriculture has become more and more practicable. There were nearly eight thousand machines and implements exhibited, and this fact alone implies a large and lively demand. Among them were horse pitch-forks, which, by a combination of poles, ropes, and pulleys, will fork hay or barley from a wagon to the top of the tallest rick with surprising rapidity. Plows are made to effect eight furrows at once by the aid of a steam engine; and steam cultivators loosen at once breadths of from nine feet to eighteen feet, and work to a depth of six inches. No wonder that the number of those enterprising persons increases who undertake to plow farms in any part of the country by contract. Another contrivance lays down iron shoes as a sort of endless rail under the wheels of carts on soft roads; and thus another farming difficulty is overcome. And hard roads are not neglected, for a 15-tun roller has been constructed which bites up the surface of an old road, and presses down solidly a layer of new macadam at the rate of half an acre in ten hours, and at a cost of a farthing a square yard (superficial).

THE NEW LIGHT.

Our readers have been made acquainted from time to time, with the progress of a light called the Oxygen Light, probably for want of a better appellation. The principles upon which this light is based, were stated in our report of the lecture delivered by Professor Doremus before the American Institute last winter, which will be found on page 87, Vol. 20, SCIENTIFIC AMERICAN.

To save our readers trouble, we will, however, recapitulate the features of this improvement. The well-known calcium or Drummond light was produced by directing a jet of mixed oxygen and hydrogen upon a pencil or pure lime, the gases being conveyed in separate tubes or pipes, to within a very short distance from the aperture through which they were delivered, and then flowing together and mixing in very minute quantity before combustion took place. This arrangement was adopted to secure safety, as these gases being mixed in the proportion of two of hydrogen to one of oxygen, the proportions best adapted to produce good results, form a very explosive mixture; and as their combustion does not depend upon any external substance, the flame may, upon the removal of pressure, run back through a single tube containing the mixed gases to the receptacle where they are stored and produce serious disaster.

The substitution of the common street gas for the pure hydrogen was found, while more convenient, to not greatly diminish the illuminating power. Oxygen was, however, until the discoveries of Tessie Du Motay and Marechal, an expensive gas to obtain unmixed, and the Drummond light was therefore only employed upon extraordinary occasions, its expense precluding its general and popular use.

The eminent scientists above named found that the salt called manganate of soda absorbed large quantities of oxygen under ordinary circumstances, and discharged it again when subjected to the action of superheated steam. By this means oxygen can be obtained sufficiently pure at a price, we are informed, not exceeding one dollar per thousand cubic feet.

In the attempt to render this cheap oxygen in connection with the cheap street gas available in application to popular use, it was found that something more durable than the lime pencils was necessary. Pencils of magnesia were substituted and subsequently, of the oxide of zirconium; and the light produced by the ignition of these materials is undoubtedly the most brilliant and powerful light ever produced at a rate which could render its popular use practicable.

The following objections have been made to this light; namely, the increased expense of the double service pipes required, the want of diffusiveness in the light, which, although powerful, as we have stated it to be, is asserted to penetrate, rather than illuminate the surrounding space to a great distance; and, lastly, the danger which would attend the introduction of inodorous explosive gases into dwellings.

The expense of the service pipes is by no means a serious objection, as the cheapness of the light—if we accept the statements of those best informed in regard to it—will render the introduction of the service a very profitable investment.

The want of diffusiveness is an objection which only applies to the lighting of streets, squares, and parks; and we have shown in a previous article, that this most probably arose, in the trial of this light in London, from placing it too low down. Any light requires for its proper diffusion a refracting and reflecting medium, and it would be easy to show by a diagram that the lower a light is placed the more of its rays will reach the ground and be absorbed without the possibility of reaching to remote distances.

The objection made by the English journals in regard to the danger of introducing these gases into dwellings, will be found to vanish upon even a superficial examination.

Oxygen and hydrogen mixed in the proper proportions are violently explosive. So is a mixture of common illuminating gas and air, nevertheless the gas now in general use is admitted to be the safest illuminating material ever generally adopted. But the latter has so strong an odor that it cannot escape even in small quantities, without being detected. It would not be difficult to mingle with the oxygen some odoriferous gas which would be wholly consumed in the ordinary course of burning, and the presence of which would evidence any leak in the oxygen pipe. The street gas pipe would, as now, betray any leaks by the odor. Lastly, that any explosion may take place, both pipes must simultaneously leak at approximate points—a contingency so remote that it does not seem very frightful. We believe these gases may be carried into buildings with perfect safety, and that the increased purity of the air in rooms lighted by this method would be alone a full compensation for all its drawbacks real and imaginary.

We were present at an exhibition of this light at the works of the Oxygen Gaslight Company, in Forty-first street, in this city, on the evening of September 15th. Several experiments given by Prof. Doremus illustrative of the practical value of this light for public and private use. We were a little surprised and much pleased to see so complete an establishment, upon which has been already expended, we were informed, one hundred and twenty-five thousand dollars.

It appears to us that a new light is about to break upon this benighted world—certain it is that the time has come when some advance in the method of artificial illumination is imperatively demanded, and we certainly see no valid reason why this improvement cannot be generally adopted.

A New and Destructive Torpedo.

The United States flagship *Franklin*, with Rear-Admiral Radford on Board, is at present in the Adriatic to test the qualities of the newly-invented torpedo, the story of which once appeared in this journal. The inventors of the machine claim for it, says the *Pall Mall Gazette*, a superiority over all other torpedoes now in use. First of all, it is a mere mine, to be exploded whenever chance may present a fitting occasion. It is a projectile which can be directed with an unerring accuracy against the object to be assailed, and this at a distance of several hundred yards. Secondly, it can be projected at any depth below water that may be required; thirdly, its explosive power is such as to make the strongest ironclads now afloat as much at its mercy as any wooden ship; and lastly, the line of its direction may be made to curve or zig-zag, so that it can be used with safety in the immediate proximity of friendly vessels.

As the United States Navy have lately embodied a special corps, chiefly for coast defenses, entitled the Torpedo Brigade, in which some of the most scientific officers have taken service, it is not without importance to know that by these same "experts" the Fiume invention has been pronounced a complete success. They have tested the machine by a variety of experiments, and without a failure in any. The resistance of water at a certain depth to permit the downward course of a cannon shot, and the phenomena of "ricochet" have lately occupied great attention in the American Navy, so that, whether the present invention could fulfill the difficult condition of preserving a uniform course at a depth, say fifteen or eighteen feet below the surface, was a most interesting problem to them. To ascertain this, nets were sunk at different distances along the course the torpedo was to take, and staffs with a graduated measure attached to them. By the replaced meshes the passage of the projectile was tested, and in a course of many hundred yards found not to have varied more than a few inches.

Of course the principle of the invention is a secret, but the inventor—or, more properly speaking, the perfector of the invention—an English engineer, Mr. Whitehead, has no hesitation in saying that he derived his first suggestion of the discovery from the mechanism of the fish, and that the peculiar mechanism and functions of what is called the "swimming bladder," by whose agency the power to ascend or descend in water is secured, afforded him the first clue to his wonderful invention.

The machine is about sixteen feet long, shaped like a fish, propelled by a screw, and guided by a rudder, so that, seen in the clear water, as one of the experimentalists described, its apparent vitality and volition were positively horrifying. The Austrian Government, it is said, acting under the advice of Admiral Tegethoff, have purchased the use of the invention—the patent remains with the inventor—for £20,000. Our own government deputed a commission to examine and report on it, and, it is believed or rumored, with approval of its efficiency.

Dr. Tyndall's Theory of Comets.

Prof. Tyndall has developed a cometary theory out of his late researches upon the actinic power of light. It will be remembered that he has found that a beam of light is capable of forming a bright glowing cloud in its course through a space containing a modicum of vapor, the said cloud being first reduced by the chemical action of the light, and then rendered visible by illumination of the condensed particles.

The application of this principle to the explanation of cometary phenomena is as follows: A comet is held to be a mass of vapor decomposable by the solar light, the visible head and tail being an actinic cloud resulting from such decomposition. The tail is not matter projected from the head, but matter precipitated on the solar beams which traverse the cometary atmosphere; nothing being carried from the comet to form the tail, but something being deposited from the interplanetary space through which the body is coursing. But this explanation supposes that the sunlight has a different power when it has passed through a vapory comet to that which it possesses when it has traversed no such medium; otherwise all space would be lit up like a comet's tail. To account for such a peculiar property, Prof. Tyndall assumes that the sun's heating and chemical powers are antagonistic, and that the calorific rays are absorbed more copiously by the head and nucleus than the actinic rays. This augments the relative superiority of the actinic rays behind the head and nucleus, and enables them to bring down the cloud which constitutes the tail. Thus the caudal appendage is in a perpetual state of renovation as the comets move through space; the old tails being dissipated by the solar heat as soon as they cease to be screened by the nucleus. Nearly all the phenomena observed in those mysterious bodies are accounted for by Dr. Tyndall. One, however, he has not mentioned; namely, the peculiar luminous envelopes, familiar to comet-gazers, which surround the nucleus like a series of cloudy glass cases. No theory can be called complete which does not account for those remarkable and evidently important features.

The Andaman Monkey at the Zoological Gardens in London.

The discovery in the Andaman Islands of a new species of Quadrumana is a very important addition to our knowledge of this interesting country. One or two species of monkeys were known to exist on the adjacent Nicobar Islands, the common Macaque being one of them; but until Capt. Brown brought home the present individual no monkey was known to exist on the Andaman Islands. One or more species of monkey being found on the Nicobar Islands would lead us to expect such a thing highly probable, and had the same species of monkey been met with, nothing very remarkable would have been thought about it; but the discovery of a species hitherto unknown upon the islands that have already furnished us with a man and a pig that are quite unlike any of the neighboring races, is a circumstance deserving particular attention, and affords materials for much speculation and investigation.

This new and unique monkey has been presented to the Zoological Society by Capt. Brown, R. N., of Her Majesty's ship *Vigilant*. It dates its joining the ship's company, from Port Blair, Andaman Islands, in the Gulf of Bengal, lat. 11° 43' N., long. 92° 47' E., in the year 1864.

Jenny (for that is her name) is supposed to be eight or nine years old. For the last four years she has "served" on board the ship, and having passed all the dangers of the Abyssinian campaign and discharged with a first-class certificate and silver chain and medal for good conduct, is now waiting to receive her share of the prizes taken during the time she was in Her Majesty's service.

Jenny stands about 2 feet 4 inches in hight. In general appearance she is most like the "pig-tailed" monkey, but is at once distinguished from this species by a remarkable arrangement of the hair on the top of the head, which is somewhat of a V-shape, and is parted down the middle. The hair itself is very fine, and it is elegantly arranged round the ears. The first impression upon seeing this animal is that it is intermediate between *Macacus rhesus* and *Macacus nemestrinus*. The face is by no means fierce, the features may be even called good-natured. She has been made a great pet by the sailors, the result being that she has been educated to an extraordinary degree of cleverness. She is fond of company, and her constant companion is a chicken (a regular ship chicken, with hardly any feathers), which lives with her in cage day and night, and accompanies her in her perambulations. She walks upright on her hind legs with remarkable facility, and with much less effort than even the performing monkeys as seen in the London streets. When in an erect attitude she will carry things. Thus she will pick up her chicken and run about with it, holding it in her arms as a nurse does her child. The chicken does not seem to mind this in the least. At the word "Throw her overboard," Jenny throws the chicken smartly away from her.

It has been said that monkeys would talk, but that they know that if they talked they would be made to work. Now the Andamanian Jenny forms an exception to the "working" part (only that is very agreeable work) of the story, for if a soda-water bottle is given her she will set to work to untwist the wire. This done, she will get out the cork, if it be not too tightly fixed, and then drink the contents of the bottle. Her attitude in drinking is something quite new. She sits down on her haunches, holds the bottle with both hands, and tilts the end of it up with her hind foot, so that the liquid shall flow at the proper level into her mouth. In this attitude her appearance is most comical, and at the same time most interesting.

The most extraordinary part of Jenny's performances is that she smokes a pipe. Most monkeys will carry a pipe in their mouth and pretend to smoke, but this is the first monkey that we have ever known actually to smoke lighted tobacco out of a pipe.

Most monkeys will drink grog, but Jenny is especially fond of it, and she always takes her glass with her pipe, which she enjoys quite as much as Forecastle Jack after he has been reefing topsails. Our friend Mr. Buckland has called to see Jenny; the fair Andamanian, devoid of shyness, repaid the compliments this gentleman offered her, in monkey language, by snatching a half-smoked lighted cigar out of his mouth, and did him the honor to finish it, throwing away the end when it threatened to burn her lips.

The Andaman natives are said to be the most degraded of human beings. If Jenny is an average sample of the monkeys, we would sooner be a monkey than a man, if nature had cast our lot in the far distant Andaman Islands.—*A. D. Bartlett in "Land and Water."*

Canadian Boulder Rocks.

At a recent meeting of the Geological Society of London, a communication was read on the Geology and Mineralogy of Hastings county, Canada West, by T. C. Wallbridge, Esq., describing the gold and iron ores. A single boulder near the Shannonville railway station was said to cover an area of about five acres, and to have a thickness of 100 feet.

Prof. Ramsay inquired as to the proof of the existence of so large a boulder as one of five acres in extent. Under ordinary circumstances large boulders fell from higher rocks on to the surface of glaciers beneath, and were by them transported to the places where now found; but the fall of such a mass seemed almost incredible. He suggested that possibly it might be an outlier of the lower laurentian beds. Mr. David Forbes stated that the results of his own examination of some of the specimens from the gold mines in this district did not quite tally with those recorded in the paper, especially those of the rocks in the neighborhood of the veins. He considered that the gold in Canada was confined to the veins. Mr. Prestwich cited the discovery of a boulder between Stamford and Peterborough, which was at least 400 feet in length, and consisted of a mass of great oolite. Mr. Searles Wood mentioned a boulder of marl in the coast section near Cromer, upwards of 300 yards in length, and sixty feet in hight. Mr. Wallbridge, in reply, stated that the rock must have come at least twenty miles from its original home. The surface of the Trenton limestone rock in the neighborhood was striated in the direction of the boulder. There was no evidence of intrusion. The mass was traversed in two or three places by crevices.

We are under special obligation to correspondents, who from time to time, furnish letters for publication in our columns upon a great variety of practical topics. We highly value these contributions, and hope that our mechanics will oftener take the pen and contribute from their valuable store of practical information. The warmer season has passed away, and we are getting into the working harness once more for active work. During the coming months we hope to enrich our columns with a greater variety of practical subjects, and shall look for an increased number of useful contributions from our readers.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

Professor Henry Morton, of Philadelphia, has been elected to the newly-created Professorship of mechanics, in the University of Pennsylvania.

The recently discovered gold mines in the Hoosaympa district have been opened, and large parties of miners are among them from White Pine.

Several mechanics in Colt's armory, at Hartford, have contracted to go to Russia to make guns for that Government. They will get more pay there and expect to live cheaper than here.

An extensive ledge of feldspar has been discovered at Georgetown, Me. As it is valuable for the manufacture of porcelain measures are to be taken to have it thrown into the market.

The business of canning sweet corn has begun in Maine. Millions of cans will be put up in the State, though the yield of corn for the purpose is much below the average in amount per acre.

It is said that a little carbolic acid dissolved in the water used to moisten a whetstone, or a grindstone, will greatly increase the friction and promote the action of the stone upon the steel instrument.

A Berlin dispatch states that the Federal Telegraph Administration of the North German States will hereafter forward all messages for America by way of Valentia, owing to the "restrictions" of the French Atlantic Cable Company.

A law has been passed in the Netherlands canceling the old patent law of 1817, and, consequently, abolishing patents for inventions there. Though all existing patents remain in force, no new ones have been granted since the 1st day of August, 1869.

Les Mondes learns with pleasure that the directors of the Transatlantic French Steam Navigation Company have entered into a contract for supplying to their vessels, magneto-electric machines and other requisite apparatus for exhibiting on board, during the night-time, electric lights as signals.

A man digging a well in Ohio was overcome by the gas and dropped insensible. A brave Welsh woman saw what had occurred, and taking a handkerchief saturated with camphor, went into the well and spread it over the man's face, fastened a rope round his body, and then returning to the surface pulled him out and nursed him until he recovered. She did all the work unaided and alone.

A Pomological Congress of the United States is to meet at Philadelphia, and there will be given at the same time at the Horticultural Hall, a national exhibition of the fruits of America. All the states of the Union, says the *Press*, will be represented by the best specimens their orchards and gardens and woods can send. It is expected that a display of ten thousand dishes of rare and choice fruit, apples, pears, grapes, and berries, will be made.

The preparatory surveys of the canal from the North Sea to the Baltic, are at present terminated. The work is not to be intrusted to a private company, as was at first contemplated, but is to be executed at the cost of the State. The cost is estimated at thirty millions of thalers. Branch canals are to be united to the main line in order to increase its commercial value. The date at which operations will commence is not yet fixed, but it is not expected that it will be available for large vessels before six or eight years.

The new earth dams of the Kohanzie water works, at Danbury, Conn., are carefully constructed. Pure water will be secured by an arrangement for taking the supply from the surface of the pond. This is a tower, built of stone outside and of brick inside. The water will pass into this at the surface, and then into the supply pipe. It has been demonstrated that the impurity existing in the Kohanzie water during the summer months is confined to the bottom of the pond, and water obtained from the surface is free from it.

Few are able to give a satisfactory account of what becomes of their old shoes after having committed them to the dust heap. *Cosmos* has been looking into the question, and has found out that many of thrm are cut up into small pieces and put for a couple of days into chloride of sulphur. The leather has become hard and brittle about the end of that period, and is withdrawn from the action of the chloride of sulphur, washed with water, dried, and ground to powder. The powder is mixed with shellac or some good glue, and is pressed into molds and formed into combs, buttons, knifehafts, and other useful articles.

NEW PUBLICATIONS.

Pear Culture for Profit. By P. T. Quinn, Practical Horticulturist. New York: The Tribune Association, 154 Nassau street.

This little work contains a large amount of useful information in regard to the cultivation of the different varieties of pears, from the preparation of the soil for a pear orchard to the harvesting of the fruit. It gives also full directions for transplanting, and for judging of the adaptability of the various kinds to peculiarities of soil climate, etc., etc. Probably no kind of fruit grown in this country depends more for success upon intelligent cultivation than the pear; and many of the failures heretofore attending its cultivation are mainly to be attributed to the lack of just the knowledge this book supplies. No branch of horticulture can be made more profitable than this, with proper management, and this treatise will be the means of putting those on the high road to success who, having gone astray have hitherto met with discouraging results.

APPLICATIONS FOR EXTENSION OF PATENTS.

Gimlets.—Chester C. Tolman, of Shelburne Falls, Mass., has applied for an extension of the above patent. Day of hearing November 22, 1869.

Cloth-stretching Rollers.—Seth Simmons, of Providence, R. I., administrator of the estate of Nathan Simmons, deceased, has petitioned for an extension of the above patent. Day of hearing, November 22, 1869.

Buckles.—Stephen E. Booth, of Orange, Conn., administrator of the estate of Sheldon S. Hartshorn, deceased, has petitioned for the extension of the above patent. Day of hearing, November 29, 1869.

Treating Oils.—Philo Marsh, of South Adams, Mass., has petitioned for the extension of the above patent. Day of hearing, December 13, 1869.

Slide Valves.—James Cochrane, of New York city, has petitioned for an extension of the above patent. Day of hearing, December 13, 1869.

Wrenches.—William Baxter, of Newark, N. J., has applied for an extension of the above patent. Day of hearing January 24, 1870.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

L. W., of Mo.—You may determine the variation of the magnetic needle by the following formula: To the log. secant of the latitude (rejecting the index), add the log. sine of the sun's declination, corrected for time and place of observation; the sum will be the log. sine of the true amplitude, to be reckoned from the east in the morning or the west in the afternoon, and towards the north or south according to the declination. Then if the true and magnetic amplitudes be both north or both south, their difference is the variation, but if one be north and the other south, their sum is the variation. To determine whether the variation be to the west or east, suppose yourself looking toward the point of the compass representing the magnetic amplitude. Then, if the true amplitude be to the right of the magnetic amplitude, the variation is east, and *vice versa*. You may also determine it by first reducing the sun's declination to the time and place of observation and computing the true altitude of the sun's center. Second, substract the sun's declination from 90 degrees when the latitude and declination are of the same name, or add it to 90 degrees when they are of contrary names. The remainder, or the sum, will be the sun's polar distance. Third, add together the sun's polar distance, the latitude of the place, and the altitude of the sun. Find and reserve the difference between half this sum and the sun's polar distance, and to the log co-sine of the difference thus found, add the sum of the log. secant of the altitude, the log. secant of the latitude, and the log. co-sine of the half sum of the sun's polar distance, the latitude, and the sun's altitude (rejecting indices). Half the sum of these logarithms will be the sine of half the sun's true azimuth. Then if the true and observed azimuths be both on the east, or both on the west side of the meridian, their difference is the variation, but if on opposite sides of the meridian their sum is the variation.

J. S. G. Jr., of D. C.—The black sand you send contains iron ore to which your magnetized knife blade adheres. Its presence is not a special indication of valuable ores. The earths you speak of are species of clays, and the colors are due to the presence of various mineral substances in small quantities. On the line of the Baltimore and Washington Railroad there are fine examples of these colored earths; also on the Philadelphia & Baltimore roads. The earth that you speak of as hardening by exposure to the atmosphere is found in various places.

J. G. P., of Pa.—In a drying loft heated by a system of steam pipes on the floor, and in which a constant circulation of air is to be maintained, the air should be admitted through registers in the floor. In your case parallel openings, one inch in width, in the floor between the parallel pipes, would be best, with ventilators at the top to render the circulation as diffused as possible. These ventilators had better be numerous, small and well distributed than few and large.

L. H. W., of D. C.—The amount of borax put into water may be largely in excess of that needed for laundry purposes. Its alkaline reaction is too feeble injure the fiber of linen, cotton, or woolen textures. We do not now recollect any book containing the precise information you seek in your other queries. You had better address a letter of inquiry to Henry Carey Baird, Industrial Publisher, Philadelphia, Pa.

G. C. B., of Conn.—To take plaster of Paris casts of medals, wood-cuts, etc., you must oil the object, the impression of which you wish to obtain. Then place it, face upward, in a box or other appliance, to keep the plaster from running off while soft. Next mix rapidly the plaster with water to the thickness of cream, pour it on the mold and let it harden, which it will do in a short time.

W. B., of N. Y.—Mere motion in air has the effect to heat it rather than to cool it. It is only when the motion mixes colder air with heated air that the motion has anything to do with the cooling. The heating and cooling of air are subject to the same laws as govern the heating and cooling of all other fluids.

G. S., of Ill.—We have tested the alcohol and camphor barometer pretty thoroughly this summer, and have found it wholly unreliable. We have not much faith in any barometer as a mere weather indicator.

R. M. A., of Mass.—You need not fear any ill effects in your boiler, piping, or engine, from the blasting powder detritus, left in the well you are digging, after one or two thorough rinsings.

W. P. A., of Mass.—The information you seek cannot be given in the space we can allot you. Dussauce's "Treatise on Tanning," published by Henry Carey Baird, of Philadelphia, Pa., contains it in full.

P. J., of N. Y.—Pure gold is very malleable and in that sense plastic. When properly manipulated almost any form can be given to it without the use of heat or the aid of any solvent.

S. W. P., of N. Y.—The hair dressing of which you inquire is made of alcohol one pint, pure glycerine two ounces, and pure water one half pint. Scented to suit taste.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

PLOW.—N. Robinson, Patchogue, N. Y.—The object of this invention is to prevent the plow from choking, when plowing in stubble, manure, etc.

BURNERS FOR COAL OIL, ETC.—E. D. Boyd, Helena, Arkansas.—The object of this invention is to provide a simple and cheap perpetual wick for lamps.

HOT OVENS.—D. and J. Campbell and S. Raymond, Middletown, Pa.—This invention relates to that class of furnaces or ovens employed to heat air for the blast of hot-blast furnaces.

KEROSENE BURNER.—James R. Cole, Demopolis, Ala.—The object of this invention is to prevent the danger of explosions arising from the heating of the wick tube, and the generation of gas in the upper part of the lamp.

LIGHTNING RODS.—W. S. Reyburn and F. J. Martin, Philadelphia, Pa.—This invention consists in making a section of a lightning rod of one piece of sheet metal, doubled upon itself in ribs, in a peculiar manner, whereby a very excellent rod is produced at a very cheap rate.

VELOCIPEDE BOAT.—G. Haberland, Pontiac, Ill.—The object of this invention is to provide for public use a velocipede boat, so constructed and arranged that the driver can conveniently propel and steer it, while it is light capacious, safe, and commodious.

SASH BALANCE.—J. G. Jones, Baltimore, Md.—This invention relates to that class of sash balances in which a coiled spring is employed, and consists in a novel arrangement of such spring with the cord pulley, and a couple of small spur wheels, whereby the mechanism operates more smoothly and uniformly, while a smaller spring is required.

COMBINED SECTION MARKER AND ROLLER.—Elihu Evans, Denver City, Colorado.—This invention consists in a new arrangement and combination of section rollers and section markers, in a single instrument, to be employed on plowed ground in rolling the surface and laying off well-defined drills or channels, at any required distance apart, into which the agriculturist can lead water, and thereby distribute it uniformly over the field for the purpose of irrigation.

MELODEON.—J. B. Claxton, Russellville, Ohio.—This invention comprises two important improvements in melodeons and other instruments of a similar character. 1st. The volume of sound from each key is made to depend upon the pressure of the finger upon that particular key, so that pedals, stops, swells, etc., may be entirely dispensed with, and the loudness or softness of each sound be regulated with the utmost nicety by the touch of the player. 2d. A vibrating box, sounding board, and sounding posts are employed to increase the resonance of the instrument and soften and improve the quality of its tones.

COMBINED HAY RAKE AND LOADER.—Francis Terwilleger and John R. Isdell, Wyanet, Ill.—This invention has for its object to furnish a machine, simple in construction, and effective in operation, by means of which the hay may be collected and loaded upon the hay rack as the wagon is drawn forward.

COMBINED PLOW AND SCRAPER.—J. Reynolds, Crystal Springs, Miss.—This invention has for its object to furnish an improved scraper for plowing and scraping cotton and corn, and which shall be simple in construction, effective in operation, and easily operated.

CHURN.—James King, Suckasunny, N. J.—This invention has for its object to furnish an improved churn, which shall be so constructed that it may be conveniently nested for market or transportation.

FURNACE.—Wm. A. Madara, Spang's Mills, Pa.—This invention has for its object to furnish an improved device for regulating the stock or fuel ore and flux, so that they may pass down properly mixed, preventing the heavier parts from sliding down in the middle and pushing the fuel or lighter parts to the side, and which will prevent clogging, relieve the hearth from much of the weight, allow the blast to pass through more freely, and keep the furnace working cool in its upper part.

RAILROAD TRACK.—C. G. Wilson, Brooklyn, N. Y.—This invention has for its object to improve the construction of railroad tracks, so as to make them stronger, smoother, more durable, safer, and more easily and cheaply kept in repair than when constructed in the ordinary manner.

HAIR CUTTER.—George A. Harley, New York city.—This invention has for its object to furnish an improved instrument for cutting or "shingling" the hair of the human head, which shall be simple in construction and effective in operation, enabling each man to do his own hair cutting, if desired.

HAY LOADER.—J. G. Schorn, Iowa City, Iowa.—This invention has for its object to furnish an improved device, designed especially for loading hay upon a wagon rack, but which shall be equally applicable for loading manure, dirt, and other heavy weights, and which shall, at the same time, be simple in construction, easily operated, and effective in operation.

PICKET FENCE.—H. N. Hill, Pontiac, Mich.—This invention relates to a new picket fence, which is so constructed that it can be easily and cheaply made, and that it will be strong and durable.

SEWING MACHINE.—Francisco B. Contessa, New York city.—This invention relates to a new and useful impovement in sewing machines, whereby they are adapted for performing certain kinds of work in a better manner than such work has been done heretofore.

PAPER PULP ENGINE.—Peleg Rose, Norwich, Conn.—This invention relates to a machine called a "paper pulp engine," for reducing rags, and other paper stock, to a pulp for the manufacture of paper.

ARRANGING GEARING.—T. Salisbury, Albion, Pa.—This invention relates to a new and useful improvement in arranging gearing for driving agricultural machinery, and for other purposes.

WATER WHEEL.—Joseph Hathaway, Woodstock, Vt.—This invention relates to a new and useful improvement in car wheels, whereby many of the objections to the ordinary arrangement of the shutes and parts connected therewith are obviated.

WROUGHT-IRON MOLD FOR VULCANIZING RUBBER CAR SPRINGS, ETC.—Charles H. Franklin, Jersey City, N. J.—This invention relates to a wrought-iron mold for vulcanizing rubber car springs, etc.

COFFEE ROASTER.—Adolph Cohn, Louisville, Ky.—This invention relates to a new device for roasting or parching coffee, or malt, and has for its object simplicity of construction, rapidity of action, and economy of fuel.

AUTOMATIC DISENGAGING APPARATUS.—John H. Kingsland, New York city.—This invention relates to a new automatic disengaging apparatus, which is more particularly applicable to suspend ships boats from their davits and to release them as soon as they reach the water, but which may also be used for other purposes.

CHURN.—J. H. Wildasin and J. A. Peek, St. Charles, Iowa.—This invention consists in the application to the lower half of a cylindrical case made in two parts, and having a rotary beater working therein, of an auxiliary semicircular case with a perforated bottom, through which the buttermilk may be drawn off after the butter is formed, to facilitate gathering and solidifying the same.

AXLE BOX.—James B. Hendricks, Clayton, Ill.—This invention relates to a new axle box for carriages, buggies, and all other wheeled vehicles which have stationary axles, and has for its object to produce simpler and more durable supports for the wheels than were heretofore provided.

MATCH SAFE.—Hiram Richmond, West Meriden, Conn.—This invention consists in so forming the back of one piece, and the front sides and top of another piece, by casting, of any prepared metal, that when placed in position together for securing by screws or rivets, coincident recesses formed in each, or recesses in one and projections in the other part, will constitute bearings for the doors, which are made self-closing by weighting one side.

LAMPWICK ADJUSTER.—Wm. F. Rippon, and George A. Johnson, Providence, R. I.—The object of this invention is to provide an adjustable spring presser, for use in lampwick tubes for regulating the breadth of the wick passage in the said tubes according to the wicks, which vary materially in thickness.

TORPEDO.—James Dickey, Venango City, Pa.—The object of this invention to provide a torpedo which affords an instantaneous and explosive effect, thereby acting upon the surrounding media with a more instaneous concussive effect.

BEEFSTEAK CRUSHER.—Horace Thompson, Concord, N. H.—This invention relates to a new beefsteak crusher, which is so constructed that it will cut entirely through the fibers of the meat, without separating the same, thereby making the steak tender and palatable.

HAY RAKE AND LOADER.—Andrew Sheline, Edon, Ohio.—The object of this invention is to provide a simple and efficient hay raking and loading apparatus, for attachment to a wagon, so that while being drawn along behind the wagon it will gather up the spread hay and deliver it up to the said wagon.

CALCULATING MACHINE.—John Hermann Rudolph Reffett, Hoboken, N. J.—This invention has for its object to provide an apparatus, by means of which either one of the four rules of arithmetic, namely, addition, subtraction, multiplication, and division, can be successfully exercised for practical and educational purposes. The invention consists chiefly in the arrangement of a disk, or turn table, working between two slotted disks or plates, and carrying a system of figures and dots, or apertures, by which the required calculating systems are most effectually produced. The inventor is desirous of disposing of state and county rights, or to sell the whole patent, which is dated Sept. 14, 1869.

WASHING AND WRINGING MACHINE.—Orin Skeel, Winslow, Ill.—This improvement comprises an arrangement of grooved rubbing rollers on a spring bed in the bottom of the tub; also, in conjunction therewith an arrangement of grooved rollers on a hinged frame above the first-mentioned rollers, between which two sets, the clothes are drawn back and forth by turning the upper rollers, first one way and then the other, by means of a crank and suitable connecting gears. The said improvement also comprises a wringing attachment to the hinged frame, under an arrangement whereby it is operated by the same crank that works the grooved rollers.

ORE GRINDER.—Samuel Stephens and J. W. V. Rawlins, Houghton, Mich.—The object of this invention is to provide a simple and efficient machine for grinding ores. It consists of an arrangement of crushers or grinders suspended adjustably from a revolving plate, so as to project into a tub or mortar, into which the ore is fed in a peculiar way.

PLANTER AND CULTIVATOR.—A. J. Misenhimer, Oskaloosa, Ill.—The object of this invention is to provide a planting attachment for cultivators which may be readily applied to or detached from the cultivator, and to provide a simple and efficient arrangement of the same planting attachment.

MACHINE FOR MAKING CLOTHES PINS.—A. J. Ockington, Stratford Hollow, N. H.—The object of this invention is to provide a simple and efficient automatic machine for receiving the turned blanks from one or more lathes sawing the said blanks, which are long enough for three or more pins, and slotting and delivering them.

HARROW.—J. H. Williams, Tontzville, Kansas.—This invention consists in constructing the two branches of a triangular harrow in short sections overlapping each other, and pivoted together, so as to oscillate freely in vertical planes, and provided with strengthening links connecting each pivot bolt.

WATER REGULATOR.—Xavier Amoun, Sidney, Ohio.—This invention relates to improvements in water regulating apparatus for the supply pipes of cisterns, etc., and has for its object to provide a simple arrangement of regulating valve to be operated by a float to close the inlet passage, and turn on the water into an escape pipe when the cistern is sufficiently full and to open again and admit the supply when the water falls in the cistern and designed more especially to be used in cisterns which are supplied from the eaves of houses.

A NOVELTY IN MUSICAL INSTRUMENTS.—The number of inventions applied to musical instruments during the last decade has been very large but these inventions have been in the nature of improvements upon existing instruments; and a new musical instrument, worthy of the name, has not appeared in the last twenty-five years. This is an age of progress, however, and this wide and hitherto unworked field has been entered at last. Mr George Herrick, of Waverly, New York, has invented and just secured a patent for a musical instrument which promises to create considerable excitement in the musical world, and bids fair, the inventor thinks, to introduce a formidable rival to the piano to the music-loving public. The invention consists in connecting a key-board, like that used for an organ or piano, with a series of steel tongues like those used to produce the tones in a music box, through certain mechanical means (which cannot be easily shown without the aid of several drawings of the instrument), thereby placing the tones of the instrument at the will of the performer as completely as they are in the piano. Any one acquainted with the rich, full tones, unequaled for clearness and sweetness, of the best music boxes, may wonder why this instrument has not been invented before. This music has long been highly prized, some of the best music boxes commanding fabulous prices, but they have never come into general use; partly because of their high price, partly on account of their delicate machinery and its liability to get out of order, but chiefly because they were mere machines, playing only a stereotyped number of pieces. The invention of Mr. Herrick is intended to enable one to have an instrument possessing all the advantages of a music box with none of its defects. In a large instrument its range of tones is declared to be unequaled, and in power unsurpassed by any instrument, unless it be the pipe organ. In the higher notes of the scale its tones are of that clear dulcet quality found in no other instrument In the lower register, tones can be produced lower on the scale (but still clear and full) than by any other means than the large pipes of the organ. Finally, it will have the great advantage of not getting out of tune. For these reasons it is believed that this instrument will be a very popular one.

VELOCIPEDE.—M. L. Rood, Denver, Colorado Territory.—This invention relates to a new three-wheeled velocipede, which is so constructed that it can be propelled by a convenient motion of the feet or hands, readily steered and stopped, and that it will accommodate two riders at once.

DETACHING SHIPS' BOATS.—Chas. H. Nye, Vineland, N. J.—The object of this invention is to provide an effective means of detaching ships' boats when suspended over the side of the vessel by davits or cranes.

STEAM GENERATOR.—Levi S. Ives, Pittsburgh, Pa.—The object of this invention is three-fold, namely: 1. To separate from the feed water all mineral and organic matter in solution and suspension, thereby preventing incrustation of the boiler; 2. to heat the feed water to the same temperature as that in the boiler before it is thrown upon the heating surfaces and 3d, to prevent priming or foaming.

FURNACE FOR STEAM GENERATORS, ETC.—M. Tildesley and James Bird, Willenhall, England.—This invention has for its object the construction of furnaces, stoves, and fireplaces generally, in such manner that the air may come in contact with the fire, and a draft may be created upon all sides of the fire, at the back end, and at the bottom or under the fire, the top alone being closed, by which construction we obtain smoke-consuming fires.

FLAX BRAKES.—James Boyce, Wooster, O.—The object of this invention is to provide in combination with the "Sanford and Mallory" flax brake a feeding attachment whereby crossed and tangled stalks may be in a great measure straightened and arranged in the proper order for feeding into the said brake in the required lengthwise position.

SIDE SADDLE.—John T. Gathright and John C. Freeman, Louisville, Ky.—This invention consists in a seat of peculiar construction and application of the same to the side bars or pads usually employed, the said seat being made of thin wood and pressed into the proper shape to comprise the cantel seat proper, back and fore springs of the off horn and the support for the near horn.

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94,693.—POTATO DIGGER.—G. W. Adams and J. R. Hopper, Rochester, New York.
94,694.—RAIN WATER CUT-OFFS FOR CISTERNS.—Xavier Amoun, Sidney, Ohio.
94,695.—SWEETMEAT.—François Aroud, Lyons, France.
94,696.—DITCHING MACHINE.—Caleb Bartholomew, Ætna, New York.
94,697.—LEATHER HOLDER.—Christian Bates, Conestoga, Pa.
94,698.—CORN MARKER.—Joseph Bearden, Bath, Ill.
94,699.—SLED RUNNER.—W. N. Berkeley, Cedar Rapids, Iowa.
94,700.—BASE BURNING FIRE-PLACE HEATER.—B. C. Bibb, Baltimore, Md.
94,701.—SPRING BED BOTTOM.—H. E. Bissell, Hartford, Conn
94,702.—SAW CLAMP.—B. Blackstone, Warren, Ill.
94,703.—CLOTHES DRYER.—J. M. Blake, Buffalo, N. Y.

94,704.—Mode of Preserving Wood.—V. W. Blanchard, Bridport, Vt.
94,705.—Harvester Cutter.—Henry Bonholtzer and J. S. Shopp, Cumberland county, Pa.
94,706.—Flax Brake.—James Boyce, Wooster, Ohio.
94,707.—Lamp Wick.—E. D. Boyd, Helena, Ark.
94,708.—Animal Trap.—Julius Branch, Moores, N. Y.
94,709.—Hot Blast Oven.—David Campbell, Joseph Campbell, and Seymour Raymond, Middletown, Pa.
94,710.—Wrench.—Luke Chapman (assignor to the Collins Company), Collinsville, Conn.
94,711.—Toilet Mirror.—G. H. Chinnock, New York city.
94,712.—Toilet Mirror.—G. H. Chinnock, New York city.
94,713.—Melodeon.—J. R. Cluxton, Russellville, assignor to himself and T. W. Gordon, Georgetown, Ohio.
94,714.—Composite Gas Retort.—John Cochrane, New York city.
94,715.—Globe Valve.—M. R. Colvin, Worcester, Mass.
94,716.—Vapor Burner.—Isaac Cook (assignor to himself and H. S. Hall), St. Louis, Mo.
94,717.—Clutch for Hydraulic Wheel Presses.—A. B. Couch, Worcester, Mass.
94,718.—Three-Horse Equalizer.—Giles Cramton, Marshall, Mich.
94,719.—Blind Fastening.—J. E. Cryer, Greenpoint, N. Y.
94,720.—Cloth Sponging Machine.—George Dayspring and Edward Fitzki, Washington, D. C.
94,721.—Mode of Transporting Ships over Land.—E. M. Decy, New York city.
94,722.—Vapor Burner.—J. R. De Mahy, New Orleans, La.
94,723.—Sled Clamp.—L. R. Dexter, Lancaster, N. H.
94,724.—Refrigerator.—J. J. Doepken, Lima, Ohio.
94,725.—Cultivator.—W. A. Dryden and J. M. Turnbull, Monmouth, Ill.
94,726.—Manufacture of Crucibles.—A. K. Eaton, Piermont, N. Y.
94,727.—Tubular Well.—Jacob Edson, Boston, Mass.
94,728.—Broom and Scraper.—D. Elliot (assignor to himself, E. Seely, and J. A. Holmes), New York city.
94,729.—Lunch Box.—M. G. Fagan, Troy, N. Y. Antedated September 4, 1869.
94,730.—Mashing Machine.—L. C. Field, Galesburg, Ill.
94,731.—Chair Seat.—L. W. Field, Camden, Ill., assignor to himself and D. H. Dinsmore, Potter, N. Y.
94,732.—Hydraulic Elevator.—Henry Flad, St. Louis, Mo.
94,733.—Spinning Top.—L. O. Franke, Baltimore, Md.
94,734.—Broom or Mop Holder.—H. L. Franklin and Eugene Clark, Nashua, N. H.
94,735.—Door Bolt for Safes.—Owen Gallagher (assignor to himself and Andrew Bell), Boston, Mass.
94,736.—Artificial Marble or Plastic Material.—H. A. Garvey, Memphis, Tenn.
94,737.—Side-Saddle.—J. T. Gathright and J. C. Freeman, Louisville, Kentucky, (assignors to J. T. Gathright).
94,738.—Railway Switch.—Daniel Heldeman, Mahanoy City, Pa.
94,739.—Material for Covering Steam Boilers, Pipes, etc.—E. S. Hardy (assignor to himself and J. L. Lay), Buffalo, N. Y.
94,740.—Sewing Machine.—Luke Heery, Hinsdale, Mass.
94,741.—Tumbling-rod Cover.—John Heuermann, Davenport, Iowa.
94,742.—Air Escape Funnel.—H. F. Hildebrand, Baltimore, Md.
94,743.—Percussion Cap.—A. C. Hobbs, Bridgeport, Conn.
94,744.—Machine for Forming External Recesses in the Heads of Cartridge Shells.—A. C. Hobbs, Bridgeport, Conn.
94,745.—Machine for Forming Cartridge Shells.—A. C. Hobbs, and T. V. Boyden (assignors to the Union Metallic Cartridge Company), Bridgeport, Conn.
94,746.—System of Water Supplies for Cities.—Birdsill Holly, Lockport, N. Y.
94,747.—Safety Valve for Water Pipes.—Birdsill Holly, Lockport, N. Y.
94,748.—Automatic Regulating Valve.—Birdsill Holly, Lockport, N. Y.
94,749.—Hydrant.—Birdsill Holly, Lockport, N. Y.
94,750.—Valve for Steam Engines.—J. W. Hopkins (assignor to himself and W. H. M. Pye), Brooklyn, E. D. N. Y.
94,751.—Soil Tiller.—William Hunter and D. M. Hunter, Meadville, Pa.
94,752.—Drawing Frame.—O. P. Hussey, Nashua, N. H.
94,753.—Churn.—W. C. Kemp, Palmyra, Mo.
94,754.—Photographic Head Rest.—Wiley Kenyon, Crawfordsville, Ind.
94,755.—Bent Lever Balance.—R. G. Kimball, Albany, N. Y.
94,756.—Reversible But.—Jefferson Kindleberger and W. A. Arnold (assignors to "The Inventors' Association of San Francisco, Cal."), San Francisco, Cal.
94,757.—Flat Chain.—Chester King and S. P. Johnson, Cleveland, Ohio; said Johnson assigns his right to said King.
94,758.—Automatic Boat Detaching Apparatus.—J. H. Kingsland, assignor to J. O. Kingsland and J. W. Kelsey, New York city.
94,759.—Water Power.—A. S. Lineback, Stockton, Utah Territory.
94,760.—Picking Mechanism for Looms.—O. D. Lombard, Lowell, Mass.
94,761.—Burglar Proof Safe.—Wm. McFarland, Brooklyn, E. D., N. Y.
94,762. Bolt for Trunk Trays.—Robert McMurray, Washington, D. C.
94,763.—Steam Safety Valve.—G. F. Morse, Portland, Me.
94,764.—Gate.—Gershom Mott, Joshua Morris, Jr., and David Lupton, Big Run, Ohio.
94,765.—Warp Dressing Machine.—Moses Nelson, Taunton, Mass.
94,766.—Combined Watch Key and Key Ring.—William Patton and B. C. English, Springfield, Mass.
94,767.—Steam Generator.—Leonard Phleger, Philadelphia, Pa.
94,768.—Sash Balance.—W. H. Pilgrim, Allegheny City, Pa.
94,769.—Let Off Mechanism for Looms.—Wm. Potter and L. J. Labounty, Lowell, Mass.
94,770.—Box Opener.—Nathan Purdy, Providence, Pa.
94,771.—Ore Grinder.—Joseph W. V. Rawlins and Samuel Stephens, Houghton, Mich.
94,772.—Calculating Machine.—J. H. R. Reffelt, Hoboken, N. J.
94,773.—Lightning Rod.—W. S. Reyburn and F. J. Martin, Philadelphia, Pa.
94,774.—Combined Plow and Scraper.—J. Reynolds, Crystal Springs, Miss.
94,775.—Match Safe.—Hiram Richmond, West Meriden, assignor to Charles Parker, Meriden, Conn.
94,776.—Lamp Burner.—W. F. Rippon and G. A. Johnson, Providence, R. I.
94,777.—Water Wheel.—R. R. Royer, Ephrata, Pa.
94,778.—Vapor Burner.—Edward Savage, Chicago, Ill.
94,779.—Steam Generator for Kitchen and other Purposes.—W. B. Scaife, Pittsburg, Pa.
94,780.—Lubricator.—Nicholas Seibert, Nevada, Cal.
94,781.—Steam Generator.—Thomas Shaw, Philadelphia, Pa.
94,782.—Hay Raker and Loader.—Andrew Sheline, Edon, Ohio.
94,783.—Railway-rail Fastening.—Edwin R. Shepard, Scranton, Pa. Antedated August 26, 1869.
94,784.—Clod-fender for Growing Plants.—Lewis H. Shular, Crawfordsville, Ind.
94,785.—Composition for Paving.—John W. Smith, Washington, D. C., assignor to himself and John J. Sullivan. Antedated July 31, 1869.
94,786.—Washing Machine.—Justus Smith, St. Louis Mo.
94,787.—Coffeepot.—Oscar F. Stedman, Westfield, N. Y.
94,788.—Scroll Water Wheel.—Seymour G. Steves, Asheville, N. Y.
94,789.—Permutation Lock.—T. J. Sullivan, Albany, N. Y.
94,790.—Post-hole Excavator.—Henry Sutliff, Waverly, N. Y.
94,791.—Hay Raker and Loader.—Francis Terwilleger and John R. Isdell, Wyanet, Ill.
94,792.—Street Scraper.—J. K. Thompson, Chicago, Ill.
94,793.—Furnace for Steam Generators.—Matthew Tildesley and James Bird, Willenhall, England.
94,794.—Stove-cover Lifter.—Sylvenus Walker, New York city.
94,795.—Flute.—Oscar J. G. Wardrum, Chicago, Ill.
94,796.—Lamp Burner.—Sylvester W. Warren, Boston, Mass., assignor to himself, George B. Parrott, and George G. Desmazes.
94,797.—Sizing for Paper Manufacturers and Others.—Zenas Crane Warren and Henry Carleton Hulbert, Brooklyn, N. Y., assignors to Henry Carleton Hulbert.
94,798.—Toilet Mirror.—George Wattis, New York city.
94,799.—Process of Rectifying and Refining Whiskey and other Spirits.—H. Webster, New York city.
94,800.—Tension Attachment for Spools.—Marcus Brown Westhead and Robert Smith, Manchester, Great Britain. Patented in England December 15, 1868.
94,801.—Boot and Shoe Machine.—John E. Wiggin, Stoneham, Mass.
94,802.—Churn.—J. H. Wildasin and J. A. Peck, St. Charles, Iowa.
94,803.—Clipping Shears.—John C. Wilson, Adam Walker, and John Foster, New York city.
94,804.—Purchase for Hoisting and Lowering Top-masts of Vessels.—Wm. Winchester, Portland, Me., assignor to himself, Geo. F. McLellan, and James T. Benedict, Washington, D. C.
94,805.—Composition of Liquids for Tanning.—Ira Wood, Woodstock, Vt.
94,806.—Method of Hanging Top-sail Yards.—Joseph P. Woodbury, Portland, Me.
94,807.—Printers' Copy Holder.—W. H. Young and Chas. J. Young, Cambridge, Mass.
94,808.—Grinding Mill.—Abraham Briggs, Harrison, Ohio.
94,809.—Apparatus for Propelling Machinery.—Wm. Z. W. Chapman, New York city.
94,810.—Coffee Roaster.—Adolf Cohn, Louisville, Ky.
94,811.—Lamp Burner.—James R. Cole, Demopolis, Ala.
94,812.—Presser-foot for Sewing Machines.—Francisco B. Contessa, New York city.
94,813.—Torpedo for Oil Wells.—James Dickey, Venango City, Pa.
94,814.—Floor Gage.—Joel Fales, Cambridge, Mass.
94,815.—Wrought-iron Mold for Vulcanizing Rubber Car Springs.—Charles H. Franklin, Jersey City, N. J.
94,816.—Grinding-plate for Paper Pulp Engines.—Phineas Frost, Medfield, Mass.
94,817.—Hoisting Apparatus.—Ebenezer G. Green, East Gloucester, Mass.
94,818.—Floating Velocipede.—G. Haberland, Pontiac, Ill.
94,819.—Compound for Curing Corns, Bunions, etc.—John L. S. Hall, Wheeling, West Va.
94,820.—Hair Cutter.—George A. Harley, New York city.
94,821.—Water Wheel.—Joseph Hathaway, Woodstock, Vt.
94,822.—Clothes Dryer.—Martin R. Heliker, Norwalk, Ohio, assignor to Richard G. Elliott.
94,823.—Axle Box.—James B. Hendricks, Clayton, Ill.
94,824.—Picket Fence.—H. N. Hill, Pontiac, Mich.
94,825.—Stem-winding and Setting-attachment to Watches.—Vitalis Himmer, Brooklyn, N. Y.
94,826.—Suspended.
94,827.—Steam Generator.—Levi S. Ives, Pittsburgh, Pa.
94,828.—Portable Fence.—Charles E. Johnson, San Francisco, Cal.
94,829.—Sash Balance.—Jacob G. Jones, Baltimore, Md.
94,830.—Churn.—James King, Tuckasunny, N. J.
94,831.—Tobacco Pipe Stem.—Eduard Larssen, Stavanger, Norway.
94,832.—Compound of Hard Rubber and Fibrous Material.—R. O. Lowry, Salem, N. Y.
94,833.—Smelting Furnace.—William A. Madara, Spang's Mills, Pa.
94,834.—Carriage Axle Gage.—Modest Merk, Rochester, N. Y.
94,835.—Planter and Cultivator.—A. J. Misenhimer, Oskaloosa, Ill.
94,836.—Suspended.
94,837.—Boat-detaching Apparatus.—Charles H. Nye, Vineland, N. J.
94,838.—Machinery for Making Clothes Pins.—A. J. Ockington, Stratford Hollow, N. H.
94,839.—Carriage Wheel.—John A. Reed, New Market, N. J.
94,840.—Tooth Wash.—Pierre Riuypeyrou, San Francisco, Cal.
94,841.—Plow.—Nathaniel Robinson, Patchogue, N. Y.
94,842.—Velocipede.—M. L. Rood, Denver, Colorado Ter.
94,843.—Paper Pulp Engine.—Peleg Rose, Norwich, Conn.
94,844.—Arrangement of Gearing for Driving Agricultural Machinery.—T. Sallsbury, Albion, Pa.
94,845.—Cooking Stove.—Robert Scorer, Troy, N. Y.
94,846.—Hay Loader.—J. G. Sehorn, Iowa City, Iowa.
94,847.—Cartridge for Artillery and Blasting.—Taliaferro P. Shaffner, Louisville, Ky.
94,848.—Washing and Wringing Machine.—Orin Skeel, Winslow, Ill.
94,849.—Porcelain Knob Machine.—Thomas J. Sloan, New York city.
94,850.—Dumping Wagon.—William H. Stearrett, Wilmington, Del.
94,851.—Machine for Forming Sheet-metal Pans.—Wm. A. Tarbutton, Harrisburg, Pa.
94,852.—Beefsteak Crusher.—Horace Thompson, Concord, N. H.
94,853.—Thill Coupling.—Thomas C. Walter, San Francisco, Cal.
94,854.—Rock Drill.—John M. Whartnaby, Philadelphia, Pa., assignor to himself and Samuel P. Faunce, same place, assignors to said Whartnaby and Francis Schnechter.
94,855.—Harrow.—James H. Williams, Tontzville, Kansas.
94,856.—Railway.—Charles G. Wilson, Brooklyn, N. Y.
94,857.—Machine for Punching Metal.—Joseph Allonas, (assignor to C. Aultman and H. H. Taylor), Mansfield, Ohio.
94,858.—Hobby Horse.—Lauritz Anderson, Chicago, Ill.
94,859.—Stove-pipe Shelf.—Charles H. Begley and Charles E. Mason, Elgin, Ill.
94,860.—Machine for Planing Metals.—R. A. Belden and E. H. Cutler, New Haven, Conn.
94,861.—Harness Fastening.—Adolph Bernd, Gustav Bernd, and Abner White, Macon, Ga., assignors to Adolph Bernd and Gustav Bernd
94,862.—Key-hole Guard.—David P. Bird, Richwood, Ohio.
94,863.—Press for Molding Glassware.—John Bird, Philadelphia, Pa.
96,864.—Chimney Top.—Thomas Boyd, Cambridge, Mass.
94,865.—Harvester.—C. J. Brackebush and C. E. Merrifield, Indianapolis, Ind.
94,866.—Window-shade Fixture.—Jabez Burns, New York city.
94,867.—Combination Square.—H. N. Burr, Mount Gilead, Ohio.
94,868.—Turbine Water Wheel.—John Chase, Paterson, N. J.
94,869.—Solution for the Treatment of Wood.—E. W. Clark, Hartford, Conn.
94,870.—Washer Cutter.—William A. Clark, Woodbridge, Conn.
94,871.—Harvester.—J. M. Connel, Newark, Ohio.
94,872.—Hot-air Register.—William G. Creamer, Brooklyn, N. Y.
94,873.—Loom.—Geo. Crompton, Worcester, Mass.
94,874.—Changeable Gage Railway Car Truck.—Lancelot Davidson, Brantford, Canada.
94,875.—Rotary Clod Fender.—L. M. Doddridge, New Mt. Pleasant, Ind.
94,876.—Steam Generator.—F. B. Dunn, New York city.
94,877.—Sheet Metal for Roofing and for other Purposes.—L. S. Enos, Almond, N. Y.
94,878.—Circular Saw Mill.—David Evans, Eureka, Cal.
94,879.—Section Roller and Marker Combined.—Elihu Evans, Denver City, Colorado Territory
94,880.—Manufacture of Beer, Ale and other Fermented Liquors.—Joseph Firmenich, Buffalo, N. Y.
94,881.—Suspender Ends.—T. J. Flagg (assignor to Fisk, Clark & Flagg), New York city.
94,882.—Compound for Coating the Surfaces of Steam Boilers, etc.—W. A. French, Philadelphia, Pa.
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94,884.—Vacuum Still.—Henry Grogan, Flatbush, N. Y.
94,885.—Nut Fastener.—Manassch Grover, Clyde, Ohio.
94,886.—Medical Compound.—C. L. Hammond, Java, N. Y.
94,887.—Combined Rake and Reel for Harvesters.—A. B. Hitchcock, Juneau, Wis.
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94,889.—Horse Rake.—Jesse Hudson, Charleston, Ill.
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94,891.—Combined High and Low-pressure Engines.—T. L. Jones, Natchez, Miss.
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94,896.—Elevator.—J. T. Ketchledge, Burns, Mich.
94,897.—Blacking for Harness Leather, etc.—J. N. Knapp, Syracuse, N. Y.
94,898.—Apparatus for Carbureting Air.—J. F. Lafrogne, Paris, France.
94,899.—Velocipede.—Norbert Landry, San Francisco, Cal.
94,900.—Gate.—Wm. Leonard, Orleans, Ind.
94,901.—Ditching Machine.—Nathaniel B. Lewis, Hopewell, N. Y.
94,902.—Interfering Pad.—Walter A. Lovelace, Richmond, Mass.
94,903.—Cultivator.—E. P. Lynch, Davenport, Iowa.
94,904.—Knitting Machine.—J. McCune, Auburn, Ind.
94,905.—Fresh-air Apparatus.—John McNeven, New York city.
94,906.—Rotary Steam Engine.—L. H. Mitchell and Levi Stone, Mount Vernon, Ohio.
94,907.—Kettle for Boiling by Steam.—J. O. Morse, Englewood, N. J., and G. D. Hiscox, Brooklyn, N. Y.
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94,912.—Thill Coupling.—B. R. Rapp (assignor to himself, E. Lane, and J. G. Maxwell), Philadelphia, Pa.
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94,914.—Clothesline holder.—John Robbins, Centralia, Ill.
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94,916.—Water Wheel.—T. H. Russell, Northfield, Vt.
94,917.—Butter Tub.—A. C. Sawyer, Canton, N. Y.
94,918.—Harvester Cutter.—H. F. Shaw, West Roxbury, assignor to J. A. Woodbury, Boston, Mass.
94,919.—Saw Mill.—G. H. Shearer, Bay City, Mich.
94,920.—Die for Manufacturing Spring Callipers.—Noah C. Smith, Berlin, assignor to the Roys & Wilcox Company, East Berlin, Conn.
94,921.—Horse-power.—J. G. Stephenson, Bucyrus, Ohio.
94,922.—Attachment for Gas Burners.—R. N. Stewart, Philadelphia, Pa.
94,923.—Rock Drill.—J. P. Summers, Tiffin, Ohio.
94,924.—Sewing Machine Needle.—Hannah G. Suplee, San Francisco, Cal.
94,925.—Indicating Attachment to Weighing Scales.—Wm. F. Sweet, Jackson, Pa.
94,926.—Hook.—J. H. Tracy, Mayville, Mich.
94,927.—Velocipede.—C. M. Tyler, Indianapolis, Ind.
94,928.—Rustic Settee.—William P. Uhlinger, Philadelphia, Pa.
94,929.—Burglar Alarm.—J. N. Wells, Brooklyn, N. Y., assignor to himself, John S. Hull, and Jerome B. Bryant, Cincinnati, Ohio.
94,930.—Rest for Lathes for Turning Spheres.—Philipp Wenzel, Mayence-on-the-Rhine, Germany, assignor to Ignatius Hahn, Philadelphia.
94,931.—Clothes Boiler.—L. H. Whitney, Washington, D. C.
94,932.—Carriage Axle.—Joseph B. Wilson, Philadelphia, Pa., assignor to Eleanor Wilson, same place, and Henry M. Rile, Wilmington, Del.
94,933.—Thill for Carriages.—William W. T. Greenway, Baltimore, Md.

REISSUES.

54,111.—Children's Carriage.—Dated April 24, 1866; reissue 3,074, dated Aug. 11, 1868; reissue 3,636.—Andrew Christian, New York city.
83,367.—Fruit Jar.—Dated Oct. 27, 1868; reissue 3,637.—H. H. Collins, B. F. Collins, and Homer Wright, Pittsburgh, Pa., assignees of E. M. Davis.
50,536.—Metallic Cartridge.—Dated Oct. 17, 1865; reissue 3,638.—T. J. Powers, New York city.
88,908.—Lock Nut.—Dated April 13, 1869; reissue 3,639.—Almon Roff, Southport, Conn.
56,044.—Composition for Rendering Paints Fire-proof.—Dated July 3, 1866; reissue 3,640.—J. O. Swinney, Glasgow, Mo., and A. H. Pollock, Germantown, Ky., assignees, by mesne assignments, of J. B. Harris.
Design No. 3,530.—Sole of a Boot or Shoe.—Dated June 1, 1869; reissue 3,641.—Michael Thornton, Philadelphia, Pa.

DESIGNS.

3,658.—Mourning Card.—E. J. Godfrey, New York city.
3,659.—Fireplace Heater.—E. S. Heath, Baltimore, Md.
3,660 and 3,661.—Oil Cloth.—C. T. Meyer, Newark, N. J., assignor to E. C. Sampson, New York city. Two patents.
3,662.—"Bit" of Chopping Axes.—Henry C. Reynolds, Manchester, N. H.
3,663.—Rustic Settee.—W. P. Uhlinger, Philadelphia, Pa.

Inventions Patented In England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,459.—Machine for Making Sewing Needles.—F. W. Mallett, New Haven, Conn. August 17, 1869.
2,468.—Loom.—N. A. Baldwin, Milford, Conn. August 18, 1869.
2,501.—Manufacture of Steel.—J. Baur, New York city. August 21 1869.
1,683.—Gas Manufacture.—W. H. Gwynne, New York city, G. W. Harris, Elizabeth, N. J. May 31, 1869.
2,495.—Screw Propeller.—F. Wittram, San Francisco, Cal. August 19 1869.
2,493.—Process of Manufacturing Paint.—S. R. Bradley, New York city. August 20, 1869.
2,499.—Springs for Four-Wheeled Vehicles.—Charles Shea and Henry Roberts, Newark, N. J. August 21, 1869.
2,508.—Apparatus for Raising Water.—E. Prall, Washington, D. C. August 23, 1869.
2,509.—Gas Lamp-post.—John W. Graham, Chillicothe, Ohio. August 23, 1869.
2,510.—Substitutes for Wood, Ivory, Stone, etc.—D. Blake, Albany, N. Y. August 23, 1869.
2,528.—Braiding Machine.—J. D. Butler, Lancaster, Mass. August 25 1869.
2,537.—Carding and Spinning Machinery.—John Goulding, Worcester Mass. August 26, 1869.

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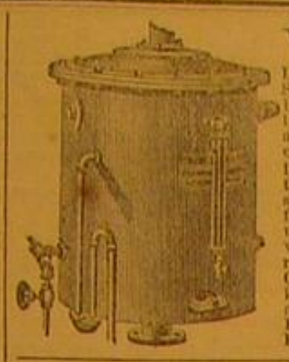

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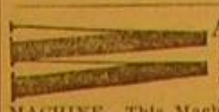

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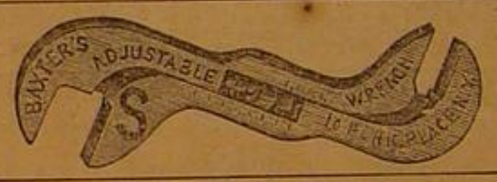

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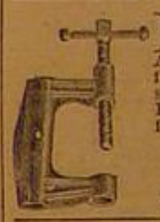

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Vol. XXI.—No. 15. NEW SERIES.] NEW YORK, OCTOBER 9, 1869. $3 per Annum [IN ADVANCE.]

MANUFACTURE OF GLASS BOTTLES.

The Glass Works of the Departments of the Loire and the Rhone, France.

For several years the various glass works of the two Departments of the Loire and the Rhone have been united in one company, under the management of Mr. Charles Raabe, who has introduced several improvements in the manufacture. The manufacture may be divided into three classes, viz., first, that of glass bottles; second, colored sheet glass; third, sundry glass ware.

THE MANUFACTURE OF BOTTLES.

This branch can be divided into five departments: the preparation of the crucibles, the setting of the furnaces, the manner of heating, the composition of the charge, and the manufacture proper.

The preparation of the crucibles demands the greatest care, and thus far no mechanical method has been able to replace their being manufactured by hand. They are made of fire-clay and the remains of old crucibles, freed from adhering vitreous particles. When properly dried and heated they will last from twenty-five to thirty days. The crucibles must necessarily resist the pressure and the chemical action of the molten mass in the furnace, and must also bear moving and withdrawal. To a certain extent the company owes its success to the careful manufacture of the crucibles.

The charges for the production of glass are composed of three principal substances; sand, carbonate of lime, and marine salt. The charges containing iron yield black glass; those that are free from iron yield clear glass. A mixture of the two produces the quality used for the manufacture of champagne bottles.

The manufacture proper is divided into four periods or terms; the charge, the melting, the cooling, and the manipulation.

When the mixture or frit is withdrawn from the vaults of the furnace, it is poured into crucibles, which are filled to the rim. This operation lasts from twenty to twenty-five minutes. The melting occupies from twelve to thirteen hours, during which time the temperature is kept at a red heat. In three hours' time the mixture attains a complete state of fusion. Its volume becomes considerably reduced, and then the charging is finished. Two hours previous to the termination of the melting the crucibles are filled up with calx or refuse glass.

The melting is so well managed in respect to fuel, the men are so well instructed, and the quality of coal so well selected for the furnaces, that every available economy is realized.

The so-called cooling is the time of about one hour and a half that follows the melting, during which the temperature is allowed to fall, the mixture is in a state of repose, and the fused materials arrange themselves according to their order of density, the glass becomes homogeneous, and fines down.

PRESS FOR MOLDING GOBLETS.

GOBLET MAKERS.

The scum is then removed from the surface. The last part of the manufacture is the manipulation, which lasts from eight to ten hours, and during which time the temperature is kept at a red heat, and the glass preserves a suitable consistency. To every crucible there is allowed sufficient room for three men—a blower, a lad, and a boy. The boy dips the glass, the lad finishes it, blows, and prepares the neck; the workman then blows the bottle, by introducing it into a mold (as shown in the large engraving), detaches it from his rod on to a table, and takes hold of the bottom with a pair of tongs. The ring around the top is then formed by presenting the neck of the bottle to the mouth of the furnace and running a string of melted glass round the extremity. The neck of the bottle is then placed a second time within the mouth of the furnace, and finished off by means of a pair of nippers. The finished bottles are handed to boys who carry them on the ends of rods to the baking furnaces, where they remain from twelve to thirteen hours exposed to a temperature of from 200° to 100°. All these operations offer many inconveniences to the workman, who is thereby exposed to a great heat, and is obliged to place the ring on the neck of the bottle while in contact with the flame. In order to ease the workmen of the company, Mr. Raabe, studied a series of improvements for which he took out patents in 1861. These improvements diminish the duration of the work, and avoid its dangers. In principle, the object is to completely suppress the thread of glass around the neck. The neck of the bottle is re-heated at a supplementary opening, then forced into a mold, and, by a slight rotary motion, assumes the form of the ring. Till then this result could not be obtained, owing to the hardness of the bottles. The advantages gained by this improvement are: the eyes are not strained, the ring is necessarily regular and neat, the mouth of the bottle is regular and smooth, and the cork more completely fits the interior cylindrical surface, the operation is more rapid, and yields six hundred and fifty bottles per man per day, instead of six hundred. Mr. Raabe has, therefore, gained rapidity, economy, safety, and the protection of the health of the workmen. Bottles of all the company's molds are disposed throughout the whole of France, at Strasburg, Paris, Nantes, Bordeaux, and Marseilles, large stocks being kept in the two latter cities. The samples exhibited at the London Exhibition, were marvels of production. The chief feature of the bottles manufactured by the company is in the poise of the neck on the body of the bottle, the softness and rotundity of the mouth and in the finish of the rim. Form and solidity are the two results gained. Some experiments made a few years back, by the Society of Encouragement, of Paris, in reference to their power of resistance, gave results that could not be obtained by any other manufactory in France or abroad. Since then progress has been made, and the use of the bottles manufactured by the company, has acquired a considerable development in the south, in the districts of Jura and Bourgoyne, for the sparkling wines made there. Even Champagne, the mother country of all effervescent wines, has commenced to draw her supplies of bottles from this company, which, notwithstanding some disadvantages, enters into competition with the old manufacturers of that locality. The following table of bottles manufactured, will illustrate the success obtained:

1853–4, 17,101,000; 1856–7, 19,583,000; 1858–9, 21,833,000; 1860–1, 23,581,000.

MANUFACTURE OF COLORED SHEET GLASS.

THE MANUFACTURE OF COLORED GLASS.

The great point in the manufacture of colored glass is the composition which here plays the chief part and decides its success. There are two kinds of colored glass—that colored in mass, and lined or covered glass. In the glass colored in bulk, the color must be uniform throughout the whole, imparting the desired hue without destroying the transparency. This, however, is not the most difficult part of the work. When glass is covered, it is necessary that the two surfaces be very perfect and that they coincide thoroughly and adhere solidly. The thickness of the colored layer must be regular, and the two glasses must not be contrary in the sense of contraction. The company had such perfect success in fixing these conditions that it may well be asserted that no covered glass can be compared to their manufacture. The compositions are infinite in their variety, and many are kept secret. The following is the composition of common sheet glass: Fontainebleau sand, 100; sulphate of soda, 36 to 40; carbonate of lime, 40; ground charcoal, 4 to 5; peroxide of manganese, 2 to 3 parts. Red glass is composed of Fontainebleau sand, 100; alkali, 18; oxide of tin, 20; oxide of copper, 15; oxide of iron, 10 parts. Oxides of chrome, cobalt, and manganese are also used for other colors, and lampblack for yellow. The lining of glass with chrome green has not been attained, but recent experiments give hopes of success. The fixing of red glass on yellow has been successfully achieved in the workshops of this company, and forms quite a new feature.

The manufacture of glass cylinders is preceded by a special operation, namely, that of preparing the enamel, which is too well known to require any description. The four periods of manufacture, previously alluded to in that of bottles, is here again brought into practice: the charge, the melting, the cooling, and the manipulation. The melting takes sixteen hours, during which time—the same as for bottle glass—the crucibles are filled up as the contents diminish. For certain colors, such as rose, violet, and yellow, the duration is limited to twelve or thirteen hours.

The cooling takes two hours, and after the skimming has been effected, the manipulation commences, which lasts from fifteen to sixteen hours, the temperature being a clear red heat. That work, represented in one of the small engravings, requires but one man, but one of the most adept. An assistant dips one dipper full of colored glass and places it on the end of the blowing rod, and passes it to the blower, who puts on three dips of white glass, blowing the muff in the same manner as for window or sheet glass. The enamel being well prepared, spreads with the white glass during the blowing and the stretching of the muff, and forms a uniform covering on the inside. After the longitudinal extension of the cylinders comes the stretching. The stretching of colored glass has only the peculiar feature that the workman uses the wooden polisher to stretch the sheet on the iron table, instead of the iron one, which would spot the colors. When the stretching is finished the sheets are left to cool for seven or eight hours. The sheets are about 32 inches by 24 inches, but much larger can be made. Since the exhibition of 1855, America and England have taken large quantities of colored glass. Glass, either covered or colored in bulk, is used for painting, etching, railroad signals, lighthouses, general ornaments, etc., but lined glass is especially used for etching or engraving.

In white sheet glass the south cannot well compete with the north of France, in respect to whiteness, owing to the primary materials. The manufacture is conducted in the same manner as in colored glass.

The manufacture of goblets or glasses is of excellent quality, and varied among the products of the glass works of the Loire and the Rhone. Here, however, and especially for chemical use, the color is faulty, notwithstanding numerous experiments to render the crystal pure and white. It was finally resolved to construct furnaces on the Belgian system, that is, of a circular shape, with a large grating in the center, charged from two openings in the furnaces. Two flues, placed between two consecutive crucibles, draw the air into the vertical flues which run along the top into the large chimney which stands some twelve feet higher than the roof. In this manner, with stronger draft and a more intense heat, the pots can be left uncovered, thereby avoiding the fumes, and yielding a very white glass, from Fontainebleau sand and lime from the Rhone.

The appreciation of the Jury of the great Exhibition of London, was based more upon the qualities adapted to general consumption and the low prices, than otherwise, and these conditions were amply fulfilled by the company. The number of furnaces in use is thirty, twenty of which are at Rive-de-Gier, nine at Givors, and one at Vienne. Twenty-two are used for the manufacture of bottles, three for white sheet glass, two for colored sheet glass, two for the manufacture of drinking glasses, and one for common glassware. The company holds the first place among the manufactories of France, and employs in all some two thousand men, women, and children.

What English Workingmen Think of Free Trade.

We learn from the *Ironmonger*, that a well attended meeting, convened by "the Trades of Great Britain Defense Association"—a body which, it was stated, was inaugurated by the masters and journeymen lathrenders of London at a meeting in May last—was recently held at the Shoreditch Town Hall, "to take into consideration the present critical state of the country, the depression of trade, and the general want of employment, consequent on the importation of foreign manufactured goods, and to petition Parliament for a commission of inquiry as to the working of our commercial policy." The following resolution was moved by Mr. S. Bartlett: "That the principle of free trade should be based upon an equality of international exchanges; but, other nations not having adopted the principle, it has become injurious to England, and is the cause of the present depression of trade, the want of employment and the increase of pauperism. This meeting, therefore, considers it their duty to the Government to institute an immediate inquiry into the working of our commercial policy, with the view of ascertaining how far this unreciprocated free trade contributes towards producing this depression, want of employment, and pauperism, and to what extent it may be limited so as to produce an effectual remedy." The mover said the subject of the meeting was not to protest against free trade *per se*, but against the manner in which the policy inaugurated by the Manchester school of economists had affected the manufacturing and industrial interests of the country. The free trade policy of England was not reciprocated by other countries, and no more striking proof of this could be found than the fact that, according to the Board of Trade returns, the imports of this country exceeded the exports in value by £67,000,000. Mr. Cobden and his co-laborers promised the workingmen increased wages and a reduction in the cost of provisions, but what was the result? Industry after industry was being annihilated, and emigration was the only panacea suggested. There was a grevious error at the bottom of this state of things, and he hoped the working classes would unite as one man in the request to the Government to inquire how far our so-called free-trade policy had produced the present depression in trade, and the consequent pauperism and want of employment. Mr. Sangster, in seconding the resolution, asserted that we lost immensely by the French treaty, which he said was of a protectionist character, and ignored the free trade principle as far as England was concerned, and if it was not put an end to would cause the ruin of English commerce and industry. English exports were heavily taxed by every nation, and it was time that something should be done to insure fair play, else foreign manufacturers would inundate our market, and the representatives of our manufactures would become the hewers of wood and drawers of waters of Europe. Mr. Brooks, in an animated speech, attributed the increase of pauperism and its accompanying ills to our commercial policy, and denounced the notion that nothing but emigration could improve the condition of the working population. The resolution was unanimously adopted; and a petition to Parliament, embodying the views of the speakers having been adopted, the proceedings terminated.

Dust.

The atmosphere teems with dust—more, of course, in towns and cities than in the country. There are three great and never-ending sources of dust. One is the beating about of woven fabrics, such as the sweeping of carpets, brushing clothing, and making beds. The next is the wear of the roads by horses, vehicles, and pedestrians. The third is the burning of fuel. There are also other sources of dust too numerous to particularize. Nothing but air-tight vessels will exclude dust. It is pumped in and out of every watch, every bookcase, jewel-box, or casket, every cupboard, every writing-desk, immediately there is the slightest change of temperature of the surrounding air. The expansion or contraction of the air causes it to pass in and out of the most minute fissure. A glass-covered engraving will quickly show whether it is perfectly lined to exclude dust; if it is not so, at the point where the air passes in and out under the glass there will the print exhibit a pointed brown dust discoloration. This is the kind of dust which we see in cities and towns. But dust has other aspects, from the dust storms of Egypt and Australia, to the particular dust made during hay-making time, the thrashing of corn, and the grinding of grain. Starchy granules are at all times to be found in the air. Again, the atmosphere is loaded with seeds. No sooner is a new railway bank thrown up of the purest virgin gravel, than in a few weeks it is covered with verdure. The great purifier of the air from dust is rain; the air is thoroughly washed by rain, and the dust therein for a time is removed. It is the excessive dust in the air, though not visible, which in dry seasons is the cause of many diseases.—*S. Piesse*.

THE London *Spectator* says the English mechanic gains little or nothing by emigration, except the chance of a good gratis education for his children. The unskilled laborer gains, in addition, a great increase of wages, of comfort, and of liberty; while the agricultural laborer may be said to gain everything.

There has been a Providence caring for mankind millions of years before the first man stood erect in this creation. The first coal-making plant that waved in the breeze was prophetic of the coming man.

WHAT IS FOUND IN THE AIR.

From the Scientific Review.

Quite as much might be written upon the composition of the air we breathe as upon that of the water we drink. But it happens that muddy water is more visible than dirty air, and generally attracts more attention, though in reality foul air is far more injurious to man than foul water, for the latter comes first of all in contact with the digestive organs, which have the power of repelling, to a certain extent, any noxious or poisonous ingredient, whilst impure air is, on the contrary, intimately mixed up with the blood at every inspiration, and introduced at once into the system by thousands of minute blood vessels.

The refined chemical processes that have been brought to bear upon the analysis of water, and have proved so useful in a sanitary point of view, have been no less successful with regard to the atmosphere. By washing or filtering large volumes of air, we find, besides the gases oxygen, nitrogen, and a considerable amount of organic matter, germs and spores of fungi, certain acids, ozone, nitric acid, ammonia, and several other substances may be detected in greater or less quantities, according to the localities, the season of the year, the direction of the wind, the proximity of the sea, etc. Arago and De Fonvielle have written upon the sulphur which lightning finds in air and deposits upon the objects which it strikes; Baron Liebig and Lassaigne have found nitrates and ammonia in the air, which are washed down by thunder storms. Professor Barral has noticed that phosphate of lime is likewise present to a certain extent in the atmosphere, and Dr. Phipson, in its curious little work on meteors, describes an experiment in which a sheet of glass covered with glycerin, and exposed to the wind after the great fall of shooting stars in November, 1866, collected certain black corpsucles, which, on being treated with hydrochioric acid, gave yellow chloride of iron, and were, probably, some of the substance of shooting stars.

The passing of the alkali act of 1863, which compels manufacturers to consume 95 per cent of the hydrochloric gas evolved from the sulphate of soda furnaces, has gone far to purify the air of large manufacturing towns, and to protect the vegetation that exists around them, and contributes pure oxygen to their atmosphere. The reports published by Dr. Angus Smith on the operation of this Act show that its beneficial effects continue. The last report, recently issued, contains the results of some interesting observations on the air of cities, and gives some notion of the ordinary state of the atmosphere of towns.

The refinements of modern science are enabling us to grasp a class of facts hitherto unknown except by the effects which they produce. The air seems now to be undergoing an investigation similar to that which was commenced some years ago in regard to the water supply. "Horrors" hitherto unknown burst upon mankind when the microscope revealed the animal organisms which reveled in the polluted water of the Thames. More recently science has been able to detect not merely the signs of actual and present contamination, but the tokens of a previous pollution. Hence, the analytical chemist is able to give us the history as well as the character of the water we drink, and can tell whether in its course down the stream it has at any time been in contact with decomposing animal matter. The question is not merely curious, but of great sanitary value, since there is reason to believe that sewage sometimes gives to water a species of poison which remains even when the sewage itself is destroyed. Something of the same kind is now being revealed in regard to the atmosphere. By examining rain we are enabled to discover what are the gases and substances which float in the air. When there is no rain it is possible to wash the air in bottles, and so make it yield the foreign matters with which it is impregnated.

Rain varies greatly in its character according to the source from whence it proceeds, and the locality where it falls. Falling on the coast, and coming from the sea, it contains chiefly common salt, which crystallizes readily. The proportion of sulphates to chlorides is larger in rain than in sea water. This is a general rule, holding good from Central Germany to the most northern Hebrides, and, as we advance inland the rain-water sulphates increase. These sulphates are derived from the sulphureted hydrogen, which otherwise would be intolerable, and which is given off by decomposing matter. The pure oxygen of the air combines with the stinking gas, oxidizes it, and makes it harmless, so far as the gas itself is concerned

Just as the nitrates in the water supply of London are a measure of the "previous sewage contamination" of that fluid, so the sulphates washed out of the air by rain are a measure of a similar contamination affecting the atmosphere. There is, indeed, a disturbing cause in reference to air. The sulphates are largely increased in the atmosphere of towns by the combustion of coal. From the same cause, coupled with the decomposition of certain substances, there is an increase of the ammoniacal salts in the rain as towns increase. Rain may also become acid from the presence of sulphur, combined with oxygen. Towns vary in their atmosphere and their rain. Civilization not only pollutes rivers, but pollutes likewise the aerial currents. The rain of Manchester turns the blue litmus paper red, and where most soot is found there is much acidity. Sulphuric acid exists as the result of a large consumption of coal. Rain coming after a period of drought is particularly rich in acid, while continuous rain reduces the quantity.

Even where there are no alkali or glass works there is a certain amount of chlorides in the air in excess of that which the sea contributes. This is rather a puzzling circumstance; but Dr. Angus Smith offers an explanation of it. He suggests that the extra chlorides come from the burning of coal, and have their origin in the common salt of the ancient seas.

But there is much more in the air than acids and salts, and a day will come when the Registrar General will publish monthly analyses of the London air, like the present returns with regard to the water supply.

Tuns of solid impurity may doubtless be found in a month's supply of air to the metropolis. Not long ago an enthusiastic projector proposed to "lay on" fresh air from Hayes Common, in Kent, to be conveyed into metropolitan houses by means of pipes. If ever this idea becomes an accomplished fact it may be proper to analyze the air as "drawn from the company's mains." At present we have to rely on aerial reservoirs in the nature of parks and open spaces, the value of which is undoubted.

Mr. Dancer has studied the character of the solid particles contained in the air of Manchester. Samples of the air were washed by Dr. Angus Smith, and the fluid was afterwards microscopically examined by Mr. Dancer. A single drop of the water was computed to contain no less than a quarter of a million of fungoid spores. The fact was verified by examining an extremely small particle, and multiplying the result. The bottle of water having been kept for thirty-six hours, the quantity of fungi, already so great, "visibly increased," and on the third day minute creatures were observed moving about in the fluid. Keeping, however, to our former figures, we find that 150 drops of water would contain more than 37,000,000 of the fungi, these 150 drops being the washings of 2,495 liters of the air of Manchester, which is about the quantity of air passing through the lungs of a man in ten hours!

The drops of water yielded a kind of dust, which in the space of three or four days produced considerable numbers of animalculæ, in which monads were most conspicuous. In this dust were particles of partially burned wood, fragments of vegetation, filaments of cotton and granules of starch.

Dr. Angus Smith has also experimented on smoke of various degrees of blackness and brownness, and shows that the difficulty of consuming smoke does not commonly arise from a deficiency of air in the furnace, but from the fact that a rapid draft often fails to allow time for proper combustion. It is now certain that the black smoke prohibited by act of Parliament, contains carbonic oxide, one of the most poisonous of gases. Carbonic oxide is only detected in smoke by the illegal density, and when we find this black smoke is really an expensive article to produce, we seem to be furnished wtth every reason why such a nuisance should be prohibited.

But though man and his works tend constantly to render the atmosphere dirty and unfit for life, nature on the other hand tends to counterbalance the evil. The constant production of ozone and nitric acid in the air of the country, the presence of iodine and ammonia and sweet scented essences occasionally met with in our atmosphere, the evolution of oxygen by trees and shrubs, are so many beneficial influences which contribute to purify the air.

Value of Meteorological Observations.

An instrument which can accomplish the registration of sunshine and cloud would furnish information of the utmost value to agriculture, and some of the most important industrial pursuits of our country. We may illustrate what is here meant by taking one of the most valuable of our farm crops —the hay crop—as our example, though, as will be seen, the remarks apply to all other agricultural products. On a fertile soil the weight of grass that may be produced depends on two conditions—the supply of a sufficiency of rain, and the furnishing a sufficiency of sunlight in the eleven weeks between the middle of April and the last of June. The rain brings into the growing plants the inorganic materials they require from the soil, and of course, furnishes their requisite supply of water; the sunlight forms in them their various organic and nutritive material. Now last year (1868), during the period referred to, there was a copious supply of water, but, owing to prolonged cloudy weather, an insufficient supply of light—the grass was all the time growing, as it were, in the shade. When haymaking came, observing farmers remarked how much longer than they expected it took to cure the grass; that is, to get rid of its water; and how great a falling off there was in the resulting weight of hay. Nor was this all. The diminished quantity of nitrogenized material it contained caused it to be less nutritive; a greater weight of it was required to fatten cattle, or even to keep them in good condition. The effect was felt by those interested in raising animals for sale, and eventually in the quality and cost of butcher's meat.

The object of meteorological observations is to enable us to record the past and predict the future state of the weather, and that the imperfect manner in which this has hitherto been accomplished has been mainly due to the unreliable and unsatisfactory mode in which such observations have been made. When self-recording machinery, such as New York has in her Central Park, shall have been established in all our large cities, the problem of predicting the weather will undoubtedly be solved. One most important agency is, however, essential to this result—it is telegraphic communication between such various observatories. A little consideration will show how this, which is at present a vague conception floating in the popular mind, can be carried into effect. Already telegraphic companies, desirous of aiding the progress of science, send over their lines, without compensation, brief dispatches of the state of the weather and aspect of the sky. They report, for instance, that at St. Louis it is cloudy—at Charleston, the wind is at the north. They also give the hight of the thermometer. But this information is really of little use. What is wanted is a statement of *changes* in the weather, with the time of their beginning and end. Thus, if it were stated that a rain-storm began at Raleigh, North Carolina, at 2 A. M.; that a rain-storm began in Richmond, Virginia, at 11 A. M.; that the same occurrence happened at Washington at 5 P. M., and at Philadelphia at 10 P. M., the inference would be that this was in fact the same rain-storm advancing northeastwardly, and that it would reach New York at about three o'clock on the following morning. In like manner if the time of ending were given at each successive station, its time of ending at others not given might be foretold. If to this information were added the quantity of rain that had fallen in succession at each place, the condition of the storm, as to whether it was on the increase or decrease, could be indicated, and perhaps the point at which it would die out. Now what is here said by way of illustration in the case of rain, applies to wind-storms, tornadoes, periods of great heat, periods of great cold, and other atmospheric phenomena.—*J. W. Draper in Harper's Magazine for August.*

Establishment of Soap Factories.

The fabrication of soaps requiring substances of different origin, the manufacturer must prefer that locality where the crude materials which furnish the basis of the fabrication are abundant and easy to be obtained. It is thus that a manufactory of soap with olive oil for its base, will be in better condition of success in a seaport, or in its neighborhood, than in an inland city, because the oil being imported, the manufacturers of soap of the other localities would obtain those oils from second hand, with much expense, and could not compete with the manufactories of the seaports.

For the fabrication of the other kinds of soaps, such as those of tallow, greases, animal oils, oleic acid, etc., experience proves that this fabrication succeeds, in general, better in the inland cities, and particularly in the northern than in southern localities. It is then important in the establishment of a soap manufactory, to make products similar to those employed in the locality. For example: a manufacturer of oleic soap will realize fine profits in New York, Philadelphia, Cincinnati, etc., and may experience a loss in New Orleans, and other cities of the south.

As for the other conditions which have to be observed in establishing a manufactory of soap, it must, if possible, be established in a locality where the supplies are convenient, and can be obtained with little expense. It is thus we see in France, that the principal manufactories of oleic acid soaps surround the manufactories of stearic acid, which furnish them with the oleic acid; they thus save the expenses of transportation. In industry, a useful economy is one of the most essential elements of success.

In regard to the working material, it is about the same in all manufactories; however, there exist some modifications, but these modifications are only in the apparatus used to prepare the lyes. Thus, in all the manufactories where crude soda is employed to prepare the lye, to wash the soda and extract its alkali, they use vats built of masonry, or large cylindrical tanks made of sheet-iron; whilst, if salts of soda or potash are employed, their solution is effected by means of boiling water in cast-iron or sheet-iron kettles. Necessarily, these different methods of operating cause modifications in the apparatus for preparing the lyes.

There exist also some differences in the construction of the frames according to the kind of soap which is manufactured. Thus, at Marseilles, the frames in which the soap is run are always made of stone, while in other localities they are generally of wood. As for the kettles, those of Marseilles are of stone, elsewhere they are of cast iron, sheet iron, or wood. Their shape is generally the same in all manufactories; it is a truncated cone.

The manner of heating is improving every day. Heating by steam is now employed in all large factories.—*Dussauce's Treatise on the Manufacture of Soaps.*

Watering Streets with Saline Solutions.

Our readers will recollect an article on the above subject published on page 217, Vol. XIX, of the SCIENTIFIC AMERICAN, wherein it was stated that a solution of mixed chlorides of calcium and sodium had been satisfactorially used for this purpose. We now learn that this system is in full and successfull operation in Liverpool, with the cordial co-operation of the local authorities. In Liverpool it is found that 75 per cent of the work of water distribution is saved, but probably the most interesting fact elicited, is that in streets watered on this system, sweeping may be practically dispensed with. This is a result worth noting, and we hope something of the kind may be tried in this city. We have no doubt of the efficiency and cheapness of the method, the expense of the salts employed being covered by the saving in cost of sprinkling.

A Small Engine.

W. I. Trafton of Manchester, N. H., who has already made one miniature steam engine of great delicacy and beauty, is about to construct another. He is to make every part of the engine, with the boiler, from a single silver half-dollar. When done it will be placed under a glass case three-quarters of an inch in diameter and an inch and an eight in hight. The boiler will hold about 8 drops of water, but one-half that quantity will run it several minutes. It will have all the parts of an engine, and the boiler will have two minute gages. Some of the smaller parts can only be made by the aid of a powerful magnifying glass.

Senator Sprague is said to be the largest employer in the United States. He gives work to about eight thousand persons, and has recently raised their wages fifteen per cent.

Improved Siding Hook and Combined Tool.

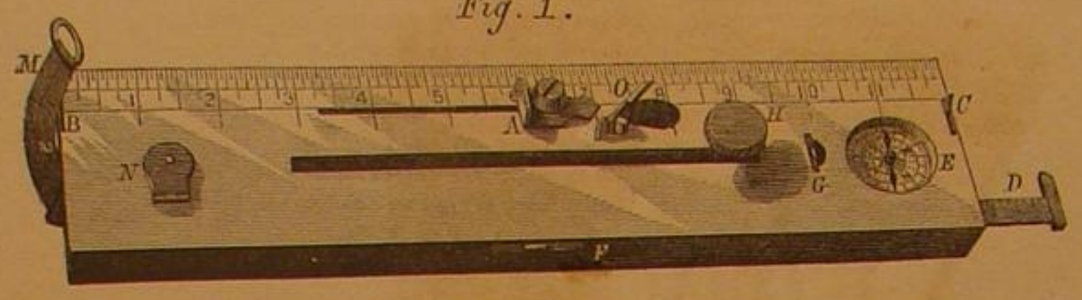
Our engravings exhibit the form and details of W. A. Sharp's combined joiners' tool and siding hook. The form of the tool is distinctly shown in Figs. 1 and 2.

It is made of mahogany, or other suitable wood, and covered on all sides with polished brass plates. It is twelve inches long, two and one half inches wide, and three fourths of an inch thick.

The plates on the front and back sides are graduated to form common foot rules, which are divided into eighths and sixteenths. An adjustable slide, A, Fig. 1, may be set to all widths between three and six inches from the spur, B, and by loosening the set screw which holds it, and reversing its position, it can also be set to all widths between five and eight inches from the spur, C, so that spacing may be done from one or the other spurs for all widths between three and eight inches.

The spurs, B and C, are attached to the screws that fasten the end plates, and a quarter turn of these screws throws them up, in which position they engage, by notches not shown in the engraving, with the brass surface plate and are firmly held in position; a reverse motion turns them below the surface plate out of the way. These spurs may be taken out to be sharpened by loosening the screws referred to, which releases them, and as their lower ends are slotted they may then be slid off the screws. A screw driver is attached to the end of the calliper bar, D, sliding in on the right hand side of the compass, E. On the right hand side of the tool is a spirit level, F, and on the side near the compass is a plumb level, G. The convenience of this level will be apparent to every joiner. In the same side plate is cut a second longitudinal slot in which plays a bolt, with milled thumb nut, H, carrying at the opposite end a diamond-shaped knife blade, I, Fig. 2, used to mark across the siding in weather-boarding. When not in use the knife is drawn inside of the surface plate by a spring which holds it until again required. The knife is V-shaped, which insures a smooth cutting stroke when moved in either direction. By removing the thumb nut, H, when in the position shown in the engraving, the knife may be taken from the knife block (which plays in a groove between the side surface plates), through a hole in the surface plate, Fig. 2, corresponding to a hole in the knife block, in which the shank of the knife blade is inserted.

Fig. 1.

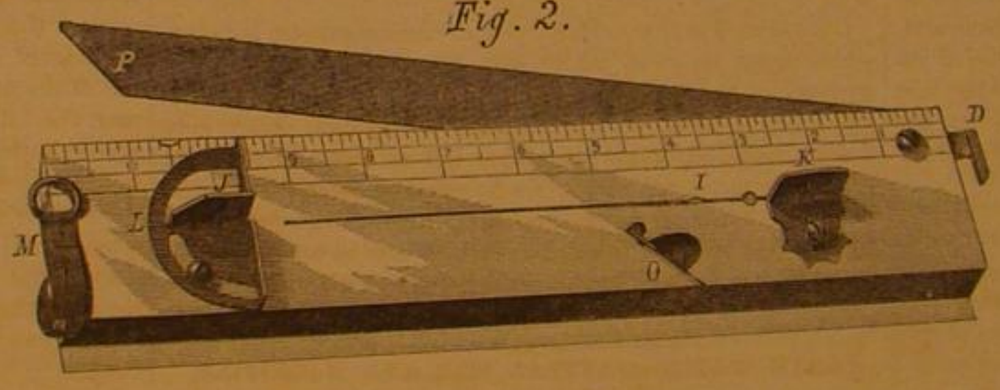


SHARP'S COMBINATION SIDING HOOK.

By placing the tool on the siding at the right-hand corner boards, or casings, with the guards, J K, against the casing, the knife may be drawn down by the thumb nut, H, to mark the board or siding, and by reversing the tool the same may be done at the other corners.

By placing the half circle plate, L, Fig. 2, on the lower edge of the siding or any studding, the siding may be marked squarely across to form a head joint. The half circle, L, is graduated, so that it may be set to a right angle with the knife slot, or to any other angle required for cutting miters, as when siding up under eaves on gables. A set screw holds it when so adjusted. The guard, K, is also adjustable laterally to correspond with the set of the half circle-plate, L.

Fig. 2.



M is a tape line of any desirable length, graduated on one side to feet and inches, and on the other side to links, and wound in by a crank, N, or a spring between the plates.

O is a plane for making joints when the sawing has been defective, or a rabbet plane for bench, or getting out moldings. The bit can be readily taken out and sharpened.

A try and bevel square blade, P, which may be graduated to inches, shuts into the edge of the tool, as shown in Fig. 2, with set-screw pivot, and can be opened by the thumb nail like a knife blade. By loosening the set screw it can be slid back in the slot to form a try square, in which position it is held by the set screw. This is a convenient feature in cutting the siding around moldings.

We need not specify more particularly the uses to which the different parts of this ingenious tool may be put as they will be perfectly obvious to every mechanic.

The inventor claims that it will save its cost in a very short time, in the saving of time consequent upon the use of a large number of tools liable to be misplaced on the scaffold.

The workman, attaching it to his suspender, need only take upon the staging his hammer and nails; all the other operations required may be accurately and rapidly performed by the use of this combination tool. When not in use all the parts exterior to the plate may be removed leaving only a flat surface to the tool when it is packed in the chest.

The inventor feels confident that a workman once employing this tool would be content to use no other.

Application for a patent is pending through the Scientific American Agency, by W. A. Sharp, of Tama City, Tama Co., Iowa, who may be addressed for the entire right, or for the right to manufacture on royalty.

Stewart and Tait's Experiments on the Heating of Bodies by Rotation in Vacuo.

Since the theory of a universal all-permeating elastic ether, far more subtile than any known gas, even when expanded to the utmost by mechanical means, has been found to account for the phenomena of light and heat more perfectly than any other, the actual demonstration of its existence has been a desideratum. The experiment described in the present article, although to our minds not at all satisfactory, were undertaken to prove the real existence of ether.

The experiments are those of Balfour Stewart, F.R.S., Superintendent of Kew Observatory, London, and P. G. Tait, M.A., of Edinburgh, a description of which we extract from "Professor Pepper's Cyclopædic Science."

These gentlemen, having obtained certain results in air, were encouraged to construct an apparatus wherewith to procure rotation *in vacuo*.

In this apparatus a slowly-revolving shaft is carried up through a barometer tube, having at its top the receiver which is to be exhausted. When the exhaustion has taken place, the shaft connected with the multiplying gear revolves in mercury. The train of toothed wheels causes the disk of aluminum to revolve 125 times for each revolution of the shaft. The thermo-electric pile, the most delicate thermometer or test of heat, is connected by two wires carried through two hole in the bed-plate of the receiver with a Thompson's reflecting galvanometer needle. The outside of the thermo-electric pile and its attached cone was wrapped round with wadding and cloth, so as to be entirely unaffected by currents of air.

During these experiments the disk of aluminum was rotated rapidly for half a minute, and a heating effect was, in consequence of the rotation, recorded by the thermo-electric pile.

To obviate the objection that the electric currents which take place in a revolving metallic disk might alter the zero of the galvanometer, the position of the line of light was read before the motion began, and immediately after it ceased, the difference being taken to denote the heating effect produced by rotation.

The thermometric value of the indications given by the galvanometer was found in this way: "The disk was removed from its attachment and laid upon a mercury bath of known temperature. It was then attached to its spindle again, being in this position exposed to the pile, and having a temperature higher than that of the pile by a known amount. The deflection produced by this exposure being divided by the number of degrees by which the disk was hotter than the pile, gives at once the value in terms of the galvanometric scale of the heating of the disk equal to 1° on Fahrenheit's scale.

The disk of aluminum being blackened with a coating of lampblack, applied by negative photographic varnish, and rock salt inserted in the cone, the following results were obtained.

No. of set.	No. of observations in each set.	Time at full speed.	Heat indications ° Fahrenheit.
I.	3	30	0·85
II.	4	30	0·87
III.	4	30	0·81
IV.	3	30	0·75

To ascertain whether the radiant heat recorded was derived from the rock salt, or from heated air, or from the surface of the disk, the next series of experiments were tried.

EPXERIMENTS WITH BLACKED ALUMINUM DISK WITHOUT ROCK SALT.

No. of set.	No. of observations in each set.	Time at full speed	Heat indications ° Fahrenheit.
V.	3	30	0·92
VI.	3	30	0·93

With certain modifications of the above experiments it was satisfactorily proved that the effect was not due to heating of the rock salt, or to radiation from heated air; it must therefore be due to the disk of aluminum, which seemed to have rubbed against some matter which remained in the receiver after the air was removed. The question being "Was this ether?" the experimenters further state that:

1. It may be due to the air which cannot be entirely got rid of.

2. It is possible that visible motion becomes dissipated by an etherial medium in the same manner and possibly to nearly the same extent as molecular motion, or that motion which constitutes heat.

3. Or, the effect may be due partly to air and partly to ether.

Not to leave the matter wholly undecided, it was suggested by Professors Maxwell and Graham that there is another effect of air, namely, fluid friction, the coefficient for which they believe to be independent of the tension.

It would appear, however, that the fluid friction of hydrogen is much less than that of atmospheric air, so that were the heating effect due to fluid friction it ought to be less in a hydrogen vacuum. An experiment proved that the heating effect due to rotation in a hydrogen vacuum was 22·5, while in an air vacuum it was 23·5, and the authors are inclined to consider these numbers as sensibly the same, and that the experiment indicates that the effect is not due to fluid friction; at the same time they do not suppose that their experiments have yet conclusively decided the origin of this heating effect, but they hope to elicit the opinions of those interested in the subject, which may serve to direct their future research.

These experiments are considered by Professor Pepper as more satisfactory than any previously tried, and, taken in conjunction with facts, such as the temporary phosphorescence of certain bodies by what is termed insolation or irradiation, or the action of light in reducing certain salts to their metallic state, or the elaborate and beautiful effects obtainable from thin films of solid, fluid, and gaseous bodies, or the action of crystallized bodies on polarized light, they do altogether impress the reasoning faculties with a conviction that a vibrating motion accompanies the production of all light, which can only be propagated by the communication of these vibrations or tremblings to a medium, itself as subtile, rare, and exquisite as the delicate mechanism that sets it in motion.

Waterproofing Walls.

One of the most recent of the many uses to which Mr. Frederick Ransome's process of manufacturing artificial stone has been applied is in protecting the outer walls of buildings, so as to enable them to resist the action of the weather by making them waterproof. Through well-built and substantial walls, moisture will make its way, and the ordinary type of dwelling house is very pervious to wind-driven rain. We recently noticed what Mr. Ransome is doing in preserving stone, and his system of waterproofing is only an application of the same process.

The external surfaces of the walls to be protected are first washed with a silicate of soda or solution of flint, which is applied again and again, until the bricks are saturated, and the silicate ceases to be absorbed. The strength of the solution is regulated by the character of the bricks upon which it is to be applied, a heavier mixture being used upon porous walls, and a lighter one of those of denser texture. After the silicate has become thoroughly absorbed, and none is visible upon the surface, a solution of chloride of calcium is applied, which, immediately combining with the silicate of soda, forms a perfectly insoluble compound, which completely fills up all the interstices in the brick or stone, without in any way altering its original appearance. By this operation the wall is rendered perfectly watertight, and, as the pores of the bricks are thoroughly filled for a considerable depth from the surface with the insoluble compound, which is entirely unaffected by atmospheric influences, no subsequent process is necessary.

Already Mr. Ransome has successfully applied this process to a large number of buildings, several of which were previously almost uninhabitable from the constant dampness, and a lengthened experience has proved that it is not only thoroughly effective; but, from the comparative insignificance of its original cost, and the fact that renewals are never required, the system recommends itself for general adoption in preference to all other methods of waterproofing.

The Beet-Root Sugar Crop.

A recent issue of the *Journal des Fabricants de Sucre*, says that the late heat has proved favorable to the beet harvest in Europe. Reports of the crops continue to vary according to the locality. In some districts it is generally in fine condition in others not so good; and in some places there are great complaints of the white worms, which are attacking the beet with all their destructive powers. The smaller beets, which are expected to form the greater portion of the harvest, require frequent watering, and they must have very favorable weather if they are to turn out well. The fine promises of spring have disappeared, and a good average harvest is all that can be anticipated; but it will not nearly approach the 300,000,000 kilogrammes of sugar which were looked to at the commencement of the season. The temperature which has materially improved in Germany, has produced a great change in the growth of the beet, and has quite dissipated all the fears which were entertained as to the approaching harvest. According to the later estimates taken in all sugar-producing countries in Europe, the production on the quantity of beet sown will be ten per cent more than last year.

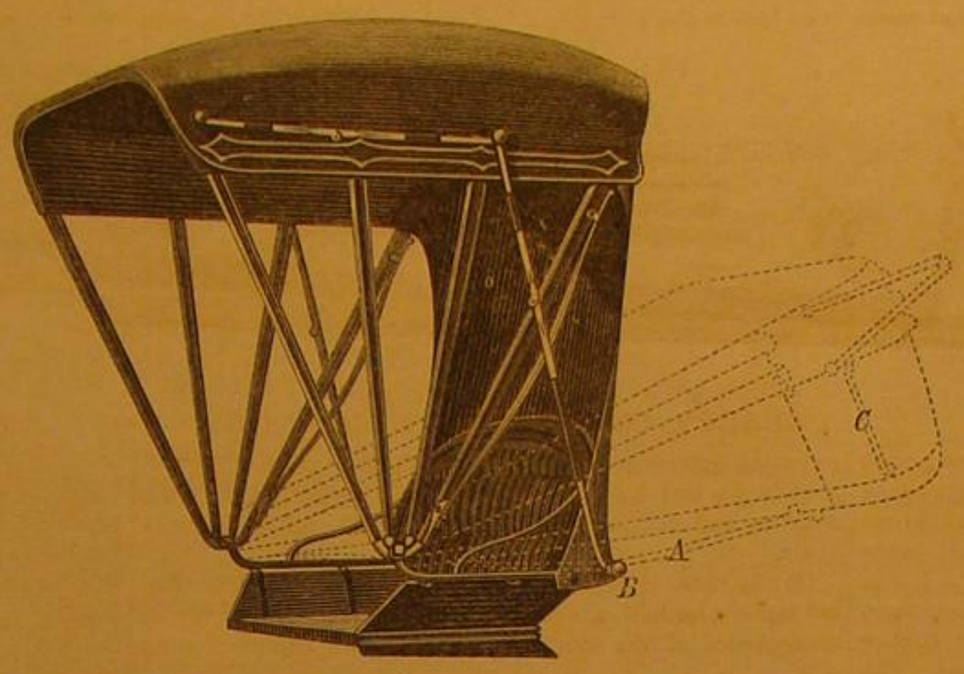
Camphor Water.—This useful domestic medicine is thus prepared: Take a quarter of an ounce of camphor and inclose it with a glass marble in a muslin bag; put this into a wide-mouthed bottle, such a one as is used for preserved fruit. Now fill up the bottle with water that has boiled a few minutes and has been allowed to become cold. The glass marble is used to keep the camphor from floating, which it otherwise would do. After about three days the water will become saturated with the camphor, and may be poured off as required. A wineglassful is a dose. It is very useful as an antispasmodic in hysteric and nervous affections.—*S. Picaso.*

Improvement in Buggy Tops.

The simple improvement we herewith illustrate is well designed to remove an inconvenience to which we have heretofore called the attention of our readers, namely, the bumping of the rear bow in carriage tops upon the prop-blocks, and the consequent wear and sometimes breaking of that bow, and the wrinkling of the top cover when the top is thrown back. The improvement consists in placing a flat steel spring on the upright part of the rear bow, in the manner shown in the engraving, and a rigid brace of metal, to keep the rear bow and the one next it constantly separated, so that the leather of the top need not be crushed and crumpled between them. In the dotted outline the position of the parts when the top is thrown back is well shown; A being the spring resting upon the prop-block, B, and C being the metallic brace which keeps the bows separated.

The engraving so well exhibits the nature of this improvement that further description will not be needful. This improvement is one that will commend itself to carriage builders and users. It may be applied without at all detracting from the beauty and grace of the top as ordinarily constructed, and will add greatly to its convenience and durability.

Patented through the Scientific American Patent Agency, August 24, 1869, by J. S. Wayne, whom address at Quincy, Ill.



STILLENGER'S PATENT BUGGY TOP.

To Color-Stain Dried Grass.

There are few prettier or naments, and none more economical and lasting, than bouquets of dried grasses, mingled with the various gnaphalia, or unchangeable flowers. They have but one fault; and that is, the want of other colors besides yellow and drab or brown. To vary their shade, artificially, these flowers are sometimes dyed green. This, however, is in bad taste, and unnatural. The best effect is produced by blending rose and red tints, together with a very little pale blue, with the grasses and flowers, as they dry naturally. The best means of dyeing dried leaves, flower, and grasses, is simply to dip them into the spirituous liquid solution of the various compounds of aniline. Some of these have a beautiful rose shade; others red, blue, orange, and purple. The depth of color can be regulated by diluting, if necessary, the original dyes with methyl or spirit down to the shade desired. When taken out of the dye they should be exposed to the air to dry off the spirit, They then require arranging, or setting into form, as, when wet, the petals and fine filaments have a tendency to cling together, which should not be. A pink saucer, as sold by most druggists at sixpence each, will supply enough rose dye for two ordinary bouquets. The druggists also supply the simple dyes of aniline of various colors, at the same cost. The pink saucer yields the best rose dye. By washing it off with water and lemon juice, the aniline dyes yield the best violet, mauve, and purple colors. —*S. Piesse.*

Coating Castings with Gold and Silver.

GILDING.—Gilding cast iron by means of gold amalgam is very difficult, as the amalgam does not stick to the iron. It is therefore necessary to brush the well-cleaned surface of the iron with a concentrated solution of copper vitriol, and to apply the amalgam to the precipitated copper. As under certain circumstances the coating of copper is injurious, Böttger coats the articles direct with mercury by means of the electro-positive zinc in the following manner: The article to be gilded is well cleaned and boiled in a porcelain vessel together with 12 parts of mercury, 1 part of zinc, 2 parts of iron vitriol, 1½ parts of muriatic acid of 1·2 specific gravity, and 12 parts of water; in a short time a layer of mercury will deposit upon the iron, and upon this the gold amalgam may be uniformly distributed.

The gilding may also be effected upon polished iron in the following manner: If a nearly neutral solution of chloride of gold be mixed with sulphuric ether and agitated, the ether will take up the gold and float above the denser liquid. When this auriferous ether is applied by a camel hair pencil to brightly polished iron or steel, the ether evaporates and the gold adheres. It is fixed by polishing with a burnisher. This gilding is not very rich or durable; in fact the affinity between gold and iron is feeble compared to that between gold and copper or silver.

Gilding of cast iron by the galvanic way is also difficult, and is successful only if the article is perfectly clean. It is advisable previously to coat the article with copper or silver.

Polished iron may also be gilded with heat by gold leaf.

SILVERING CAST IRON.—Iron to be silvered is first provided with a coating of copper, upon which the silver is applied either by means of amalgam or silver leaf.

Cast iron can be well silvered by the galvanic way without a previous coppering.—*Practical Treatise on Metallurgy.*

Preparation of Sizes for Gilding.

GOLD OIL-COLOR, OR SIZE.—The English method of preparing the color in size, which serves as the ground on which the gold is laid, is, to grind together some red oxide of lead with the thickest drying oil that can be procured—the older the better. To make it work freely, it is mixed, before being used, with a little oil of turpentine, till it is brought to a proper consistence.

GOLD WATER SIZE.—One pound of Armenian bole, two ounces of red lead, and a sufficient portion of black lead, are ground separately in water, and then mixed, and re-ground with nearly a spoonful of olive oil. The gold size is tempered by mixing it in parchment size which is clear and clean, and has been passed through a fine sieve to clear it of all foreign matters. The *parchment* size is made by boiling down pieces of white leather, or clippings of parchment, till they are reduced to a stiff jelly.

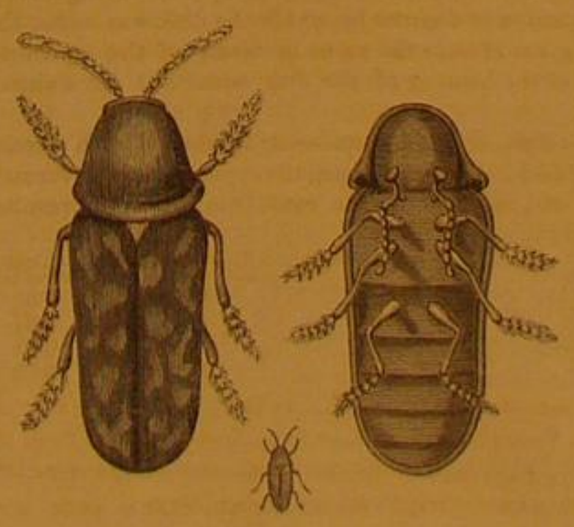
PREPARATORY SIZE.—Boil a handful of the leaves of wormwood and two or three heads of garlic in a quart of water, until the liquid is reduced to one half; then strain it through a cloth, and add half a handful of common salt, and nearly half a pint of vinegar. The design of this composition (usually employed in gilding looking-glass and picture frames) is to obviate the greasiness of the wood, and prepare it the better to receive the coats which are to be laid on, and to preserve it from the ravages of worms. When used, it is mixed with a sufficient portion of good glue, boiling hot. In applying it to the gilding of plaster or marble, the salt must be left out of its composition; as, in damp situations, this would produce a white saline efflorescence on the surface of the gold.

WHITE COATING.—A quart of strong parchment size and half a pint of water are to be made quite hot, and to this are to be added (in small portions from time to time) two good handfuls of common whiting passed through a fine sieve; this mixture is to be left to infuse for half an hour, when it is to be stirred carefully so that the amalgamation may be perfect.

COLORING YELLOW.—Half a pint of parchment size is taken, which must be clean, white, and clear, and of one half the strength of that used for the white coating; this is warmed, and there is mixed with it two ounces of yellow ocher, very finely ground in water; it is then left at rest, and the clear portion decanted, which gives a fine yellow color, that serves, in water gilding, to cover those deep recesses into which the gold cannot be made to enter; it serves also as a mordant for the gold size.—*The Painter, Gilder, and Varnisher's Companion.*

DEATH WATCH---NATURAL SIZE AND MAGNIFIED.

Among the popular superstitions which the almost general illumination of modern times has not been able to obliterate, the dread of the death watch may well be considerud as one



of the most predominant; yet it must be allowed to be a very singular circumstance that an animal so common should not be more universally known, and the peculiar noise which it occasionally makes be more universally understood. The insect, an engraving of which we present herewith, in question, is a small beetle belonging to the timber-boring genus, *Anobium*, and the popular superstition alluded to is, that when its beating is heard, it is a sign that some one in the house will die before the end of the year. It is chiefly in the advanced state of spring that this little creature commences its sound, which is no other than the call or signal by which the male and female are led to each other, and which may be considered as analogous to the call of birds; though not owing to the voice of the insect, but to its beating on, or striking, any hard substance with the shield or forepart of the head. The prevailing number of distinct strokes which it beats is from seven to nine or eleven; and this very circumstance may perhaps still add to the ominous character which it bears among the vulgar. These sounds or beats are given in pretty quick succession, and are repeated at uncertain intervals; and in old houses, where the insects are numerous, may be heard at almost any hour of the day, especially if the weather be warm. The sound exactly resembles that which may be made by tapping moderately hard with the finger nail on a table. The insect is of a color so exactly resembling that of decayed wood, viz., an obscure grayish brown, that it may for a considerable time elude the search of the inquirer. It is about a quarter of an inch in length, and is moderately thick in proportion, and the wing shells are marked with numerous irregular variegations of a lighter cast than the ground color. It is singular that this insect may so far be familiarized as to be made to beat occasionally, by taking it out of its confinement, and beating on a table or board, when it will readily answer the noise, and will continue to beat as often as required.

Utilization of Pine Leaves.

Near Breslau, in Silesia, are two establishments, one a factory where the pine leaves are converted into what is called "forest wool" or wadding; the other, an establishment for invalids, where the waters used in the manufacture of this pine wool are employed as curative agents. The manufacture has extended, for there are now factories at Runda, in the Thuringer-wald, at Jonkoping, in Sweden, Wagenerger, in Holland, in parts of France, and other places. Two cases of these products were shown at the last Paris and Havre Exhibitions, which contained various illustratirns in the shape of wool for stuffing mattresses and other articles of furniture instead of horse-hair, vegetable waddings, and hygienic flannel for medical application, essential oil for rheumatism and skin diseases, cloth made from the fiber, articles of dress, such as inner vests, drawers, hose, shirts, coverlets, chest preservers, etc., and other useful applications. In the preparation of the textile material an ethereal oil is produced, which is employed as a curative agent, for burning, and as a useful solvent. The liquid remaining from the decoction of the leaves is used for medical baths. The membranous substance and refuse are compressed into blocks and used as fuel; from the resinous matter they contain, they produce sufficient gas for illuminating the factory in which the manufacture is carried on.

Invention of the Spirit Level.

He who first filled a glass bottle with a liquid, leaving a small quantity of air therein to form a bubble, then corked the bottle and laid it flat on one side, with the bubble floating against the upper part was the unconscious inventor of the spirit level, which is a very simple instrument in appearance, but of the utmost value, when properly made, to the astronomer, the engineer, and the builder; for when the bottle is placed horizontally, the bubble always mounts to, and rests at its most elevated point; and the tangent to that point, when the middle or apex point of the bubble coincides therewith, is a horizontal line; that is a line at right angles, or perpendicular to the direction of gravity or the plumb line passing through that point.

This was first perceived and applied, so far as is known, in France in 1666, by Melchisédec Thévenot, who was a great amateur of science and a writer of books of voyages and travels. In this respect he enriched the literature of France as much as Hakluyt enriched that of England half a century earlier. It was at Thévenot's house that the learned men who founded the Academy of Sciences of Paris used to assemble; and it was at one of their meetings that he propounded the spirit level.

A description of the instrument, accompanied with figures, was first published in the *Journal des Sçvants*, Paris, November 15, 1666, under this title:—*Machine nouvelle pour la conduite des eaux, pour les bâtiments, pour la navigation, et pour la plupart des autres arts.*" The instrument is there called an air level; and is described as a glass tube, hermetically sealed at both ends, containing spirits of wine, which do not freeze, and a small quantity of air forming a bubble. It is stated that the instrument is capable of giving, with much exactness, the direction of the horizon, the perpendicular to the horizon, and vertical angles; and that it is easier to make, more convenient to use, and indicates a level line more readily and accurately than any other instrument.

The Colorado Expedition.

The expedition under the command of Col. Powell, the Colorado explorer, has returned to Chicago, having successfully traveled through the entire Grand Cañon, from Green River to the point where the Colorado debouches into the open plain in the territory of Arizona.

From the point where Colonel Powell's last letter was written the expedition descended the river about four hundred miles, between walls almost vertical, ranging from five hundred to one thousand five hundred feet high, the exterior of the cañon being from two thousand five hundred to four thousand feet above the bed of the river. More than two hundred waterfalls and cascades, emptying themselves over the walls of the cañon into the main river, were seen in this distance, with almost every variety of natural scenery. The geological formation of the cañon consists principally of limestone and sandstone; granite is only found at three places and in a limited amount. No discoveries of precious metals were made, and there were no indications of gold or silver found in the bed of the river.

One section of the cañon was found to consist of a very fine

beatifully-polished marble, which at present is entirely inaccessible. The country traversed was barren beyond description, and is pronounced by Colonel Powell as not susceptible of cultivation, even by irrigation.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

The Assimilation of Inorganic Substances in the Animal Economy.

Messrs. Editors:—In criticising some remarks on phosphatic bread, which appeared in the Scientific American of September 11th, you ask for the writer's authority for the statement there made, that inorganic matter cannot be assimilated by the animal organism. After a more thorough examination for authority, we are willing to admit that the proposition in question might have been submitted with greater caution.

The "ordinary facts" to which you advert, relating to common salt in food and to preparations of iron administered by physicians to chlorotic patients, if facts, are by no means universally admitted by chemists and physiologists.

Dr. Bellows (late Professor of Chemistry, Physiology, and Hygiene) says of salt, "It is not in any sense nutriment as it does not furnish support to any organ or function, and does nothing toward sustaining life, as has often been proved in the case of the famished sailor who only increases his sufferings by taking salt water in very small quantities." He also says: "There is enough salt in common natural food to account for all the salt actually incorporated into the system."

Frederick William Headland, of the Royal College of Physicians, in London, in a standard work on the action of medicines, in attempting to prove that the iron from the shops does enter into the blood as a part of it says: "In some cases of chlorosis the blood was analyzed before giving iron, and after it had been given for a few weeks, and was found to contain more of red globules after taking the iron than before." But says Dr. Bellows, "scores of cases can be brought where under a different treatment the results were the same and even more striking, without a particle of iron, and my explanation is, that the effect of the iron was that of a mere stimulant promoting sanguification from food taken in the meantime containing iron." Joseph R. Parks.

Muscatine, Iowa.

[Would it not be well for our correspondent to extend his reading to some other author than Dr. Bellows? This brilliant meteor of science has not yet flashed across our horizon; we do not find his name enrolled on any list of standard authorities in our possession. There is evidently some confusion in the minds of some of our correspondents on the constituents of animal and vegetable tissue, and as to what ought to be regarded as organic and inorganic substances. We will, when convenient endeavor to set them right on these points. —Eds.

Spectrum Lines of Aurora.

Messrs. Editors:—During these times of auroral abundance our Canadian skies frequently present interesting scenes. Shortly after midnight on the morning of Sept. 3d, aurora borealis hung over us, waving like luminous canvas floating in the breeze, and forming a brilliant corona near the star Scheat, in Pegasus. The light seemed to flow in two currents, the uppermost remaining quiet, and the lower current changing with great rapidity.

On this occasion I submitted the aurora to careful spectrum analysis, and am happy to report an observation made with the spectroscope, which may help to settle the question of the nature of polar light. I succeeded in obtaining a distinct spectrum, consisting of one very bright line in the yellow and one faint line in the green. The bright line was close to the sodium line D, and coincident with an air line in the solar spectrum. The dim line in the green I could not identify as belonging to any known substance.

The conclusions resulting from the identification of the bright line in the spectrum of aurora are important, showing that polar light is principally incandescent oxygen gas.

The presence of this gas in excess, in regions traversed by aurora, may result from the decomposition of water. The electric currents effecting the separation and rendering the oxygen luminous. The re-union of oxygen and hydrogen form water again, which is visible as a turbid atmosphere, noticeable during auroral displays. But it may be asked, Why do not the lines of hydrogen appear in the spectrum of aurora? The answer is, because its temperature is not sufficiently high to render the gas incandescent. In a partial vacuum oxygen is luminous at a lower temperature than hydrogen, because of its density, which is sixteen times greater, and still increased by the continuous passage of electric currents.

Another question that may arise is this, Why does the air line in the spectrum of aurora appear bright, while the same line in the solar spectrum is black? An explanation is found in the fact that there is no sufficient absorbing medium, between the aurora light or luminous oxygen, and the earth, while the solar line is seen after absorption by its passage through a deep luminous stratum of the earth's atmosphere.

Toronto, C. W. D. K. Winder.

Cutters on Reaping Machines.

Messrs. Editors:—Your correspondent in No. 11, current volume, is very much in error in some of his statements, in his criticism of one or two former communications on the subject of cutters for reaping machines: While I fully agree with him that the serrated sections are best, I see no reason for his great "surprise that any one should advocate smooth edges"; in as much as the fact that a great majority of machines have smooth cutters, will abundantly prove that your former correspondent is well sustained. In the second place, it is a great mistake to suppose that "the serrated sections are as hard as it is possible to make steel;" for in that case they would be nearly valueless, as they could neither be straightened nor sharpened; and a long experience with reaping machines in a rough country, has taught me that the bending and battering of these sections are of daily occurrence, and that they can be straightened and ground with impunity. John Milton.

Hillsboro, Va.

The Scientific American Under a Corner Stone.

Messrs. Editors:—Please send me a copy of the Scientific American for September 8, 1869. On the occasion of the laying of the corner stone of the Wesleyan church at this place, my copy of the above date arrived just in time for me to inclose it with the other papers and documents, which, in a hermetically sealed metallic box, were deposited in their (probably) long resting place beneath the corner stone.

I thought that possibly in the far future, the contents of that box might see the light once more, and that no paper on this continent could convey to future generations so correct an idea of the civilization and materal condition of the world in the latter half of the nineteenth century as a copy of the Scientific American.

I thought too, of the "good time" the printers, engravers, inventors, and scientists of that (future) age would have over the resurrection of a well-preserved copy of the Scientifc American of September 18, 1869.

Perhaps, long after your able efforts are ended, and your dust has mingled with mother earth, some future editor of the Scientific American will be permitted to see this embodiment of the invention, art, and science of the present day, and write a splendid leader on "Wonderful results of Invention: The Nineteenth Century and the Present Age," or some other theme which so pregnant a sheet would suggest.

Meantime be it mine to thank you for the pleasure and instruction which your journal always affords me.

James Stimson, M. D.

St. George, Brant Co., Ontario.

The Hartford Steam Boiler Inspection and Insurance Company.

This company make the following report for the month of August, 1869:

During the month 390 visits of inspection have been made, 584 boilers examined, 579 externally, and 156 internally, and 45 tested by hydrostatic pressure. The number of defects discovered, 403—of which 20 were especially dangerous. These defects were as follows: Furnaces out of shape, 17—1 dangerous; fractures in all, 196; burned plates, 25—1 dangerous; blistered plates, 38—1 dangerous; cases of incrustation and scale, 57—2 dangerous; cases of external corrosion, 26—5 dangerous; cases of internal corrosion, 1; cases of internal grooving, 1; water gages out of order, 8; blow out apparatus out of order, 6; safety valve overloaded, 15—6 dangerous; pressure gages out of order, 39—1 dangerous; boilers without gages, 5; cases of deficiency of water, 5; boilers without blow-out apparatus, 1—dangerous; boilers condemned as unfit for use, 2—both dangerous.

In commenting upon the above record, we can say but little that has not already been said. A marked improvement in one respect, however, will be noticed. And that is, that there are less dangerous defects than are usuallly noticed in our monthly reports, and as the business of the company increases, this improvement in the condition of boilers under its care will be more and more apparent, for when defects are discovered by the inspectors' periodical visits, they are pointed out and at once repaired. The expense is comparatively small, little time is required, and the boiler or boilers are thus kept in good condition.

When boilers are left for months or years without careful examination, they become badly corroded, incrusted, or burned, so that when they are overhauled for repairs, they are often found not worth repairing, or if repaired, at a cost nearly equaling the expense of new ones. It is an old adage that "a stitch in time saves nine," and this is as true in the case of steam boilers, as in the case of the good housewife who "sews tares while the husbandman sleeps."

Fractures, which are too numerous, are the result, either of faulty construction or poor management. Mr. Henry Hiller, chief engineer of the National Boiler Insurance Co., of Manchester, England, in his annual report, says of this difficulty. "The fractures at the seams and over the furnaces of externally fired boilers, some of which were of a most dangerous character, were due to various causes; viz., faulty arrangements of feed pipes, sedimentary water, or irregular working and firing. When the feed water contains much sediment, frequent cleaning of the interior of this class of boiler is especially necessary."

External corrosion is a serious evil, and one to which careful attention should be given. Boilers that are bricked in, are especially liable to this difficulty. A slight leak at the seams, goes on wearing away the plates until they are reduced to a very dangerous thinness. We have in our collection several specimens showing the insidious work of this evil. One specimen of plate is reduced to the thinness of paper, and the day before our inspector discovered it, 80-pounds pressure was used on the boiler. We copy from the report of Mr. Edward B. Marten, chief engineer of the Midland Boiler Inspection and Assurance Co., Stourbridge, England, with whose report we have recently been favored.

"In one or two cases frequent warnings as to damage going on from leaking fittings have been disregarded, until absolute danger has been reported, and when the boilers have been cleaned off and examined, those in charge have been dismayed at the extent of the corrosion in a short time. All leaking in the brick work around boilers should be entirely stopped if they are to last their proper time and work in safety." The over-loading of safety valves is still a prevalent evil, and one the steam users should be more particular in guarding against. The safety valve should be frequently raised, but this should be gently done. Never raise it suddenly, nor let it drop heavily upon its seat, for, by so doing the spindle may be bent, thus making its seating imperfect.

One of our inspectors reports 2 safety valves with corroded seats, and rusted fast. Now it is evident that an inoperative safety valve is worse than none, for while there is the appearance of safety, there is positive danger.

It will be noticed that 2 boilers have been condemned as unfit for use. The searching investigation which is given to boilers will discover weak points, if such there are, and we presume that many boilers in use would be at once condemned if they were thorough inspected by competent men.

We could extend these comments on all the defects and defective attachments of boilers, but space forbids. We shall take up other points in future.

Obituary.—Thomas Graham Chemist.

A cable dispatch from London reports the death in that city of Thomas Graham, the celebrated chemist and Master of the Mint. He was born in Glasgow, Scotland, on the 21st of December, 1805—his father being a merchant and manufacturer in that city. Mr. Graham was educated at Glasgow School, and subsequently at the University of Glasgow, where he graduated, taking the degree of M.A., in 1826. He then moved to Edinburgh, but at the end of two years, returned to his native place and established a laboratory for the practical study of chemistry. He also lectured at the Mechanics' Institute, and was elected Andersonian Professor at Glasgow. This office he held until 1837, when he resigned for the purpose of accepting the Professorship of Chemistry in the London University, to which he had been appointed. In 1855 Sir John Herschel retired from the Mastership of the Mint, and Mr. Graham was appointed to fill the vacancy, holding the position with credit until his death.

There has probably been no chemist in Great Britain of equal ability to Mr. Graham during the past quarter of a century. His study of the sciences was complete, and his discoveries and works have been of great scientific importance to the world. His most remarkable discoveries were the law of the diffusion of gases, the diffusion of liquids, and the new method of separation known as dialysis. For the first named discovery he received the Kieth prize of the Royal Society of Edinburgh in 1834, and for the last, the Copley medal of the Royal Society in 1862. Of his literary productions, the most important and best known, is "Elements of Chemistry," which has been extensively circulated and read in Great Britain and Germany, and is also a familiar work to scientific students in the United States and other parts of the world. Mr. Graham was elected a Fellow of the Royal Society in 1836, a corresponding member of the Academy of Sciences of the Institute of France in 1848, and was created an honorary D.C.L. by Oxford University in 1855.

The readers of the Scientific American will remember the account given on page 244, of our last volume, of the discoveries made by Mr. Graham respecting the properties of hydrogen.

Gas for Lighthouses.

A series of letters and reports sent to the Commissioners of Lighthouses and the Board of Trade has resulted in a request being made to Professor Tyndall, by the latter body, that he would report upon the proposal to substitute gas for oil as an illuminating power for lighthouses, as illustrated in the lighthouses of Howth Baily and Wicklow Head. Various experiments were made at Howth Baily, and Professor Tyndall says that the superiority of the gas over the oil flame is rendered very conspicuous by these experiments. The 28-jet burner possesses 2½ times, the 48-jet burner 4½ times, the 68-jet burner 7¾ times, the 88-jet burner 9¾ times, and the 108-jet burner 13 times the illuminating power of the four-wick flame. The oil lamp with which the gas flame was compared was the most perfect one employed by the Commissioners of Irish Lights. Further experiments were also made, and it appeared that the whole of the gas-lighting apparatus was entirely under the control of the keeper, and that no damage was likely to arise from it. The 28-jet gas burner, when seen from a position some miles off, appeared to be very nearly upon an equality with the oil lamps, but when muffled to represent a fog it had a slight advantage. Of course with the brighter jet burners a great improvement was apparent, and before the 108-jet burner the oil lamp grew quite pale. By the adoption of a system of gas lighting a great saving in cost would be effected; but such a system would not be possible on rock lighthouses. Professor Tyndall recommends the encouragement of this system of illumination in Ireland.

To kill cockroaches take carbolic acid and powdered camphor in equal parts; put them in a bottle; they will become fluid. With a painter's brush of the size called a sash tool, put the mixture on the cracks or places where the "critters" hide; they will come out at once. It is wonderful to see the heroism with which they move to certain death. Nothing more sublime in history; the extirpation is certain and complete. While on this theme I would add that a mixture of carbolic acid with water—one-fourth acid three-fourths water—put on a dog, will kill fleas at once. I have seen it tried.

G. W. B.

Darwinism and Design.

(From the Student.)

Darwinism is only one of several branches of a kind of philosophy long known to students of the historical developments of human thought. The Darwinian apparatus consists in a multitude of facts collected from an immense field of research, and pointing to particular methods by which hereditary changes in the organic world may lead to the preservation or extinction of particular forms. That offspring sometimes vary from the parent type is beyond dispute; that such variations are sometimes hereditary, is equally beyond dispute, nor can any one deny that when a modification arises which gives a group of creatures more power to fight their battle of life, they will be benefited thereby, and may multiply and flourish in situations where creatures not so modified would die out.

The extent to which Darwin's "Natural Selection" is sufficient to account for the changes that have occurred, is open to question. Laws and principles of which we have as yet no cognizance, may assume an importance we are not prepared for; but no fresh discovery can invalidate the facts on which Darwin and his followers rely. No one who has weeded a garden can doubt the reality of the "battle of life" which he portrays, and no one who has watched insects attacking plants, birds assailing insects, and climate with its fluctuations, frequently fighting against all, can doubt that the natural world does present a scene of struggle, in which the strongest and the best protected prevail, while the weaker and less protected have to give way.

Of course, such terms as "strong" and "weak" must be understood in a wide sense—a delicately-organized plant, for example, may be characterized by the former epithet, when compared with a much more robust vegetable, if it surpasses the latter in power of extracting nutriment from a particular soil, or in withstanding prolonged drought, excess of moisture, or extremes of temperature. But the natural world is not made up of contention and strife any more than those elements constitute the sum of human society. Natural adaptations of the most varied and wonderful kinds abound, none being more remarkable than those which the Darwinians adduce. What can be more amazing than the dependence of a flower upon an insect, so that the butterfly, moth, or humble bee is made the carrier of pollen from one corolla to another, and an animal thus provides for the perpetuation of a vegetable race. What savors more of design than the "mimicry" which has been frequently illustrated in our pages, a plan by which a defenseless creature assumes the aspect of a strong one, a delicate creature the appearance of a tough one, or a butterfly when perching on a twig becomes indistinguishable from a dead leaf, and in each case enemies are deceived, and security obtained?

If a new writer desired to compile the most elaborate and convincing series of design arguments, he would have recourse to the Darwinian armory for the most striking of recently ascertained facts. Why, then, is Darwinism in many quarters contrasted with and opposed to design? The answer may be found in the defects of the older forms of the design argument, rather than in any conclusion that logically follows from Darwinian speculations.

Many of the older comparative anatomists contented themselves with regarding animal or vegetable organization simply from what is called the teleological point of view. They saw, or fancied they saw, the final cause, or reason why, everything was done. They collected together a great mass of information concerning special adaptations, and it was assumed that no organ, or portion of an animal, not deformed, was without its special use to that particular creature; but plain and palpable facts did not sustain the universal application of this theory. Animals were found with rudimentary parts—bones, for example, which, if developed, might have supported a kangaroo-like pouch—to which no function could be assigned, and in these cases, which are very numerous, the doctrine of special application broke down. Then came theories of "types," and if anything appeared in a creature that was not of any use to it, the explanation was that the creature in question belonged to a group all formed according to "type," and the rudimentary, or useless part, was put in to make it conform to the typical idea, something like the procedure of the old gardener, who had a particular "type" of uniformity so strongly in his mind, that, having put a naughty boy in one corner, he put a good boy in the opposite one not to damage the design. Further knowledge left the "types" high and dry on the shores of metaphysical abstraction, and introduced the notion of descent with variations, according to which the occurrence of non-essential, useless, or rudimentary points admits of easy explanation.

That certain animals see because they have eyes, and that birds fly because they have wings, are statements not inconsistent with the doctrines of final causes, though it is easy to place them in opposition to the common assertion that the animals in question were endowed with eyes in order that they might see, and that the birds were gifted with wings in order that they might fly. To perfect the design argument when it is applied to elucidate a system of descent with modifications, struggles with life conditions, and the survival of the fittest, we have to show reasons for believing that the changes which occur in the organic world, follow a law, or set of laws, indicative of intelligence, and capable of working out beneficial results. At present, the physiological laws which determine the condition under which offspring faithfully transmit or depart from the peculiarities of the parental type are unknown, and it is only a very small portion of the natural plan that comes within cognizance. So that we cannot expect to have clear information as to either purposes or conclusions. Darwin observes, "however much we may wish it, we cannot blindly follow Professor Asa Grey in his belief, that variation has been led 'along certain beneficial lines like a stream along definite and useful lines of irrigation.' If we assume that each particular variation was from the beginning of all time preordained, the plasticity of organization which leads to many injurious deviations of structure, as well as that redundant power of reproduction which invariably leads to a struggle for existence, and as a consequence to the selection or survival of the fittest, must appear to us superfluous laws of nature."

We cited this passage and remarked upon it when it was first published in Mr. Darwin's "Plants and Animals under Domestication." His argument simply reminds us of a difficulty not at all peculiar to natural history or physiology, but which encounters us in all directions. Evidently it is not the design of nature to reach what we call good ends, without what look like breaks, interruptions, and failures. If speculations on the modifications of organic beings according to the principles of Mr. Darwin, bring us into contact with many fresh puzzles and perplexities of this description, they also supply a fresh store of facts, which tend to increase our belief that the system is conformable to our religious instincts and moral nature. No natural theologian can affirm that any theory yet propounded, supplies a satisfactory explanation of all the moral difficulties, or intellectual difficulties which stand in the way or a perfect comprehension of the character of the great plan. Why it is obviously benevolent in a thousand directions, and apparently harsh in a thousand others, we do not *know*, any more from Darwin than we did from Paley, but we certainly are not left in a denser mist; and as modern researches have enabled us to catch glimpses of a far wider, more complicated, and comprehensive plan than the older thinkers had any conception of, we may, while lamenting the limitations of our mental vision, take comfort in the belief that in the vast regions of the yet unknown, there lie ample satisfaction for all our hopes, and ample resolution of all our doubt.

How to Preserve Pencil Drawings.

An ingenious means of effecting this has been invented by M. E. Rouget, of Paris. This invention consists in obtaining the fixation of such drawings, tracings, or sketches, by directly projecting on these latter any suitable adhesive liquid reduced ty a fine spray, or in what is commonly called the atomized or pulverized state, by causing the liquid to pass rapidly under pressure through one or more capilliary tubes or openings. By this method the defects of the transudation process are entirely done away with, besides which the operation is executed in less time, and may be performed at once by the artist without the slightest difficulty. As for the fixation liquid, any colorless, or nearly colorless, liquid which allows of being atomized, and which, after becoming dry, causes the particles of the charcoal, or other drawing materials made use of, to adhere sufficiently firmly to the paper or other drawing surface, may serve for the purpose. Thus, for instance, a liquid, which has given the patentee the most satisfactory results, is obtained by adding to a solution of three ounces of white sugar candy and two ounces of white shellac in about two pints of spirits of wine, a decoction of about one ounce of fucus crispus in one pint of distilled water.

Extraordinary Phenomenon.

On the evening of the 30th May the inhabitants of Greiffenberg, Germany, and the neighboring villages, for more than a German mile in circuit, were the witnesses of an extraordinary natural phenomenon. Between nine and ten o'clock thunder clouds seemed to be gathering around the Iser and Risengebirge, to the south, while the rest of the sky appeared to be covered only by light clouds. Now and then a few flashes of lightning were seen in the far distance. Suddenly all eyes were blinded by a fall of fire, differing both in form and color from common lightning, which was followed in four or five seconds by a deep and terrific report, like a loud peal of thunder. All the windows rattled and the houses seemed shaken to their foundations. Those who were in the open air say that they seemed to be wrapped in fire and deprived of air some instants. A mild and moderate rain, without thunder or lightning, followed. Opinions differ as to whether the above appearances are to be attributed to a meteor or to a sudden discharge of electricity.

Radiation of Heat from the Moon.

The Earl of Rosse is making a series of experiments by means of a thermo-pile of four elements and a 3-foot telescope, to determine, if possible, what proportion of the moon's heat consists of: 1. That coming from the interior of the moon, which will not vary with the phase; 2. That which falls from the sun on the moon's surface, and is at once reflected regularly and irregularly; 3. That which falling from the sun on the moon's surface is absorbed, raises the temperature of the moon's surface, and is afterwards radiated as heat of low refrangibility. The chief result arrived at up to the present moment is, that (the radiating power of the moon being taken as equal to lampblack, and the earth's atmosphere supposed not to affect the result) a deviation of 90° for full moon appears to indicate an elevation of temperature —500° Fah. The relative amount of solar and lunar radiation was found—89819 : 1.

Persine.

After taking food, a fluid, called "gastric juice," flows into the stomach. This liquid contains an active principle which chemical philosophers term pepsine. This body possesses a remarkable property, namely, that of converting all those substances which are known as food from the solid to the fluid state; a condition clearly necessary for its assimilation or digestion before it can enter the tissues of the body, and form the new blood requisite to sustain life. Pepsine can be artificially extracted from the stomach of a recently killed animal, that of a pig or calf in particular, and when it is placed in contact with minced-up boiled egg, butcher's meat, etc., in a glass vessel, it dissolves the meat apparently in the same way as it does in the living stomach. Substances which are occasionally taken into the stomach, such as the stones of fruit, the rind of raisins, or Orleans plums, are unacted upon by pepsine; hence such substances are truly said to be indigestible. Physicians often administer pepsine in cases where indigestion of the ordinary food occurs, and in many cases with marked benefit. The inordinate use of tobacco, ardent spirits, and condiments, arrests the flow of the gastric juice; hence the evils resulting from it. The preparation sold by most druggists, under the name of pepsine, consists of dried and powdered glandular layers of the stomachs of pigs or calves.—*S. Piesse.*

Editorial Summary.

A HEALTHY MIND IN A HEALTHY BODY.—How beneficent is the scheme in which joy begets health, and health promotes joy. Good news will give a good digestion. The sight of land has cured the scurvy in sailors. And so the head and stomach act and re-act upon each other; the head being king, the stomach a loyal and ever-grateful subject, that bounteously returns all good favors. The stomach that is well served produces a healthy body, in which the healthy mind dwells at ease, and is ever fully alive to all honorable and holy pleasures. On the body in perfect health, the mind has perfect control. Then surely the first care of every rational being should be to put all in order in the mind's tenement, since the art of attaining high health is that of reaching sound morals and elevated thoughts.

NEW LIME LIGHT WITHOUT OXYGEN.—A brilliant and steady light has been obtained by the Messrs. Darker from a mixture of common gas and atmospheric air, the latter of which contains more than a fifth part of oxygen. The air and gas are either mixed as in the Bourbouze lamp, or are emitted singly, as in some forms of the oxy-hydrogen burner. Instead, however, of the intense heat thus obtained, being employed to raise to a white heat a platina gauze cap, as proposed two years ago by M. Bourbouze, Messrs. Darker cause the flame to impinge upon lime or magnesia, either singly or in combination with asbestos, and thus obtain a light of great purity and intensity. The lime light has thus been got without the trouble and expense attendant upon the employment of pure oxygen.

A BRONZING process, applicable to porcelain, stoneware, and composition, picture, and looking-glass frames is performed as follows: The articles are first done over with a thin solution of water-glass by the aid of a soft brush. Bronze powder is then dusted on, and any excess not adherent is knocked off by a few gentle taps. The article is next heated, to dry the silicate, and the bronze becomes firmly attached. Probably, in the case of porcelain, biscuit, or stoneware, some chemical union of the silicate will take place, but in other cases the water-glass will only tend to make the bronze powder adhere to the surface. After the heating, the bronze may be polished or burnished with agate tools.

AVERAGE DUTY OF CORNISH ENGINES.—An estimate of the average duty of this class of engines, based on observations made upon eighteen engines during one month, shows the following results: They have consumed 1,377 tuns of coal, and lifted 10·2 million tuns of water 10 fathoms high. The average duty of the whole is, therefore, 50,100,000 pounds, lifted one foot high, by the consumption of 112 pounds of coal.

A CURE FOR SOMNAMBULISM.—Professor Pellizzari, of Florence, has hit upon a cure for somnambulism. It simply consists in winding once or twice round one's leg, on going to bed, a thin flexible copper wire, long enough to reach the floor. Eighteen somnambulists, treaten in this way, have been either permanently or temporarily cured. The *Gazetta Medica*, of Venice, which reports the fact, says that copper wire is known to dissipate magnetic somnambulism, and that this circumstance led the professor to have recourse to this strange remedy.

Two spirited Frenchmen, Messieurs Tissander and de Feuvièlle, have undertaken the daring enterprise of reaching the north pole in a balloon. The machine in which the bold adventurers are about to embark on their perilous journey, and which is appropriately named "Le Pôle Nord," is now being completed in the Champ de Mars, which the government have placed at their disposal for the purpose. The car, a marvel, it is said, of strength and lightness, is constructed to carry ten passengers, 4,000 lbs. of ballast, and provisions for a month.

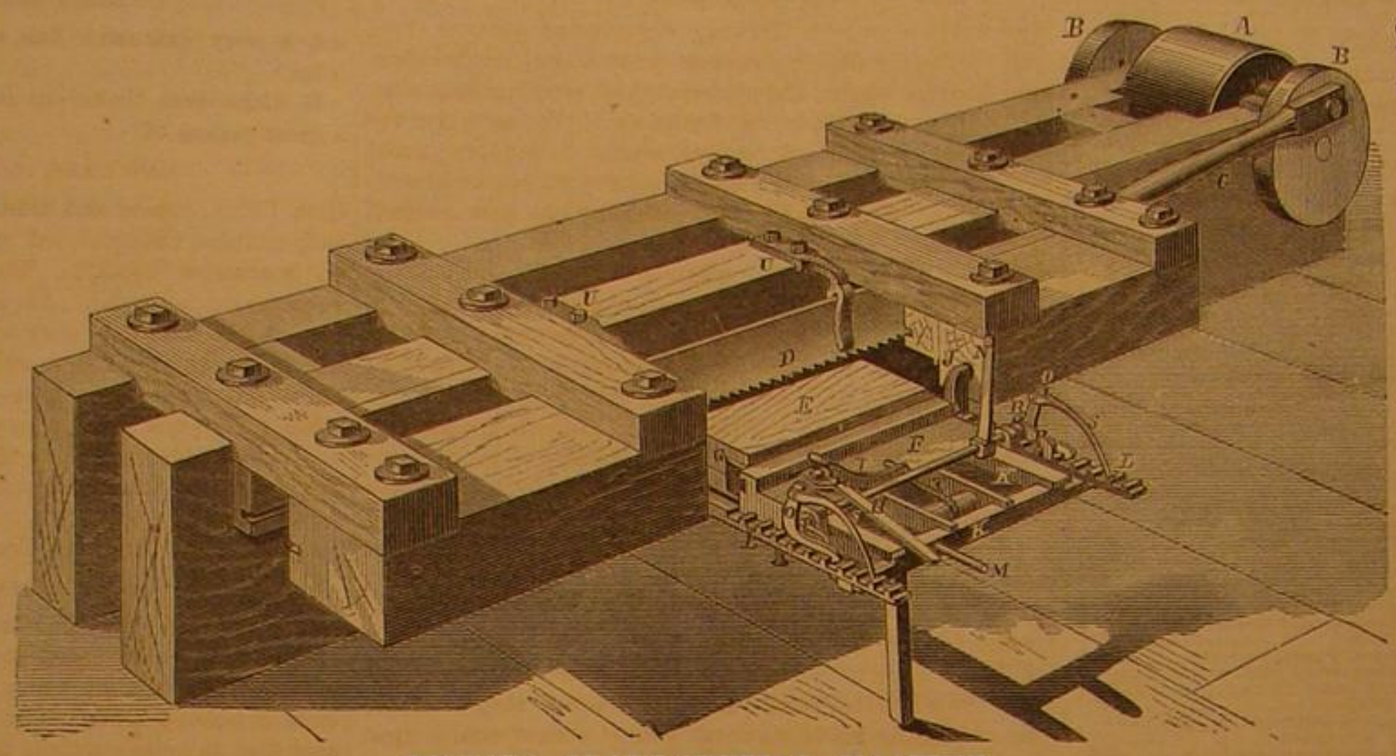
THE GERNER BOILER.—In answer to some inquiries in relation to the heating surfaces of the two boilers, alluded to in our last issue under the above title, we would say that the heating surface of the stationary boiler tested is 144 square feet, and that of the marine boiler at the offices of the New York and Erie Railroad is 400 square feet.

MR. LOCKWOODE, in referring to his article on the Manufacture of Plate Glass, page 199, current volume, wishes us to say that the grinding machines of the Birmingham Works turn out 12,000 feet of glass, and that the Lenox Company commenced their operations at Cheshire, Mass.

Improved Machine for Cutting Staves.

Two classes of machines have been employed for cutting staves; namely, those which operate upon the principle of cleavage, the wood being first steamed, and those which saw out the stave with curved faces. Of the latter class, the barrel-saw machines have been principally employed notwithstanding there are radical defects in the operation, well known to those who use them; one of the principal faults being, that in obstinate descriptions of wood, these saws will become more or less cramped out of their circular form, bind, and otherwise vex the operator, as well as perform the work imperfectly.

The improved machine herewith illustrated, may be used advantageously for cutting staves in all kinds of wood, hard and soft, and for all sizes of staves within ordinary requirements; and it could also be constructed to cut staves for the largest brewers and dyers' tanks, by sufficiently enlarging its dimensions, a great advantage over machines employing barrel saws, which cannot be employed for cutting staves of great length. In short it is one of the most substantial, and best constructed machines for this work we have ever met with.



BISHOP'S STAVE-CUTTING MACHINE.

Its operation will be readily understood by reference to the engraving in connection with the following explanations:

A is the main driving pulley keyed to a shaft which carries two crank and fly wheels, B, through which power is conveyed to the other working parts of the machines, of which there may be one on each side of the wood frame-work, but only one of which is shown in the engraving. C is the connecting rod or pitman which drives the saw, D.

This saw is concave on the side shown in the engraving, the curvature being that desired for the staves. This form gives it great rigidity, so that no saw gate or stretching apparatus is required. Guides, U, attached to the frame work are provided to steady the saw when working in obstinate kinds of timber, and the saw may be removed for filing and setting by simply taking out the key which connects it with the pitman.

Despensing with the gate renders the motion of the saw very light and a perfectly parallel motion is secured through guides not shown in the engraving, fastened to the interior of the frame work. The bolt, E, is laid on the metallic carriage, F, which slides on ways formed on the oscillating frame K. The frame, K, oscillates on the centers, J, by which the bolt is brought up toward the edge of the saw in an arc of a circle corresponding accurately to the concavity of the saw. This motion is imparted to the oscillating frame by the operator, who grasps with his left hand the handle, M, while the bolt is fed by an apparatus operated by the handle, N, and yet to be described.

The bolt is firmly held by spurs, G, one on each side of the metallic carriage, F, one of which is movable, and is driven home by the pivoted lever, H, and held there by the toothed arc, I, which engages with the lever, H, while the bolt is being sawed. The toothed arc, I, is provided with a suitable handle for raising it when it is desired to release the lever, H, and through it the movable spur, G.

We will now endeavor to make plain the means by which the feeding is accomplished. The prime motion by which this is attained is imparted by the right hand of the operator through the lever, N. When this is moved toward the saw, the bent pawls or hooks, O, attached to a common rock shaft with the lever, N, and which, while each stave is being cut, engage with the racks, L, preventing any motion of the metallic carriage toward the saw, are disengaged from the racks, L, at the same time that the upper and longer pawls, S, are drawn toward the saw and take in another tooth on the racks. The pawls, P, which play loosely on the rock shaft and engage with the opposite side of the same tooth with which O engages and prevents any motion of the carriage from the saw, are also lifted by means of an angular projection shown at R, which engages with the back side of O, as shown in the engraving. The motion of the lever, N, being then reversed, the pawls, S, engage with the tooth taken in by the former motion and the pivots which connect them with the bent pawls or hooks, O, become fulcrums of the lever, M, through which the carriage is forced along toward the saw until the bent pawls or hooks, O, again engage with the racks, L, preventing all further motion toward the saw, while at the same time the pawls, P, also engage with the rack as shown, preventing all backward movement. These pawls are so adjusted that the single forward and backward movement of the lever, M, described, feeds the bolt onward exactly the thickness of one stave; these movements being made at the same time, the front side of the frame in which the carriage rests is raised in order to bring the carriage on the opposite side of the frame down low enough to let the upper side of the bolt come under the edge of the saw.

The movements in feeding are therefore as follows, the left hand of the workman grasping the handle, M, raises the front side of the oscillating frame and depresses the bolt, while the right hand grasping the lever, N, moves it quickly backward and forward and the feeding is accomplished. Both movements are accomplished instantaneously and simultaneously. A cord or strap, T, attached to the carriage, F, and running over the roller shown in the engraving, thence over a pulley attached to the under side of the carriage, F, thence through a hole in the floor, has a weight attached which serves both as a counterpoise to the oscillating frame, K, and also acts to throw the carriage to the front when the pawls are raised.

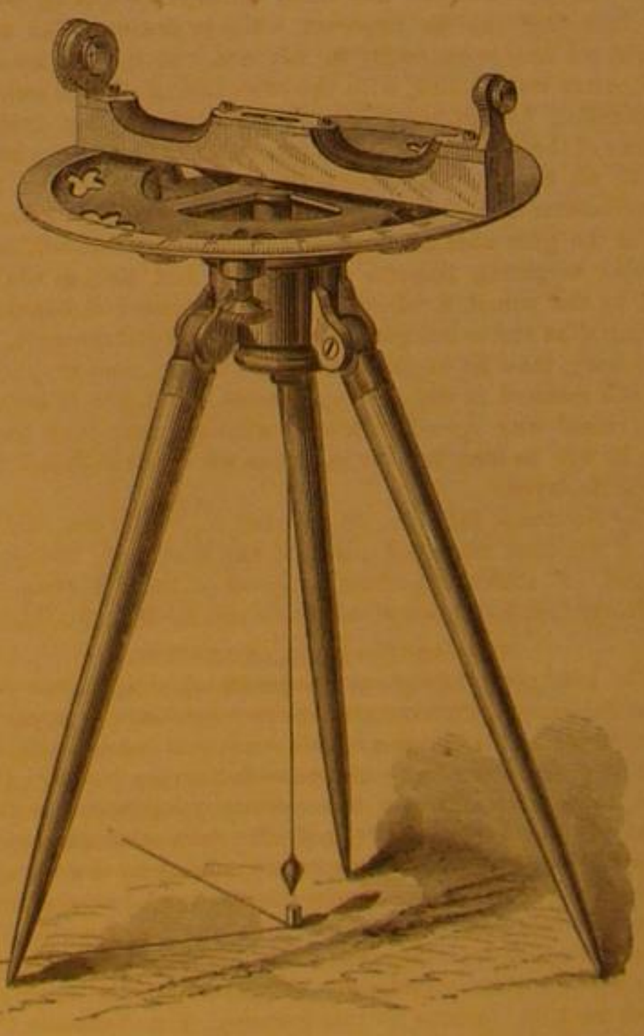
This machine has been in practical use three years, and the inventor informs us that no repairs have been found necessary during that time. He further states that a machine carrying two saws, with the attendance of two men will cut on the average seven thousand staves per day, these staves being sufficiently smooth and uniform, to be, after jointing, immediately set up into casks. Patented through the Scientific American Patent Agency, March 24, 1868, by W. R. and O. D. Bishop.

Orders for State rights, county rights, and machines, may be addressed to George M. Beach, Milwaukee, Wis., agent for the sale of this improvement.

Sibley's Improved Leveling Instrument.

The instruments heretofore employed for leveling by surveyors and engineers, though excellent for the purpose and equally well adapted for carpenters and masons, in staking out foundations, or for farmers in leveling for ditching, etc., or for mechanics in general, were too costly for general use in their application to the purposes specified.

The invention herewith illustrated can be placed in the hands of all who desire it, at one fifth the cost of the old style of leveling instruments, and for most of the purposes alluded to is equally as good. For all distances within the scope of unaided vision they are sufficiently accurate.



This level is made of iron, which is one reason why it can be afforded so cheaply.

At one end it is provided with a sight having a small aperture with a short tube attached, to obviate the dazzling effect of the light, consequent upon reflection from the edges of the aperture. At the opposite end of the level is a ring with cross wires, so adjusted that the center of the sight aperture and the intersection of the wires are level when the bubble at the center indicates that the instrument is level.

The level stands on a circular graduated table, from the center of the under side of which is suspended a plumb in the usual manner. This plumb being adjusted over any point, as the corner of a building lot, and the first line laid out, stakes can be set in a line drawn at any desired angle to the first line, by simply turning the level upon a central pivot provided for that purpose, the required number of degrees as indicated on the graduated table.

The level is of ample length to secure accuracy in sighting, and the small aperture in the sight also enables the operator to run a line with great certainty. Being made of iron, it is not liable to warp or spring. The level may be lifted off the table and the adjustment made by screws provided for that purpose. Milled thumb-nuts and screws are also provided to adjust the table to level, and a neat tripod sustains the working parts of the instrument when in use.

Patented June 23, 1868. Address for further information the Warwick Tool Company, Middletown, Conn.

The Phosphoroscope.

If a person places a poker in the fire, everybody knows that a quantity of heat can be carried by it into the next room. Heat, then, like water in a jug, can be taken into certain things and carried away from its source. Not so with sound; there is nothing yet known that will hold sound, and make itself tangible to our senses when taken away from that which produces it. Odors, like heat, are however absorbed by the hardest precious stones and polished steel. Neither the most delicate scales nor the most powerful microscope will discover anything on a diamond that has been near to musk or patchouly; but their fragrance announces the fact of retention and emission of odor. Hitherto it has been an axiom that when the light is put out we shall be in the dark. Modern science now proves to us this need not always be so; on the contrary, we can now carry light away from its source. We can, as it were, bottle up some light, and store it away in a dark cellar, assured that it is there, for we can see it. In proof of this assertion a pretty toy has been constructed for this purpose, called a phosphoroscope or light-bearer, by Messrs. Harvey and Reynolds, of Leeds. It consists of an apparatus like a color-box, which contains, instead of paints, certain glass tubes, holding various light absorbers, such as sulphides of lime, strontium, barium, etc. By exposing this light box to the full flame of a gas-burner, or to the sun, or to the light of burning magnesium, light is absorbed to such an extent that any one can see what's o'clock in the dark. Each tube, according to its contents, glows with light, but of different colors, some red, others blue; but the brightest is the green. The venders call this instrument "The Phosphoroscope, or a Trap to catch a Sunbeam."—*Septimus Piesse.*

Aero-Steam Engines---Storm's Experiments.

During a period of several years, dating from about 1851, Wm. Mount Storm, an inventor and engineer of considerable note, made a series of experiments with air and gases in connection with steam, with a view to promote economy in fuel used for generating motive power. An engine, called the "Cloud Engine," was exhibited by him at the Fair of the American Institute in 1855. The engine was named as above from the fact that the air, which was mingled in the cylinder with the steam, changed the latter into a vesicular condition, resembling fog. The inventor claimed 33 per cent, and those who saw it state that, at times, it did actually make a gain of even more than this.

Its operation was, however, fitful and unreliable, and it finally was withdrawn from public attention, and nothing more has been heard from it.

None of these experiments, however, seems to have been made on the same principles as those of Mr. George Warsop, of Nottingham, whose object is to attain to a method whereby the expansive force of heated air may be used in an engine without the difficulties attending the use of heated air alone in the cylinder, and which are met with in the engines of Ericsson, and others employing only heated airs.

In Warsop's experiments the object seems to have been to make steam assist in applying the expansive force of air.

Warsop, however, has found that a maximum effect from mixed air and steam depends upon the proper proportion of the two gaseous bodies, a conclusion which might have been theoretically drawn from a consideration of the relative capacities of air and steam for heat. Still such an inference would scarcely have warranted great hopes of economy from this source without extended experiment, and although extraordinary results—stated in a former article—are claimed, we shall not be surprised to hear that some offset to these claims has ere long been discovered.

Incidental to the results sought by Warsop is of course a better circulation in the boiler employed to generate the steam used in the experiments, from which some gain might be expected, though nothing like what is claimed.

In December, 1866, D. B. Tanger, of Bellefontaine, Ohio, took out a patent for a steam generator, between which and the apparatus of Warsop we can recognize no essential difference.

Joseph Whitworth, the inventor of the Whitworth gun, and Wm. Fairbairn, the celebrated engineer, have been created baronets.

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NEW YORK, SATURDAY, OCTOBER 9, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

STEAM PIPES AS CAUSES OF FIRE.

The extract from the *Bulletin* of the National Association of Wool Manufacturers upon this subject, published recently in the SCIENTIFIC AMERICAN, has attracted much attention and excited some alarm in the minds of many using such apparatus. Some of these have made examinations into the condition of the wood work in the vicinity of such pipes and report "all right." Some have kindly sent us specimens of the wood, showing its condition after exposure for a considerable time to the action of the heat from steam pipes. Should the article in question lead to a general examination, and should our correspondents be communicative, it is probable much useful information would be elicited. Among those who have favored us with specimens are Dr. Daniel Ayres, of Brooklyn, N. Y. The chips presented by this gentleman were taken from wood in contact with pipes of the low-steam warming and ventilating apparatus, made by D. R. Benton of the same city.

The wood appears somewhat like that which has undergone what is known as dry rot, but shows no signs of combustion. It is remarkably dry, light, and brittle, may be much of it crumbled to pieces by the fingers, and is evidently in a condition to be ignited at a comparatively low temperature. These chips are of spruce timber, with some apparently of pine, which are the most brittle.

We are decidedly of the opinion that these chips would not ignite at any temperature to which they have been exposed during several years in the building from which they were taken, but we should decidedly fear their ignition in contact with pipes filled with high steam.

Some experiments to test the temperature at which wood in this condition would ignite would be of great practical value in settling the question of safety in using steam pipes for heating purposes, and we trust such experiments will be performed by some competent person, and their results made public.

A. H. Walker, of Oswego, N. Y., sends us a specimen of excellent tinder into which some new sack cloth placed in contact with pipes carrying steam at sixty pounds, six months since, has been converted. It is strongly suggestive of fire in its appearance, and catches and continues to burn from the slightest spark.

We would like to see this subject thoroughly ventilated and some definite and reliable conclusion reached in regard to it. The question is one of the utmost importance, and all its bearings should be thoroughly understood.

AMERICAN ENGINEERING IN CHINA.

Ting, late Taotai of Shanghai, the present Footai of the province, whatever these titles may imply, commenced in 1865 an arsenal on a small scale at that city. The works cover about half a mile square, and have been carried to completion under the direction of F. J. Falls, a citizen of the United States.

The Shanghai *News-Letter*, now before us, gives some details of interest, from which we extract some items.

In each of the different departments there is a mandarin, acting as an overseer over the native workmen, to prevent idleness among them, and to exercise a general control, but not in any way to instruct the native workmen, this being done entirely by the foreigners acting as foremen, etc. All the accounts of the arsenal are kept by Chinese officers.

Some steamers have been constructed, launched, and supplied with guns, and more are now under way, in addition to which one vessel 280 feet long and another vessel 260 feet long are projected—entire machinery, boilers, engines, and armament to be constructed at the arsenal.

A college is in formation, and literary men, appointed by the government, are at present employed with foreigners, translating works on mathematics engineering, chemistry, etc., in order to prepare class books in the Chinese language for the use of the arsenal, to b read throughout the middle kingdom, to educate the Chinese in all that relates to an arsenal, ship building, etc.

Engineering students are to learn mechanics in the college, and the practical parts in the shops. Navigating students are to have a large training ship, so that they may learn seamanship practically and theoretically.

The works contain a drawing department, pattern shop, foundery, forging shop, boiler shop, musket shop, engine shop, heavy machine engine and gun workshop, erecting shop, musket-finishing shop, shop for finishing shells, shop for the manufacture of Congreve rockets, rocket tubes, etc., mold loft, yards, storehouses, etc., all fitted out with approved tools and fixtures. Additional heavy machinery has been ordered from England.

Mr. Falls has gained the confidence of the Chinese, and has also the confidence and hearty support of his own officers; and the Chinese Government, being desirous of building steam vessels, and having every confidence in Mr. Falls, leave the entire responsibility of their construction with him.

The earlier energetic efforts made have now grown into successful results, and are fast growing into larger proportions, which will greatly contribute to the building up and regeneration of the Chinese nation, resulting in advancing the Chinese people, to make China strong in her own resources; to make her a living nation.

To Mr. Fall's able supervision, with the hearty support of his officers, Fung-ta-jen and Sung-ta-jen, also with the zeal of subordinate mandarins, these good results are being brought about. This able engineer is entitled to the respect of his fellow-citizens, as his energy and ability reflect credit upon his native country.

THE EXHIBITION OF THE AMERICAN INSTITUTE.

The present writing found the machinery department still incomplete. Only three of the engines exhibited were running, driven by Root's boiler, the setting of Harrison's boiler being yet uncompleted. Only a few of the machines were in operation, and, as nearly every exhibitor was too busy in arranging his machinery to give information, we decided to again defer a notice of this department; and though it contains more of general interest to our readers than probably any other in the Fair, we must ask them to accompany us, for the present, in a ramble first through the

SILK DEPARTMENT.

Those of our readers who have followed the various articles on the manufacture of silk, published in these columns during the past year, are pretty well informed in regard to the present status of this industry. It will, therefore, be unnecessary to occupy much space in any general remarks upon this subject. We will say however, that in many lines of goods American products can now fairly compete in quality with the best that can be imported, while in sewing silks and twists, we are considerably in advance. In dyeing, we are now pretty well skilled, with the exception of what is technically called "weighting," *i.e.*, the restoring, in the dyeing process, of the weight lost in the process called boiling, wherein all of the gum is washed away. In this, however, the manufacturer is the only loser, the consumer being a gainer; for, as the gum adds nothing to the strength of the silk, and as, also, weighting imparts no strength, and also, as silk is sold by the pound, it follows that the purchaser of American sewing silks and twists gets more yards, of equal strength, for his money, than he would obtain were the original weight of the silk restored in the coloring process. But this is not the only reason why American sewing silks and twists are superior, as will be seen further on, when we notice in detail the goods displayed.

The Nonotuck Silk Co., 28 Warren st., New York, exhibit one of the most beautiful cases on the floor, very tastily arranged. It shows the whole progress of the silk from the mulberry-tree leaf, upon which the worm feeds, to finished

SPOOL SEWING SILKS AND TWISTS.

The case contains various specimens of cocoons, raw silk from Japan, and TSATTLEE, a superior kind of silk imported from China. It is brought to this country in bales of 100 lbs., and its value is from nine to twelve dollars per pound. This firm, as well as others, in this country, manufacture sewing silks and twists from Tsattlee, and also, from other fine grades of silk. In Europe, these grades are made into dress goods, ribbons, etc., and inferior grades are employed for twists, etc.; a second reason for the superiority of American goods of this class. English manufacturers state that they would not get first cost for their goods, were they to employ the quality of stock used in America for this purpose. The Nonotuck Silk Co. show in their case a large variety of colors, all of which compare favorably with imported goods. It may be observed here, that a slight deficiency is admitted for American goods, in the aniline colors, but this can only be detected by experts, and in some dress goods shown here, even the most critical would be forced to admit that no foreign goods, of the same class, can excel the beauty of either their colors or textures. The goods of the company under consideration are equal, in this respect, to any goods of the same class exhibited, and, we are informed, they have, in their establishment, the oldest American silk dyer in the country, who has been in their employ thirty years.

The following incident well illustrates the progress of the manufacture of twists in the United States, and also shows how one improvement creates a demand for others.

Less than twenty years ago, I. M. Singer applied to the Nonotuck Silk Co., for a twist suitable for use on sewing machines, and, as an inducement for this company to commence its manufacture, ordered *five pounds*, enough to supply him for several months. This company held Mr. Singer's trade, thus initiated, till it amounted to *eighty thousand dollars per annum*. The value of machine twist now made in the United States, amounts to probably not less than a quarter of a million dollars, the demand having been entirely created by the sewing machine.

Geo. Comings, of New York, exhibits

SILK DRESS TRIMMINGS,

not a very extensive line, but praiseworthy in style and color.

B. Richardson, broker in raw silks, of New York, exhibits a great variety of

RAW SILKS, COCOONS, EGGS, ETC.,

from China, Japan, and Europe. This is a very interesting, and, to those unacquainted with the details of the business, an instructive display. The French and Italian silks are particularly beautiful. An important peculiarity of French and Italian silks is the uniformity of the thread; as in winding, great care is taken to wind from the same number of cocoons, and, whenever any one runs out, to replace it by another. This case is an important addition to the department, although it does not show the progress of the silk industry in the United States so much as the exhibitions of manufactured goods.

Cantrell and Chapin of Crestkill, N. J., exhibit

CANTON MACHINE TWIST,

a cheap variety of goods, but excellent of their kind; in our judgment, they are equal to any of the same class on exhibition. They are, for many kinds of work, as good as the more expensive kinds. Two cases are shown, one of which is arranged in quite a unique manner. It contains 3,500 spools, so placed that the name of the firm appears in prettily blended colors on a black background. This firm, also, manufacture Tram silks and organzines, for weaving, and are preparing to to enter upon the weaving of dress goods on

LYALL'S POSITIVE MOTION LOOMS,

one of which is now running on the floor, weaving dress silk, and attracting much attention. Its adaptation to this kind of work was minutely set forth in an illustrated description published on page 17, current volume of the SCIENTIFIC AMERICAN, to which we refer the reader. Another loom of this kind is also at work on goods *six yards and one quarter wide*, but a notice of which would be out of place here.

Werner, Itschner & Co., of Philadelphia, exhibit a small case of

RIBBONS,

which are, though commendable, scarcely equal to some exhibited by other establishments, yet to be noticed.

Horstmann Bros. & Co., of Philadelphia, exhibit a great variety of

UPHOLSTERY GOODS, REGALIA, CARRIAGE TRIMMINGS, MILITARY GOODS, AND LADIES' DRESS TRIMMINGS;

also, sashes, scarfs, and a great variety of other goods of their manufacture, all of excellent quality, and in a great variety of beautiful designs and colors. This firm have probably carried jacquard-loom weaving to a higher degree of perfection than any other American manufacturers, and the variety of the goods made by them is, we believe, the most extended of any American firm. We were much gratified, on a visit to Philadelphia, last winter, to witness the extent and systematic workings of their immense establishment, in which we spent considerable time, an interested spectator. The goods they exhibit are an honor to the firm and to the country, and they attract much attention from the visitor.

James S. S. Shapter, of New York, Secretary of the department, exhibits

DRESS SILKS,

beautiful in texture and color. We were gratified to witness the great progress which has been made in the manufacture of this kind of goods, as evidenced not only by this display, but also by other cases of goods exhibited.

The beautiful case of dress silks exhibited by P. G. Givernaud, of New Jersey, through his agents, Benkard & Hutton, of New York, can not be excelled by any goods ever imported. Both in texture and color they will be admitted by good judges to be first-class.

The same may be said of the splendid case of dress silks exhibited by Cheney Bros., of Hartford and Manchester, Conn., the leading silk manufacturers in the United States, who present a much larger variety of goods, forming one of the most attractive features of the Department. Their case contains, besides dress silks, ribbons, machine twist, poplins, Florentines, figured and plain, *gros grains*, extra fine organzine, buttonhole twist, etc., all of fine quality. It is a very rich display.

T. Baare, of Schoharie, N. Y., also exhibits a fine variety of dress silks, of good colors, and of undoubted good quality.

The Dale Manufacturing Company, in which the manufacture of dress silks has only quite recently been commenced, also exhibit a number of styles of dress silks, in connection with a large variety of

TAILORS' TRIMMINGS,

hat bands, and other narrow goods, to the manufacture of which their works are principally devoted. A full description of their mill was given on page 282, Vol. XIX., of this journal, to which the reader is referred. Their case, which is

acknowledged to be the most elaborate in design of any on the floor, contains, also, a fine sample of buttonhole twist, with other samples, which render it one of the most attractive on exhibition.

The Oneida Community, of Oneida, N. Y., exhibit a fine case of machine twist, which is not only admired for its intrinsic merit, but for the superior manner in which it is spooled. It is quite evident the Community can "do some things as well as others."

Wm. Watson & Sons, of Paterson, N. J., exhibit Canton and

TSATTLEE TWIST,

which compares favorably with other goods of the same kind on exhibition.

The Excelsior Manufacturing Co., Paterson, N. J., exhibit first-class sewing silk and machine twist.

Dunlap & Malcolm, of Paterson exhibit a small case of machine twist, the colors of which are good.

Hamil & Booth, of Paterson, N. J. (Passaic silk works), exhibit a beautiful selection of sewing silks, machine twist

EMBROIDERY SILKS

tram, organzine, and fringe silks, both colored and in gum, a display which ranks among the best in the department.

INCIDENTAL

to the display in this department is a small case by J. W. Gregory, of New York, containing raw fiber, and plain and colored textures made of the celebrated

RAMIE FIBER,

which will attract much attention from those interested in the introduction and growth of the Ramie plant in the United States. The textures seem very fine and soft, but it is evident from these samples that the art of dyeing them is yet imperfectly understood. They show very poorly in contrast with the brilliant colored silks in the department.

Another small case, by Bernstein & Mack, of New York, contains a

MODEL MACHINE FOR THE MANUFACTURE OF CHENILLE,

with some samples of this class of goods which are pretty.

The progress made in this industry since the former exhibition of the American Institute, is perhaps as marked as in any other department of the fair. This progress has been made against many great difficulties, and exhibits the enterprise and energy of American manufacturers in the most favorable light.

The present tariff is fast building up this industry, and if continued, will not only extend but permanently establish it; and the production of raw silk, already very successful in some sections, may be made to add largely to the present resources of the country. California will, eventually, not only become the vineyard of North America, but, in connection with certain parts of the Southern States, become, so far as the growing of silk is concerned, the Italy of this continent.

From the silk department we will ask the reader to accompany us into the

DEPARTMENT OF THE DWELLING

which comprises apparatus for warming, lighting, cooling, and ventilating, cooking stoves, kitchen utensils, carpets, oilcloths, tapestry, cabinet furniture, table furniture, ornaments for parlors, building accessories, mantels, grates, etc. Carpets are exhibited principally in the woolen department, noticed in our last, and we shall not here allude further to them. The class of

TABLE FURNITURE

comprises a large variety of pressed and cut glass ware, plated goods, cutlery, etc., which we must pass, for the present at least without detailed notice. We will, however, state that the class is finely represented and the wares are finely designed, and some of them very artistic, making a display very creditable to the manufacturers whose goods are displayed.

One of the most extensive classes in this department is that of

STOVES, RANGES, HOT-AIR FURNACES, AND OTHER HEATING APPARATUS,

the most striking of which is the Empire Range, exhibited by Moncuse & L. Duparquet, of New York. It is a magnificent piece of workmanship, twenty-four feet long by six in width, and capable of being extended to any desirable length by putting in sections. It is one of the most complete ranges we have ever seen, provided with an electro-motor engine for turning the spits and all sizes of vessels for the performance of culinary operations. A complete dinner for a regiment might be prepared on it.

Among the manufacturers who have praiseworthy goods of this class on exhibition, we notice W. C. Lesster, of New York; Hull Grippen & Co., New York; John Q. A. Butler, New York; H. G. Giles & Son, of New York; Burtis & Rice, New York; Barry & Lane, New York; J. W. Lane & Co., New York. The fact that the exhibitors in this class are principally from New York, does not perhaps derogate from the representative character of the display, as the wares are fair samples of wares of this kind made throughout the country. The furnaces and ranges of Barry & Lane, of New York, and the New Portable Furnace exhibited by J. W. Lane & Co., of New York, are specially commendable.

Next to heating apparatus in importance ranks lighting apparatus. In this class we find a few machines for the production of a

DOMESTIC GAS LIGHT,

among which appears the apparatus of C. F. Dunderdale, of New York, illustrated and described on page 164, current volume of the Scientific American, to which the reader is referred. The Domestic Gas-light Works exhibited by J. T. & R. H. Plass, of New York, is an apparatus for charging air with the vapor of the light hydrocarbon oils. The Patent Vapor Stove, House-lamp, and Gas Light, exhibited by D. H. Lowe, of New York, are pieces of apparatus which generate gas from similar liquids for purposes indicated sufficiently by the names of the articles. The most unique of these devices is, however, Gardiner's apparatus for turning on and off, and lighting gas by electricity. This apparatus is, however, intended for lighting the public gas lamps of cities, as well as for use in hotels and private dwellings. The inventor thus describes its application to this purpose: At the Station House may be placed a key-board, and in connection with each key is an indicator, which corresponds with the indicators of the electro-magnetic stop-cocks, which are placed in each lamp post. When the operator wishes to light any street or district, he presses the key, which moves the indicator in the office; at the same moment all the stop-cocks in that district, or street, move according to the indicator at the office. The operator has perfect control of all the public lamps in the city, as he can light any district or street he wishes without interfering with any other portion of the city, and can turn off the gas by the same movement of the keys, as he knows by his indicators when the gas is turned off or on.

Mitchell Vance & Co., of New York, exhibit a fine assortment of

CHANDELIERS AND GAS FIXTURES, GILT AND MARBLE CLOCKS AND BRONZES,

which make a fine display, many of the designs being very artistic indeed. The alcove containing this collection is arranged in an elegant manner, and attracts much attention.

In the department of

FURNITURE

there are some beautiful articles exhibited, many of which are, in the words of Goldsmith—

. . . contrived a double debt to pay,
A bed by night, a chest of drawers by day.

Among the most beautiful pieces of furniture thus adapted to various uses is the Multiple and Dividing Table, exhibited by Dronhard & Roye, of New York. It is elaborately and beautifully inlaid, the material of which it is constructed being principally ebony. By releasing two small hooks, the table divides longitudinally in halves, the tops of each half spreads out, and two library or card tables are formed with green cloth tops, which replace the inlaid design previously visible. By closing the tops each half becomes a beautiful consol, which may be wheeled against the wall of an apartment, and is as chaste and beautiful in design as the original table. This is a *chef d'œuvre* of workmanship.

M. Sulzbachcher, of New York, exhibits a very attractive piece of furniture, which is by day not merely a chest of drawers, but an elegant cabinet with secret compartments for papers and valuables, shelving for books and papers, etc., etc. The lower part, however, contains a very nice spring bed all complete, but so snugly folded and tucked away that not the slightest suspicion of its existence would enter the mind of the spectator were it not displayed by the attendant. This is also a paragon of fine workmanship, and excites much admiration.

Another bedstead exhibited by Pullman & Bro., of New York, by day simulates—we must confess rather poorly—a bookcase.

Dexter Howe, of New York, exhibits a new kind of rocking chair, which is very comfortable to recline in, and which has no projecting rockers to encumber the room and destroy other furniture; is easy and regular in its motion; does not wear the carpet; is not affected by the uneven surface of a floor; applicable to any style of chair, and symmetrical in appearance. The improvement seems really a good one, and is attracting much notice.

In the display of

WATER FIXTURES

we find some familiar but excellent things.

Wm. S. Carr & Co., of New York, exhibit their excellent new Monitor Pan Water Closet, probably one of the very best things of the kind now made anywhere.

John Keane & Co., of New York, exhibit what they call a "Patent Extractor and Hydro-Valve," designed for house and ship water-closets, intended to obviate all necessity of care in attendants, and to keep itself clean and cut off all foul gases.

The Colwells Shaw and Willard Manufacturing Co. exhibit their

PATENT LEAD-INCASED BLOCK-TIN PIPE,

with a new improvement, obviating all objections hitherto made by plumbers as to the difficulty in making joints in such pipes. Our readers are already aware that we hold this pipe in high estimation, from numerous allusions to the improvement which have been made in these pages.

Among

ARCHITECTURAL IMPROVEMENTS

we notice iron skylights, ventilators, etc., etc., exhibited by the Hudson River Iron Works, of New York, whose work in this line is of superior quality.

Also Perkins' Patent Fire-proof Window Shutter, exhibited by H. O. Baker, of New York, which is also well constructed to subserve the purpose designed.

Some specimens of

STEAM-MACHINE CARVING,

shown by A. Henkel & Co., of New York, are really very remarkable in execution. Heads, figures, *bas reliefs*, etc., are exhibited, and are well worthy of particular notice.

Specimens of

NATURAL WOOD PRINTING,

where an exact transcription of the figure formed by the grain of wood, is made upon paper hangings, are shown by the New York Wood Company, of New York. The process by which this is accomplished has already been described in these columns. The hangings produced exactly resemble veneers cut from oak, walnut, or other wood.

P. H. Schaad, of New York, exhibits a most chaste and beautiful

MARBLE MANTEL,

after an original design, which elicits general admiration.

The Penrhyn Slate Company exhibit several specimens of their

ENAMELED SLATE MANTELS,

table-tops, etc., which are also rich in design and finish.

Among

LAUNDRY MACHINERY

there are a great many styles of washing machines and mangles. Some of very large size, to be driven by steam power, are shown by the New York Laundry Manufacturing Company, capable of doing an enormous amount of work in a very short time. These machines are running by power supplied by the Institute, and attract much observation. There are other machines intended for power on the floor, but none in operation. We find in this department also a large display of clothes wringers, meat-chopping machines, and a host of all kinds of implements and improvements designed to lessen the work of the dwelling, and add to the comfort of mankind.

A very large number of

MINOR IMPROVEMENTS

and articles are shown, a mere list of which would be too large for our space. Anything from a patent carpet tack to a washing machine may be met with here, and we shall notice only a very few of these efforts of real Yankee genius.

The

BURGLAR ALARM TELEGRAPH,

exhibited by E. Holmes, of New York, attracts universal attention. It is connected with all the windows of the building, and greatly adds to the security of the costly articles on exhibition. It is, in the language of the inventor, "A watchman that has but one house to protect, is always on the spot, never goes to sleep, cannot be bought off, and an experience of eight years without a failure proves that it is perfectly reliable and satisfactory."

No department of the exhibition exhibits the value of small inventions, and the interest taken in them by the public, more than this, which, at the time of our visit, attracted more spectators than any other, except the department of machinery.

THE ONE NEEDLE FAMILY KNITTER.

The first page of the present volume bore an illustration and description of Hinkley's one-needle family knitting machine. The terms in which we spoke of this ingenious and simple device were received in some quarters with skepticism, but we had full confidence that the future history of the machine would demonstrate the soundness of our judgment in regard to its merits.

We styled it a "family knitter" from the conviction that the simplicity of its parts and the ease with which it can be operated, as well as the rapidity with which the necessary manipulations can be learned, would enable even children of twelve or fourteen years to operate it satisfactorily. We were, however, somewhat astonished on the evening of the 24th Sept., upon a visit to the Exhibition of the American Institute, to see a child of only seven years operating the machine with skill and apparent ease. Upon inquiry we ascertained that the name of this little worker, around whom a large and admiring crowd had gathered, was Miss Alice Hall, daughter of Thomas Hall, Esq., of Brooklyn, New York.

This exceeded any opinion we had formed of the general utility of this knitting maching in the household, but when Miss Alice made her bow, and her younger sister, Florence, only *four* years old, took her place at the machine, we, in common with the crowd of lookers-on, could hardly refrain from some enthusiasm. Back and forth went the machine under the deft management of those little fingers, and still the wonder grew as well as the texture.

Several prominent gentlemen of the press were present, and all agreed that this episode in the routine of the Fair must greatly strengthen the favor with which the public are now regarding this invention.

The machine is exhibited by the Hinkley Knitting Machine Co., No. 176 Broadway, of which Mr. A. G. Page is the president, who has received a great many testimonials respecting its merits, and the demand for it is constantly increasing.

We presume no one visiting the fair will fail to examine it for themselves, as it certainly is one of the chief attractions of the department in which it is displayed.

The knitter is about the size and weight of a Wheeler & Wilson sewing machine, and unlike any other knitting machine is operated equally well by the foot or the hand. The price of the machine is so small that it is within the reach of those in the narrowest circumstances, while its adaptability to ornamental work renders it a most desirable addition to the fancy work tables of the wealthy.

Electric Beacons.—Thomas Stevenson, C.E., Edinburgh, recently conducted an experiment at Granton, with the view of showing the practicability of illuminating beacons and buoys at sea with the electric light, produced by means of a battery on shore. A submarine cable, fully half a mile in length, was laid between the east breakwater of Granton Harbor and the chair pier at Trinity. The operator occupied a station near the center of the breakwater, and the light was shown at the point of the pier in front of an ordinary lighthouse reflector, producing a most brilliant flash. The flashes were emitted with great rapidity; as many as 500 can be transmitted in a minute, but the machine can be regulated so as to send one every second, or at any other desired interval. The experiment gave entire satisfaction.

OMISSION OF OATH UNDER SEC. 6. ACT OF 1836---FRAUD IN OBTAINING THE EXTENSION---THIRD PARTIES CANNOT TAKE ADVANTAGE OF SAME---LAW OF COMBINATIONS---WHAT WILL INFRINGE A COMBINATION CLAIM.

We give below the most valuable portions of a decision lately made by Judge Clark in the New Hampshire District, in the suit in equity, George Crompton vs. The Belknap Mills *et al.*

The respondent objects to the Marshall Patent of December 11, 1849, that the invention was neither new nor useful, and that the patentee did not, before the granting and issuing of the letters to him, take the oath prescribed by section 6th, of the act of July 4, 1836, that he verily believed he was the original inventor or discoverer of the art, machine, etc., for which he solicited a patent.

A Patent is deemed *prima facie* evidence that the patentee has made the invention. There is, in this case, no sufficient evidence to overcome that presumption, or *prima facie* case.

There is evidence that "open-shed" fancy looms were used prior to Marshall's invention, but not involving the combination of Marshall. His invention must, therefore, be taken to be new. Precisely how useful it may be, the court have not undertaken to decide; but that it is sufficiently so to support a patent, we have no doubt. Other looms may have been preferred by different persons, or may have found a readier sale; but that good cloth can be woven by Marshall's loom and invention there is sufficient evidence.

To warrant a patent, the invention must be useful—that is, capable of some beneficial use, in contradistinction to what is pernicious, or frivolous, or worthless. These objections to the patent cannot therefore avail. Nor can the other, that the oath required by the 6th section of the act of 1836 was not taken, for two reasons.

1st. We are not satisfied the oath was not taken. The letters patent recite that it was. The respondent finds, among the papers on file in the case in the Patent Office, a blank form of the oath, with the jurat not signed by any magistrate, and hence he argues the oath was not taken. But the oath may have been taken for all that; and this negative testimony cannot overcome the direct recital of the letters patent that the oath was taken; or the presumption that the requirements of the law were complied with in issuing the patent. But suppose it were so. Suppose the oath was not taken, would the patent be void on that account? It was held otherwise by Justice Story in the case of Whittemore vs. Cutter, 1 Gal., 429. The taking of the oath, though to be done prior to the granting of the patent, is not a condition precedent, failing which the patent must fail. It is the evidence required to be furnished to the Patent Office, that the applicant verily believes he is the original and first inventor of the art, etc. If he take this oath, and it turns out that he was not the first inventor or discoverer, his patent must fail, is void. So, if he do not take it, and still he is the first inventor or discoverer, the patent will be supported. It is *prima facie* evidence of the novelty and originality of the invention until the contrary appear.

So the act says, on payment of the duty—that is, fees—the commissioner shall make an examination, and, if the invention shall be found useful and important, shall issue a patent. Suppose the fees should not be required or paid, would the patent therefore be void? Yet the one requirement appears to be as much a condition precedent as the other. Both directory, not to be dispensed with; but neither involving the validity of the patent when granted.

The next objections are to the reissued patent, and they are two. 1st. That the original patent was void, and the reissue was therefore so; and 2d. That the reissue was not for the same invention as the original.

The first of these objections has already been disposed of. It was maintained in the argument, that the original patent was void for want of the proper oath, and that the defect could not be cured by the reissue. But, whether the oath were taken or not, we are of the opinion, as already expressed, that such an omission would not invalidate the patent, nor would it affect the reissue. The second objection to the reissue is a more serious one, and for its proper determination requires a careful examination and comparison of the original patent to Marshall, and the reissue to Crompton.

We think that substantially the same invention is described in the two patents.

But if it should be held that the original patent to Marshall, and the reissue to Crompton, assignee, were valid, it is contended that the extension to Marshall, was not, for three reasons, to wit:

1. That as Marshall never had any interest in the reissued patent, it could not be extended to him.
2. That no sufficient notice was given to the public of the application for the extension of the patent; and
3. That the extension was obtained by fraud.

To the first objection, to wit, "that as Marshall never had any interest in the reissued patent, it could not be extended to him," it is a full answer, that, in judgment of law, the reissue is only a continuation of the original patent. So held in Read vs. Bowman, 2 Wallace, 604; and as Marshall was the original patentee, the extension was legally and properly to him. The extension enuring, under the statute, to the assignees and grantees to the extent of their respective interests.

The second objection is that there was no notice ever ordered, or given of any application to extend the reissued patent. There was of the application to extend the original patent, and the objection stands upon the supposition, or idea, that they are two distinct patents, while in judgment of law they are one. If the reissue was only a continuation of the original patent, then a notice to extend the original would seem to have been sufficient.

Again, under the act of 1836, the Secretary of State, the Commissioner of Patents, and the Solicitor of the Treasury were a board of commissioners to "hear and decide upon the evidence produced before them, both for and against the extension." It has been held that the functions of this board were judicial, and that their judgment settled conclusively all questions of notice.

The statute of May 27, 1848, 9 Statutes at Large, 231, section 1, provided that the power to extend patents then vested in the board of commissioners "Should be vested solely in the Commissioner of Patents; and in Clum vs. Brewer, 2 Curtis, 506, it was held, that the act of the commissioner in extending a patent was conclusive of the facts, which he is required to find, in order to grant such extension, in the absence of fraud or excess of jurisdiction. But here, third, it is said, that the extension was procured by fraud. We do not, however, think this objection is open to this respondent. He stands before the court, accused of infringing the complainant's patent. He may, undoubtedly, show that the invention claimed by the complainant was not new, or useful, or that it had been dedicated to the public, Or that there was no sufficient specification or description, and so that there was in fact no infringement for which he should answer, but we think he cannot attack the granting and validity of the patent in this collateral manner.

If there was fraud practiced in obtaining the patent, that is a matter between the Patent Office and the patentee; and can, perhaps, be inquired into by some proper proceeding of the officers of the Government to vacate the patent. But in this particular, like a judgment, it must be respected and enforced, until reversed or annulled by some proceedings directly for that purpose. It is not exposed to the attacks of strangers or third persons for such reason.

The question then is, whether the Thomas loom, as it is called, infringes the Marshall patent as reissued and extended? The original patent to Marshall, December 11, 1849, claimed the movable spring rests to hold the jacks of the harness, and the "evener," and the combination of the rotating, lifting, and depressing bars, so as to revolve, etc. As reissued to Crompton, the claim was for combining with the jacks and with the lifter and depresser and pattern chain, or any equivalent mechanism for determining the pattern, a mechanism for holding the jacks either in their elevated or depressed position when not required to be operated, substantially and for the purpose specified.

The language is "a mechanism for holding the jacks." This is broad enough, upon its face, to cover any mechanism, and if it stood alone and unaided it would be so general and uncertain as to be entirely void, but in the specification the holding mechanism is described particularly and precisely, and the claim is limited by such specification. Here, then, are combined five elements, to wit: the jacks, the lifter and depresser, the pattern chain, and the holding mechanism; and any machine combining, substantially in the same manner, substantially the same elements, or well-known substitutes for the same, must be regarded as an infringement of this reissued patent. But it would not be infringed by a combination which dispensed with one of the elements and substituted therefor another element, substantially different in construction and operation, but serving the same purpose; nor by any and every combination of the same elements, which may produce the same result, but only by the peculiar combination of the elements described, or one substantially the same.

The elements here combined are old, the patent is for the peculiar combination, and the doctrine of mechanical equivalents does not apply.

The identities or diversity of two machines depends, not on the employment of the same elements or powers of mechanics, but upon producing the given effect by substantially the same mode of operation, or substantially the same combination of powers.

Following these principles and adjudications, we proceed to the examination and comparison of the Marshall and the Thomas looms. In both we find, substantially, the same jacks, differing in form, but performing, substantially, the same office. In both we find, substantially, the same elevator and depresser; arranged in the Marshall loom in a rotating, endless chain, so that the same bar in going up is an elevator, but in rotation or revolution, going down, becomes a depresser.

These three elements are substantially the same, but when we come to the holding mechanism we find a marked and substantial difference in the two machines. In the argument of the respondent's counsel, it was contended, that the holding mechanism of the Marshall loom was not only the "series of horizontal spring latches, or catches," and the shoulders on the two prongs of the jacks, but that it included the connecting mechanism of the jacks with the heddle lever, the pattern mechanism, and the "evener." Now, although it be true that the connecting mechanism and pattern mechanism of the jacks hold the jacks securely upon the spring latches, as upon a seat, until they be forced or allowed to come off by the pattern mechanism, and although in the operation of the machine there is a point of time after the jacks are forced off the springs, when the heddle levers are firmly held by the evener, so that the jacks cannot move, nor the sheds close, until allowed to do so by the removal of the evener, yet we have considered the holding mechanism to be as described in the patent, to wit, the series of horizontal spring latches or catches, and the notches on the prongs of the jacks, and still we find the holding mechanism of the two machines to be substantially different.

In the Marshall machine, the elevator carries upward a particular jack, the beveled face on the projecting notch on the prong of the jack meets the beveled face of the spring, presses it back, and passes it. Then the spring flies out under the shoulder of the jack and the jack rests upon it, in a manner similar to a window sash raised and resting on the old and familiar window spring. Here it sits or is held until the pattern mechanism forces it off the spring and allows it to descend. When a jack is carried down by the depresser, it is held by a similar spring; being kept on its seat by the pattern mechanism, until allowed to be drawn off by the oblique connecting mechanism.

Now in the Thomas loom there is a very different mechanism or device. There is a jack which is carried up and down by an elevator and depresser. On one side of this jack there is a gearing connecting it with and operating a sector. As the jack goes up and down, it rolls or rocks this sector forward and backward as if you should turn a wheel part of the way round, say one fourth, and then bring it back again, and so continue.

In or near this circumference of this sector, there is a cam groove, and playing in this cam groove, forward and backward, as the sector moves, a projecting stud or friction roller connected with an arm of the heddle lever. This heddle lever rocks upon its fulcrum, and as the arm, guided and controlled by the projecting stud in the cam groove, is carried upward or downward by the cam groove, the ends of the rocking heddle lever are carried backwards and forwards, elevating or depressing, or holding stationary the harnesses. In the one end of the cam groove is a concentric into which the projecting stud or roller falls, which it is contended by the complainant's counsel is a substitute for the spring latch or catch of the Marshall loom; but we are of the opinion it is not so; but that the whole cam groove, of which the concentric makes a part, is more correctly a substitute for the cam; and that this device of the Thomas loom much more resembles in principle and operation the old Middlesex cam loom than it does the Marshall loom. It cannot be conceded that the Marshall and the Thomas holding devices are the same, because the operation in both cases is performed by a surface of metal passing under or over another surface, and that therefore one infringes the other. In the old Middlesex cam loom one surface passed over another, to wit, over the cam, and was elevated, depressed, or held stationary by it; yet it was very different from the Marshall device. We cannot give the Marshall holding device any such latitude of construction.

There is also in the Thomas loom a brake connected and operating upon the periphery of the sector, retarding, regulating, and governing its motion. And whether we regard this brake as a part of the holding mechanism or not, we think and conclude that these two elements are substantially different, and that one is not a well-known substitute for the other.

We now come to the last element or device, to wit, the pattern mechanism. Had the pattern to Marshall not been surrendered, and a new one issued, the question of infringement, if it arose at all, must have arisen between the holding mechanism of the two looms; but that patent having been surrendered, and a new one issued, claiming a combination of elements, that new one is liable to be avoided, by showing that the Thomas loom uses a substantially different element from any one of those combined.

To return to the pattern devices. These two mechanisms or devices are very different in their construction and in their operation. H. B. Renwick, one of the complainant's experts, says: "I think the pattern chain in model B" (the Thomas loom) "is, considered by itself, a substantially different species of pattern chain from that specially described and represented in the drawing of the Marshall reissue, and differing from it in the fact that it requires motion in two directions in order to cause it to operate upon the jacks, while the chain represented in the drawings of Marshall requires motion only in one direction." Precisely in the sense mentioned by this expert we are now considering these two devices or mechanisms, that is, by themselves; and in that view they are substantially different, in principle, construction, and operation. But if we consider them in regard to the functions they perform, we shall find as great and substantial difference. Both select the jacks to be operated, but the pattern chain, in addition to this, in the Marshall loom, forces the jacks off the upper series of spring catches, and holds them on to the lower series, in both instances in opposition to the force supplied by the oblique connection of the jacks with the heddle levers. Both these devices are said to be old. That is true in a limited sense. The Marshall chain is old. The Thomas mechanism is old in the fundamental principle. It is that of the Jacquard pattern; but Thomas has made two improvements upon it, which are not old. They are also said to be well-known substitutes for one another; but it is very evident, both from the testimony of the experts, and an examination of the machines, that, though the Marshall pattern mechanism might be applied to the Thomas loom, there is no apparent practical mode of applying the Thomas pattern mechanism to the Marshall loom, with its present method of holding the jacks. Can one device be said to be a well-known substitute for another which cannot be used for it? Thus much for the elements of the Marshall combination. We now pass to the combination itself. Is the combination in the two machines substantially the same? It may be said they cannot be, if the elements are not the same, as gold and copper is not the same combination as silver and copper. But the inquiry is to another point. Is the method or manner of the combination the same? We think not. Indeed, there seems to be as wide and substantial a difference in the mode of combination as in the things combined. Take, for instance, the combination of the jacks with the holding mechanism in the Marshall loom. By the lengthening of the lower heddle lever, giving an oblique direction to the connection of the jacks with the upper lever and lower, the protuberances upon the prongs of the jacks are held upon the upper series of spring catches. There is no such connection, device, office performed, or combination that we can discover in the Thomas loom.

Again, take the combination of the pattern mechanism in the Marshall loom with the jacks. It is so arranged as to hold the protuberances of the jack upon the lower series of spring catches, there performing substantially the same office that the oblique connection of the jacks with the heddle levers does in regard to the upper catches. There is nothing like this in the Thomas loom.

Again, take the combination of the holding mechanism, with the pattern mechanism and jacks, and there we find a substantially different combination, or mode of combination, in the two looms. In the Marshall loom the jacks are combined with the holding catches, by their oblique connection with the heddle levers, keeping the jacks seated upon the upper catches, until forced off by the pattern cams, and pulling the jacks off the lower catches when not held on by the cams. Is there any such arrangement in the Thomas loom? We do not find it, nor anything nearly approaching it. In the Thomas loom the jack is connected with the rocking sector by a gearing, rocking the sector backwards and forwards as the jack goes up and down. In the circumference of this sector is a cam groove, or slot; in this groove plays a stud or friction wheel attached to an arm of the heddle lever.

This stud is guided and held by the cam slot, thus elevating, depressing, or holding the heddle lever as it comes into one or the other part of the slot. The pattern mechanism has nothing whatever to do with this holding, elevating, or depressing, further than to select the particular jack. We leave out of this combination the brake purposely, though that device in the Thomas loom, and the "evener" in the Marshall, play very important parts, both in holding the shed open, and in preventing its closing too quickly.

We might pursue this examination and comparison further, but have gone far enough to warrant the conclusion to which we have come, that the respondents have not infringed the complainant's reissued patent. To constitute an infringement of a patent for a combination, the defendant must have used the same combination, constructed and operated substantially in the same way.

A patent for a combination is not infringed unless all the essential parts of it are substantially imitated. The patentee of a combination cannot treat another as infringer, who has improved the original machine, by the use of a substantially different combination, though it produce the same result.

A patent for a combination of three distinct things is not infringed by combining two of them with a third, which is substantially different from the third element described in the specification.

In Morris vs. Barrett, 1 Fish, 461, it was held, that in an action for an infringement, the machines themselves, as shown by the models, were evidence entitled to the highest credit.

We have examined the models in this case very carefully and repeatedly: and they have very materially aided us in coming to a satisfactory conclusion; particularly in determining how much weight was to be given to the opinions and explanations of the experts, two of which appeared on each side, swearing with equal confidence and apparent intelligence in opposite directions.

The complainant's bill must be dismissed with cost.

B. R. CURTIS & CAUSTEN BROWNE, for Complainant.
T. A. JENCKES & JOSHUA D. BALL, for Defendants.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

The first annual fair of the Lake Shore Grape Growers' Association will be held at Erie on Friday and Saturday, October 15 and 16.

The Titusville *Herald* says that the petroleum production for August was considerably increased by the opening of the new wells.

The Central Park Commissioners have defined the lines and filed the maps for the widening of Broadway from Thirty-second street to Fifty-ninth street.

The mean rate of discharge of the Mississippi into the Gulf of Mexico is upwards of thirty-eight million six hundred thousand pounds of water per second.

A new granite quarry has been opened in Jamesport, Washington county, Maine. The stone has a beautiful pink color, which, if durable, will render the stone very valuable for building purposes.

Twenty-two States were represented at the meeting of the American Pomological Society, at Philadelphia. The exhibition of fruit was very attractive and comprised a great number of specimens.

About 100 feet of embankment of the Erie Canal at Pool's Brook, near Kirkville, were carried out on the 21st of September, and the flood covered the Central Railroad track, temporarily suspending travel. One track is now in use. It will require several days to repair the break.

A huge chimney has been completed at the Earl of Dudley's estate at Coneygre Works, near Dudley, England. Special arrangements for the consumption of fuel necessitated the carrying of the stack to a hight of 190 feet. It is strengthened by iron-work for a distance of 100 feet above the ground.

The Croton Water Works in process of erection at High Bridge are now well advanced, and by next spring the inhabitants of Washington Hights are promised all the water they want. The reservoir is nearly completed, requiring only some grading of its banks, coping, and further work on the western gate.

Herr Krupp must look to his laurels. A larger block of steel than has ever issued from his works is now in progress of casting at Osnabruck. It weighs 200 tuns, whereas the block with which Krupp astonished the world at the Great Exhibition of 1862 weighed only twenty, but he has surpassed this feat in later years.

Dr. Koller recommends concentrated glycerin as a substitute for spirits of wine for the preservation of zoological and anatomical preparations, on the ground that it is not liable to evaporation, that it is not combustible, and that, moreover, it preserves better the natural color of various preparations usually kept and preserved in spirits of wine.

The contractor for the erection of the railroad bridge over the Missouri river, which is intended to connect the Missouri and Iowa railroads directly with the Union Pacific is said to have received notice from the Irish laborers of that locality that he will not be allowed to employ Chinamen on the work. He has, nevertheless, made contracts in California to obtain Chinese laborers, and he intends to bring them to Omaha soon. It is very probable that we shall soon hear of some fighting.

M. Pollack, of Bautzen, Saxony, states that he has used for several years, a paste made of pure oxide of lead, litharge, and concentrated glycerin, as a cement to fasten stone to stone, and iron to iron. This mixture hardens rapidly, is insoluble in acids (unless quite concentrated), and is not affected by heat. He used it successfully in joining different portions of a fly wheel; and when used as a cement for stone, it was found easier to break the stone than effect a separation at the joint.

As a new method of fusing difficultly decomposable minerals, it is recommended that 1 part of the mineral, previously very finely powdered, should be mixed with 3 parts of fluoride of sodium, and that this mixture, after having been placed in a platinum crucible, should be covered with 12 parts of powdered bisulphate of potassa. Chrome iron ore, hard hematite, tin ores, and rutile corundum, and the like, are very readily brought to fusion and disintegrated by this flux, even with no more heat than that obtained by a good Bunsen gas-burner.

The *Shipping and Commercial List*, of New York, in alluding to the amounts paid to passengers by the different railroad companies as compensation for damages, says that probably not one of all the accidents which inflicted the injuries that had to be paid for was the result of a natural cause. Most of them were attributed by the verdict of the coroners' juries to broken rails or the carelessness of employés. Experts have declared that accidents from broken rails would be practically done away with, were the rails made in two or three continuous parts, and the expense of this in the manufacture could not be great.

In the year 1863 there were 3,991 applications for letters patent filed in the British Patent Office. The stamp duties received in respect of patents amounted to 119,271 pounds. After deducting expenditure, there is a considerable yearly surplus income; and the aggregate surplus from 1852 to the end of last year exceeds 726,000 pounds. The Commissioners complain of the insufficiency of the building for the requirements of the office. Complete sets of the Commissioners of Patents' publications—each set including more than 2,500 volumes—have been presented to the most important towns in the kingdom, to be accessible to the public free of charge.

M. Reinsch, having experimented with various salts in order to determine which was best suited to prevent timber bursting into flame has come to the conclusion that impregnating timber with a strong solution of rock salt is as good (if not a better) preservative against its bursting into flame, as water-glass (silicate of soda). Rock salt costs much less than water-glass, and it has also the effect of keeping the timber free from dry-rot and noxious insects. He also says that the use of a solution of salt in extinguishing a fire with fire-engines would be very effective, but it is questionable whether the engines would not soon become worthless from the effect of the salt.

The recent terrible coal-mine accident at Avondale, says the Easton *Free Press*, calls to mind a former great accident in Pennsylvania mines, which occurred in Carbondale in 1850. A large mine caved in, destroying over a hundred lives, and ruining the mine. When the cave-in occurred the pressure of air from the falling mass was so great that it blew a boy and a mule an eighth of a mile out of the narrow entrance to the mine. A few of those entombed worked their way out through all the dangers of fire-damp and foul air, but the most of them perished by starvation, or fell a prey to the rats, which in coal-mines grow to an enormous size. One man was seven days in digging his way to the surface.

A bituminous composition, which may be used in the shape of bricks or as a coating on any desired foundation, has been invented, and is said to be suitable for the bottoms of reservoirs, for pavements of streets and terraces, and many other applications. It is composed of the following ingredients in the proportions stated: For every 100 pounds weight of bitumen—sulphur, 37½ lbs; gallpot (or in case of necessity colophony), 25 lbs; lamp-black, 12½ lbs; sand, 25 lbs — 100 lbs. For bitumen to be applied on wood the quantity of sand may be reduced by about 5 lbs weight, and it is preferable that the wood be rough. In preparing this bitumen the sulphur must first be thoroughly melted in a sheet iron caldron or in an earthenware pot; the gallpot is then added, and when this is almost entirely melted the lampblack is introduced, and, lastly, the sand. The whole is carefully mixed over a moderate fire.

A charcoal flower-pot has been patented in England. The charcoal is molded into the approved form in such a manner that its peculiar porosity may be in no way interfered with. By this means, not only is the oxygen of the air allowed free access to the soil within the flower-pot, but the water with which the soil is moistened is, by the filtering and purifying powers of the carbon, deprived of all those "hard" qualities which are known to be so deleterious to the growth of plants. Further, the sulphurous vapors, which are usually present in the atmosphere of large towns and constitute the principal reason why floriculture is attended with so much difficulty in all cities heated with coal and lighted with gas, are, by the use of the charcoal flower-pot, fixed in the pores of the carbonaceous sponge. Hence, not only are pure air and pure water insured to the plant; but, all noxious vapors being removed, it follows that a healthy and vigorous growth and luxuriant development cannot but ensue.

NEW PUBLICATIONS.

MAN IN GENESIS AND GEOLOGY; or, the Biblical Account of Man's Creation, Tested by Scientific Theories of his Origin and Antiquity. By Joseph P. Thompson, D.D., LL.D. New York: Samuel R. Wells, Publisher, 389 Broadway.

The kind of discussion contained in this book is of very little interest to us, and we regard it as of very little value to the world. The statement made in the first paragraph of the preface begs every disputed question at the very threshold of the book. This statement is in the words of the author as follows: "No fact declared by science can be accepted as true if it conflicts with any statement of the Bible." That an author starting with such a proposition could ever arrive at truth is morally impossible. Therefore it is not surprising that the book instead of being a candid research after truth, is a weak attempt to make all known facts coincide with the writer's interpretation of the Scriptures. Not that the facts of science necessarily conflict with the Mosaic record. All we can say is, that in some cases they *seem* to conflict with *our* understanding of that record. But to start out properly in a search for truth, one must divest his mind of preconceived notions—a standard of candor to which the author of this book has been evidently unable to attain.

THE METALLURGY OF IRON AND STEEL, Theoretical and Practical, in all its Branches, with Special Reference to American Materials and Processes. By H. S. Osborn, LL.D., Professor of Mining and Metallurgy in Lafayette College, Easton, Pa. Illustrated by 230 Engravings on Wood, and 6 Folding Plates. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street. London: Trubner & Co.

This is a voluminous and exhaustive treatise, rivaling in extent the celebrated work of Crookes and Röhrig on the same subject, but having, as stated in the title, more especial reference to American materials and processes. We will give a review of this important work as soon as we have time to give it the examination it merits.

We are also in receipt of the Annual Report of the State Engineer and and Surveyor on the Canals of New York, for the Year 1868, and also the State Engineer's Report on Railroads for the same year; able documents containing much information, abstracts of which we will lay before our readers in due time.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,423.—FURNITURE CASTER.—J. L. Woolf, St. Louis, Mo. August 13, 1869.
2,529.—MOTIVE POWER.—H. Call, Concord, N. H. August 25, 1869.
2,544.—HULLING APPARATUS.—J. F. B. Marshall and A. Jones, Boston, Mass. August 27, 1869.
2,547.—APPARATUS FOR REFINING LARD, ETC.—C. J. Everett, Highwood Park, N. J. August 27, 1869.
2,553.—TREATING CONGLOMERATES OF CAST IRON, ETC.—T. S. Blair, Pittsburgh, Pa., and F. Ellerhausen, Ellerhouse, Nova Scotia. August 28, 1869.
2,569.—MACHINERY FOR MANUFACTURING NAILS, BRADS, ETC.—E. L. Brundage, Middletown, N. Y. August 30, 1869.
2,570.—FURNACE.—G. G. Clarkson and J. L. Paige, Rochester, N. Y. August 30, 1869.
2,577.—WASHING MACHINE.—J. J. Grant, Philadelphia, Pa. August 30, 1869.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

J. R. M., of Kansas.—To find the flow of water through a 2-inch orifice under a head of twenty-five feet, you must first determine the velocity of the flow per second, and multiply this by the area of the aperture. You will then have the theoretical flow per second, although this is subject to some variations consequent upon the shape of the aperture, and other considerations which must be taken into account. Assuming that the aperture is round and the diameter two inches, the velocity would be forty feet per second. The area of the port is 3·14 square inches, which, multiplied into the velocity per second in inches, will give the amount theoretically discharged in cubic inches, or 1507·20 cubic inches per second. Two thirds this will be the *actual flow*, or 1004·8 cubic inches per second, equal to 1·66 horse-power. To utilize this power economically we advise the employment of a small turbine. A good work for you to get on such subjects is "Silliman's Physics."

G. B. A., of Ohio.—Cotton cloth may be rendered nearly fireproof by steeping it in a solution of alum and letting it dry. A better process is to starch it with starch mixed with phosphate of ammonia, a little more by weight of the salt than of the starch. Grind the dry starch and the salt together in a mortar, and then prepare the starch with the mixture in the usual way. After starching the cloth with this preparation, it should be rolled up in a dry cloth, and allowed to remain till nearly dry, and then ironed, using a little white wax to prevent the sticking of the iron.

H. B., of Tenn.—It takes just as much weight to pull down a balloon as it will carry up, and it is one of the most uneconomical of machines. It can only be advantageously employed where no other means of transportation are practicable. A balloon might be made to work in the manner you specify, and from the novelty of the thing passengers might be attracted. You are under a mistake as to the use of chairs on railroads. A rail placed on a tie without a chair, would soon be jammed down into the wood under heavy work. You should see and talk with some experienced railroad engineer.

J. F. J., of N. Y.—There is no doubt that the diving dress used by divers in submarine work, would have enabled people to have descended into the Avondale coal mine without danger of suffocation; but the dress is too weighty to be used in work unless partly sustained by the buoyant power of water. Besides the walls of a coal mine are very different things from water walls, and flexible pipes would stand a poor chance of maintaining their integrity in being sawed across their sharp angles.

G. L. B., of Mass.—The products of the combustion of all hydrocarbon oils are carbonic acid and water. The carbonic acid is formed by the chemical union of the carbon in the oil with the oxygen of the air, and the water is formed by the union of the hydrogen in the oil with the oxygen of the air. Ordinarily, the water, being converted by the heat into steam, escapes notice; but when a cold body, as a piece of iron, is held for a moment in the flame it condenses this steam and the water becomes visible. The theory of your friend is all wrong.

C. P. S. W., of N. C.—The white earth you send us is silicious lime, resulting from the remains of minute diatoms. Under the microscope the shells of the diatoms, covered with beautiful and delicate lines, are distinctly visible. We can have a sketch made of some of these shells, if you desire, at a charge of $5. The earth will probably be useful as a polishing powder.

G., of Tenn.—The recipe for the hair composed of oxide of bismuth, spermaceti, and lard, recommended to you, will be as harmless as any other grease plaster provided the oxide of bismuth does not contain arsenic, with which it often is found mixed. As a hair renewer it is no better than barn-yard manure or roadside mud.

J. S. C., of Me.—The sectional area of the horizontal flue leading from your boiler to the chimney, ought to be twenty-two inches in diameter instead of sixteen. No advantage would result from making the flues of chimneys taper towards the top. Horizontal flues ought to have from one fifth to one sixth more capacity than upright flues.

A. W., of N. Y.—We believe a fan to be a very uneconomical method of conveying the sawdust shavings, etc., from a mill to a fire room and cannot therefore advise it. We infer this from general principles, as we have not seen a fan used for that purpose. We are confident, however, that you will do better with the drag hitherto employed.

J. R. R., of Md.—We think salt as good as anything to pack eggs in for winter use. They should be kept in a dry cool room but not where they will freeze, and the package should be turned once a week to prevent the eggs from settling to one side of the shell.

J. L. R.—Nothing yet discovered is more effectual in retaining heat in vessels than thick coatings of loose felt. You can take a useful lesson from the Norwegian cooking apparatus, illustrated and described on page 161, current volume, of this paper.

S. S., of Conn.—You can use screws in making the model. The mineral you send appears to be mica schist, containing minute garnet specimens.

J. H. Keine.—We advise the use of plumbago (black lead) mixed with tallow for wooden cogs.

W. E. E., of R. I.—Etherial phosphorus, so-called, is a simple solution of phosphorus in ether.

G. G. W., of Pa.—The information you seek will shortly appear in our columns.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

COMBINED COTTON AND CORN PLANTER.—A. H. Wootton, Bartow, Ga.—This invention has for its object to furnish a simple, convenient, and effective machine, which shall be so constructed and arranged that it may be easily adjusted for use, for planting cotton seed or corn, as may be desired.

FRUIT JAR.—J. M. W. Kitchen, Brooklyn, N. Y.—This invention has for its object to improve the construction of fruit or preserve jars, so as to make them simpler in construction, and more convenient, reliable, and effective in use.

CURRY COMB.—John M. Baker, Marshfield, Ohio.—This invention has for its object to improve the construction of curry combs, so that when the front teeth have become worn, the comb-plate may be reversed or turned half way around, causing the rear teeth to become the front ones, enabling the curry comb to be used much longer than it otherwise could be.

CORN HARVESTER.—John McLeish, Chicago, Ill.—This invention has for its object to furnish a simple, convenient, and effective machine, by means of which the corn stalks may be cut, the ears separated from the stalks and deposited in a suitable receptacle, and the stalks deposited in bundles or bunches upon the ground.

REVOLVING PLOW.—Wm. J. Dawson, Brookfield, Mo.—This invention has for its object to furnish a simple, convenient, and effective machine, by means of which cultivated land may be prepared for the reception of the seed thoroughly and well, and which may be operated with a comparatively light draft.

FIREPLACE HEATER.—R. D. McDonald, Jersey City, N. J.—This invention has for its object to furnish an improved open grate fireplace heater, which shall be so constructed and arranged as to utilize the heat that usually escapes into the chimney, economizing fuel and obtaining the advantages of a stove and open fire.

CHURNING MACHINE.—Samuel D. Lucas, Winterpock, Va.—This invention has for its object to furnish a simple and convenient churning apparatus, by means of which one or more churns may be operated at the same time, bringing the butter in a very short time and with a comparatively small amount of labor.

SICKLE GRINDER.—Henry Millard, York, N. Y.—This invention has for its object to furnish an improved machine for grinding, mowing, and reaping machine cutters, which shall be simple in construction, easily operated, and so arranged that the cutters may be ground all the way from point to heel.

REVOLVING DOUGH MIXER.—Thomas Holmes, Williamsburgh, N. Y.—This invention has for its object to improve the construction of the improved dough mixer, patented by the same inventor, June 15, 1869, and numbered 91,335, so as to make it simpler and less expensive in construction while doing its work equally well.

CULTIVATOR.—Isaac J. Morrow, Everton, Ind.—This invention has for its object to furnish an improved cultivator, which shall be so constructed and arranged that the amount of dirt allowed to pass to the plants may be conveniently controlled and regulated.

HAY AND GRAIN ELEVATOR.—John Dennis, Oswego, N. Y.—This invention has for its object to furnish an improved apparatus, by means of which an entire load of hay or grain may be raised to the upper part of a barn at one operation, thereby saving the labor and time required when it is pitched up or raised by the forkfull.

COMBINED SOFA AND BED.—Wm. H. Schwalbe, New York city.—This invention has for its object to improve the construction of combined sofas and beds, so as to make them more convenient in use, and so as to better adapt them for use in the various places in which they may be required.

SPRING FOR WAGON TONGUES.—George Alexander, Romney, Ind.—This invention has for its object to furnish an improved attachment for the forepart of a wagon gearing, by means of which the tongue may be supported at a greater or less elevation, as desired, so as to relieve the horses' necks from the weight of the tongue, and in a great measure protect them from the thrashing of the tongue when the wheels strike an obstruction.

COFFEEPOT.—Hermann von Holten, Hoboken, N. J.—This invention has for its object to furnish an improved coffeepot, which shall be so constructed and arranged as to force the boiling water through the compartment containing the ground coffee, which water extracts the strength from the coffee and flows thence into another compartment whence it is poured out for use.

PROCESS FOR PRESERVING EGGS.—John Longmaid, New York city.—This invention relates to a new and useful improvement in preserving eggs for market and use.

SEWING MACHINE.—M. C. Hawkins, Edinboro', Pa.—This invention consists in a novel manner of connecting the upper, or needle, with the lower, or shuttle shaft, by means of a pitman and loose crank, and in a novel manner of arranging and operating the take-up bar, and of combining it with the needle bar, so that it will operate in conjunction with the same.

ROCKING CARRIAGE.—A. Armando, New York city.—This invention relates to a new carriage, more particularly intended for children, and so constructed that it may be propelled by rocking motion, and that it will be rocked when propelled by other means.

RAILROAD STATION INDICATOR.—A. C. Rodgers, Fort Washington, Pa.—This invention relates to a new apparatus for displaying, within railroad cars, the name of the station which the car is approaching, or at which it has arrived. The invention consists of a system of levers and toothed wheels, by which intermittent rotary motion, in either direction, can be imparted to a drum, around which a belt or chain containing the names of the stations is placed. The apparatus is set in motion by a stop arranged on the track striking a lever suspended from the car.

SAFE.—Joseph P. White, Savannah, Ga.—This invention consists in constructing the safe of an inner thick and strong shell of metal, and an exterior thin shell made of chilled iron, and having on its interior surface flint, emery, or any other substance which in drilling will generate sparks of fire to explode powder, with which a space between the two shells is to be filled so as to blow off the outer shell, to create alarm and to disable the burglars.

WATER WHEEL.—W. E. Hill, Renovo, Pa.—This invention consists in an improved arrangement of buckets, designed to cause both a direct and reacting application of the water; that portion of the buckets designed for the reacting application of the water being made adjustable by the action of springs to vary the discharge orifices, as the volume of water or the resistance of the wheel changes. It also consists in an improved arrangement of the gates, and also in an arrangement for packing the joints between the wheel and the scroll.

COTTON PRESS.—C. J. Beasely, Petersburg, Va.—This invention relates to improvements in cotton presses, having for its object an improved arrangement of means whereby the follower may be worked, both up and down, by the same operating lever, working in the same way; also a simple arrangement for varying the leverage, as the force required is greater or less; also an improved arrangement of the follower to facilitate filling the case.

RAILROAD CAR.—Perry Prettyman, Paradise Spring Farm, Oregon.—This invention relates to improvements in railroad cars, the object of which is to prevent them from running or being thrown off the track from any cause. It consists in the application to the car trucks of auxiliary axles and wheels so arranged that the said wheels will be suspended between an inward projecting portion or flange of the top of the rail, and a corresponding widened portion of the bottom of the rail, the upper flange of the said rail serving by its action on the auxiliary wheels to hold the cars from running off, and the lower flange serving for the track of the said auxiliary wheels, which receive and support the cars of the main axle brake.

OPERATING CHURN DASHER.—William Kegg, Lasselsville, N. Y.—This invention relates to an improvement in the method of operating the dashers of butter churns of the old style, or where the dasher is attached to a rod or staff, and given a vertical reciprocating motion by hand, or by means of any other suitable power.

SELF-WINDING CLOTHES-LINE MACHINE.—W. A. Coventry, Paterson, N. J.—This invention relates to a new and useful improvement in an apparatus for automatically winding up a cord, or clothes-line.

SELF-CLOSING FAUCET.—A. Brinckmann, New York city.—This invention relates to a new faucet for water pipes and other purposes, which is to be self closing, so that no liquid can be lost by accidentally leaving the faucet open. The invention consists in attaching a weighted lever to the spigot of the faucet which lever will always automatically draw the faucet closed, and which will also serve as a handle for operating the faucet.

HORSE POWER.—C. L. Drury, Rockingham, Vt.—This invention relates to a new horse power of that class in which the animal moves on an inclined plane or disk, and the invention consists in the arrangement of devices for adjusting the position of said wheel and in the application of adjustable

anti-friction bearings for the transmitting axle, as well as in the general arrangement and combination of parts.

TELEGRAPH APPARATUS.—David Flanery, New Orleans, La.—The object of this invention is to provide a portable telegraph apparatus comprising a "relay magnet," "key," "sounder," "local galvanic battery," and writing desk, all contained in a portable box such as may be slung upon the shoulder by a strap, to be carried from place to place by the operator. Also, to provide an improved local battery specially adapted for a portable apparatus.

GALVANIZED IRON.—J. D. Grey, Pittsburgh, Pa.—This invention consists in preparing the iron, previous to galvanizing it, in a way calculated to provide a better article in point of toughness and appearance when finished, the zinc covering being disposed much more evenly and in large spangles over the entire surface of the sheet.

SIDE-SADDLE TREES.—Louis Triplett, Columbia, Ky.—This invention relates to improvements in the construction of side-saddle trees, and consists in forming the cantel belly, right horn, and spring, of one piece of sheet metal, and the "straining" and foundation of the seat of another piece in a way to produce an improved form and more economical construction.

BIT HOLDER.—Jacob Winkelhouse, New York city.—The present invention relates to a new and useful device for securing bits in their places by means of a slotted bolt and spring.

BROWNING AND MAKING COFFEE.—James Galloway, Chetopah, Kansas.—This invention relates to a new and useful improvement in the method of preparing coffee, whereby much time is saved, and the entire aroma is preserved.

TRACTION ENGINES.—C. C. Merriman, Brighton, N. Y.—This invention relates to an improvement in traction engines, and it consists in producing the traction by feet secured to revolving wheels.

THRASHING MACHINE.—Joshua Siep and Henry J. Schmeyer, Macungie, Pa.—This invention relates to new and useful improvements in machines for thrashing and cleaning grain, whereby many of the objections to the old style of thrashing machine are obviated.

RAILROAD.—George V. Sheffield, and Jas. F. Coburn, Hopkinton, Mass.—This invention relates to new and useful improvements in railroads, having reference both to the rail and track, and the flange and tread of the wheel to run thereon.

WATER-CLOSET VALVE.—W. Smith, San Francisco, Cal.—This invention relates to new and useful improvements in valves for water closets, whereby they are rendered more useful and durable than they have hitherto been.

SELF-CLOSING TELEGRAPH KEY.—Joseph J. B. Frey, New York city.—This invention relates to a new and improved key for telegraphic instruments, whereby the circuit is always kept closed when the instrument is not at work, the key automatically closing when released from the pressure of the finger or hand.

MACHINE FOR PICKING WOOL.—James Cate, Rumsey, Ky.—This invention relates to a new and useful improvement in machines for picking and cleaning wool.

HAME-BENDING MACHINE.—J. H. Preston, Jefferson City, Mo.—This invention relates to a new and improved machine for bending wooden hames whereby that operation is greatly facilitated.

EXTENSION TABLE.—Joseph P. Curry, Vincennes, Ind.—This invention relates to a new and useful improvement in extension tables, whereby they are made more convenient and useful than they have heretofore been, and consists in extending and contracting the table by means of a shaft, crank, and cords.

VAPORIZING FURNACE AND PANS.—L. Scott, Sinking Spring, Ohio.—This invention relates to a furnace and an arrangement of pans for boiling and vaporizing juice or sirup, in the process of working sorghum sugar or molasses, and for other purposes of a similar nature.

THRASHING MACHINE.—F. A. Geisler, Bristol, R. I.—This invention relates to new and useful improvements in machines for thrashing grain, and winnowing or cleaning it at the same time.

HAY FORK.—E. J. Fenn, Medina, Ohio.—This invention relates to new and useful improvements in forks for handling hay, and consists in operating two tines by means of a bar and lever.

COMPOUND FOR RESTORING DAMAGED TOBACCO.—Wesley A. Wright, Liberty, Va.—The object of this invention is to produce a substance for restoring the good qualities of moldy or decaying tobacco so that it will again receive as nearly as possible the qualities and appearance of fresh and good tobacco, for the purpose of preventing its loss.

STUMP EXTRACTOR.—T. W. Fay, Camden, N. J.—This invention relates to a new stump extractor, or stone and log lifter of that class in which the power is applied to a screw shaft by means of a nut. The invention consists in a new manner of supporting the nut to avoid friction, and in a novel manner of fastening the supports to the main plate and the shoes to the supports.

RAILROAD CAR HEATER.—Josiah E. Kline, Wheeling, West Va.—This invention relates to a new apparatus for heating railroad cars and for properly ventilating the same, and consists in the general construction and arrangement of parts for producing a fireproof and convenient heating attachment.

UNIVERSAL GUIDE FOR STAMP MILLS.—C. A. H. Rice and A. J. Van Deren, Central City, Colorado.—This invention relates to a new device for guiding the shafts of stamp mills, and consists in the general construction of parts, whereby the guide pieces are securely held and readily adjusted.

WIND WHEEL.—Charles C. Harris, Lafayette, Ill.—The object of this invention is to provide a simple and cheap wind wheel with self-adjusting wings, or brackets, capable of opening to the wind on one side and closing on the other. The invention also comprises an improved arrangement for transmitting motion from the said wheel, especially adapted for operating pumps.

LAMP.—H. Long, Kittanning, Pa.—This invention consists in an improved arrangement of means for conducting the wick through a reservoir of water after having taken up the oil, the said water reservoir being interposed between the oil and the flame so as to prevent generation of gas; also to prevent the contact of the flame with the oil in the reservoir.

CULTIVATING HOE.—John J. Ray and James R. Young, New Orleans, La.—This invention consists in the arrangement of a pair of scraping blades, of wood or metal, to work on the ground in an edgewise position in the form of two sides of a triangle, cut off at some distance from the apex, and connected by framing so that it will allow the said blades to work on each side of the row without disturbing the standing plants, the ends most widely separated being drawn foremost, to gather the earth and turn it up in a double ridge against the rows of plants. Near the bottom inside, the blades are provided with laterally projecting cutters to sever the weeds, and wheels are placed at the front end on which the frame may be tilted to be moved from one row to the other.

FLY BRUSHES.—Henry R. Robbins, Baltimore, Md.—This invention relates to a portable apparatus in which a brush or fan is made to oscillate by means of machinery for the purpose of driving flies from a table or bed, and creating, at the same time, a breeze.

HORSESHOE.—Capt. Charles Peillard, of the Empire of France.—This invention consists in dividing a horseshoe in two parts, of equal length, the division taking place at the middle, and the line of section being partly straight and partly circular, so as to form, at the extremity of one branch, a curved projection, and, at the adjacent extremity of the other branch, a depression of corresponding shape, by which the two branches are connected when nailed upon the hoof, without a hinge.

RESERVOIR BACK FOR COOKING STOVES.—Henry R. Robbins, Baltimore Md.—The object of this invention is to provide an attachment for cooking stoves, which will enable the cook always to have a supply of hot water on hand, the quantity and boiling temperature of which can be seen at a glance, without removing the cover of the boiler. At the same time, the construction and arrangement of the apparatus are such as to protect the back of the fire-pot from burning away, thereby rendering the stove more durable and less expensive, in the matter of repairs, than those heretofore introduced into general use.

LAMP SHADE.—R. W. Churchill, Bridgeport, Conn.—This invention relates to improvements in lamp shades for application to the chimneys of kerosene and other similar lamps, having for its object to provide an improved construction and arrangement for shades made in sections for expanding and contracting, to vary the size of the shade.

HORSE HAY RAKE.—W. P. Ewing, Fancy Hill, Va.—This improvement in horse hay rakes is designed to provide a simple and efficient machine for attachment to a sulky, whereon the operator may ride while driving and attending to the rake, and it consists in a rake having one set of teeth, detachably connected to the sulky, and provided with suitable operating and governing apparatus.

HOISTING APPARATUS.—G. H. Kamnacher, Columbus, Ohio.—The object of this invention is to provide a cheap and simple portable hoisting apparatus for bricklayers and builders, for hoisting the building material, and it consists of a peculiar arrangement, on a bench or "horse," of a large grooved hoisting wheel, a pair of balancing platforms, vertical guides for the same, and hoisting ropes.

COMBINATION LOCK.—J. P. White, Savannah, Ga.—This invention relates to improvements in combination locks, consisting of a series of vibrating tumblers, notched at the ends for the reception of a lug on the bolt, when sliding back for unlocking, which are provided with auxiliary tumblers, to be acted on by a series of rotating cam disks worked by the key, to move the said tumblers for bringing the notches therein to the position coinciding with the lug on the bolt, to allow it to be retracted. These auxiliary tumblers are engaged with the others by spring dogs, when the bolt is at the locked condition, and the whole are suspended on the cam wheels, so that the notches do not coincide with the lug on the bolt, thereby preventing its withdrawal.

Official List of Patents.

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FOR THE WEEK ENDING SEPT. 21, 1869.

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94,934.—REVENUE STAMPS FOR CIGARS.—Anson Atwood, New York city. Antedated September 13, 1869.
94,935.—ALLOY FOR TUBING.—John S. Barden, Providence, R. I.
94,936.—ALLOY FOR MAKING WATER METERS.—John S. Barden, Providence, R. I.
94,937.—BOILER FEED WATER REGULATOR.—John S. Barden, Providence, R. I.
94,938.—WASHING MACHINE.—George W. Benton, East Pike, N. Y.
94,939.—FELTING MACHINE.—Job W. Blackham (assignor to himself and James H. Prentice), Brooklyn, N. Y.
94,940.—BRUSH.—Charles Boeckh, Buffalo, N. Y.
94,941.—BRUSH.—Samuel Brillinger, Clarence Center, N. Y.
94,942.—APPARATUS FOR EVAPORATING CANE JUICE.—M. S. Bringier, Ascension Parish, La.
94,943.—AXLE BOX LID.—John Bristow, Detroit, Mich. Antedated September 6, 1869.
94,944.—SIGNS FOR STREET LAMPS.—Erastus Caswell and Herman Lachmann, Chicago, Ill.
94,945.—SASH PULLEY.—Charles B. Clark, Buffalo, N. Y.
94,946.—SCRUBBER.—Charles E. Clum (assignor to himself and Moses C. Haskell), Troy, N. Y.
94,947.—MACHINE FOR CLOSING THE SEAMS OF METALLIC VESSELS.—E. T. Covell, Brooklyn, N. Y. Antedated September 10, 1869.
94,948.—PROTECTOR FOR STEMS OF BOATS.—Wm. P. Davis and Samuel Elwell, Jr., Gloucester, Mass.
94,949.—DOOR SPRING.—Frederick Dodge, Syracuse, N. Y.
94,950.—SURGE RELIEVER FOR CABLES.—John J. Emery, Owl's Head, Me.
94,951.—NECKTIE.—Franklin Field, Troy, N. Y.
94,952.—GRINDING MILL.—Morrison Foster, Cleveland, Ohio.
94,953.—PORTABLE FENCE.—Newton J. Glover, Waveland, Ind. Antedated August 31, 1869.
94,954.—WASHING MACHINE.—J. T. Greenwood, Beloit, Wis.
94,955.—COMPOUND FOR EMERY WHEELS AND OIL STONES.—N. B. Hadley and R. J. Costain, Northampton, Mass.
94,956.—MACHINE FOR DRESSING MILLSTONES.—J. B. Harris, Ottawa, Ill.
94,957.—MOUNTING LEASE RODS FOR LOOMS, ETC.—Wm. A. Hastings, Thorndyke, Mass.
94,958.—TILE MACHINE.—Simeon Hawkins, Carmel, Ind.
94,959.—APPARATUS FOR EVAPORATING CANE JUICE.—L. S. Hereford, West Baton Rouge parish, La.
94,960.—BRAKE SHOE.—Amos A. Hotchkiss (assignor to himself and Wm. J. Qualey), Hannibal, Mo.
94,961.—ARGAND LAMP.—Andrew B. Howland, Titusville, Pa.
94,962.—HOLDBACK FOR CARRIAGES.—Thomas F. Kiff, Havana, N. Y., assignor to Elijah A. Simmons, Chatsworth, Ill.
94,963.—FIELD FENCE.—Edwin King, Dunkirk, N. Y.
96,964.—ADJUSTABLE HARROW.—John Kinhart, Athens, Ill.
94,965.—METALLIC BUTTON-HOLE OR CLASP.—Jeremiah R. Little, Jamaica Plains, Mass.
94,966.—HARVESTER.—Charles E. Mason, Elgin, Ill.
94,967.—DRYER.—Oscar F. Mayhew, Indianapolis, Ind.
94,968.—GAGE FOR TURNING BEVELS.—George W. Moore, Worcester, Mass.
94,969.—METHOD OF PURIFYING NITRIC ACID.—George M. Mowbray, Titusville, Pa.
94,970.—RAILWAY FROG.—James Patterson, Hornellsville, N. Y.
94,971.—ARCHIMEDEAN SCREW WATER ELEVATOR.—Wm. H. Plumb, New York city. Antedated September 3, 1869.
94,972.—CHIMNEY.—Peter Portois, San Francisco, Cal.
94,973.—STEAM ENGINE VALVE.—Elting Post, Boston, Mass.
94,974.—WEIGHING SCOOP.—David H. Priest, Watertown, and John R. Howard, Charlestown, Mass.
94,975.—ANIMAL TRAP.—W. N. Reed, Washington, D. C.
94,976.—SEWING MACHINE.—T. S. Reeve, C. D. Smith and H. L. Swartwout, Chicago, Ill.; said Smith and Reeve assign their right to said Swartwout.
94,977.—BASKET FOR GRINDING TILE.—Peter C. Reniers, Pittsburgh, Pa.
94,978.—STEAM GENERATOR.—S. T. Russell, Springfield, Ohio.
94,979.—SPRING SEAT FOR VEHICLES.—Samuel S. Simmons, Watsonville, Cal.
94,980.—NEEDLE THREADER.—Corelli W. Simpson, Bangor, Me.
94,981.—CARRIAGE SPRING.—Alfred E. Smith, Bronxville, N. Y. Antedated September 15, 1869.
94,982.—GAS MACHINE.—Andrew R. Spang and Daniel F Sheaf, Dayton, Ohio.
94,983.—CLOTHES POUNDER.—Orrin J. Stickles, Canton, N. Y
94,984.—FIREPLACE.—James C. Strong and Luther C. McNeal, Buffalo, N. Y.; said Luther C. McNeal assigns his right to said James C Strong.
94,985.—MACHINE FOR PAINTING FLOOR OILCLOTHS.—C. W. Stront and Amos Wilder, Hallowell, Me.
94,986.—STOVEPIPE DAMPER.—Isaac Van Hagen, Chicago, Ill.
94,987.—BAG AND SHOE-STRING FASTENER.—John H. Weeden (assignor for one half to George C. Thomas), Waterbury, Conn.
94,988.—DUMPING CART.—F. Hancock Williams, Washington, D. C.
94,989.—WAGON-TONGUE SUPPORT.—George Alexander, Romney, Ind.
94,990.—ROCKING CARRIAGE.—A. Armando, New York city.
94,991.—CURRY COMB.—J. M. Baker, Marshfield, Ohio.
94,992.—VELOCIPEDE.—Robert J. Barr, Philadelphia, Pa.
94,993.—COTTON PRESS.—Charles J. Beasley (assignor to himself and Tappey, Lamsden & Co., Petersburg, Va.
94,994.—MANUFACTURE OF IRON AND STEEL.—Henry Bessemer, London, England. Patented in England, December 31, 1857.
94,995.—MANUFACTURE OF IRON AND STEEL.—Henry Bessemer, London, England. Patented in England, March 21, 1868.
94,996.—MANUFACTURE OF IRON AND STEEL.—Henry Bessemer, London, England. Patented in England, March 21, 1868.
94,997.—MANUFACTURE OF IRON AND STEEL.—Henry Bessemer, London, England. Patented in England March 21, 1868.
94,998.—SELF-CLOSING FAUCET.—A. Brinckmann, New York city.
94,999.—WOOL-PICKING MACHINE.—James Cate, Rumsey, Ky.
95,000.—LAMP SHADE.—R. W. Churchill, Bridgeport, Conn.
95,001.—WATER CLOSET.—Geo. Conrod, New York city. Antedated Sept. 8, 1869.
95,002.—SELF-WINDING LINE MACHINE.—Wm. A. Coventry, Paterson, N. J.
95,003.—EXTENSION TABLE.—J. P. Curry (assignor to S. S. Burnet), Vincennes, Ind.
95,004.—BOX LOOP FOR CARRIAGE TOPS.—C. H. Davis, Syracuse, N. Y.
95,005.—REVOLVING PLOW.—William J. Dawson, Brookfield, Mo.
95,006.—HAY AND GRAIN ELEVATOR.—John Dennis, Oswego, N. Y.
95,007.—HAMES FASTENER.—M. L. Drake, Rockford, Ill.
95,008.—HORSE-POWER.—C. L. Drury, Rockingham, Vt.
95,009.—METHOD OF HEATING TAN-BARK LEACHES BY STEAM.—L. C. England, Philadelphia, Pa.
95,010.—HORSE HAY RAKE.—Wm. P. Ewing, Fancy Hill, Va.
95,011.—STUMP EXTRACTOR.—T. W. Fay, Camden, N. J.
95,012.—HORSE HAY FORK.—E. J. Fenn, Medina, Ohio.
95,013.—TELEGRAPH APPARATUS.—David Flanery, New Orleans, La.
95,014.—SELF-CLOSING TELEGRAPH KEY.—J. J. B. Frey, New York city.
95,015.—COFFEE ROASTER.—James Galloway, Chetopah, Kansas.
95,016.—THRASHING MACHINE.—F. A. Geisler, Bristol, R. I.
95,017.—MANUFACTURE OF GALVANIZED IRON.—J. D. Grey (assignor to himself and John Lippincott), Pittsburgh, Pa.
95,018.—WIND MILL.—C. C. Harris, LaFayette, Ill.
95,019.—SEWING MACHINE.—M. C. Hawkins, Edinborough, Pa.
95,020.—WATER WHEEL.—Wm. E. Hill, Renovo, Pa.
95,021.—REVOLVING DOUGH MIXER.—Thomas Holmes, Williamsburgh, N. Y.
95,022.—HOISTING APPARATUS.—G. H. Kamnacher, Columbus, Ohio.
95,023.—OPERATING CHURN DASHER.—William Kegg, Lassellsville, N. Y.
95,024.—DOOR KNOB.—J. J. King, New York city.
95,025.—FRUIT JAR.—J. M. W. Kitchen, Brooklyn, N. Y.
95,026.—RAILROAD CAR HEATER.—J. E. Kline, Wheeling, West Va.
95,027.—LAMP.—Henry Long, Kittanning, Pa.
95,028.—PROCESS FOR PRESERVING EGGS.—John Longmaid, New York city.
95,029.—CHURN.—S. D. Lucas, Winterpock, Va.
95,030.—FIREPLACE.—R. D. McDonald, Jersey City, N. J.
95,031.—CORN HARVESTER.—John McLeish, Chicago, Ill.
95,032.—TRACTION ENGINE.—C. C. Merriman, Brighton, N.Y.
95,033.—MACHINE FOR GRINDING MOWER & REAPER KNIVES.—Henry Millard, New York city.
95,034.—MACHINE FOR WINDING BOBBINS.—F. H. Morrill, Philadelphia, Pa.
95,035.—CULTIVATOR.—Isaac J. Morrow, Everton, Ind.
95,036.—COMPOSITION FOR USE IN FIRE EXTINGUISHERS.—J. M. Muterse and H. G. De Valory, Guerande, France.
95,037.—MACHINE FOR BENDING WOOD.—H. H. Nichols (assignor to P. S. Whitcomb), Keeseville, N. Y.
95,038.—MEAT-CUTTING MACHINE.—August Nittinger, Jr., Philadelphia, Pa.
95,039.—EXTRACT OF MADDER FOR DYEING AND PRINTING.—Alfred Paraf, New York city, assignor to Edward Sabine Renwick, trustee.
95,040.—PROCESS FOR PRINTING COLORS ON TEXTILE MATERIALS.—Alfred Paraf, New York city, assignor to Edward Sabine Renwick, trustee.
95,041.—RAILWAY RAIL CHAIR.—D. C. Pierce, Washington, D. C. Antedated Sept. 8, 1869.
95,042.—MACHINE FOR BENDING WOOD.—J. H. Preston, Jefferson City, Mo.
95,043.—RAILWAY CAR TRUCK.—Perry Prettyman, Paradise Spring Farm, Oregon.
95,044.—CULTIVATING HOE.—J. J. Ray and J. R. Young, New Orleans, La.
95,045.—GUIDE FOR STAMP MILLS.—C. A. H. Rice and A. J Van Deren, Central City, Colorado Territory.
95,046.—RAILROAD STATION INDICATOR.—A. C. Rodgers (assignor to himself and Lewis Shaffer), Fort Washington, Pa.
95,047.—STRAW CUTTER.—J. H. Ryland, Baltimore, Md.
95,048.—SOFA AND BEDSTEAD.—William H. Schwalbe, New York city.
95,049.—PAN AND FURNACE FOR EVAPORATING.—Lewis Scott, Sinking Spring, Ohio. Antedated Sept. 10, 1869.
95,050.—COMBINED THRASHING MACHINE AND SEPARATOR.—Joshua Seip and H. J. Schmeyer, Macungie, Pa.
95,051.—RAILWAY.—G. V. Sheffield and J. F. Coburn, Hopkinton, Mass.
95,052.—SAW.—Joseph H. Smith, and Elijah G. Peckham, Toledo, Ohio.
95,053.—NICKEL-FACED TYPE.—Luther L. Smith, Brooklyn, N. Y.
95,054.—SLOW-CLOSING VALVE FOR WATER CLOSETS.—W. Smith, San Francisco, Cal.
95,055.—SIDE-SADDLE TREE.—Louis Triplett, Columbia, Ky.
95,056.—COFFEEPOT.—H. Von Holten, Hoboken, N. J.
95,057.—ROTARY MECHANICAL POWER.—A. G. Waterhouse, San Francisco, Cal.
95,058.—COMBINATION LOCK.—J. P. White, Savannah, Ga.
95,059.—SAFE.—J. P. White, Savannah, Ga.
95,060.—BIT HOLDER.—Jacob Winkelhouse, New York city.
95,061.—MINING PUMP.—Hiram Wolf (assignor to himself and A. D. Wolf), St. Louis, Mo.
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95,178.—Fence Post.—M. K. Butterfield, Eddyville, N. Y.

REISSUES.

85,578.—Cooking Stove.—Dated Feb. 2, 1869; reissue 3,642.—Clement Olhaber, Cincinnati, Ohio.
92,357.—Steam Water Elevator.—Dated July 6, 1869; reissue 3,643.—W. E. Prall, Washington, D. C., and A. C. Rand, New York city, assignees of W. E. Prall.
42,118.—Grate.—Dated March 29, 1864; reissue 3,644.—G. L. Smith, Brooklyn, N. Y.
70,941.—Steam Engine.—Dated November 19, 1867; reissue 3,645.—Jules Strehler, New York city, assignee of Eugene Bourson.
92,840.—Rotary Oven.—Dated July 20, 1869; reissue 3,646.—D. A. Kennedy, William Wadsworth, and E. D. Murray, Darien, Wis., assignees of D. A. Kennedy.

DESIGNS.

3,664 to 3,666.—Hinge.—Milton Bradley, Springfield, Mass., assignor to the Union Manufacturing Company, New Britain, Conn. Three patents.

EXTENSIONS.

Knitting Machine.—Clark Tompkins, of Troy, N. Y., and John Johnson, of Boston, Mass.—Letters Patent No. 13,586, dated Sept. 18, 1855; reissue No. 965, dated May 15, 1860.

Machinery for Folding and Measuring Cloth.—J. D. Elliot of Leicester, Mass.—Letters Patent No. 13,542, dated September 11, 1855.

Steam Gage Cocks.—Albert Bisbee, of Chelsea, Mass.—Letters Patent No. 13 563, dated September 18, 1855.

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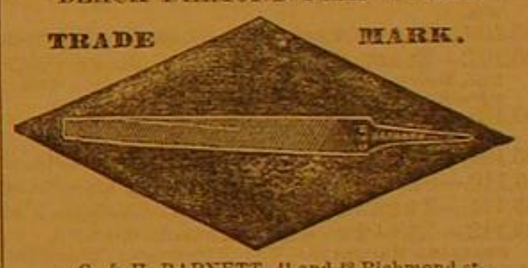

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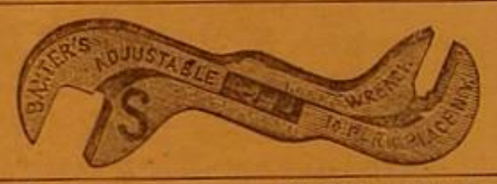

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SCIENTIFIC AMERICAN

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ADDRESS OF THE HON. S. S. FISHER, U. S. COMMISSIONER OF PATENTS BEFORE THE AMERICAN INSTITUTE.

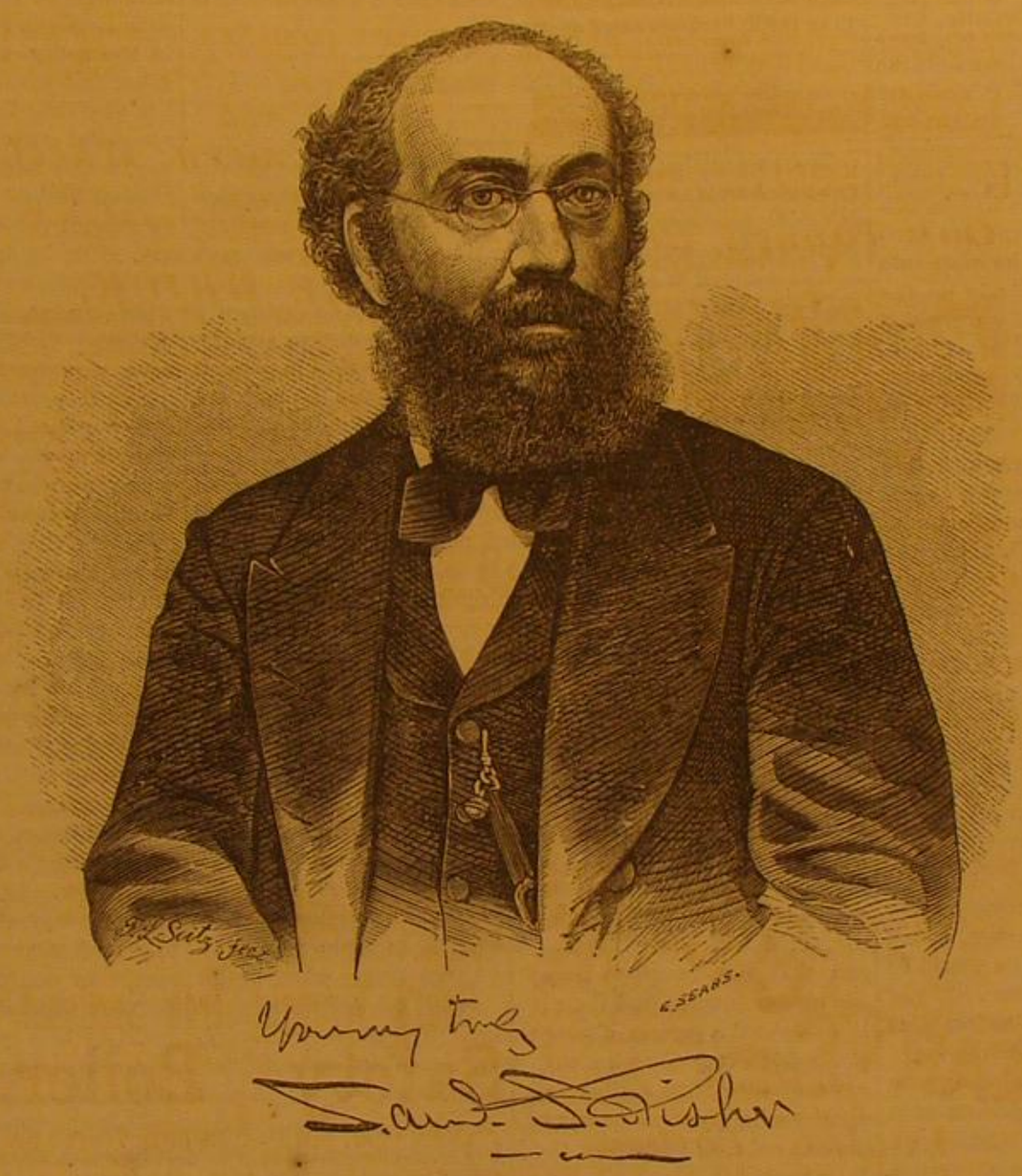
On the evening of the 28th September, the Fair of the American Institute was honored by the presence of the Hon. Samuel S. Fisher, Commissioner of Patents, who delivered an interesting address on the occasion, which is here given in full. We also present a portrait of this gentleman who has acquired great popularity by his energy and promptness in the transaction of business, as well as by the marked ability he has displayed in the performance of the arduous duties of his office. The vexatious delays which formerly tormented inventors no longer exist; and the whole business of the office has been systematized so thoroughly that it meets with universal approval.

No Commissioner of Patents has achieved greater popularity, in so short a time, than Mr. Fisher. This is due to the rare combination of natural talent and educational fitness he brings to bear upon the work of the office. As our readers are aware he resigned a lucrative legal practice, in accepting the Commissionership; and the legal acumen which had secured him this practice enables him now to grasp nice distinctions, and to decide quickly and soundly upon all cases which, in the routine of the department, are brought before him.

THE COMMISSIONER'S ADDRESS.

LADIES AND GENTLEMEN: I left Washington with no other object than to visit this exhibition and extend the right hand of fellowship to those who were endeavoring to secure its success. I had no thought of speaking to you, and should have been glad if the managers had been willing to accept the seeing of the eye for the hearing of the ear. I bring you, therefore, no well-considered oration, but desire only to offer a few plain words of greeting, and a thought which it has occurred to me this may be the proper time and place to express. Among the earliest reminiscences of my boyhood are the Fairs of the American Institute, which were held many years ago—so many that I fear to count them—in Niblo's and Castle Garden. Of details I remember very little, except that there were models of ships and steamboats, and that two or three boys lost their fingers by injudiciously turning the horse powers, and that everything wound up with fireworks and a grand flight of rockets by Mr. Edge, of pyrotechnic fame. Once, indeed, at Castle Garden, I believe, the closing exercises were varied by omitting the fireworks, and substituting the bombardment of the Castle of San Juan D'Ulloa by the French, which mimic siege we converted into real earnest in a few years thereafter. From the character of these recollections you will see that I must have been very young indeed.

One thing, however, was noticeable even by my young eyes, and may be noticed now—that nearly every article in the Fair bore upon it the imprint of that magic adjective "patented." Those were the days just after the passage of the great Patent act of 1836, which established what is now the distinctively American system in regard to the grant of letters patent, and yet already the Patent Office had become a power in the land, and was sheltering under its wings the little brood of new-fledged American inventions. I have said that the fact which I noticed in my boyhood may be noticed now. You cannot walk through any of these aisles without finding in every niche, upon every table, above and around you, articles which have themselves been patented or are the product of patented processes or machines. I suppose, if upon your outer wall a banner were displayed announcing that no article would be received for exhibition with the creation of which letters patent had nothing to do, that very few of the many things upon exhibition here to-night would be stopped at the threshold by the prohibition. For this result, this and kindred institutes and associations are, in part, responsible; a responsibility, let me hasten to say, for which they need in nowise be ashamed. These great exhibitions—displays—advertisements—as I think one of your papers has called them, have made many an invention familiar to the public that would otherwise have remained unknown; have given many an impulse to some halting enterprise that would otherwise have failed to reach the goal; have called capital to the aid of genius, by showing to capital where it might profitably be employed. Many an inventor has grown famous, and many a manufacturer rich, through the medium of your expositions, the awards of your juries, and the distribution of your diplomas and medals. The work of the Patent Office and of all such societies as this, is one. It has for its purpose the protection and development of the inventive genius of our country. We are more especially charged with protection, *you* with development, or, as I suppose you would prefer to phrase it, our motto is, "Protection to American genius," while yours is, "Protection to American industry." How both have prospered in their work may be learned by comparison of the earlier Fairs of this Society with the present, and by a glance at the Patent Office reports.



HON. S. S. FISHER, COMMISSIONER OF PATENTS.

WHAT HAS BEEN DONE IN FORTY YEARS.

During the forty years that this institute has been in existence, the department of huge vegetables, and of quilts with wonderful patchwork, has become sensibly smaller, while that of wonderful labor-saving machines and beautifully-wrought fabrics has become sensibly greater. (I believe I have seen a solitary pumpkin to-day). In the days when I gazed with delight upon Mr. Edge's fireworks, the click of the sewing machine was never heard; electricity had not yet condescended to come out of the lecture room and enter the lists as a practical science; india-rubber, hard and soft, with its manifold applications, was a mere black and sticky plaster for shoes and ugly overcoats. We had the steam engine, as it came from Watt, and the steamboat as it was left by Fulton.

As for these beautiful textiles, it would have seemed madness to have dreamed that we should ever dare to dream of them thereafter. In the Patent Office, under the act of 1836, the Commissioner and "one examining clerk" were thought to be sufficient to do the work of examining into the patentability of the two or three hundred applications that were offered. Now sixty-two examiners are overcrowded with work, a force of over three hundred employés is maintained, and the applications have swelled to over twenty thousand per annum. This year the number of patents granted will average two hundred and seventy-five per week, or fourteen thousand in the year. These numbers are so startling, when compared with the days of which I have been speaking, that people are sometimes ready, in their haste, to suppose that there must be something wrong about the system, and some have doubtless been prepared to join hands with a few of your disaffected cousins across the water and to demand the repeal of the Patent laws and the abolition of the system itself.

OUR PATENT SYSTEM DEFENDED.

It has occurred to me, that, standing here to-night as the official representative of this system, it would not be inappropriate for me to say a few words in its behalf. In the first place no comparison can properly be made between our system and that of other countries. In England and on the Continent all applications are patented without examination into the novelty of the inventions claimed. In some instances the instrument is scanned to ascertain if it covers a patentable subject-matter, and, in Prussia, some slight examination is made into the character of the new idea; but in no case are such appliances provided, such a corps of skilled examiners, such provision of drawings, models, and books, such a collection of foreign patents, and such checks to prevent and review error as with us. As a result, an American patent has, in our Courts, a value that no foreign patent can acquire in the Courts of its own country. This has rendered property in foreign patents exceedingly precarious. Such as are granted have not been subjected to examination; they have no *prima facie* weight. Yet they *may* be valid. It is true that no one knows this, not even the inventor; but the possibility that they may prove so makes them weapons in the hands of unscrupulous men to frighten and coerce manufacturers who have very imperfect means, short of litigation, of arriving at the truth or falsehood of the self-asserted pretensions of the patentee. On the other hand, the inventor is in as much doubt as the manufacturer. He does not know what to claim as his invention. As he alone is to fix the limit, as there is to be no revision, he may claim much or little, how much or how little he must always doubt. As a consequence, foreign patents are of doubtful value, and the whole system has fallen into some disrepute.

THE SUPERIORITY OF AMERICAN INVENTIONS IN EUROPE.

I suppose that the foreign patents of American inventors, that have been copies of patents previously granted in this country, are the best that are granted abroad, and I know that many an English or French invention that has been patented without difficulty there, has been stopped in its passage through our office by a reference to some patent previously granted in this country, or perhaps in the very country of its origin. In spite of our examination, which rejects over one third of all the applications that are made, or, more properly, because of it, invention has been stimulated by the hope of protection; and nearly as many patents will issue in the United States this year as in the whole of Europe put together, including the British isles. But a few days ago I took up a volume of Italian patents to see what progress the new Kingdom was making in invention, when I was amused and gratified to find on every page the name of the universal Yankee, re-patenting there his American invention, and, I suspect, much the best customer in the Patent Office of united Italy. The truth is, we are an inventive people.

A NOVEL CATALOGUE OF INVENTIONS.

Invention is by no means confined to our mechanics. Our merchants invent, our soldiers and our sailors invent, our schoolmasters invent, our professional men invent, aye, and our women and our children invent. Cheap protection has been a fertilizer that has produced much growth of brain and much fruit of discovery. One man lately wished to patent the application of the Lord's Prayer, repeated in a loud voice, to prevent stammering; another claimed the new and useful attachment of a weight, or other article possessing gravity, to a cow's tail to prevent her from switching it while milking; another proposed to cure worms by extracting them by a delicate line and a tiny hook baited with a seductive pill; while a lady patented a crimping pin, which she declared might also be used as a paper-cutter, as a skirt supporter, as a paper file, as a child's pin, as a bouquet-holder, as a shawl fastener, or as a book mark. Do not suppose that this is the highest flight which the gentler sex has achieved. It has obtained many other patents, some of which have no relation to wearing apparel, and are of considerable value.

THE VALUE OF PATENTS CONTRASTED.

But, I am asked, what proportion of all patented inventions prove to be valuable to their projectors or to the public? One-tenth? Probably not much more than that; but, let it be remembered, there are few failures so harmless as that of a useless invention. The patent gives it a chance to prove itself

worthy of the public patronage. It simply declares that if it be good it shall not be stolen; but, if it be useless, nobody will want to steal it. But of all those who enter upon any occupation of life, how many succeed and how many fail? How many young men have entered the bar, and have failed to take rank with Evarts, O'Connor, or Brady? How many have launched their bark, laden with mercantile ventures, and have been stranded, while Claflin and Stewart were sailing into port? How many have been moved to "start a paper," who have lived as long, but not to as much purpose, as Raymond, Bennett, or Greeley? I suppose that nine failures to one success is a very fair proportion for the professions of the world, including that of the inventor; or, at all events, I do not suppose that the failures among inventors are more numerous than among every other class of workingmen. As to property in inventions, I shall not stop to discuss it. That a man having, by long experiment—by patient thought—by brilliant genius—by the expenditure of time and of means, conceived and brought to perfection and embodiment some new idea, having created some new substance, put in motion some new machine, put some old force to new work, or given to some new force a field for labor, is not entitled to call this which he has done his own and to set his price upon it, need not I think be argued before honest men? If we owe nothing to the men who have made this century so illustrious by their great conceptions, then we owe nothing to anybody, and repudiation ought to be the watchword of the age.

A CASH DEBT DUE INVENTORS—HOW TO REWARD THEM.

We do owe them much, not merely a debt of sentimental gratitude, but a debt payable in cash, which shall lift them above want, and place them upon such a pinnacle of happiness that the world shall say, "Thus shall it be done unto the man whom the nation delighted to honor!" How shall we give pecuniary consideration for inventions? There are two ways in which this might be done. One is by the purchase, for cash, by the Government of all inventions, for the use of the nation. This plan is met at the outset by the impossibility of determining the value. Every inventor supposes himself to have a fortune in every conception that he puts into wood and iron. Stealing tremblingly and furtively up the steps of the Patent Office, with his model carefully concealed under his coat, lest some sharper shall see it and rob him of his darling thought, he hopes to come down those steps with the precious parchment that shall insure him a present competency and that shall enrich his children. I should think if he were offered a million, in the first flush of his triumph, that he would hesitate about touching it without sleeping over it for a night. Yet fourteen thousand millions would be a pretty heavy bill to pay from a treasury not over full. Fourteen hundred millions might be thought an important addition to the national debt, or even one million four hundred thousand, which would be just $100 a piece for all the patented inventions of 1869. I think, therefore, that we may set aside the plan of purchase as impracticable.

HOW TO DEAL JUSTLY BY THE INVENTOR.

No commission could satisfy the inventor, and no price that we could afford to pay would take the place of the stimulus of the hope of unlimited wealth which now lightens his toil and shines like a beacon at the entrance of the harbor that he hopes to make. The other plan is to offer protection for a limited time, in payment for the new discovery. We may say to the inventor, "You have a valuable secret, which may benefit us. To disclose it without protection would be to lose it. To keep it would deprive us of its use. If you will disclose it to us by so describing it and illustrating it, as that we may fully understand it and may avail ourselves of it without difficulty, we will agree that for seventeen years you shall be protected in its use. You may make out of it what you can. When your limit of time has expired we shall have it without further payment. We cannot pay you in money, we will pay you in time." I submit that this is a fair bargain. A new thought developed, explained, described, illustrated, put on record for the use of the nation—this on the one side. The right to the exclusive benefit of this new thought for a limited time, and protection in that right—this on the other. This is the patent system. A fair contract between the inventor and the public—ideas paid for by time. It is manifest that the utmost good faith is required upon both sides. On the one hand there must really be an invention; no stealing of the ideas of other men, no crude notions resulting only in experiment. The inventor must have something to sell. On the other hand there must be protection—no infringement, no piracy, no stealing of the soul of the invention by clothing it in immaterial changes of form.

THE INVENTOR'S BEST SECURITY IS TO TAKE A PATENT.

To secure this fair dealing we have, on the one side, the Patent Office, with its examiners, its drawings, its models, its books, and its foreign patents, to scan and test the invention. On the other side we have the courts of law to protect the inventor and punish the thief. It is possible that these instrumentalities may do their work imperfectly. This may sometimes happen; but to the extent to which they do it, a fair contract for an honest and useful purpose is made and is maintained. This is the American system. Under its protection great inventions have been born, and have thriven. It has given to the world the steamboat, the telegraph, the sewing machine, the hard and the soft rubber. It has reconstructed the loom, the reaping machine, and the locomotive. It has trained up each trunk of invention until it has become a graceful tree with many branches, adorned with the fruits of many improvements and useful modifications. It has won from the older homes of the mechanic arts their richest trophies, and, like Columbus, who "found a new world for Castile and Leon," it has created new arts, in which our nation has neither competitor nor peer. Without the protection of our Patent laws, no such exhibition as this would have been possible. By far the greater number of the inventions which now crowd the shelves of the Patent Office would be missing. No doubt many weaklings would thus have been spared a contact with a cold and unfeeling world; but many vigorous children, that have come to a robust manhood, would have perished long since for want of sustenance. Men will not take the risk of introducing new inventions, of educating the people in their use, of overcoming opposition and prejudice, unless they can be assured of reasonable protection in their work until their capital has made return. They will not sow that others may reap, and, when the land is ready for the harvest, come forth with greater capital and more laborers, and thrust aside the pioneer who has borne the burden and heat of the plowing and cultivating. For the proper administration of such a system as I have attempted to sketch, it is manifest that much skill and honesty are needed in the Patent Office, in all its departments. Speaking for the gentlemen associated with me, I believe them to be both skillful and honest. They pass in review many valuable interests. They are attended by a body of skillful practitioners. They are beset by an array of eager inventors. If in the examination of twenty thousand applications they make no errors, they would deserve statues of gold. That they make no more, and that in all these years and in all their number well-founded charges of corruption have been few and far between, are strong tributes to their integrity and ability. On behalf of this great American bureau of invention, I bring you greeting to-night; on behalf of the one hundred thousand American inventors whom it represents, I bespeak for it your cordial support and sympathy.

ROQUEFORT CHEESE.

[From the Grocer.]

The preparation and maturing of Roquefort cheese are the most elaborate, careful, and interesting of all cheese-manufacturing processes. In its rich color and blue vein marbling, it bears a close resemblance to our Stilton, the most esteemed by the *gourmet* of all native cheeses, of which, perhaps, it is the most carefully made. The art of dining is an eminently progressive art, and with the advance of knowledge and the refinement of taste, the Roquefort cheese increases in respect. The amiable and witty Brillat-Savarin, who was the most enlightened of gastronomes, has said that a dinner without cheese is like a lovely woman with only one eye. Many other gastronomes go further than this, and declare that no choicely concocted *menu* is complete without *fromage de Roquefort*. It cannot be regarded as a new favorite by any means; indeed it may be said to be as old as the hills which give it birth, for it was a familiar delicacy to the Roman palate, and its praises were sung by Pliny. The birthplace of Roquefort cheese is in the mountains which rise in the southeast of France, half way between the Eastern Pyrenees, and the beautiful but boisterous gulf of the Mediterranean, called the Gulf of Lyons. The village of Roquefort, in the French department of Aveyron, is a place somewhat difficult to get at. It is about ten miles from the railway station at Milhau. It lies on the flank of a mountain in one of the most beautiful valleys of France. It is sheltered by forests of superb chestnut trees, a limpid mountain stream runs before it, while behind tower the rugged sides of the plateau of Larzac, 1970 feet above the sea level. It is upon this plateau that the immense flocks of sheep from whose milk the cheese is made find their food. In the sides of these rocks is excavated a perfect cheese-citadel. The cliffs are honeycombed in every direction with caverns, natural and artificial, some of them five stories in hight. Hence we find in this district a happy combination of requisites; the summit of the plateau offering pasturage, the broad flanks of the rocks caves for warehousing and ripening, while the village so snugly nestling below supplies the human elements of the trade. The food which the ewes obtain upon the stony pasturage is composed of herbs of the choicest flavor, and a great deal of the superiority of this kind of cheese may be attributed to this cause; but it is to the caverns of Roquefort, above all, that the success of the comestible is due. The average temperature of these caverns is about 30° Fahrenheit. The learned have been fertile in theorizing as to the causes of this low and equable temperature; but, according to M. Turgan's great work "Les Grandes Usines de France," to which we are indebted for a great deal of the information to be found here, no generally accepted explanation has yet been given. Whatever may be the cause, these cool vaults were turned to good use by the local shepherds from the most distant times, and Roquefort cheeses are very often mentioned in old French charters. By an edict of the parliament of Toulouse, in 1550, the monopoly of the Roquefort cheese manufacture was granted to the village of that name, and other persons were prohibited from making it. As time went on, and commerce extended, the reputation of these caverns spread till the country folks, for miles around, came to offer payment for the privilege of depositing their cheeses in these rock-warehouses. A better system of trade was inaugurated at a later period. By this improved mode, which simplified the process of production and sale, the producers sold their wares to the proprietors of the caves, who kept the cheeses till they were perfectly ripened, and then sold them on their own account. Just before the close of the last century, the entire trade was in the hands of three rival firms, and the annual production was about 250 tuns. Between the years 1800 and 1815 the production rose to 500 tuns. After the fall of Napoleon, and until about 1830, there was an almost perfect stagnation of trade in France. The cheese fell in price, the three monopolists were ruined, and the Roquefort establishments passed into new and more numerous hands. Subsequently the trade was exposed to vicissitudes, out of which however, it came triumphant, and at the present day it is in a flourishing condition; it is better organized, and its commercial relations are widely extended. As we have stated, the cheese of Roquefort is made from the milk of ewes, of a particular breed, called the Larzac breed, named after the plateau of Larzac, which was their original feeding ground. Some years ago many attempts were made to improve the old style of manufacture, by using the milk of the cow and of the goat, as well as by introducing another breed of sheep; but these experiments always turned out unsuccessfully. Forty years since, General Saligusc put to the Larzac ewes some merino rams. He desired to try the effect of crossing—hoping to get blended in the cross-bred animal the milk-producing qualities of the ewes, and the silky merino of the ram. Unfortunately his experiments were imitated by others, for the result was a great falling off in the production of milk. A new order of things now prevails; the sheep-owners seek for animals of the pure race, careful feeding and the best hygienic conditions are relied upon to improve the quality of the fleece. But it is the milk-producing powers of these animals that occupy the farmer's most anxious care. At the present moment there are about 350,000 sheep. We may set down the rams, lambs, sick beasts, etc., at 150,000; the remaining 200,000 are milk-producing ewes. The average value of a three-year-old ewe is 20 francs. At the age of seven years they are fattened up for market, and are sold to the butcher at the September fairs, at an average of 15 francs each. It used to be the plan to feed the sheep exclusively on wild thyme, lavender, rosemary, sage, and mint, together with such other kinds of herbage as could be found growing in the rocky crevices of the stony plateau. A cow could never find sustenance in this region, even if she could pick her way over the rugged ground. Lately, however, various successful attempts have been made to introduce Burgundian hay, which has been found capable of sustaining the almost tropical heat of midsummer in this region. Each ewe yields an annual profit to her proprietor of 28 francs—that is to say, milk, 20 francs; wool, 5 francs; and lamb, 3 francs. The average annual production of six ewes is about 200 lbs., which is about double what they gave a century ago. This increased yield is due to careful keep of the animals; they never pass the night in the open air, but are brought home from the pasturages every evening to clean, spacious, and well-ventilated sheep-folds. After being allowed a rest of one hour, the whole of the ewes are driven out into a roomy courtyard, where they are milked. It requires seven persons to milk, twice a day, a flock of two hundred ewes. The way in which they are milked is somewhat peculiar; each ewe passes through three different hands. The first draws from the teat all the milk he can, by gently pressing the udder; this done, he passes on the animal to the milker seated next him. This latter gives two or three sharp blows with the back of his hand upon the teat, and then milks until the udder appears to be exhausted. The third milker then takes the ewe, strikes it in a similar way, and draws away whatever remaining milk there may be in the teat. It is usual to mix the evening's produce with that of the following morning, obtained before the departure of the flocks for the pasturage. The evening's milk is heated up, but as a rule the morning's milk is not. After being mixed and curdled by rennet in the ordinary way, the curds are subjected to very great pressure to get rid of as much whey as possible. The curd is then placed in earthenware molds, with holes pierced in them. Between the different layers of curd there is placed a small quantity of a bluish-green powder, which is supplied to the ewe-owners by the proprietors of the caves. This powder is nothing else than mold of bread prepared in a certain way specially for this purpose. The powder acts as a ferment, which, during the subsequent sojourn of the cheeses in the caves, hastens the production of those blue veins which the connoisseur exacts in his *fromage de Roquefort*. The cheeses are turned many times during the three days in which they remain in the earthenware molds. They are frequently wiped, so as to dry them without heat, and during the drying stage they are often wrapped in coarse cloths to prevent them cracking. When they have acquired the necessary consistency, they are transferred to the caves. The very best kinds of Roquefort cheese are produced in the immediate environs of the village of that name, but the adjoining valleys of Camarés and Sorgue produce a great quantity of less excellent kinds. The difference in quality is due to the fact that the pasturage is superior in the neighborhood of Roquefort. The cheeses are sold at the various fairs held during the year in the department of Aveyron. A society of proprietors purchases the cheeses from the producers at a fixed price; and by carefully drawn-up agreements the former engage to take all that the latter can produce. By this method, which appears to suit both parties, the precious cheeses escape being hawked about on hot and dusty country roads. They pass at once from the dairy to the caves. Many of the farmers forward their produce to the caves in carts, but for the most part the cheeses are taken thither on the backs of mules, which set out before sunrise so as to escape the heat as much as possible. Each description of cheese has its own distinctive mark, which shows from which dairy it has come. By this mark its maker can always be recognized. Should there be any faults of shape or quality, the maker has to answer for them to the cave proprietor. As a rule, however, the agriculturists never attempt fraud. At this stage, the cheeses weigh about 6½ lbs. each, are about eight inches in hight by four in diameter, and of a shining white color. They are all examined on entrance to the receiving room of the caves, after which they are forwarded to the salting hall, there to undergo special treatment. The temperature of this salting hall is not less than fifteen degrees lower than the outer re-

ceiving room. The light of day never enters here; every one is therefore provided with a lamp on his entrance.

Although at the period of our visit the weather was very hot and the village outside was infested by quite a plague of flies whose biting powers were perfect, we saw none in the caves—the coldness and darkness were too much for them. The salting-hall is a spacious vault in which the cheeses are piled up after having received a handful of salt on top and bottom. They are stacked up in threes, and every eight days they are turned. By this time the salt has gradually permeated them, and the floor is covered with a quantity of moisture. About six pounds of salt are used for fifty cheeses. From the salting-room they are carried to the more remote vaults, the temperature of which is still lower. These caves, which are mere apertures in the solid rock, afford that low and even temperature to which is due the success of the Roquefort cheese manufacture. A current of icy air runs so swiftly through these gloomy galleries, that an unprotected candle will be extinguished if held up. In these deep caves the cheeses are scraped, a process which is repeated several times. By these means the residuum of salt and other impurities are taken off. They are then piled up once more, in such a way that a free current of air may pass all round them, after which they are left to dry still further.

The women employed in this duty are very warmly clothed, with sabots, thick woolen shawls tied behind their back, and caps covered with a handkerchief. This toilet appears simple enough, but it is made with coquettish care. The hair is neatly braided over the temples, the cap is brilliantly white, the ribbons gay, and the handkerchief of the brightest colors. Nearly 300 women, most of them young, are employed in these caves; and as one goes downstairs at the entrance, one hears the sound of sabots and voices mingling together in a confused Babel of noises. To your sense of smell, there is the prevailing odor of cheese; to your sense of hearing, not an unpleasant vibration of voices. Indeed, some of these women excel in singing snatches from operatic melodies. A never-ceasing activity goes on in these dark caverns lighted only by the little portable lamps which the workwomen carry about with them. These women are called *cavaniéres*, and are engaged for a season of eight months at a salary of 200 francs. They sleep in dormitories provided by the cave-owners, who also board them. The dexterity of these cheese-scrapers is very great, and their style of manipulation most rapid. They hold the cheese in one hand, lightly pressing it against the breast, while with the other they rapidly pass the blade of a sharp knife over top, bottom, and sides. In this fashion the *cavaniéres* remove a certain kind of moldiness which is developed upon the exterior of the cheese under the influence of the cave atmosphere. The whiteness and fineness of this moldiness are held to attest the beneficial action of the caves as a maturing agent. If this moldiness ceases to be white and evenly deposited, and becomes more or less thickly coated and darkly marbled, it is a sign that the ripening process is going on badly. This, however, rarely happens, especially in the older caves. The first scrapings are edible, and are made up into little rolls, which are much relished, and find a ready sale in the country round about. After two or three weeks the cheeses no longer put on a white moldiness. The rapidly hardening cheese now assumes a gray tint, with reddish streaks and blue dots. Still the scraping goes on, but there is considerably less to take off. At length, after a stay of between six and eight weeks, the cheese is in a fit condition to be sent into the market. It has by this time acquired the proper reddish tint, streaked with blue veins.

This is the *fromage de Roquefort* so highly esteemed in France and elsewhere. In the months of August and September it is to be found on the table of every *restaurateur* in France; but if the connoisseur would taste it in its highest perfection, he must wait until the month of November, when, if carefully kept, it will be found of truly exquisite flavor.

SPONTANEOUS IGNITION IN WOOLEN MILLS.

John L. Hayes, Esq., editor of the *Bulletin of the National Association of Wool Manufacturers*, gives in an article published in the July number of that periodical, some interesting and important facts in regard to spontaneous ignition in woolen mills, a few of which we extract. Much has been said upon this subject, at various times, in the SCIENTIFIC AMERICAN, yet it is of so much importance, that any facts throwing light upon this source of conflagration, or calculated to put proprietors on their guard are always seasonable.

The combustion of oily wool waste, says Mr. Hayes, is familiar to all older manufacturers; that the cases do not more frequently come under the eyes of manufacturers is due to the precautions now generally in use. Mr. Kingsbury, of Hartford, has informed me of two cases which came under his observation where spontaneous ignition had taken place in barrels of oily waste left accidentally in woolen mills. In both cases, the fires were extinguished without damage. Mr. Gould related to me this circumstance: Some years since a large quantity of what was called clean woolen waste, used in the manufacture of coarse satinets, had been brought from a woolen mill, and stored in a wool-house in Pearl street, Boston. The insurance companies having been informed of the fact, notified the party storing the waste to remove it, on pain of forfeiture of his insurance. Objection having been made to the fastidiousness of the insurance offices, Mr. Gould himself piled up portions of this waste in a yard at the rear of his office in State street. The waste was found to be very oily on handling. The pile was exposed in a damp warm day in August. In less than twenty-four hours the pile took fire spontaneously.

Mr. Badderley, in his report on the fires of London for 1853, says, "The most remarkable case of spontaneous ignition that has occurred for some time, occurred at the residence of Mr. Fletcher, at the Library of the Philosophical Society, in George street, Manchester, who, on entering his room one afternoon, found the sofa on fire. Having dragged it into the yard, and extinguished the fire that was burning in the interior, he found, upon examination, that the sofa had been filled with cap bottoms and rovings, woolen materials, which being greasy had spontaneously ignited."

According to Mr. Gould, my informant, a workman who had been polishing a door of a house in Boston with linseed oil, at the end of his day's work requested that his oily woolen over-clothes might be left in the cellar, which was assented to. At half-past eleven at night, the occupants of the house were awakened by the smell of burning woolens. Upon making search from the attic to the cellar, the door of the latter was opened, and a flame started by the admission of the air showed the combustion in the oiled clothes of the workman. A fire took place at the house of Mrs. Colburn, a neighbor of mine, at Cambridge, Mass., from spontaneous ignition of woolen rags saturated with linseed oil, which had been used in cleaning furniture. Dr. Jackson relates a case where a fire occurred in a house newly-furnished, from spontaneous ignition in a pile of chips of oil-carpeting. The proprietor, from excessive caution, slept in the house before it was occupied by his family, and fortunately discovered the fire and ascertained its cause. Upon stating the case to Dr. Jackson, he says, "My floors are covered with oil-carpet chips; why do they not take fire?" "Because," says the chemist, "the chips not being in contact, the heat is conducted away. In a pile, they accumulate the heat originally induced from the drying oil in the chips attracting the oxygen of the air. Can you set fire to anthracite coal spread upon the floor? No: but pile up the lumps so that the heat may accumulate, and they are readily ignited."

The celebrated Mr. Braidwood, for nearly thirty years superintendent of the London Fire Brigade, says, "Sawdust, in contact with vegetable oil, is very likely to take fire. Cotton, cotton-waste, hemp, and most other vegetable substances, are alike dangerous. In one case, oil and sawdust took fire within sixteen hours; in others, the same materials have lain for years, until some external heat has been applied." He observes that spontaneous ignition is generally accelerated by natural or artificial heat.

The danger of spontaneous ignition in piles of charcoal dust is not generally apprehended. The liability of piles of fine charcoal to ignite has long been known to manufacturers of gunpowder. Mr. Hadfield, in a paper containing "Observations on the circumstances producing ignition in charcoal in atmosperic temperatures," published in the "*Philosophical Magazine*," states generally, "If twenty or thirty hundred of charcoal, in a state of minute division, be put together in a heap, and left undisturbed, spontaneous combustion generally occurs." He states the results of a series of experiments tried by him. The following experiment was the most remarkable: "On the 13th of October, 1931, small charcoal was thrown into a heap which covered about ten feet square, was about four feet deep, and contained two or three tuns in weight. In three days, the temperature had increased to 90°, though it was at first only 57°, that of the air. On the 19th, it was 150°, and on the 20th combustion had occurred in several places." He observes, "This experiment was the most satisfactory one that had come under my notice. The charcoal had been made at least ten or twelve days before it was put together, and had been lying during the interval in small heaps freely exposed in the open air."

I have obtained the following remarkable and instructive examples from Dr. C. T. Jackson. They were originally communicated to the American Academy. At the request of several insurance officers, who regarded the facts as very important, they were published in the Boston papers substantially as here stated.

"Three times," says Dr. Jackson, "I have set fire to charcoal at temperatures below that of boiling water. My first experiment or observation was accidental. I was preparing, while at Bangor, Me., for a lecture, in which I had occasion to show an artificial volcano. I took a tray filled with gunpowder and laid it on a stove to dry. I then took a paper of pulverized charcoal, such as is sold by the apothecaries for tooth-powder, the charcoal being wrapped in white paper, and placed it on the top of the gunpowder which was being dried upon the stove. Having occasion to go out, I took off the paper of charcoal and laid it on the table. When I came back, in about twenty minutes, I observed the paper smoking. The charcoal was completely consumed. During all this time, the gunpowder remained on the stove unexploded.

"My next observation was this: While at work in my laboratory, I had occasion to use a piece of charcoal for blow-pipe experiments. I went down into my cellar, and brought up a piece of light, fine, round charcoal, suited for that purpose. It was damp. I laid it on the top of a column stove to dry, directly beside a tin pan containing water, which was not boiling, and never did boil there. I took the charcoal off the stove and laid it on my table. A short time afterward I discovered that it was on fire all through the piece. I laid it aside, and it burned entirely to ashes. The theory of the ignition of the charcoal under these circumstances struck me at once. Charcoal has wonderful porosity: it has the power of analyzing air, and absorbing the oxygen with comparatively little of its nitrogen. The pores of the charcoal were previously filled with moisture. Drying expelled this moisture. The oxygen of the air was condensed in the charcoal, taking the place of the moisture. The condensation of the oxygen produced sufficient heat to ignite the charcoal. I repeated this experiment again intentionally, watching it carefully, and with the same result." The instructive bearing of these remarks will be shown hereafter, in connection with the subject of heating with steam-pipes.

The theory of spontaneous ignition has already been intimated in the observations of Dr. Jackson upon the burning of charcoal. The spontaneous ignition of oily waste and of charcoal proceeds from the same cause—the absorption and condensation of oxygen. We observe that the contact of vegetable or drying oils with porous carbonaceous substances is most promotive of spontaneous ignition. The drying qualities of these oils, which fits them for paints, is due to their absorbing oxygen from the atmosphere. The porous oily materials absorb and condense the air within their pores. Oxidation then commences immediately, and raises the temperature, which again accelerates the oxidation; and the process goes on, with continually increasing rapidity, till at length the mass bursts into a flame. The low conducting power of such a porous mass greatly facilitates the combustion by preventing the dissipation of the heat generated. The massing of the materials in piles, boxes, or barrels promotes the retention and accumulation of the heat, at first excited by oxidation. Moisture also promotes combustion by supplying oxygen. Besides, it has been recently shown that the simple act of moistening such substances as cotton, hair, and wool, is attended with a slight though constant disengagement of heat. It should be observed that the paraffine oils, or the hydrocarbon oils from petroleum, do not absorb oxygen. Dr. Hoffman, the President of the London Chemical Society, warmly recommends their use for lubricating machinery; saying that "they are safer than many of the oils previously used, inasmuch as they no not absorb oxygen, and consequently cannot undergo spontaneous combustion when smeared upon cotton waste."

Managers and workmen should know that spontaneous ignition is not an accidental and exceptionel phenomenon.

With the proper conditions, it is as certain as the firing of gunpowder with a spark. The cask of gunpowder, so instinctively dreaded, will not explode till the spark is applied. The pile of oily waste, harmless and innocent to all appearance, slowly but surely takes from the oxygen of the air the means for its own combustion; itself lighting the conflagration, which, most frequently, bursts forth when manager and operatives are locked in slumber.

The Boiler Explosion at the Indiana State Fair.

The boiler of Sinker & Co., which was in use at the Indiana State Fair, at Indianapolis, exploded on the 1st October, killing nineteen persons and wounding about one hundred persons. The cause of the explosion was, at the time of our going to press, still undetermined.

The scene at the Fair Ground after the accident was most heart-rending. Many of the killed were torn in fragments. In one family, consisting of a mother and three children, the mother was killed and the two older children badly scalded; the youngest was unhurt. A gentleman and lady were walking together; the gentleman was killed and the lady unhurt. Everything is being done to alleviate the suffering wounded that can be done, though it is feared that several will die.

The whole country sympathizes with the sufferers from this fearful calamity, which, although resulting in less loss of life, yet considered in all its aspects is scarcely less terrible than the recent catastrophe at Avondale.

The Manufacture of Steel.

The Paris *Presse* says:—"An experiment of a most interesting character, and having the highest interest for the iron industry, has taken place at the Marquise Stock Works, in presence of two eminent persons of the Ecole Centrale. The object of this experiment was to make steel by one operation, a problem which has engaged all metallurgists, and if solved, would cause an industrial revolution. M. Aristide Berard, an engineer whose name is familiar to all who have occupied themselves with this question, proposed to change second class metal in course of refining into steel of at least ordinary quality, by means of a process alternately oxidizing and reductive. His efforts have been crowned with success. The product obtained by his process, in presence of two competent judges, proved to be steel of good quality, suitable for all purpose, and made with the facility necessary to its application to practical industry. The operation was effected in a reverbatory furnace, lasted about an hour and a half, and was accomplished with as much facility as puddling. In this process, instead of acting on 480 pounds of metal to obtain iron of number one quality, from 6,600 to 11,000 pounds of metal is made by only one operation into steel ingots ready for the workshop, and with an unexpected economy. We will be much deceived if this invention has not in it the germ of a complete revolution in metallurgy."

A patent has recently been granted for a method of refreshing horses while in harness, which consists in making the bit hollow, and having perforations in it. A rubber tube extends from one side of the bit to the carriage, and by pressing a rubber bag which contains water, the driver is enabled to refresh his horse whenever he chooses without stopping. For saddle horses the water bag is suspended from the horse's neck, or upon the pommel of the saddle.

CORNS.—The pain occasioned by corns may be greatly alleviated by the following preparation: Into a one-ounce phial ask a druggist to put two drachms of muriatic acid, and six drachms of rose-water. With this mixture wet the corns night and morning for three days. Soak the feet every evening in warm water without soap. Put one third of the acid into the water, and, with a little picking, the corn will be dissolved.—*Jessie Piesse.*

SIEMENS ON PATENTS.

Mr. Siemens, in his address before the Mechanical Science Section of the British Association, took occasion to make some remarks on the patent laws of England, of which the following is an extract:

"Closely allied to the question of education is that of the system of letters patent. A patent is, according to modern views, a contract between the commonwealth and an individual who has discovered a method, peculiar to himself, of accomplishing a result of general utility. The State, being interested to secure the information and to induce the inventor to put his invention into practice, grants him the exclusive right of practicing it, or of authorizing others to do so, for a for a limited number of years, in consideration or his making a full and sufficient description of the same. Unfortunately, this simple and equitable theory of the patent system is very imperfectly carried out, and is beset with various objectionable practices, which render a patent sometimes an impediment to, rather than a furtherance of applied science, and sometimes involve the author of an invention in endless legal contentions and disaster, instead of procuring for him the intended reward. These evils are so great and palpable, that many persons, including men of undoubted sincerity and sound judgment on most subjects, advocate the entire abolition of the patent laws. They argue that the desire to publish the results of our mental labor suffices to insure to the commonwealth the possession of all new discoveries or inventions, and that justice might be done to meritorious inventors by giving them national rewards.

"This argument may hold good as regards a scientific discovery, where the labor bestowed is purely mental, and carries with it the pleasurable excitement peculiar to the exercise and advancement of science on the part of the devotee; but a practical invention has to be regarded as the result of a first conception, elaborated by experiments and their application to existing processes in the face of practical difficulties, of prejudice, and of various discouragements, involving also great expenditure of time and money, which no man can well afford to give away, nor can men of merit be expected to advocate their cause before the national tribunal of rewards, where, at present, only very narrow and imperfect views of the ultimate importance of a new invention would be taken, not to speak of the favoritism to which the doors would be thrown open. Practical men would undoubtedly prefer either to exercise their inventions in secret, where that is possible, or to desist from following up their ideas to the point of their practical realization. If we review the progress of the technical arts of our time, we may trace important practical inventions almost without exception to the patent office. In cases where the inventor of a machine or process happened to belong to a nation without an efficient patent law, we find that he readily transferred the scene of his activity to the country offering him the greatest encouragement, there to swell the ranks of intelligent workers. Whether we look upon the powerful appliances that fashion shapeless masses of iron and steel into railway wheels or axles, or into the more delicate parts of machinery; whether we look upon the complex machinery in our cotton factories, our dye works, and paper mills, or into a Birmingham manufactory, where steel pens, buttons, pens, buckles, screws, pencil cases, and other objects of general utility are produced by carefully elaborated machinery at an extremely low cost; or whether we look upon our agricultural machinery by which England is enabled to compete, without protection, against the Russian or Danubian agriculturist, with cheap labor and cheap land to back him, in nearly all cases we find that the machinery has been designed and elaborated in its details by a patentee who did not rest satisfied till he had persuaded the manufacturers to adopt the same, and removed all their real or imaginary objections to the innovation. We also find that the knowledge of its construction reaches the public directly or indirectly through the patent office, thus enlarging the basis for further inventive progress.

"The greatest illustration of the beneficial working of the patent laws was supplied, in my opinion, by James Watt, when just about 100 years ago, he patented his invention of a hot working cylinder and separate steam engine condenser. After years of contest against those adverse circumstances that beset every important innovation, James Watt, with failing health and scanty means was only upheld in his struggle by the deep conviction of the ultimate triumph of his cause. This conviction gave him confidence to enlist the coöperation of a second capitalist, after the first had failed him, and of asking for an extension of his declining patent.

"Without this opportune help Watt could not have succeeded in maturing his invention; he would, in all probability, have relapsed into the mere instrument-maker, with broken health and broken heart, and the invention of the steam engine would not only have been retarded for a generation or two, but its final progress would have been based probably upon the coarser conceptions of Papin, Savory, and Newcomen.

"It can easily be shown that the perfect conception of the physical nature of steam which dwelt like a heaven-born inspiration in Watt's mind was neither understood by his contemporaries nor by his followers up to very recent times, nor can it be gathered from Watt's very imperfect specification. James Watt was not satisfied to exclude the condensing water from his working cylinder, and to surround the same by by non-conducting substances, but he placed between the cylinder and the non-conducting envelope a source of heat in the form of a steam jacket, filled with steam at a pressure somewhat superior to that of the working steam. His successors have not only discarded the steam jacket, and even condemned it, on the superficial plea that the jacket presented a larger and hotter surface for loss by radiation than the cylinder, but expansive working was actually rejected by some of them on the ground that no practical advantage could be obtained by it. The modern engine, notwithstanding our perfected means of construction, had in fact degenerated in many instances into a simple steam meter, constructed apparently with a view of emptying the boiler in the shortest possible space of time.

"It is only during the last twenty years that the subtile action of saturated steam in condensing upon the sides of the cylinder when under pressure, and of evaporating when the pressure is relieved toward the end of each stroke, has been again recognized and insisted upon by Lechatelier and others who have shown the necessity of a slightly super-heated cylinder in order to realize the expansive force of steam. The result has been a reduction in the consumption of fuel in our best marine engines from six or eight to below three lbs. per gross, indicated horse-power.

"Would it be safe, in view of such facts as these, to discard the patent laws, which, as I have endeavored to show, lay at the very foundation of our modern progress, without making at all events a serious effort to remedy those evils, which, it admitted on all hands, now adhere to them? These evils need, for the most part, no special legislation, but can be traced to the imperfect manner in which the existing patent laws are carried into effect. It is a hopeful circumstance that, during the next session of Parliament, the whole question of the patent laws is likely to be inquired into by a special committee, who, it is hoped, will act decidedly in the general interest without being influenced by special or professional claims. They will have it in their power to render the patent office an educational institution of the highest order."

MACK'S IMPROVED FEED-WATER HEATER.

The great advantages of storing up heat in steam, from which it can be transmitted to water by condensing the steam in the water, have long been recognized in large establishments devoted to dyeing, soapmaking, and other industries necessitating the use of large quantities of hot water. The large amount of latent heat in steam is thus converted into sensible heat in water, and as much greater is the latent heat of steam at 212° than of water at the same temperature, that one pound of steam at 212°, condensed in five and a half pounds of water at 32°, will give a result of six and one half pounds of water at 212°. Thus one pound of steam will cause five and a half pounds of water to boil, and, as the transfer of the heat to the steam is extremely rapid, this method is employed with economy and great convenience to heat water held in wooden tanks, etc., at a distance from the furnace, which may be so constructed as to conduct the heat to the boiler and retain it therein more effectively than could be possible were the heat applied to the bottom of an open vessel.

Fig. 1.

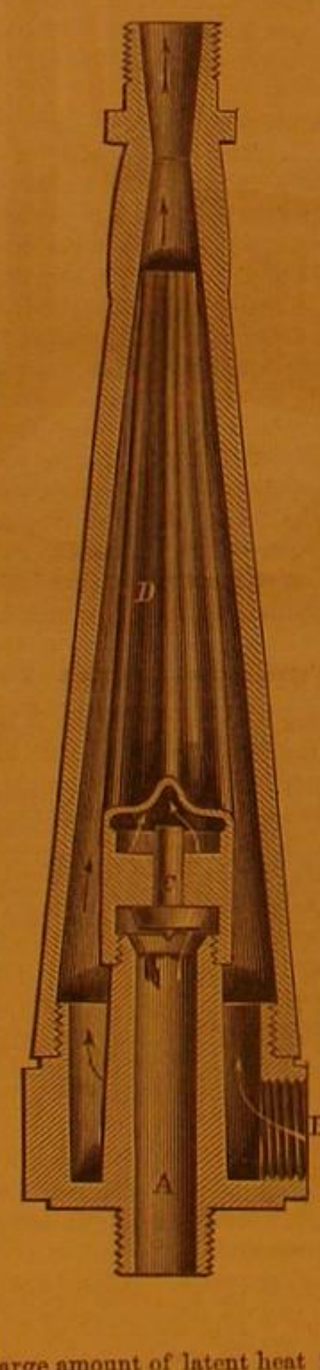


Fig. 2.

There are, however, some drawbacks to this method as hitherto practiced, which, among other things secured, the invention herewith illustrated is designed to obviate. During the admission of the steam into water at any ordinary temperature, the steam being discharged directly into the water, there is a constant succession of loud reports, very disagreeable to listen to; and when the temperature rises towards the boiling point, steam will begin to escape from the surface of the fluid undergoing the process of heating, and thus more or less heat will be lost unless care is taken to constantly adjust the flow of steam to the rate at which condensation takes place.

The apparatus under consideration obviates both these difficulties by mixing steam and water together in constant streams, which can be proportioned so as to deliver the water into a tank or locomotive boiler at any temperature required between 32° and 212°.

Its external shell is of the conical form, shown in Fig. 2, while its internal construction is shown in section in Fig. 1. A is the water induction port, and B the steam induction port. The water entering at A is forced on, by the pressure of its head, or by a force pump, through a corrugated pipe, D, and discharged through it at a short distance from and within the apex of the external conical case. This pipe is formed so as to present four corrugations, leaving very thin spaces between their inclosing walls, through which the water flows in very thin strata. This pipe is also formed of thin sheet copper, and therefore transmits heat with great rapidity to the water from the steam, which flows all around, within the space inclosed between this water-induction pipe and the outer cone.

The steam thus imparts its heat gradually to the water, and whatever residuum there may be left, on its reaching the end of the water-induction pipe, is condensed there in the current of water, with which it mingles, both then flowing out together, in the form of water heated to a temperature regulated by the proportional flow of the water and steam.

A check valve, C, prevents any return flow which might ensue upon too great an increase of steam pressure in proportion to the water pressure inadvertently applied.

Those acquainted with the theory and applications of heat and steam will recognize in this instrument perfect compliance with scientific principles, and its convenience, in large laundries, dye houses, breweries, etc., etc., will be apparent.

The temperature obtainable in the water heated, of course, depends upon dimensions and capacity of boiler, velocity of induction of both steam and water, and the temperatures of the steam and water; but as all these things can be adjusted and are susceptible of mathematical determination, any temperature between 32° and 212°, for any quantity of water required is attainable, and even the time required to heat it may be computed. There is, therefore, no element of uncertainty in the operation.

The instrument has been used in the soap and candle works of the inventor, hose being employed to deliver heated water to any part of the building to increase the temperature of fluids flowing from one vat to another, etc. It has also received warm commendations from prominent steam engineers in the West, and has been adopted after trial in the House of Correction, at Detroit, for heating the baths in that institution, etc. It is well adapted for cooking and laundry purposes in penitentiaries, prisons, almshouses, hospitals, hotels, etc., and, the inventor informs us, is being adopted by the Michigan Central Railroad for washing cars. Many other applications of this invention will suggest themselves to practical men, one of which is likely to be its application to heating water for locomotive boilers after they are blown off. It now takes about three hours to blow off, clean out, refill, and get up steam in an ordinary locomotive boiler. By the employment of this heater taking steam from a stationary boiler, the boiler might be washed out with hot water, and immediately filled with water at 212°, thus enabling it to start in one third the time now occupied for this purpose.

These heaters are made to deliver streams varying from one half an inch to two inches in diameter.

Patented, July 13, 1869, by Wm. B. Mack, 23 St. Antoine street, Detroit, Mich., whom address for State and Territorial rights.

A New Alarm Bell for Locomotives.

A new alarm bell was tested on the Detroit and Milwaukee Railroad lately. The invention consists of an ordinary bell, weighing about 100 lbs., placed on the platform of the locomotive, immediately over the cow-catcher. A rod attached to the eccentric shaft causes a clapper to strike the bell each turn of the driving wheel. The bell is suspended loosely, and revolves from the force of the stroke it receives, so that all parts of the surface are equally exposed to wear. The advantages of this arrangement are a continuous sound, slow or rapid in proportion to the speed of the engine, each 15 ft. producing a stroke of the bell. In case of an accident, the railroad company can always prove that their bell was ringing according to law; and owing to the position in which this bell is placed, the sound can be distinctly heard about three miles in day-time, and by night four miles or more, the ground and the continuous rail, both excellent conductors of sound, assisting in carrying the vibrations. The Detroit and Milwaukee Railroad have twenty-four of these alarms already in use, and intend to provide all their passenger engines with them. Mr. Ben. Briscoe, the inventor, went to Detroit in 1837, and in 1842 took charge of the Detroit and Pontiac, then a strap railroad, with pony engine and one little car, and performed the duties of master mechanic, engineer, fireman, and sometimes of conductor. In those days signal bells were unnecessary, because the train did not run fast enough to hurt cattle.

Georgia State Fair.—The State Agricultural Society of Georgia will hold a Fair at Macon, Ga., beginning on Tuesday, Nov. 16, 1869, and offer an extensive premium list, only a portion of which is limited to the State of Georgia, most of the premiums being open for competition to exhibitors from any part of the United States. Information may, we presume, be obtained on application to the Secretary, D. W Lewis, Esq., Sparta, Ga.

Improved Cotton and Hay Press.

A notice of this press was given in an article on the Exhibition of the American Institute, published on page 217, current volume of this journal. It may now be seen at the fair exhibited by Mr. Champman, the patentee. It was there stated to have been manufactured and exhibited by Whitney & Co., instead of which the name should have been Campbell, Whittier & Co. We herewith give an illustration and brief description of this press, which will give a general idea of its form and operation.

By the engraving it will be seen that the bale is made at the bottom, and that the side and end doors are easily removed, thus giving free access to the bale from all sides.

The follower block, shown as at the top, may be swung over to one side when the press is to be filled, leaving the top of the press perfectly open to receive the material to be pressed. When full the follower is returned to its place, shown by the dotted lines, and worked down. The levers are compound, and also adjustable, so that the fulcrum may be altered to make a short stroke, when the article is loose and little power is needed, or a long stroke, as it becomes more compressed and great force is obtained.

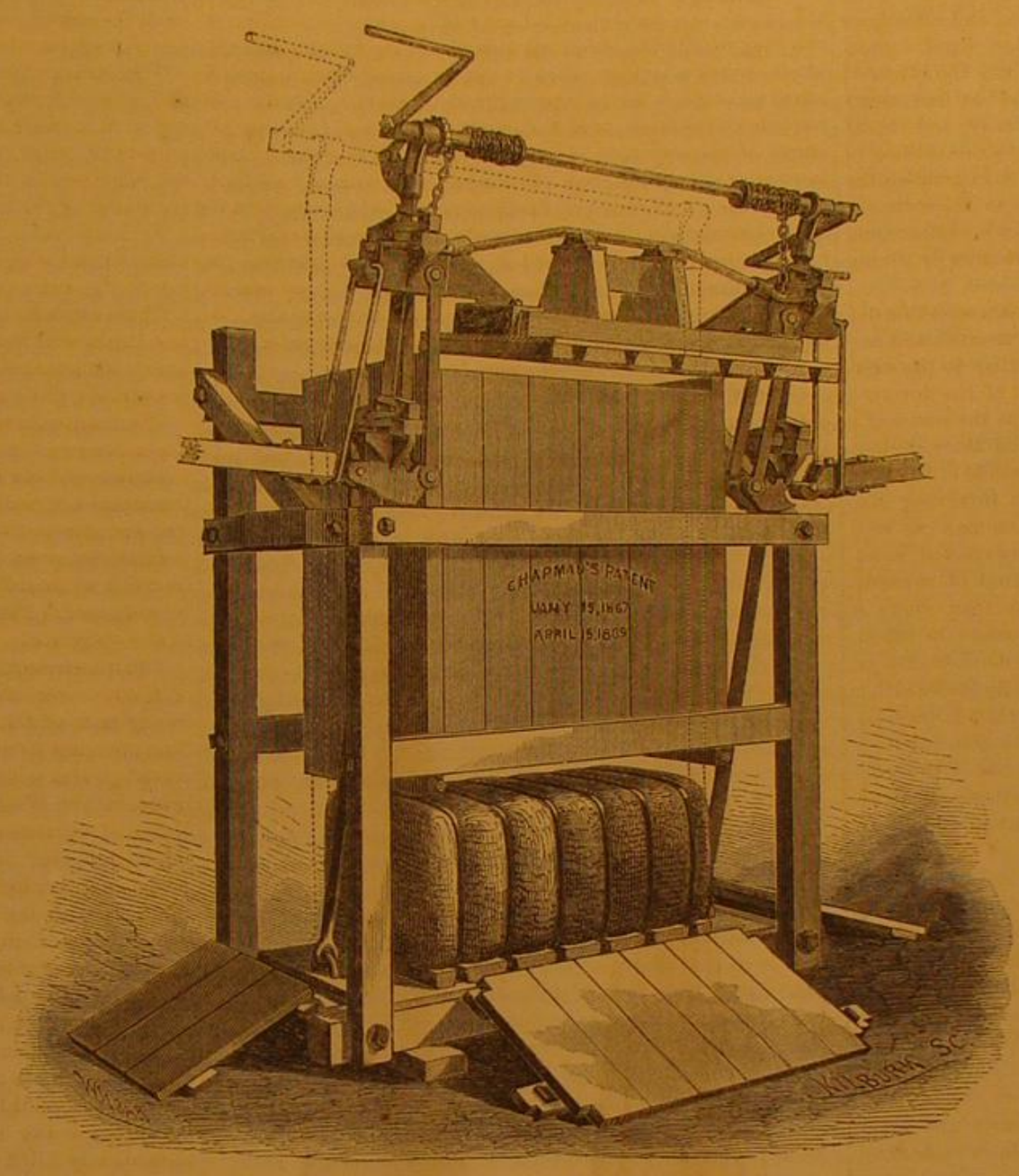
By the peculiar arrangement of the levers and clutches, the follower may be raised very quickly and independently of the levers. In most other presses it requires as much, or nearly as much time to raise the follower block as it does to compress the cotton.

In this the follower is run up quickly and swung over to one side, thus being entirely out of the way for refilling.

These presses are sold cheap, and are durable and substantially made, and from the construction we judge them to be very effective.

Patented January 15, 1867.

For further particulars address Campbell, Whittier & Co., Manufacturers, Boston, Mass.



CHAPMAN'S COTTON AND HAY PRESS.

Nervous Dyspepsia.

Those persons who use their brains much, and who have but little tone or power to their stomachs, should above all things avoid purgatives. So says the *The Herald of Health*, and adds that very much of the natural distress which this class of dyspeptics feel, is caused by the large intestine becoming weakened, dislocated, and filled up with offending matters which there is not strength to remove. In such cases, it is important that the patient do less work with his head, and more with his muscles. If there is strength enough, the daily use of ax or hoe for three or four hours will prove highly beneficial. Riding on horseback is an excellent exercise, providing the saddle is a comfortable one and the horse an easy goer. Hard-trotting horses are not good ones for invalids to ride. A galloping horse is the best for such a person. Those who live in the country can easily take either of these forms of exercise, but they are not always available in the city. In such cases the gymnasium or movement cure are valuable means of treatment. Half an hour daily for a nervous dyspeptic in a movement cure will work wonders.

The diet should be plain and nutritious. It will not do to overload the stomach, yet as much food as can be digested well should be taken. Mastication should be slow and thorough. Such invalids are apt to eat too fast. The remedy for that is to talk a great deal at the table; to get if possible into a good humor before taking a mouthful, and keep in it to the end of the meal. It is generally best to omit the dessert. Fruit is often condemned by the nervous dyspeptic. We are sure, however, that it is not always the fruit which is at fault, but the way of using it. Let it be taken in the morning, and before anything else is eaten, if possible; at first, take small quantities to accustom the stomach to it, Avoid fine bread, vegetables, and pastry; also tea, coffee, and tobacco. Omit the supper, or at least, let conversation at the table be much and eating little.

It is often advisable to cover the abdomen with the wet compress in this disease for an hour or two daily. The compress should be covered with a dry one. A sitz bath at bed time is very serviceable if there is a disposition to sleeplessness, as sleep is very necessary. Patients can not have too much sleep. If mental labor is performed, let it be done between 9 in the morning and 1 P. M. After this, dine and recreate, or perform light physical labor. The after-dinner nap may be useful, providing it does not not interfere with sleep at night, in which case an hour of quiet and rest is better.

The habit of drugging for this disease with all sorts of quack nostrums is very absurd. Hygiene medications will do all that can be done much better. The grand rule should be to live naturally and happily, and throw medicines to the dogs, and nine cases out of ten the sufferer will get well.

Impaired Taste.

Of all the senses, that of taste is the worst treated, the most perverted. The delicate little nervous fibers which are distributed to the minute papillæ that cover the surface of the tongue, soft palate, and fauces, and which constitute the organ of taste, are boiled by hot tea and coffee, burned by hot food, and irritated and inflamed by salt, pepper, spices, vinegar, liquors, etc., until it is a wonder that they can distinguish a peach from a potato. That these things *do* blunt and injure the finer susceptibilities of the nerves of taste, there is not a shadow of doubt. The only wonder is that they do not destroy the sense of taste entirely. Persons accustomed to using these things freely can not distinguish the delicate natural flavors of food, and therefore lose a large share of that gustatory enjoyment which they should experience, and which those who still possess a healthy taste do experience. To an unperverted taste water is the sweetest and most agreeable of drinks, while to many it is scarcely endurable, unless it has mingled with it some sharp, strong-flavored substance. Many persons can not relish the delicious peach even, without peppering and spicing it highly, and then it is not the peach that they taste but the condiments used with it. To such persons, plain, simply-prepared food tastes insipid, while those whose organs of tastes are unperverted such food is filled with delicious flavors. Those who have impaired their sense of taste can, to a certain extent, have it restored, by carefully avoiding the use of the substances which caused the injury. The increase of gustatory enjoyment which they will experience from such a change, will only be believed after thorough trial. There is scarcely one in a thousand whose taste is not more or less perverted and blunted by the use of highly seasoned food or drinks. Simple, healthful food is the exception, while rich, strongly-flavored, and complicated dishes are the rule, because demanded by the perverted tastes of the people.—*Herald of Health.*

THE AUGUST METEORS.

From the Spectator.

A very ancient tradition prevails in the mountain districts which surround Mount Pelion, that during the night of the Feast of the Transfiguration (August 6) the heavens open, and lights, such as those which surround the altar during the solemn festivals of the Greek Church, appear in the midst of the opening. It has been thought by Quetelet, and Humboldt considered the opinion probable, that this tradition had its origin in the successive apparition of several well-marked displays of the August meteors. If this be so, the date of the shower has slowly shifted—as that of the November shower is known to have done—until now another holiday is associated with it, and the simple peasants of Southern Europe recognize in the falling stars of August the "fiery tears of good St. Lawrence the Martyr."

It is wonderful to contemplate the change which in a few short years has come over all our views respecting these meteors. Ten years ago it was considered sufficiently daring to regard the August system as part of a zone of cosmical bodies traveling in an orbit as large perhaps as that of our own earth. Now, the distance even of Neptune seems small in comparison with that from which those bodies have come to us, which flash athwart our skies in momentary splendor, and then vanish forever, dissipated into thinnest dust by the seemingly feeble resistance of our atmosphere. Accustomed to associate only such giant orbs as Saturn and Jupiter, Uranus and Neptune, with orbits which must be measured by hundreds of millions of miles, the astronomer sees with wonder these tiny and fragile bodies traversing paths yet vaster than those of the outer planets. And even more remarkable, perhaps, is the immensity of the period which the August shooting star has occupied in circling around the central orb of our system. Each one of these bodies has been in the neighborhood of the earth's orbit many times; yet the last visit made by them took place years before the birth of any person now living, since the period of meteoric revolution has been proved to be upwards of 118 years.

Another strange feature of the August meteor system is the enormous volume of the space through which, even in our neighborhood, the meteor stratum extends. The famous November system is puny by comparison. Striking that system at a sharp angle, the earth traverses it in a few hours, so that if the earth went squarely through it the passage would occupy, it has been estimated, less than a hundred minutes. Thus the depth of the November meteor bed has been calculated to be but a hundred thousand miles or so. But the earth takes nearly three days in passing through the August meteor system, although the passage is much more direct. For the August meteors come pouring down upon our earth almost from above, insomuch that the radiant point on the heavens whence the shower seems to proceed is not very far from the North Pole; whereas the November meteors meet the earth almost full front, as a rain storm blown by a head wind drifts in the face of the traveler. Thus the depth of the August system has been estimated at three millions of miles; and this depth seems tolerably uniform, so that along the whole of that enormous range (to be counted, as we have said, by hundreds of millions of miles), through which the August ring extends, the system has a depth exceeding some four hundred times the diameter of the earth on which we live.

Yet it is probable that the whole weight of the August system, vast as are its dimensions, is infinitely less than that of many a hill upon the earth's surface. For the weight of the separate falling stars of the system has been determined (by one of the wondrously subtile applications of modern scientific processes) to be but a few ounces at the outside; and even during the most splendid exhibition of falling stars the bodies which seemed to crowd our skies are many miles apart, while under ordinary circumstances thousands of miles separate the successively-appearing meteors. Indeed, it is well remarked by an eminent member of the Greenwich corps of astronomers, that the planets tell us by the steadiness of their motions that they are swayed by no such attractions as heavily-loaded meteor systems would exert. "The weight of meteor systems must be estimated by pounds and ounces, not by tuns," he remarked.

The spectroscope has taught us something of the constitution of these bodies, though they never reach the earth's surface. Professor Herschel, third in that line of astronomers which has done so much for science, has employed an August night or two in trying to find out what the August meteors are made of. With a spectroscope of ingenious device, constructed by Mr. Browning, F.R.A.S., for the special purpose of seizing the light of these swiftly-moving bodies, Professor Herschel was successful in analyzing seventeen meteors. The most interesting of his results is his discovery that the yellow light of the August meteors is due to the presence of metal sodium in combustion. This metal has a very striking and characteristic spectrum, consisting of two bright orange yellow lines very close together; and this double line was unmistakably recognized in the spectrum of the August meteors. To use the words of the observer, "their condition (when rendered visible to us by their combustion) is exactly that of a flame of gas in a Bunsen's burner, freely charged with the vapor of burning sodium; or of the flame of a spirit lamp newly trimmed, and largely dosed with a supply of moistened salt.

It is strange to consider what becomes of all the sodium thus dispersed throughout the upper regions of the air. There can be no doubt that in some form or other—mixed or in combination—it reaches the earth. The very air we breathe must at all times contain, in however minute a proportion, the cosmical dust thus brought to us from out the interplanetary spaces. Nay, for aught we know, purposes of the utmost importance in the economy of our earth, and affecting largely the welfare of the creatures which subsist upon its surface, may be subserved by this continual downpour of meteoric matter. We know already that the different meteor systems are differently constituted. For instance, the white November stars are much less rich in sodium than the yellow August ones. Each system, doubtless, has its special constitution, and thus the air we breathe is continually being dosed with different forms of metallic dust—now one metal, now another, being added, with results in which did we but know it, we are doubtless largely interested. Nor is it certain that deleterious results do not occasionally flow

from an overdose of some of the elements contained in meteors. It might be plausibly maintained on evidence drawn from known facts and dates, that occasionally a meteoric system has brought a plague and pestilence with it. The "sweating sickness" even has been associated (though, we admit, not very satisfactorily) with the 33-year returns of great displays of November shooting stars. Without insisting on such hypotheses as these, which scarcely rest on stronger evidence than the notion that the destruction of Sodom and Gomorrah was brought about by an unusually heavy downfall of sodium-laden (that is, salt-laden) meteors, we may content ourselves by pointing out that the labors of eminent chemists have shown that the air is actually loaded at times with precisely such forms of metallic dust as the theories of astronomers respecting meteors would lead us to look for.

THE MANUFACTURE OF SULPHURIC ACID.

From the Report of J. Lawrence Smith, United States Commissioner to Paris Exposition.

I.—APPLICATION AND PROGRESS OF THE MANUFACTURE.

When we glance over the chemical products that influence to the greatest extent the useful arts of society, we find them among the acids and alkalies; for by the chemical reaction of these compounds, furnished by nature or art, the manufacturing and domestic arts generally obtain a multitude of useful compounds. But of all substances that have made their imprint on the modern progress of the arts, there is no one approaching sulphuric acid in importance, produced as it is from the cheapest materials furnished by nature, and of which there seem to be inexhaustible supplies. Glass making, soap making, bleaching, calico printing, dyeing, etc., are all debtors to sulphuric acid.

It is said that the consumption of sulphuric acid in any country will show, with that of iron, its industrial activity. The low price of the acid is one of its great merits; the ordinary form known as oil of vitriol, being the most concentrated form in ordinary use, is now made in France at a cost of about one and a quarter cent per pound, and in England for a shade less; in this country ill-advised legislation makes a much higher and fluctuating price.

No material change has taken place in the last ten years or more in the manufacture of sulphuric acid. The well-known method of converting sulphur into sulphurous acid, and completing the oxidation of it by the oxygen of the air, aided by one of the oxygen compounds of nitrogen, is still the predominant method; and, in fact, all of this acid that is manufactured, except the small quantity made by distilling copperas, and called Nordhausen acid, is made by this process.

It will not, however, be unprofitable to the readers of this report to enumerate some of the various attempts made in the last twenty years to supplant the present method in lead chambers. Lealand and Deacon, in 1854, suggested the use of chambers made of stone, or earthenware. Simon, in 1860, proposed vulcanized gutta-percha, but on trial this substance was found more destructible than lead. Peter Ward, in 1862, proposed a series of glass sheets to increase the surface and hasten the reaction; that, however, had been used before, and as the formation of sulphuric acid is not dependent on surface action, it is of no advantage. Philips and Kuhlmann, as far back as 1838, proposed the use of heated air, and sulphurous acid passed over spongy platinum, but this has been almost forgotten. Fouché and Lepelletier, in 1850, employed a series of large Woolfe bottles instead of the lead chambers, at Javelle, near Paris, but this has been long since abandoned. Kuhlmann proposed to pass a mixture of sulphide of hydrogen, obtained by proper means from soda waste, through nitric acid in stoneware bottles, but the method was never put in practice. Petrie, in 1860, applied a system of stoneware columns, filled with pebbles, through which currents of nitric acid and sulphurous acid in proper proportions were passed; but this has not been successfully applied. Several years ago Persoz accomplished the oxidation "by passing the sulphurous acid gas through nitric acid, diluted with from four to six volumes of water, and heating to 212° Fah., or through a mixture of nitric acid, or a nitrate with hydrochloric acid. The reaction takes place in a comparatively small vessel of suitable material; the gas arising from the deoxidation of the nitric acid is reconverted into nitrous acid by air and water. Theoretically, it works without a loss of nitric acid; nevertheless the process has never been adopted in practice, possibly from want of suitable material to withstand the combined action of the two strong acids.

II.—SUBSTANCES EMPLOYED IN THE MANUFACTURE OF SULPHURIC ACID.

Sulphur.—There was a most beautiful display of specimens of sulphur from the south of Italy and from Sicily; and these countries furnish all the sulphur that is employed in the arts and in agriculture, except some little that is employed for domestic use in countries producing it, of which notice will be taken a little further on.

While we now obtain the larger proportion of sulphuric acid made in Europe from pyrites, it is very much to be desired that new and abundant supplies of sulphur may be found, for the acid made from this substance directly is purer, and the apparatus required less expensive than when pyrites is used. Besides the sulphur exhibited from Southern Italy and Sicily, there were specimens from Apt, in France, which locality furnishes a poor sulphur mineral. Also in the neighborhood of Constantine, in Algiers, there is native sulphur. In central Italy, near Bologna, there is a vein of sulphur ore about fifteen miles long, but the mineral is not rich, and is necessarily taken from a great depth, sometimes over 800 feet. About 12,000 tuns are produced here annually, which is almost entirely consumed in the neighboring country for dressing cases of the vine. From the Papal States there were also specimens of sulphur, but the quantity produced there is very small, not exceeding 500 tuns. The Spanish specimens come from Murcia and neighboring localities, where there are some fine mines of sulphur.

Besides the above, there were specimens on exhibition from Galicia, near Cracovy, from Corinthia, in Hungary, from the Grecian island of Milo, from Tripoli, Isthmus of Suez, on the borders of the Red Sea, province of Rio Grande, in the north of Brazil; but, as already stated, it is from Sicily that we obtain the great bulk of sulphur used in the arts. In this island the strata of sulphur extend over a length of about 170 miles, superimposed one on the other to a depth of from three to twenty-five feet and containing about thirty per cent of sulphur. The mines are owned by various influential individuals, who, by restricting the supply and by rude and imperfect mining, keep up the price to the present standard. There have been as many as 1,000 mines opened, but at the present time not more than one half are worked.

The manner of obtaining the sulphur has been frequently described, and was formerly of a crude character. The method now in most frequent use is that of Tucci, the inspector of of mines of Catanisette and Catania. It is by means of a species of furnace called *calaroues*, by which very large amounts of the mineral can be operated upon at once. These *calaroues* are simply circular furnaces of a conical form, having an inclination of from 20° to 45°, according to the nature of the gangue (which is calcareous or of gypsum), so that the viscous sulphur can descend and run off at the bottom. The walls of the furnace are about one foot thick and ten feet deep, and made of a capacity to hold more than 1,000 cubic yards of the ore; at the bottom of the furnace there is a hole to run off the melted sulphur, being the outlet of a channel coming from the interior of the furnace, which channel is continued for a little distance outside the furnace, and is branched and arched over by laying masses of the mineral so as to form little tunnels leading to a reservoir.

The furnace is charged by putting large lumps in the middle, and then smaller fragments on the outside, and finally covering all over with previously exhausted ore. Around the upper part of furnace are several small chimneys going down a foot or two; by these the furnaces are kindled at the top and air is supplied by percolation from above. One operation requires about twelve or fourteen days. The sulphur which has been collected in the reservoirs is cast into molds. The furnace requires twelve or fourteen days to cool down, when it is cleaned out and recharged; and this operation is repeated so long as the furnace lasts.

There are recent processes of separation proposed by Fangére, and by Emile and Pierre Thomas, depending on heat, but they deserve no special notice.

The most novel method is that of Deiss; namely, to dissolve out the sulphur by sulphuret of carbon, and an apparatus has been erected to extract by his process several tuns of sulphur daily, but practical difficulties still exist and prevent it from becoming a complete success. The quantity of sulphur produced in Sicily has gradually increased from 46,000 tuns in 1832, to 300,000 tuns at this time, worth from $22 to $24 a tun at the port of exportation. This increased consumption of sulphur, in spite of the diminished use of it in the chemical arts (for it will be shown a little further on that pyrites to the amount of 800,000 tuns, representing 250,000 tuns of sulphur, has taken its place), is due to the very large and increasing amount used for preventing diseases of the vine—diseases that have been almost exterminated by its use; but its use is kept up, as it is considered of great importance to give the vineyards an annual treatment of sulphur. If, however, sulphur should fall in price a little below what it is now, it would again come into general use in the manufacture of sulphuric acid.

Sulphur from Soda-Waste.—In the German section were shown the results obtained by the process of M. Mond, a chemist, of Utrecht, by which he extracts sulphur from soda-waste. The soda-waste has ever been a great nuisance, as well as a great loss in the manufacture of soda by Leblanc's process. It has become so great a nuisance in many of the large factories, that stringent sanitary laws have been passed concerning the disposal of it; and in some places, where it has been scattered over large surfaces, birds have been known to be asphyxiated while flying over it, and to fall to the ground.

A large amount of sulphur is thrown away in this waste, so that for forty or fifty years chemists have endeavored to solve the problem of turning it to some account. The prospects now are that it can be made to yield up much of its sulphur, and the residue to furnish a valuable fertilizing agent, instead of a pestilential nuisance. Some idea may be formed of the abundance of this waste when it is stated that for every tun of alkali manufactured one and a half tuns of dry waste is produced, furnishing the accumulations referred to, that during moist and rainy weather emit sulphureted hydrogen gas, and in solution, poisoning waters of all kinds in the neighborhood.

Besides the process of Mond there are two others brought forward, one by M. Schaffner, and the other by P. W. Hoffman; and seven works exhibit sulphur prepared by one or other of these processes. All the processes are based on the same principle—the conversion of the insoluble sulphide of calcium in the waste into soluble compounds, by bringing it freely in contact with air, in order to oxidize it; lixiviation of the oxidized mass, and precipitation of sulphur in these liquids by a strong acid, as muriatic acid.

(To be continued.)

Reverie is not thought, though many people mistake it for thought. Thought is systematic; reverie is disjointed and fragmentary. Thought is laborious; reverie is the reverse.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Heat from Percussion and Heat from Friction.

Messrs. Editors:—On page 149, current volume, under the head of "Hammering Iron until it is Red Hot," I find the following, which I quote: "It has been asked whether iron could be hammered cold until it became red hot." And it is stated that, as an experiment to prove the affirmative, "when a piece of very tough iron was hammered with a moderately heavy hammer it became hot, but would not scorch a piece of paper. It was then hammered by two men, one of whom used a sledge hammer, but with no better result. Presently another workman took a horseshoe nail, and after hammering for less than two minutes with a light hammer part of the nail was brought to a bright red heat. The blows were light but frequent, and the nail was partly turned at each blow."

Now, is this not in strict accordance with the vibratory theory of heat?

No doubt a great part of the muscular force imparted to the hammer was, in both cases, changed into sonorous vibrations in the material sustaining the shock; this, of course, would produce the sensation of sound instead of heat.

The blows of the heavy hammer did not, directly, produce heat, but as the iron was not sufficiently elastic to recover from so great a compression, it was condensed, which caused a certain part of its latent heat to become sensible, but beyond this nothing was obtained. The light hammer, if at all, condensed the iron very little, and, the blows being "light but frequent," its force was expended in producing the very rapid molecular vibrations necessary in bringing it to the red heat which it acquired.

The human arm is incapable of striking very rapid blows, but if to the periphery of a wheel a series of small hammers be attached so that by the revolution of the wheel they will rapidly and in succession strike on a piece of iron it would probably produce a red heat much sooner than is possible by the hand alone. By greatly reducing the size of the hammers and increasing their number we would nearly approach what would seem to be the best mode of producing the desired result. Now let us look at the file, the saw, and the grindstone, and see if they do not furnish direct proof in support of theory.

What else than percussion would a piece of iron receive if pressed against the teeth of a revolving circular saw? Except the saw be put in too rapid motion the jumping of the iron from one tooth to the next would, in effect, be the same as so many distinct blows.

The same holds in relation to the grindstone. As it revolves hold one end of a nail against it, and it will soon, by leaping from one granule of the stone to another, acquire such an inconceivably rapid molecular vibratory motion as to become red hot. That a piece of iron under these conditions will soon become intensely hot is well known. The coarser the grit of the stone the more apparently is its action analogous to percussion.

These remarks lead us to see the close connection between friction and percussion—the one being insensibly graduated into the other; the difference is only in degree. Who can draw a line of separation? Spectrum.

Havana, N. Y.

The Gerner Boiler.

Messrs. Editors:—Permit us to correct an error in your statement, in your issue of October 9, respecting the amount of heating surface in the small Gerner boiler you tested at Paterson, N. J.

The boiler is 10 feet long, 2 feet front, and 3 feet rear diameter, giving a total heating surface of $83\frac{8}{100}$ square feet, instead of 144, as stated. The results obtained by you being over 15-horse power shows $5\frac{1}{2}$ square feet in these boilers to be sufficient to produce a horse power, and illustrates the efficiency of the heating surface. Kasson & Co.

New York city.

On the Flow of Elastic Fluids.

Messrs. Editors:—On pages 50 and 118, of the current volume of the Scientific American, are articles "On the Flow of Elastic Fluids through Orifices or Pipes." The theory of this subject which appears to be accepted by the writers of these articles, is the old theory, and the only one, so far as I know, that has as yet found its way into treatises on physics. It is, however, a theory which is widely at variance both with sound theoretical philosophy and with the results of experiment. It is, in fact, nothing more than the theory of inelastic and inexpansible fluids applied to those which are elastic and expansible; it being assumed that there is no difference between the two in respect to the law of their flow except what is due to the smaller ratio of weight to pressure in the elastic fluids.

The effect of the expansibility of elastic fluids is such as to take them entirely out of the law which governs the flow of those that are inelastic. It causes the flow into a vacuum in a given time to be only half as great as the old theory calls for; and this, not because the velocity of the flow is less than that theory assigns, but because the density of the flow is only half as great as the theory assumes it to be.

Another curious and important fact which results from the expansibility of a fluid, is that when it flows from one vessel into another containing fluid of less density, the fluid in the receiving vessel has no effect whatever to obstruct or retard the flow, unless its density exceeds half the density of that in the other vessel. In other words, steam at 20 pounds pressure in the cylinder, will discharge itself into the condenser already containing steam, of not exceeding 10 pounds, just as

rapidly as into a perfect vacuum. The bearing of these facts on the question of the proper size for ports and pipes in steam engines will be readily seen.

It appears from the first clause of the article on page 50, that some of the readers of the SCIENTIFIC AMERICAN are seeking information on this subject. I would refer such to the *American Journal of Science*, 2d series, vol. 5, page 78, where they will find the true law of the flow of elastic fluids set forth and mathematically demonstrated, and to vol. 12, page 186 of the same journal, where they will find the same law completely confirmed by experiment.

New Haven, Conn. ELI W. BLAKE.

Business Correspondence.

MESSRS. MUNN & CO.:—I herewith acknowledge the receipt of the official notice allowing a patent for my Can Opener, and I deem it my duty to thank you for your prompt and able management of my case. This is the third patent which you have obtained for me this year.

I have received several circulars from various patent attorneys residing in Washington, who offer their services free of charge until a patent is obtained. But I assure you, gentlemen, that I would sooner pay you your charges in advance, and run the risk of losing the amount along with the first Government fees, than to trust such agents with any business of mine. Therefore I care not whether they are capable or honest so long as I am satisfied with your manner of doing business.

I will cordially recommend your Agency to such of my friends as may need the assistance of patent attorneys.

I am, sirs, very respectfully yours,

WM. M. BLEAKLEY.

Verplanck, N. Y., Sept. 29, 1869.

MESSRS. MUNN & CO.:—I have received the two patents, one on a Bolt Heading the other on a Hook-Bending Machine, which you have obtained for me. Allow me to express my appreciation of the able manner in which my specifications and claims have been prepared, and to thank you for having so speedily obtained favorable decisions from the Patent Office.

Any influence which I can have in this part of the country, I assure you will be in your favor. Truly yours,

D. G. MORRIS.

Catasauqua, Pa., Sept. 16, 1869.

MESSRS. MUNN & CO.:—I received the patent on the 17th and the copies on the 20th.

I am so well satisfied with the manner in which you prosecuted the application to a successful termination that I shall give all such business to you in the future, and will influence any person—needing the services of a trustworthy and intelligent attorney—among my acquaintances, to give their business into your hands. I am truly yours,

LEVI S. IVES.

Pittsburgh, Pa., Sept. 21, 1869.

MESSRS. MUNN & CO.:—We have received our patent, and are highly pleased with the way in which the business has done. The ability which carried it through, and the care bestowed on its preparation, are above praise, and we will gladly intrust to your hands any further business we may have to do. Very truly yours,

J. H. WILDASIN & J. A. PECK.

St. Charles, Iowa, Sept. 24, 1869.

[We are constantly receiving warm commendatory letters like the above, from our many clients. The Patent Soliciting Department of this Office is going on with marked success, and inventors who contemplate taking out patents for their improvements can always avail themselves of our advice and assistance on the most favorable terms.—EDS.

New Cornish Engine.

We learn from the *Press* (Philadelphia) that the Cornish engine just started to work at the Schuylkill Works differs from the ordinary Cornish engines in having the heavy lever beams placed down upon each side of the cylinder, with their bearings resting directly upon the bed-plate and stone foundation, instead of over the cylinder, in the usual manner.

By this plan much greater stability is secured, and expensive alterations and additions, which would have been necessary with the ordinary form of engine, were avoided.

The size of the steam cylinder is 72 inches diameter and ten feet stroke, and the pump plunger is 36 inches diameter and ten feet stroke. The beams weigh about 28,000 pounds each, and the load in the plunger is about 60,000 pounds. This machine is capable of raising 7,500,000 gallons of water per twenty-four hours.

The action of the engine is peculiar. The steam is admitted upon the top of the cylinder, and after the piston has passed through about one-third of its stroke, the steam is cut off, the rest of the stroke being made by the expansion of the steam in the cylinder. The plunger has now been raised to the top of its stroke; a valve is then opened allowing the steam on the top of the piston to pass to the underside of it, thus putting an equal pressure on both sides of it, and allowing the plunger and its weight to fall by its own gravity and thus force the water to the reservoir. It will be seen that this plunger must, therefore, be heavy enough to lift the load of water in the main, and also to overcome the friction of the water in the pump and pipes.

The engine was designed by the Chief Engineer of the Water Department, Frederick Graff. In order to be able to make the contractors for the building of the engine (Messrs. Merrick & Sons) entirely liable, they were intrusted with the design for the details of parts, and are by their contract held responsible for the strength and proportions of these details. The engine is a splendid specimen of massive machinery, and reflects great credit upon Mr. Graff and Messrs. Merrick & Sons. The water is forced into the stand-pipe at the works, and thence through a main 36 inches in diameter and 312 feet long to the reservoir.

The engine is rt present worked by the old boilers. The appropriation for the new set of boilers intended for her was delayed more than eight months by the refusal of the Democratic members of Select Council to vote for the loan asked for their erection. They are now in place at the works, and will be put into use in a few weeks.

(For the Scientific American.)

DETERMINATION OF THE AMOUNT OF EXPANSION OF MINERAL OILS.

BY PROF. VANDER WEYDE.

In order to remove all doubts concerning the amount of expansion of petroleum, to prove that it does not expand more than whisky, and less than alcohol and most of the acids and oils, as stated in my communication to the SCIENTIFIC AMERICAN, page 38, current volume—I give here some of the data on which my statement was founded; and will exhibit only a few of a great number of determinations which I have made to settle this question, selecting those which recommend themselves by simplicity, because of the round numbers obtained

First Method by Means of the Specific Gravity Bottle.

A small bottle, with ground-glass stopper, made so as to contain, when entirely full, exactly 50 grammes of pure distilled water at 65° Fah., was filled with heavy kerosene, the product of the last stages of distillation, marking 30° on Baumés hygrometer; it contained at 32° Fah. exactly 44 grammes of the oil. When heated to 212°, a certain quantity of oil did overflow, and after cleaning and cooling [the weight of a hot object cannot accurately be determined on a sensitive balance, because of the air currents generated; this as a hint to young chemists] it was found to contain 41·15 grammes, proving an expansion of 2·85 grammes, or 6·5 per cent of the whole. As, however, the glass of the vessel expands, according to Regnault one 290th of its volume, this fraction of the 44 grammes has to be added for correction; it is nearly 0·15 grammes, which makes the expansion of the oil from 32° to 212° Fah., equal to 2·85 + 0·15, or 3 grammes, which is one 14·7th part of 44 grammes, and an expansion of 6·8 per cent., or 0·068. Other determinations with the same oil gave sometimes 0·069, 0·070, and 0·071.

Common kerosene of 49° Baumé was placed in the specific gravity bottle, and one of the samples gave, at 65°, exactly 40 grammes; heated to 125° it gave, after correction for glass expansion, 1 gramme less, being 0·025 for 60°, consequently 0·075 for 180°. When cooled to 35° it gave a contraction in bulk of 0·048 gramme, or 0·012th part of 40 grammes, corresponding to an expansion of 0·012 for 30°, or 0·072 for 180°. When heated from 120° to 180°, the expansion was found to give a co-efficient of nearly 0·079.

On these facts I founded my statement referred to, that the rate of expansion is less between 32° and 60°, and more at about 180° than the mean expansion, which is 0·076.

Light gasoline of about 90 Baumé was experimented upon, one sample gave for contents of spec. gr. bottle at 30° Fah., 32·43 grammes, and at 60° exactly 32 grammes. This gave an expansion of 0·43 grammes for 30° Fah. of heat, or one 74th part of the whole, which would give for 180° a little more than one twelfth, or 0·083—a rate of expansion only slightly larger than ether and turpentine, equal to most animal oils, but considerably smaller than alcohol, nitric acid, olive, and linseed oil.

In crude petroleum the expansion was found always between 7 and 8 per cent, and in proportion as they were heavy or light, it was nearer to the first or to the second of these numbers.

Second Method by Means of the Hydrometer.

When placing a thermometer and hydrometer in kerosene of 40° Baumé, at 65° Fah. temperature, and heating it to 125°, the hydrometer will sink and indicate 46°; as now 40° Baumé corresponds with a specific gravity of 0·83, and 46° Baumé with 0·819, it indicates an expansion of 0·83—0·819, or 0·021, which is the 40th or 0·025th part of 0·83, this amount for 60° gives 0·075 per 180°, the same as found above.

It will be found, in general, that for every ten degrees increase of the thermometer the hydrometer sinks one degree lower, and *vice versa*. For the lighter oils, a little above nine degrees Fah. will correspond with one degree difference in the hydrometer, and for the heavier oils 10·5° to 11° Fah. of heat will be required to make this difference, but in general ten degrees heat for one degree gravity is near enough for practical purposes; and, in fact, this is so well known that it is depended upon by experts as a necessary correction in determining the quality of different grades of oil. As 50° and 60° Baumé, respectively, correspond with a specific gravity of 0·785 and 0·769, the difference of these last numbers, 0·076, correspond with 18° of Baumé's scale, which, again, correspond with the expansion for 180° heat. Every degree of Baumé's scale corresponds thus with 0·076 divided by 18, or 0·00042, nearly, for the corresponding difference in specific gravity.

Third Method by Means of the Thermometer alone.

When taking a correctly graduated alcoholic thermometer, breaking the top open, heating the bulb so as completely to remove the alcohol, and then filling it with petroleum to such an extent as to make the freezing point of water 32° Fah. on the scale, to correspond with the surface of the petroleum in the tube when cooled to 32°, then placing this thermometer in hot water of 122°, as indicated by another thermometer, then the petroleum thermometer will only indicate about 100° on the scale; as the scale was constructed for the alcohol, its degrees are as much too large for the petroleum degrees as the expansion of alcohol exceeds that of petroleum; in this case it is found that 122—32 or 90 parts of alcohol correspond with 100—32 or 68 parts of petroleum; these numbers—90 and 68—are nearly in the same ratio as 0·100 and 0·076, the numbers expressing the ratio of expansion of alcohol and petroleum—another verification of the statements in the table published on page 38, already referred to.

When we consider the simplicity and reliability of all these methods, by which the rate of this expansion may be determined, and the perfectly accurate manner in which they corroborate one another, it is indeed surprising that M. Deville, before the French Academy, dwells so largely on the "very great expansion in bulk which mineral oils undergo by increase of temperature," and that when "barreled during the cold season it will expand largely with the first appearance of hot weather, and burst the vessels, on the same principle that ice ruptures our hydrants." [See SCIENTIFIC AMERICAN, page 376). That M. Deville does not communicate the ratio of this, according to him, so extraordinary expansion, is not truly scientific, and makes his whole statement unreliable.

I adhere to my opinion expressed before, that the cause of leakage of petroleum barrels by heat, is the elongation of the iron of which the hoops are made, which makes the staves loose; besides this, the staves will contract from the same cause, which increases the leakage; add to this the extreme penetrating power and volatility of the lighter portions, chymogene, gasoline, etc., which is so largely increased by any rise in temperature, and we have a perfectly satisfactory explanation of the increase of danger in hot weather.

Why Coffee is a Stimulant.

The changes which heat effects in the elements contained in the green coffee berry have been little studied; we merely know, from the researches of MM. Baitron and Fremy, on the one hand, and of M. Payen on the other, that the brown bitter substance and the aromatic principle are produced by the decomposition of that part of the coffee bean which is soluble in water, and that a large part of the caffeine disappears during the roasting. It is said that this (caffeine) is carried away with the volatile products generated in the operation.

By roasting coffee in an apparatus which allows of the recovery of all the volatile products, I have ascertained that if caffeine be carried away with the volatile products, it can only be in such small quantity as is not appreciable by weight, and cannot explain the considerable loss which takes place during roasting carefully performed. The loss is experimentally found to equal nearly one-half of the caffeine originally existing in the coffee. I have succeeded in demonstrating that the lost caffeine has been transformed into a volatile base—methylamine, or methylammonia (C_1H_5N), which was discovered by M. Wurtz. The following are the facts which prove the change of caffeine into methylamine during coffee-roasting:

If pure caffeine be submitted to the action of heat, and the vapor be carried through a tube heated to about 300° Cent. (about the heat which is necessary for roasting), and filled with fragments of pumice-stone, which delay the passage of the vaporized matters, only a feeble decomposition occurs; the greater part remains unchanged, and the little that is decomposed gives no characteristic product except cyanogen. This experiment tends to prove that it is not the caffeine which furnishes the volatile alkaloid existing in roasted coffee. But a very different result is obtained if, instead of acting on free caffeine, we experiment on caffeine in analogous circumstances to those in which it exists in green coffee. M. Payen has, in fact, shown that caffeine exists in that berry in the form of the *tannate*, *i. e.*, a combination of caffeine with a tannin peculiar to coffee. On submitting to the action of heat the tannate of caffeine which has been prepared with tannin of gall-nuts, we obtain, as with green coffee, methylamine: this compound behaves, under the influence of a temperature of about 300° Cent., in a manner similar to the tannate of caffeine first isolated by M. Payen. The whole of the methylamine produced during the roasting of coffee is not found in the solid residue; a certain proportion escapes with the volatile matters. It is easy to extract the alkaloid from roasted coffee by distilling the extract of coffee, made with cold water, with a weak base, such as lime. The addition of this alkali to an infusion of coffee immediately liberates the methylamine, the special ammoniacal odor of which is readily perceptible.—*M. Personne.*

Advertising Made Easy.

At a recent meeting of the "Society of Practical Engineers," one of the Society's M. D.'s read an elaborate paper on water meters, and closed with an eloquent description of a meter which the speaker had himself invented. He believed that he had made the most accurate, the most simple, the most durable, and the cheapest water meter in the world; and he invited for it the closest scrutiny and investigation of all concerned. This apparatus, he said, could be furnished at two dollars apiece.

This is certainly cheap enough; we had no idea that an accurate, simple, durable water meter could be had for so small a sum of money. Besides, we are pleased to notice the liberal conduct of the learned society, in permitting the discoverer to eulogize the merits of the meter in the proceedings of the evening. The Secretary of the Society will please send us its advertising terms.

THE Snorer's Companion is the name of a newly patented device to be attached to the backs of church pews, forming a comfortable head rest, and enabling the owner to sleep through the dullest sermon with the greatest satisfaction.

DEMUTH'S IMPROVEMENT IN GLASS WINDOW LIGHTS.

This invention is one of the simplest character, and can be described in very few words; notwithstanding which fact it possesses several important advantages which the practical mind will at once recognize.

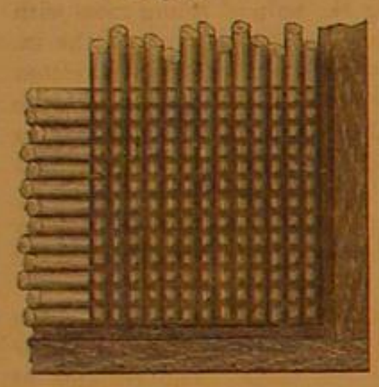
In place of figured, ground, or stained glass used for transmitting light without permitting objects to be viewed through them, for office windows, screens, signs, etc., the inventor employs a series of glass rods cut to the proper length and placed side by side in grooves cut in the frame or sash, as shown in Fig. 1; or two or more series of glass rods placed across each other at right angles, as shown in Fig. 2, or at any other angle desired to produce a given effect.

Fig. 1.

The light, in passing through these rods, becomes broken up so as to cut off vision through them, at the same time that the illuminating power of the light transmitted is not materially impaired when plain white glass is employed.

The advantages claimed for this method of using glass in window lights, screens, etc., are, that a much cheaper light can be made in this manner than by grinding, etching, or staining glass; that in case of breakage only the broken rods need be removed and their places supplied with new rods at a comparatively small cost; while, by using rods of various colors, in a single or crossed series, as shown in the engraving, very striking and showy effects can be produced by the transmitted and refracted light through such a series; the combinations of color being practically without limit.

Fig. 2.



This invention was patented through the Scientific American Patent Agency, by William A. Demuth, September 22, 1868. The agent for all sales is Victor E. Mauger, 110 Reade street, New York, who may be addressed for further information.

THE DRIVE WELL.

A recent number of the *Country Gentleman* contains an interesting communication from Dr. S. J. Parker, an old resident of Tompkins County, New York, showing conclusively that the drive well is an old invention, and was in actual use at Syracuse, New York, between 1840 and 1847. Dr. Parker says:

A piece of cast iron about six feet long, both with and without side holes, was made, and a hole four to six inches in diameter in the center. This cast iron point was fastened to a wooden log ten or more feet long, and pressed down in the mud near the lake. Then to this log, joining like the common aqueduct log, everywhere in use, the second log was secured, and so on a third and fourth and more logs, as one after the other they were sunk to the salt water. A shed with earth and stones to weight the part of the logs and of the ground so as to sink the log tube was used. Here is truly, in 1840 to 1847, the American driven well, for it had a point, a tube sunk without the removal of the earth upwards, holes near the point, and what is singular the tube itself was used as the pipe of the pump, for the line of logs, nearly or quite a quarter of a mile long to the Salina pump-house, was attached to the top of the tube, and drew the water that distance; that is, drew the water up one hundred and sixty or eighty feet, thence along the level many rods to the pump-house, and up to the great cylinder worked by the canal water wheel, and forced it, a boiling stream, to the top of the tanks; whence a similar line of logs conveyed it to the fires that boiled the water. There were wells over twenty years ago, seen by tens of thousands of our citizens, with every principle or device of the American driven well that inventive skill can name. The substitution of one material, gas-pipe, for log-pipe, is not invention but the choice of a mechanic, artist, or engineer.

In some cases a wooden plug was driven in the cast iron pipe, which weighed several hundred pounds, and the well sunk to near the salt water by the pressure of the stones that lay near by—the tube being dry and clear over 100 or 150 feet, when a heavy bar on the end of a rope was let down and the plug driven out. The tube was thus cleared at the point after being sunk.

In 1869, Dr. Parker had occasion to drive a tube well for his own use, and employed for this purpose two old locomotive flues, which he had welded together, making a pipe 16 feet long. This he pointed with a block of wood, drove it down with an axe, then with an iron rod pushed out the wooden point, and thus in an hour's time, at a cost of only $2·50 he had a good well, which has been in operation ever since. The Doctor was advised to apply for a patent, but as he had only copied the plans which he saw used several years previous, he felt that he could not conscientiously take the oath of invention. Other parties saw the pump at the time the Doctor started it, and since that time several patents have been granted for improvements. It remains to be seen whether the original patentees of the drive well can sustain their broad claims in view of the facts above presented.

ANDREWS' PATENT SAW HANGINGS AND SAWS.

The improvements to which the attention of our readers is invited in this article, and which are illustrated in the accompanying engravings, are, in our opinion, the most important recently made in methods for hanging mill saws. These improvements, however, not only include the hanging of the saw, but an inspection of the engravings will show an important change in the saw itself.

Fig. 1

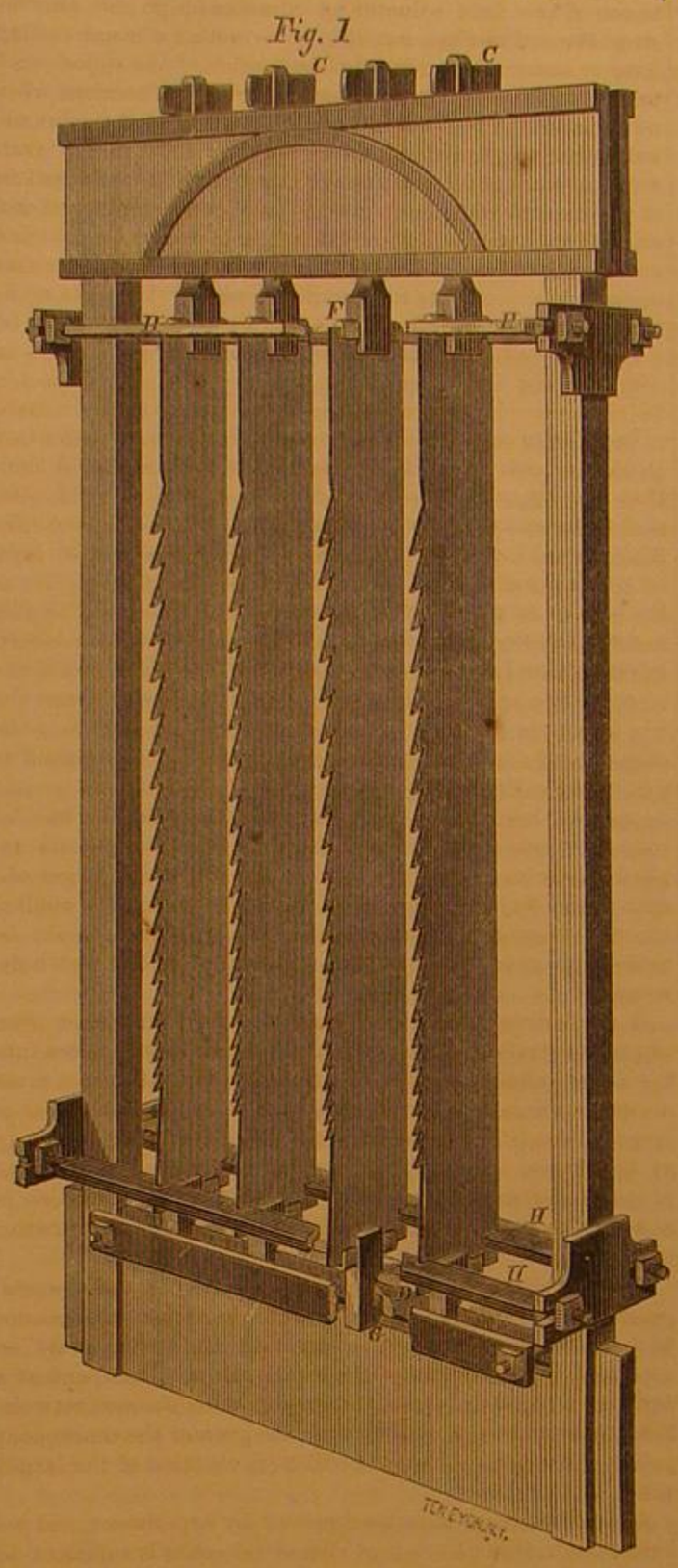


Fig. 4

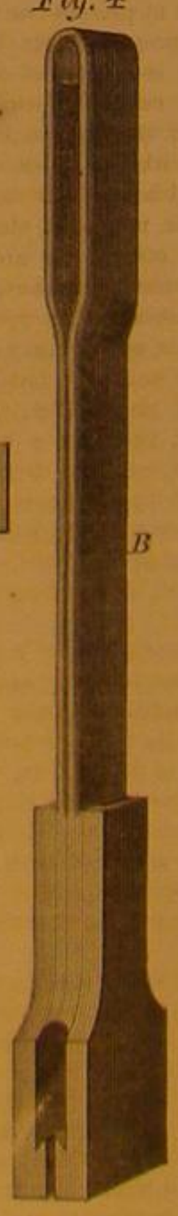


Fig. 2

Fig. 5

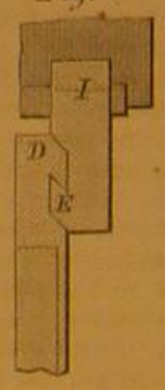


Fig. 3

The objects sought in these improvements are five; namely, to do away entirely with punching or drilling saws at the mill; to allow the strain to be placed at any desired part, and to be gradually changed as the saw wears away; to enable the sawyer to adjust the "rake" of the saw, or, as it is commonly styled, the "overhang," in a very short time; to permit the employment of thinner saws and thus reduce waste in the kerf; and, finally, to obviate the objections against the exclusive use of fine teeth, or of coarse teeth, on such saws, by a compromise between them; the teeth at the upper part of the saw being coarse and gradually becoming finer toward the bottom.

We shall treat the means by which these objects are attained in the order of their statement; but we ought, perhaps, to state first that they are the result of long experience in the cutting of lumber, and that an intelligent analysis of first principles has been brought to the aid of experience in bringing them to their present state of perfection.

The punching of the saw at the mill is avoided by placing over the end of the saw a piece of metal, the form of which is shown in Fig. 2, drilled and permanently riveted to the saw.

Upon this piece of metal is slipped the hook shown in Fig. 3, the slot, A, of this hook being made to admit and fit closely the metallic piece shown in Fig. 2, and a short portion of the saw blade below it. The bearing at the upper part of the slot, A, is curved, as shown at the dotted line, I, Fig. 5, to permit parallel strain in adjusting the overhang. Fig. 3, however, is the hook used at the bottom of the saw, while Fig. 4 represents the application of the same method to the upper end of the saw blade; the shank, B, of the stirrup passing through the upper girt of the saw gate, and being keyed up in the usual manner, as shown at C, Fig. 1. A metallic plate, D, bolted to the lower girt, Figs. 1 and 5, and grooved to fit the hook, as shown in section at Fig. 5, forms the means for making the attachment of the saw at the lower end. These attachments are shown at F and G, Fig. 1, parts being broken away for the purpose. This engraving gives a good representation of a gang of saws mounted in the manner described.

It will now be seen that any desired rake, or overhang, may be given to the saw, and that the strain can be placed at any desired part by simply tapping loose the keys, C, and sliding the blade in the slots A of the hook, Fig. 3, or the stirrup, Fig. 4.

These advantages lead naturally to the securing of the fourth object above enumerated; namely, the employment of thinner saws than could otherwise be used, as the strain may be adjusted in a line parallel and very near to the teeth. The distance between the saws is regulated by the bars, H, having slots sawed on their inner edges to fit the thickness of the blades.

The manner in which the fifth object sought is attained has already been stated in general terms; but as this involves a new principle in the construction of mill saws some further explanation is needful.

It is well known that hand rip saws are made with coarser teeth at the heel than at the point, or so that fine teeth commence and coarse teeth finish the cut. Fine teeth cut at the outset much more smoothly than coarse ones, but as soon as they become clogged with sawdust they lose their efficiency to a great degree. As this partial clogging becomes most troublesome at the latter end of the stroke, the arrangement adopted in these improvements brings the larger teeth into play just where they are needed, and obviates the rank tearing of coarse teeth at the commencement of the cut, and reduces the amount of splintering at the bottom of the kerf, Thus a much smoother action and better work are obtained.

These improvements have secured the warmest approval from some of the most extensive lumber manufacturers in the United States. Among these we may mention Benjamin W. Thompson, superintendent of the celebrated Dodge Mills, Williamsport, Pa., and J. G. Marvin, foreman of the same, who state that they should be very unwilling to dispense with their use. Numerous other testimonials from prominent men in the lumber trade, have also been shown us, which leave no room for doubt as to the value of the improvements.

It is almost unnecessary to mention that these improvements may be adapted to double hook gates as well as to single hooked ones, or that the attachment shown in Fig. 2, when clasped and riveted to the saw, must greatly strengthen the plate. They are also equally applicable to muley saws.

A patent for the improvements in saw hangings was obtained April 21, 1868, one on the improved construction of the mill saw, December 29, 1868, and on the strap or tab, June 1, 1869, by E. Andrews, of Williamsport, Pa., who may be addressed for further information.

S. H. K., of Ky., sends us a sample of eggs of the Rear Horse, and says, "In your current volume, page 181, I notice a cut and concise history of the Rear Horse. They have been known to me by the name of 'Devil Horse.' I have always been afraid of them, not because they ever did me any harm, but because they looked as if they might if they had a chance, and I have always killed them. The mother of this bundle of eggs, I suppose I killed only a few days before I received your statement about them. It is a source of relief to me to know that they are harmless, as I frequently meet them.

Dynamite.—A correspondent writing from St. Louis, says, "Will you please, in your paper, inform venders of "Dynamite" that a subscriber thinks if they would advertise with you, they would increase their sales?"

Scientific American,

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NEW YORK, SATURDAY, OCTOBER 16, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

THE HYDROSTATIC PARADOX.

Such has been the term applied to the enunciation of the truth, that any column of water, however small, may be made to raise any weight, however large, experimentally shown in the familiar piece of apparatus known as the water bellows. This proposition is theoretically correct, although there are practical limits to its application. Why it should be considered paradoxical,however,any more than the action of a lever, has always been a puzzle to us. Theoretically, it is just as true of the lever, that any weight, however small, may be made by its means to raise any weight, however large, as of the water bellows, or the hydrostatic press.

In either case, on the principle of "virtual velocities," the weight of the body which raises, multiplied into the distance it moves, will always equal the weight of the body raised multiplied into the distance it moves, friction being supposed to be nothing. And, practically,in all cases the weight which raises must be enough heavier than would be found by this equation, to overcome the friction of the apparatus, whether bellows or lever.

Some of our correspondents are puzzling their heads over the theory of hydrostatic pressure as applied to the press of Brahma, and we are in receipt of not less than a dozen inquiries in regard to this subject. We will endeavor to answer these inquiries definitely in this article. The subject only becomes obscure, when we attempt to get back of nature's laws, to find out *why* things are as they are. We shall confine ourselves to the simple question of *how* they are. The equilibrium of fluids was ascribed by Pascal to the principle of virtual velocities above mentioned. This principle or law of nature has been thus enunciated: "Forces in equilibrium must be to each other as their velocities." It may be added, that when any two forces are so related to each other that the motion which each tends to produce is in an opposite direction to that of the other, and so that the distances through which each would move, if an additional force were made to aid either, would be inversely as the forces themselves, then unless an additional force be made to aid one or the other of the two forces thus related, neither will produce motion.

An example of two forces thus related would be two springs, one having a strength equal to the support of two pounds, the other a strength equal to the support of four pounds, attached to fixed supports, and acting upon the ends of a lever six feet long, resting upon a fulcrum placed two feet from one end and four feet from the other—the two-pound spring the shorter. In this case, no motion would take place unless one of the springs were assisted by an additional force. The two forces would be in equilibrium.

Now, when a small column of water supports a larger column, their weights are two forces, exactly so related. Neither column can descend without the other ascends,*i.e.*, moves in an opposite direction, and the distances through which the columns would move would be inversely, as their weights. That either may move, an additional force must be applied to at least one of them, which will cause a motion in both. But an infinitesimal additional force applied to one column would be sufficient to destroy the equilibrium,unless some resistance or counteracting force should immediately impede the motion of the other column. Moreover, the properties of fluids are such,that the weights of any two columns of fluids, connected at their bases by a fluid medium, invariably sustain the relation we have described, unless some other force acts upon one or both columns.

It is unnecessary for our present purpose to complicate the question by a consideration of columns of unequal diameters in different parts, the columns here spoken of being those of uniform diameter throughout.

Further, although this law of virtual velocities has been the subject of many explanatory efforts, we know no more about it to-day than we do about the nature of gravity. All we can do is to recognize its existence as we do that of gravity, all else must be merely fruitless speculation.

The hydrostatic press of Brahma,applies an additional force to one of two fluid columns in equilibrium, to not only destroy the equilibrium, but, also, to overcome a counteracting force or resistance opposed to the motion of the opposite column. We have said the two forces in two such columns when no additional force is applied,are the weights of the columns; but as the weights of the columns are to each other as their sectional areas,these areas may be used as the representatives of the two forces, and it will be more convenient to so consider them. But as these areas, when geometrically similar, are to each other as the squares of their diameters, we may operate still more conveniently by making these the representatives of the two forces.

Let the small column of a hydrostatic press be one inch in diameter, and the large column be two inches in diameter. When these columns are in equilibrium, the weights will be to each other as their sectional areas, which are to each other as the squares of their diameters, or as one is to four. Here we have a force of one balancing a force of four, simply because they are so related, that if motion should take place by the action of an additional force on either column, one must move in an opposite direction four times as far as the other. It follows that, as the motion produced by this force must be transmitted through the fluid medium connecting the two columns at their bases, and as this medium is the condition which establishes the peculiar relation between the two forces, the ratio between the force applied and the resistance it will overcome must be exactly the same as existed at first between the two columns, so that if a force of six pounds be applied through a piston resting on the top of the smaller column, it will balance a weight of twenty-four pounds applied through a piston resting on the top of the larger column; and any less force than twenty-four pounds, applied through a piston, to the top of the larger column, would be raised one inch for every four inches the smaller piston descends.

It also follows, that the quantity of fluid displaced from under the smaller piston is exactly equal to that injected into the larger cylinder,and that the stroke of the small piston must always be through a greater distance than the movement of larger piston in the same time, the distances being inversely as the forces. The principle which underlies the action of of this machine, namely, the principle of virtual velocities, is as immutable and as inscrutable as the existence of matter and force.

We have here, also, a reason why great hydrostatic power, generated by a small column of water in such a press cannot be made to generate a motion any more rapid than could be produced by the motion of the small column itself, and as a further and final deduction,the greater the difference between the diameters of the pistons, and the greater the consequent power of the press,the slower will be the motion of the larger piston.

All of these facts have been proved by experiment, and we have shown that the law of virtual velocities is sufficient to account for them.

THE WANDERING OF PHOSPHORUS IN PLANTS.

Phosphorus, long known as a chemical rarity costlier than gold, but at present one of the most extensively used of chemicals, is prepared from bones. However, bones can only be regarded as organs of collection, as originally it is derived from the earth. Phosphorus is not found in a native or uncombined state, since its affinity for oxygen is very great. United with this latter element it mostly forms phosphoric acid, which again is met with in union with such bases as soda, lime, magnesia, etc.

These compounds are termed phosphates, and are widely distributed over the globe, although they rarely occur in large masses on one spot. They occur in the soil—in most limestones, and in many clays and marls—which fact accounts for their value as fertilizers. Nearly all iron ores contain traces of phosphates; these are reduced in the process of smelting, phosphorus being set free; hence its presence in cast iron, wrought iron, and steel. The excellent Russian iron from the furnaces of Prince Demidoff, near Nischnetagilsk, according to Schafhäutl, owes its qualities to a trace of phosphorus. Still, this admixture is not always desirable, since, if exceeding certain limits, it makes the iron cold-short.

Phosphorus is also a component part of our own body; it exists there not only as phosphoric acid, but also in a de-oxidized condition united with organic substances; as, for instance,in the fatty matters of the brain, whence the well-known sentence of Moleschott, "No thought without phosphorus!"—a sentence, it may be stated, that has been the subject of considerable abuse. However, it is not only in the brain that phosphorus is met with, for, according to Ronalds, a part of the phosphorus of the urine, from which this element had first been separated, occurs also united with an organic compound.

How does the phosphorus pass into the human body? Through plants especially. To them the part has been assigned to withdraw it from the soil and to prepare it for the food of man. Before phosphorus was known to exist in the animal kingdom, its presence in plants had been considered as an acknowledged fact; indeed, phosphorus was found in them before it had been ascertained in the urine of man. The number of vegetables greatly increased in which the element in question was met with; it remained unknown for a long time that it had to be ranked among their constituent parts, and even when this could no longer be doubted, its origin remained an enigma. Although Fownes had already stated that many volcanic minerals contained phosphorus, this assertion was not regarded as true. To modern times it was reserved to throw light upon this subject. In the molybdate of ammonia, chemistry now possesses an exceedingly sensitive reagent for phosphoric acid, which is so very important for the growth of plants. It has been ascertained by Forchhammer that a soil in which phosphoric acid can scarcely be detected, contains of this material not less than 790 pounds per acre, to a depth of one foot. Is it therefore surprising that phosphates occur so frequently in mineral springs and rivers? It seems that the phosphates in plants serve especially for the formation of the albuminous bodies, that are so all-important for the building up of the human framework. With regard to the wandering of phosphorus in plants, we present the following interesting facts of Corenwinder:

Young plants always yield ashes rich in phosphorus. However, after the maturity of the seeds or fruits (for which phosphoric acid is especially needed), the stems and leaves are found to contain only traces of this acid; and when all the seeds have reached perfect maturity, the stems, leaves, and roots are generally devoid of phosphorus. This element appears to occur in an intimate combination with the albuminous principles of vegetables. Indeed, if these are dissolved with water or other liquid, the phosphates pass also into solution, while they become insoluble, when the albuminates are coagulated by boiling water. The vegetable organs which lack phosphorus, seem also to be free of albuminous substances, at least not a trace of phosphates could be met with in the woody pericarp of certain fruits, as in the almonds and hazelnuts, the ashes of which yield principally silica and lime.

The exudates of plants generally contain no phosphoric acid; at least such is the case with manna and gum-arabic. It is known that in exhausting the pulp of young roots with water, fibrin is obtained, which contains pectose and the incrusting substances. It follows, therefore, that the skeleton of vegetables owes its solidity not to the phosphates,as is the case with that of the animals. The leaves that remain in the forests during winter yield ashes rich in iron, silica, and lime, but free of phosphorus. It is also worthy of note that, although analysis has as yet failed to discover phosphates in the sea, the maritime plants contain considerable quantities of this substance.

Corenwinder, at least, has searched in vain for phosphoric acid in the water of the North Sea, as well as in the boiler sediments of vessels crossing the ocean. The pollards of flowers and the spores of cryptogams are rich in acid of phosphorus; this being especially the case with the pollards of *Lilium candidum*. It is remarkable that the ashes of pollards and those of the semen of animals are nearly alike in their component parts, they being both rich in phosphoric acid!

From all we know, it is certain that the presence of phosphates in plants is necessary to the formation of the organic substances in question. For agriculture it would be highly important to know whether there exists a relation between the quantities of the phosphates and those of the albumenoids, but unfortunately very little is known about this subject, and it will demand manifold and extensive researches before satisfactory information will be obtained. But such researches are very desirable, for it should be the duty of agriculturists to look rather to the production of highly albuminous matters, than to endeavor to bring certain organs of plants to a high state of development without regard to their nutritive value.

THE EXHIBITION OF THE AMERICAN INSTITUTE.

A writer in the New York *Tribune* has given expression to singular views in regard to the character of American inventors. He says that "with some notable exceptions, they have exhibited their powers of invention with reference to secondary rather to general principles; more by using the discoveries of other people than their own." "Of course," he continues, "we shall be told that there are but few general principles, while the details may be considered as infinite, and we shall be reminded, too, that upon Dr. Franklin's discoveries in electricity almost a whole science has been founded—that steamboat navigation, the use of ether in surgery, the mowing machine, are ours, and the power-printing press, the telegraph, and the sewing machine, were all conceived beneath the skies of this new world. We grant that these, and others which could be named, are proud achievements, and their application to so many of the wants of daily life gives them especial prominence; still, we ought to consider that, in compass, acuteness, and perseverance, the English mind is unexcelled, for to it we owe the discovery of the use of steam, the invention of the steam engine, of the power loom, of the spinning jenny, and of the locomotive and railway, all of which required the application of grand principles, and they are of such immense utility that they have an influence upon almost every being on the face of the globe. However, the art of printing from movable types clearly was a necessary preliminary, and it would seem that the German nation was not to be deprived of some share in the great work of modern progress."

The writer of this paragraph has evidently not comprehended the distinction between invention and discovery. Invention is the application of general principles to the construction of new machinery or the development of new processes. Discovery has nothing in common with it. The former either discards experiment, or uses it only to verify the truth of previous conceptions arrived at by a process of pure reasoning. The latter progresses only through experiment—theory only pointing out probable paths of discovery in which to conduct experimental research.

The inventions alluded to by this writer were all, in this

regard, secondary, or based upon general principles previously discovered.

While we grant to England a large share of honor, both for discovery and invention, we not only accord to Germany and France equal shares of honor in the development of general principles, upon which England and America have based their inventions, but we unhesitatingly assert that, when the age of these nations is taken into account, America has led them all, both in discovery and invention.

The length of this article will forbid entering upon an argument to prove the truth of this claim, but we shall not hesitate to take up the gauntlet in its defense at a future time should it meet with denial.

Ample illustration of the originality and comprehensive character of American inventive genius may be found in the

MACHINERY DEPARTMENT

of the American Institute Exhibition, to which, after two weeks' enforced delay, we now invite the attention of our readers. Much of the delay was caused by the tardiness of exhibitors, and also to the fact that the unexpected magnitude of the display in this department took the managers by surprise. Preparations to transfer a portion of the machinery to the main floor were necessitated; the structure specially erected for this purpose proving too small to place all who desired room. This compelled extension and modification of the original plan, the erection of new lines of shafting, etc.; but at last all these obstacles are surmounted, and every machine, we believe, which demanded power has been or will be accommodated.

THE BOILERS

which supply the main driving engines with steam are three, known as the Root, the Harrison, and Salisbury boilers. The former is made and exhibited by the Root Steam Engine Co. of New York. It was illustrated and described on page 273, Vol. XX., of the Scientific American, to which the reader is referred. The Harrison boiler is of peculiar construction, being composed of hollow cast-iron globes or shells communicating with each other in all directions, by short tubes, so as to permit of a free circulation, around and between these globes and tubes the heated gases of combustion play. Immense heating surface is secured in this way, while each of the globes may be considered as a separate small boiler, having only the same liability to explode that would attend an isolated boiler of the same size and construction. There can be no doubt that these boilers will endure, with safety, enormous pressures, and their steam-generating power is said to be highly satisfactory. This boiler is made and exhibited by Joseph Harrison, of the Harrison Boiler Works, Philadelphia.

The Harrison boiler has attached to it Berryman's Patent

LOW-WATER ALARM,

constructed on a novel principle, and evidently a very sensitive instrument. It consists of a globe and steelyard, with counterpoise. When the water is at the proper hight the globe stands full of water, and its weight counterbalances the weight on the steelyard. As soon as the water falls too low, steam immediately replaces the water in the globe, and the counterpoise falls a short distance, opening a whistle valve, which gives an alarm. The same instrument might easily be adapted to control the feeding of a boiler by means that will readily suggest themselves to engineers.

The Salisbury boiler is a new claimant for public favor, and we hear it spoken well of. We are, however, unable to give details of its construction. At the present writing it had not yet been used to supply steam to any of the engines, though wewere informed that Rider's engine mentioned below would be driven by it.

These boilers are placed outside the main building under an open shed, the managers not permitting any fires on the floor of the building in which the exhibition is held. In this shed are also placed some of the engines exhibited, which we will notice in passing.

Adjacent to the Root boiler stands the Roper

IMPROVED CALORIC ENGINE,

Illustrated and described on page 257, Vol. XX., of this journal, to which we refer the reader. We have no doubt that this engine deserves to rank among the best of its class now in market, and as a small, portable, safe motor, it may be advantageously applied where steam is out of the question.

Here stands, also, the portable engine invented by William Baxter, of Newark, N. J., illustrated and described on page 353, Vol. XX., of this journal. It is quite evident from the interest taken in this engine by engineering visitors to the Fair, and the warm encomiums bestowed upon it, that this engine is to occupy a prominent place among improvements of a similar character in this country. The engine is placed disadvantageously on account of the conditions of the lease above specified, but notwithstanding this drawback it will make its mark. It consumes the smoke so thoroughly, and employs such a small quantity of steam, that notwithstanding the exhaust enters the smoke-pipe, no sign of either smoke or steam can be seen issuing from the end of the smoke-pipe. It is driving two blowers, requiring four-horse power, as tested by Neer's dynamometer, and does this work with a surprising economy of fuel. These blowers will be more particularly noticed in a subsequent article, together with others on exhibition. On the

MAIN FLOOR

of this department are placed a number of large horizontal engines, which are well finished, and the peculiarities of which are well known to engineers, we shall not, therefore, in our notice of these, enter much into details, but confine ourselves to such general remarks as suggested themselves to us in the brief time we could allot to each of them. The designs of these

STEAM ENGINES

show much taste and skill, and most of them are highly ornamented in their finish.

The Fishkill Landing Machine Works exhibit a thirty-horse horizontal engine having tapering, cylindrical, and, consequently, balanced valves, so adjusted that their wear can be taken up by a set screw. The ports in these valves are formed analogously to those of the gridiron slide valve. The movement of the valves is obtained by a system of plain and bevel gearing, the induction valves being actuated by a differential cam, which, through the action of the governor, gives the required cut-off. The exhaust valves are worked by a simple eccentric, driven by the same gearing which imparts motion to the differential cam.

The Novelty Iron Works horizontal engine, illustrated and described on page 161, current volume, of the Scientific American, will be exhibited although not yet in place.

A stationary engine of eighty-horse power made and exhibited by Babcock & Wilcox, of New York, is a good engine. The motions of the valves are shown through glass plates. The peculiar features of this engine were fully described and illustrated on page 257, Vol. XVII., of this journal, to which we refer the reader. The cut-off valves are actuated by the steam itself. The governor is of peculiar construction, by which all variation, consequent upon the movement of the balls in an arc of a circle, is obviated, these balls having a parallel motion instead of the ordinary one. The valves also have a constant travel under all circumstances by which many advantages are secured. Altogether this engine will repay careful examination from engineers visiting the department.

The Delamater Engine Co., of New York, exhibit a very handsomely designed horizontal engine of the Rider's Patent, and also an upright engine constructed on the same general principle. In this engine the cut-off valve ports are cut obliquely to the longitudinal axis of the main valve, on the back of which plays the cut-off valve. The cut-off valve face is convex, and the seat is turned out to the true arc of a circle. The form of the valve is triangular in plan, and the two oblique parts in the seat are placed relatively at the same angle as the corresponding sides of the valve. A partial rotation of this valve on its spindle, therefore, opens or covers these ports sooner or later in the stroke, and the motion which performs this partial rotation is derived from the governor. The cut-off may be made, therefore, at any point of the stroke desired, the parts employed to accomplish these results being very few and simple.

William A. Harris, of Providence, R. I., exhibits one of the celebrated Corliss engines of eighty-horse power. It would be entirely superfluous to dwell upon the construction of this engine, which is well known to engineers throughout the civilized world. There is no doubt in our minds that in economy, beauty of finish, and a happy combination of all the essentials to a perfect steam engine, it ranks among the first, not only in America but in the world. The reader will find some remarks upon this engine in the Scientific American for October 24, 1857, setting forth the advantages gained by the Corliss improvements; and during the twelve years which have succeeded the engine has had a history which its inventor may justly regard with pride.

The engines exhibited this year show that American engineers are giving most careful and earnest attention to economy in the production of steam power, and although the number shown is not large, it may safely be said that they represent all that is best in American steam engineering practice.

Charles E. Emery, General Superintendent of the Fair (partially known to our readers through a series of articles on "Modes of Testing the Power and Economy of Steam Engines," published in Vol. XIX. of the Scientific American), informs us that a competitive test of these engines will be made ere the close of the Exhibition. The judges have not, however, yet been appointed.

We also notice in this connection Tupper's

FURNACE GRATE BARS,

exhibited by L. B. Tupper, of New York, an illustrated description of which will be found on page 360, last volume of this journal to which the reader is referred. The bar is designed to secure the best draft, while its great depth enables it to conduct away the heat from the upper surface and prevent the grate from rapidly burning out. Ample provision is also made for expansion and contraction.

Another good thing appears to us to be the

FIRE-PROOF CEMENT,

exhibited by the inventor, Mr. Barnum, of Troy, N. Y., intended as a non-radiating covering for boilers, steam pipes, etc. It is much cheaper than felt, in our opinion more efficient, and is said to be more durable. We are informed that it has been adopted in the Bessemer Steel Works at Troy, and is giving good satisfaction.

One of the most important machines now running at the exhibition is

LYALL'S POSITIVE MOTION LOOM.

A description of this loom, published on page 17, current volume, of the Scientific American, with engravings showing its operation has been more extensively copied in American and foreign scientific and mechanical papers and periodicals than probably any article of a similar character ever published in this country. This is a sufficient evidence of the importance of the improvement, which we stated in that article, was consequent upon its radical character.

The statements we then made in regard to it have all been sustained in practice, insomuch that some would-be authorities on mechanical subjects who took exceptions to the radical character of the invention, and even its originality, have been compelled to acknowledge all the points claimed in our descriptive article. We do not hesitate to pronounce this loom the chief attraction of the Fair to the manufacturing public. There are two on exhibition, one of which is running on dress silk and the other is weaving drugget six and a quarter yards in width. The operator of the drugget loom is a young girl, who is able to manage it with perfect ease, and can control its speed at will, the character of the work being the same no matter how low the speed may, within any reasonable limit, be carried. This is the only loom in the world which can weave goods of any required width.

Any one examining the beautiful silk texture, in the smaller loom, will be convinced of its value as a silk loom. We must however pass from this interesting feature of the department to a cursory review of the collection of

WOOD-WORKING MACHINERY,

undoubtedly the best ever displayed at any one exhibition in this country. One of the first improvements that catches our eye in this department is the

BLIND STILE MORTISING MACHINE,

invented and patented by Leonard Worcester, and exhibited by the agent for its sale Mr. Martin Buck, of Lebanon, N. H. It does its work automatically, rapidly, and excellently; and fully sustains all that was claimed for it in a descriptive illustrated article, published on page 152, current volume, of our journal.

John J. Sanders, of New York, exhibits a combined

SAWING AND MITERING MACHINE,

very substantially constructed, and capable of performing a great deal of work very accurately. It was illustrated and described in our issue of October 7, 1868.

The method of setting and securing the planing bits, or cutters, in this machine is peculiar and very effective; it can be also applied to any tenoning, grooving, or planing machine, as it leaves a clear throat for the discharge of chips, unimpeded by bolt head or other devices, and does not necessitate the slotting of the bit which is simply a plain plate.

Geo. L. Cummings, of New York, exhibits a

FLUTING MACHINE

for banisters and all similar work, the peculiarity of which is, that the cutter-head, once set, remains immovable, the work being lowered away from the cutters by an adjustable center. By this means perfect uniformity in the work is secured. We were much struck with the simplicity and beauty of this machine. This gentleman also exhibits a saw table with a circular grooving saw, which works equally across or lengthwise of the grain, the saw being set inclined to the arbor. He also exhibits a 6-inch four-sided molding machine which is evidently capable of doing good work and a good deal of it.

C. B. Rogers & Company, of New York, display a set of improved

SAW ARBORS,

with self-oiling boxes. These arbors are made of the best English steel, and are elegantly finished. The boxes are cast on a solid bed, which connects the two together in such a manner that it is impossible for them to get out of line. They also exhibit an upright shaping machine, very neat and strong, with iron frame self-oiling steps and boxes. Also a pin and dowel machine with power feed, in which the operator has only to start the rod into the head and it will come out finished. Also a patent molding machine, working four sides at once, capable of making every variety of moldings, from the largest and most complicated down to the smallest. This machine also does double surfacing and matching to 10-inch, planing and matching staves, planing siding, sticking stair rail, etc. They also show a slat-sticking machine for blind slats, small moldings, etc., which works four sides simultaneously the same as the larger machines. An entirely new machine also exhibited by them is an

OUTSIDE HEAD-MOLDING MACHINE,

which works four sides at once, and does work from twelve inches deep by 9 inches wide, down to any required size. They claim that this machine will stick 20,000 feet per day. All of the machines exhibited by this firm are highly finished and substantially made.

A. S. & J. Gear & Co., of New Haven, Conn., and Concord, N. H., exhibit an elegant and substantial

VARIETY MOLDING MACHINE,

a simple and perfect piece of mechanism for planing and cutting straight, waved, circular, and elliptical moldings, spiral work, and all irregular forms. The forms produced are of endless variety, graceful and elegant, and scarcely more expensive to produce than plain moldings. This is one of the most attractive machines displayed.

Among

PLANING, TONGUEING, AND GROOVING MACHINES,

the principal firms represented are: John B. Schenck & Son, Matteawan, N. Y., and S. A. Woods, of Boston and New York.

Some recent improvements on the Schenck Woodworth Machine were illustrated and described on page 241, last volume, of the Scientific American, to which the reader is referred. As now constructed it is a massive and powerful machine, easy to take apart and clean, and kept in perfect running order without difficulty.

The Woodbury's patent planing, tongueing, and grooving machine is also a good machine, and worthy of special mention. This is exhibited by S. A. Woods, of Boston and New York, who also exhibit a very complete

SAW-GUMMING AND SHARPENING MACHINE,

the working parts of which are constructed upon a tringular iron frame, upon the top of which is suspended a swing frame, the back end having a driving shaft (forming the hinge with tight and loose pulleys; from this, power is transmitted to the arbor upon which is secured a vulcanite emery wheel. The arbor on which the saw is placed is so arranged that universal motion is readily obtained to accommodate any size or shape of tooth desired. The wheel is held away from

the saw by means of a coil spring, under the swing frame. The frame is pressed down, bringing the wheel in contact with the saw with one hand, and the saw turned on the arbor with the other—thus the slightest touch can be given to the tooth of the saw without injury. The position of the operator is such that he can look directly across the tooth of the saw, and judge correctly when it has received the finishing touch.

The same firm exhibit a set of self oiling saw arbors with patent self-oiling boxes, by the use of which sufficient oil can be applied to run a saw for months, and all waste of lubricators is obviated.

A large variety of

CIRCULAR, SCROLL, GIG, AND ENDLESS BAND SAWS ARE EXHIBITED,

among which we notice Grosvenor's adjustable saw bench, with both cross-cut and slitting circular saws, exhibited by J. P. Grosvenor, of Lowell, Mass., and a combined gig and circular saw, by Hassenpflug Brothers, of New York, to be worked by hand power

Beach's Patent Scroll Saw, exhibited by C. B. Rogers & Co., of New York, is one of the best scroll saws we have ever seen. Perfect tension of the saw is attained and maintained, this tension being secured by direct connection, and equalizing the power on both halves of the stroke. The saw may be run at great speed, and should either pin in the saw break, the saw stops instantly and can, in no case, be either doubled or broken.

McChesney's Gig or Scroll Saw, exhibited by Thos. L. Cornell, Birmingham, Conn., is also a very convenient machine and well made.

We were very much pleased with the Talpey's Self-feeding Hand-slitting Saw Machine, exhibited by the sole manufacturer, William H. Hoag, of New York, a most perfect-working, effective machine, requiring very little power. The power is applied from a winch, through a very simple and compact system of gearing, forming a very unique and ingenious device. This is one of the best things shown.

The Safety Band Saw, exhibited by the inventor and manufacturer, J. T. Plass, of New York, attracts much attention. It obviates all danger of injury to the operator in case of breakage. The details of its construction may be found, with illustration, on page 129, current volume, of this journal.

First & Pryibil, of New York, also exhibit an endless band saw machine, made entirely of iron except the table; a very well made and elegant machine. They also exhibit an improved gig saw machine, which for all kinds of work is probably one of the best machines constructed.

In conclusion, we may express our conviction that in the perfection of wood-working machinery, this country ranks first in the world. The machines exhibited show a commendable regard for perfect workmanship, so essential to durability in all rapid-running machines, and the display is a credit, not only to the exhibitors, but to the institution under whose auspices this exhibition is held.

ANNUAL REPORT OF THE PRESIDENT OF THE WESTERN UNION TELEGRAPH COMPANY.

In some respects, this is a remarkable document. This Company have a capital stock of $41,063,100, including sinking fund, amounting to $494,800, which, deducted from the total capital stock, leaves a balance of $40,568,300, on which a dividend was paid last July. The net profits of the year ending July 1, 1869, were $2,801,457·48, less than seven per cent on this capital.

During three years, from the commencement of 1866, the net profits of the company have been $8,015,432·06. Out of these profits, $4,134,879·10 have been expended in the construction of new lines, purchase of telegraph property, redemption of bonds, purchase of real estate, interest on bonds, sinking fund, and miscellaneous expenditures, leaving a balance for dividends of $4,044,595·34.

No one will be disposed to think these profits too large; but we have no doubt that the profits on all telegraph property in the United States might be made much larger by a general and large reduction of tariff. The present rates, while they do not afford the companies, on an average, seven per cent interest on the capital invested,—many of the smaller companies netting far less than this,—are still so high that the telegraph is not, as it ought to be, a rival to the postal system, in the transmission of messages. Until such a consummation can be approximated, large profits on telegraph property cannot be expected.

Another obstacle to progress has been, want of uniformity in the tariff of charges in different sections of the country. On this head, the Report under consideration gives us information, not only as to the cause of non-uniformity, but the influences which tend to perpetuate it. It says:

"This peculiarity was the result of the great number of separate organizations, having tariffs upon various bases, which required adding together at the termini of two or more lines, so that, upon a dispatch, which was transmitted a few hundred miles, two or three rates were sometimes charged. For instance, a few years since, there were five telegraph companies owning the lines connecting Portland, Maine, with Cleveland, Ohio, and the tariff between these two places was ascertained by the addition of the local rates from Portland to Boston, Boston to Springfield, Springfield to Albany, Albany to Buffalo, and from Buffalo to Cleveland. The same system prevailed throughout the United States until after the consolidation of the lines made it possible to transmit messages between places thousands of miles apart without the necessity of booking or re-checking at intermediate points. This result necessitated a remodeling of the tariffs, and the work has been going on uninterruptedly ever since; but when it is considered that a complete revision of the system required a separate tariff book to be made out for over three thousand other offices, changing and equalizing the rates to more than three thousand other offices, the immense labor and responsibility incurred in the undertaking may be imagined.

"Various plans have been considered for simplifying and equalizing the tariffs, but some practical difficulties developed in all of them. The existence of rival lines, built by speculators, whose profit is in their construction, and which essay to do business at rates less than the cost of the service, necessitates the reduction of our rates upon certain routes disproportionately, and prevents the adoption of a general rate strictly proportioned to distance.

"Considerable reductions in the rates for both private and press dispatches have been made within the past year, amounting in some cases to fifty per cent, and while these abatements have taken place to the greatest extent in those sections of the country where there are rival lines, the tolls over some of these routes being less than the cost of service, yet they have not been confined to these points, the rates having been decreased at more than one thousand offices where there is no opposition. A new tariff of rates is now preparing and will shortly go into operation, based upon air-line distances, irrespective of the routes over which the lines run.

"The following inventory shows the number of stations, miles of line and wire, and amount of machinery belonging to the Company:

"The Western Union Telegraph Company has 3,469 stations; 52,099 miles of line; 104,584 miles of wire; 103 miles of submarine cables; 2,607 instruments for reading by sound. 1,334 recording instruments; 3,807 relay magnets; 4,180 transmitting keys; 132 repeaters; 19 printing instruments; 710 switch boards; 1,887 cut-offs; 1,666 lightning arresters; 14,929 cups of main battery; 7,210 cups of local battery; 9 punching machines for the 'Fast' system, not in use."

A peculiarity of this apparatus will be observed to be, that it nearly all belongs to the Morse system; but we cannot believe, with this report, that "the time will probably never come when this system will cease to be the leading system of the world." We grant that no device yet designed to supersede it has done so, and that it still is used on "95 per cent of all the telegraph lines in existence." We grant its simplicity and "peculiar adaptability to the telegraphic traffic of the country," but the man who hazards a prediction of permanency in regard to any mechanism employed in any department of industry or science in the 19th century, is certainly a bold prophet.

But we have not space to review this report further at this time. Some interesting remarks upon fast methods of telegraphy we reserve for a future number.

RETURN OF C. F. HALL, THE ARCTIC EXPLORER.

On the 26th of September, Mr. C. F. Hall returned to New Bedford, after completing the second of the Arctic explorations which were undertaken by him, for the purpose of ascertaining the ultimate fate and collecting the relics of Sir John Franklin's expedition. The method adopted by Mr. Hall in prosecuting the search, though at first sight it might appear extravagant, was, in reality, about the most likely to lead to success. Discarding the use of strongly built ships and costly equipments, he determined on a land search, trusting mainly to sledges as a sufficient means of transit, and to such food as might be had among the natives, for subsistence. He seems to have had, in early life, received no special training for an enterprise of this kind, and, it is said, that he had not even been to sea; yet, with indefatigable zeal and with an adequate conception of the magnitude, difficulties, and perils of his self-imposed task, he went to work manfully, systematically, and patiently, to qualify himself for it. He departed from New London on his first journey, which was rather of a tentative character, on the 29th of May, 1860, and returned to the same port on the 13th of September, 1862. The result was satisfactory. Besides making some geographical corrections, he found that he could endure the rigorous climate and live as the Esquimaux lived; he acquired their language and became familiar with their character and customs and, moreover, from information he then received, he was enabled to limit his field of inquiry, and even had grounds for believing that some of the crews might be still alive. In 1864 he published an account of this journey, and in the same year he set out on his second expedition, now completed.

The latest account made public of his recent exploration is a letter written by himself while at Repulse Bay, to his friend, Mr. Henry Grinnell, and is dated June 20th, 1869; the leading facts in which may be thus briefly stated:

There now can remain no doubt of the fate of Franklin's companions; none of them reached even Montreal Island. Their bones lie scattered along the coast of King William's Land. Now a solitary grave was found, and again a place of encampment showed that whole companies fell and died there. What adds peculiar horror to this part of the narrative is the fact that were it not for the inhospitable and cruel character of the natives, some, at least, of Franklin's company might have been restored to civilized society. They were starved to death. The explorer considers that a summer search by a strong expedition, in King William's Land, would probably be rewarded by the discovery of the manuscript records which had accumulated during the Franklin expedition. He says that he had been informed by the natives that the records were deposited in a vault a little inward or to the eastward of Cape Victory. The refusal of his companions to abide by him, and the great probability of his meeting the fate of the gallant Crozier, alone prevented his making the summer search himself. About 150 articles, which belonged to the lost voyagers, were brought home by him, and there are hundreds of relics still in the hands of the natives. This letter closed with an account of a mutiny, on which unfortunate occasion he was obliged to shoot the ringleader.

THE NATURAL ADVANTAGES OF TENNESSEE FOR THE PRODUCTION OF IRON.

It has been the practice of many writers on political economy to regard pig iron as representing aggregated labor more than almost any other industrial product; a view which is probably correct, although superficial thinkers might be led by such a statement to overlook the importance of certain natural advantages essential to the profitable production of this most valuable material. These advantages are the existence of ore of the right quality, fuel, and limestone, so situated that they can be brought together at little cost.

Pittsburgh lies in the center of enormous beds of coal, of which her extensive iron works consume much, and waste a great deal. Limestone can be quarried and placed at the mouths of her furnaces, at small cost, but a large proportion of the ore used is brought from Lake Superior in the crude state. An air-line distance of about six hundred miles, increased by the tortuous routes of transportation to an average of, say, a thousand miles. This, notwithstanding the country all about abounds in ores of various qualities, but many of which can only be worked to advantage by the admixture of the Lake Superior ore.

If ore could now be discovered at Pittsburgh of precisely the quality brought from Lake Superior, and in an inexhaustible supply, it would largely add to the already immense mineral wealth of that locality.

It is also evident that there must be a brilliant future in store for any locality in this country, combining all the advantages named, with open avenues of communication by water or rail to the commercial centers of the United States.

Such advantages are claimed for sections in Tennessee, Northern Georgia, and Southern Alabama. A letter from George T. Lewis, Esq., published in the *Republican Banner*, of Nashville, Tenn., sets forth minutely the natural advantages of these regions, more particularly, however, of the vicinage of Nashville, and on the line of the Nashville and Chattanooga Railroad; and it must be confessed that he makes out a good case.

Assuming that the figures given by Mr. Lewis are reliable, the entire cost at which a tun of pig iron can be produced on the line of the above-named railroad, and delivered at Nashville, is $19, or $10·50 less than the same quality of iron can be made at Pittsburgh.

The following estimate of the cost of manufacturing, assuming cost of furnace to be $100,000, and its capacity to be 6,000 tuns per annum, is submitted:

Mining, loading, and transportation of 2 tuns ore	$4·00
Mining, loading, and transportation of 80 bushels coal	6·40
Quarrying, loading, and transportation of 1,000 pounds limestone	·50
Superintendence, labor, etc., per tun	4·00
Wear and tear per tun	·50
Interest on investment per tun	1·00
Incidentals per tun	·50
	$16·90

The item $4 per tun embraces employés, viz.:

	Per annum.
1 Superintendent	$3,000
1 furnace manager	1,200
1 bookkeepeer	1,500
1 engineer	1,200
1 assistant engineer	800
1 blacksmith	1,200
1 assistant blacksmith	600
1 founder	1,200
4 filers	2,400
4 keepers	2,400
2 guftermen	1,000
2 cindermen	1,000
2 weighers	1,000
6 yardmen	3,000
Extra labor	2,500
	$24,000

Or $4 per tun.

The great advantage claimed by Mr. Lewis is the quality of the ores (hematite and fossil ores) while the coals he affirms show by analysis seventy per cent of carbon with less earthy matter and sulphur than the bituminous or "furnace coals" of Wales, Newcastle, Western Pennsylvania, and Ohio, and the limestone is of a quality unsurpassed for use as a flux.

By his showing the cost of a tun of pig iron at Steubenville, Ohio, from Lake Superior ore is $29.

The cost of a tun of pig metal made at Brazil, Northern Indiana (the ores from Iron Mountain and Pilot Knob, Missouri, and Lake Superior) is	$28·45
The cost of a tun of pig metal made at Pittsburgh, the Birmingham of America (ores from Lake Champlain and Lake Superior) is	29·50

On the other hand, the cost of a tun of pig metal in Nashville is as follows:

Mining, loading, and transportation of 2 tuns ore	$6·00
Mining, loading, and transportation of 80 bushels coal	9·60
Quarrying, loading, and transportation of 1,000 pounds limestone	1·00
Superintendence, labor, etc., per tun	4·00
Interest on investment per tun	1·00
Wear and tear per tun	·50
Incidentals	·50
Total	$22·60

These statements are certainly worthy of serious attention. The mineral wealth of this region has long been known, in

a vague and general way, but we have not before met with so specific a statement as the one under review. Doubtless there are many iron masters in the country who have data to test the correctness of the figures given; but should some errors be found the margin of difference is so large that some radical miscalculation could only account for it, if the advantages claimed do not fully cover it.

Granted that the statements are reliable, and it follows that the future has large things in store for Nashville, capitalists are not blind, and the iron masters of this country are inferior in sagacity to no other class of manufacturers.

HOW TO FILE AND SET A SAW.

When Dan Rice invented that famous joke about "the greatest saw to saw that he ever saw saw," certainly the saw that he saw saw bore no sort of resemblance to many of the saws which we see saw. Saws that saw one's nerves as well as the timber, screeching and gnawing through wood instead of cutting it smoothly and sweetly, that make one's back ache to witness their operation, and heart ache to witness the useless expenditure of power and labor in much of the work performed by this useful and, when properly made, filed, and set, most effective tool.

A saw is a series of cutters, arranged either in one line or in two lines, according to the work to be performed; and all saws used in wood work (and it is such of which we speak) may be included in two classes—those which cut across the grain and those which cut lengthwise of the grain. The latter class has its teeth or cutters formed so as most to resemble a narrow chisel or plane bit. The teeth of the former class may be regarded as knives which cut, or ought to cut the sides of the kerf smoothly at the same time that they force out or split off the intervening wood.

Many mechanics are accustomed to take their saws to a professional saw filer and setter, acknowledging their own inability to perform the operation as it ought to be done, and preferring to incur expense rather than use a badly-sharpened tool. There is no necessity for this, and any man of ordinary intelligence and skill in the use of tools may easily acquire the simple art of saw filing and setting.

In order to do this, the following points must be observed: The teeth in cross-cut saws ought to cut both ways in traversing through the wood, and the teeth of both cross-cut and rip-saws should be as near as possible of equal length and sharpness. The bevel on the tooth should be more acute for soft than for hard wood. In order to secure the same bevel on all the teeth of a cross-cut saw the file must be held at the same angle in filing each tooth, and if the saw has been previously well filed, the same number of strokes of the file will be required for each tooth, provided an equable pressure is maintained.

If the teeth are uneven in length, their points ought to be first leveled with a flat file, and the beveling be subsequently governed by the point. As soon as the point becomes well defined on each tooth, provided the proper bevel has been maintained throughout, the operator should proceed to the next tooth, and so on.

The saw should be filed from the handle toward the point, as in no other way can a proper bevel be obtained and maintained throughout. If a cross-cut saw be found a little high in the middle, it may still work well, but in no case should it be lower in the middle than at the ends. The feather should be taken from the sides of the teeth by a straight, flat file, or a whetstone with a plane surface, laid along the sides of the teeth, and drawn smoothly along without much pressure. This may be done after the setting.

A rip saw will be found to work better in all kinds of wood if filed a trifle beveling, although in perfectly straight-grained wood it will work well if filed straight across. This bevel is best given to the teeth of these saws after they are set, the file being held at right angles to the teeth. Hard wood requires more bevel in the teeth of a rip saw than soft wood.

The setting of a saw is a matter of great importance. A large proportion of the power required in working a saw is caused by the friction of the plate on the sides of the kerf, and it is the object of setting to lessen this friction by increasing the width of the kerf. The making of saws thinner at the back than at the cutting edge is sound in principle, and saves much power that would otherwise be expended in friction.

A difference of opinion prevails among mechanics about the best way to set saws, some maintaining that the hammer and punch are superior to any of the patent setting tools now in use. A series of experiments which we saw performed some years since convinced us that the hammer and punch were imperfect tools for this purpose, although there is no doubt that the principle of the hammer and punch, as applied in some of the saw-setting tools which have been invented, is the best. A tooth bent and set by a blow will remain where it is put. This, on the contrary, cannot be said of teeth which are bent by sets which act on the lever principle. Nevertheless, we have seen saws very perfectly set by the latter kind of tools. Whatever means are adopted uniformity is the object to be secured; the amount of set required being dependent, of course, upon the nature of the work the saw is intended to perform, and therefore a matter to be left to personal judgment.

APPLICATIONS FOR EXTENSION OF PATENTS.

HORSE POWER.—Samuel Pelton, of Chester, Ill., has applied for an extension of the above patent. Day of hearing Dec. 6, 1869.

COTTON SEED PLANTER.—A. W. Washburn, of Yazoo City, Miss., has applied for an extension of the above patent. Day of hearing March 7, 1870.

THE TORPEDO PATENT CASE.

IMPORTANT DECISION IN THE U. S. CIRCUIT COURT BY JUDGE GRIER.

E. A. L. Roberts vs. *The Reed Torpedo Company* et al.—Within the last few years the production in oil wells has been greatly increased by lowering down into them large iron flasks containing from 6 to 10 pounds of gunpowder or nitro-glycerin, and then exploding the mass by means of a percussion cap on the top of the flask, on to which cap a weight was dropped from the top of the well.

It was established by proofs in the case that most remarkable results had been produced in the oil region by the introduction of the torpedo by Mr. E. A. L. Roberts, the plaintiff. Thus in the Eureka well, which was producing only three barrels a day, a Roberts torpedo was exploded, and its production was increased to 120 barrels a day. Hyner well was increased from 2 to 30 barrels per day, Keystone well from 5 to 175 barrels per day, Neill well from 3 to 80 barrels per day. Tarr Homestead well was increased 65 barrels per day Keystone well from 15 to 200 barrels per day.

These were only a few out of numerous cases where Roberts had succeeded. The annual production of oil due to the use of the torpedo was admitted by defendants in their argument to already have reached several millions of dollars. After Roberts had succeeded in introducing his invention a man named Reed, of Titusville, united with a former agent of Roberts, named Marston, and set up a claim as a rival inventor to Roberts.

They organized the "Reed Torpedo Company," the object of which was to make and sell to oil men torpedoes at a low rate, and to defeat Roberts' patent. The defendants based their claim upon certain trials made by Reed of torpedoes in 1863. The defendants did not deny that they were infringing the Roberts patent, but insisted that it was void by reason of what Reed had done.

The plaintiff contended that Reed was merely an unsuccessful experimenter, who had abandoned his torpedo as worthless before Roberts' patent was issued.

The oil men united with defendants to defeat the patent, and raised a large fund. They were represented at the argument by Charles M. Keller, of New York, Hon. S. A. Purviance, and B. F. Lucas. Roberts, the patentee, was represented by Bakewell & Christy, of Pittsburgh, and George Harding.

Judge Grier yesterday delivered the following opinion, deciding in favor of the validity of plaintiff's patent, and granting a perpetual injunction:

OPINION.

As I write with difficulty I can only state the conclusions to which my mind has come after a careful examination of this case.

The complainant has exhibited a patent dated 25th April, 1865. This is *prima facie* evidence of a good title, and puts on the respondents the burthen of proof that the patent is void or worthless.

I need not repeat my remarks in the case of Goodyear vs. Day (2 Wall, C. C. Rep. 299), but now adopt them as affording a rule of decision which applies clearly to the present case.

As the infringement of the patent is admitted, the only question will be as to the validity of complainant's patent of April 25, 1865.

"It was after speculation had been reduced to practice," and after repeated experiments, that the complainant succeeded in overcoming the prejudice and ignorance of the people on the subject, and persuading the public that his invention was useful; after he had established its great utility and value; and "when his genius and patient perseverance, in spite of sneers and scoffs," were completely successful, that Reed, who had before made experiments on the same subject, and was wholly unsuccessful, imagined that he had the best right to the invention, and after purchasing one or more of complainant's torpedoes, he applied on the 1st of November, 1867, for a patent for substantially the same combination of devices or machines contained in complainant's patent. On the 15th of the same month the respondents formed themselves into a company or corporation called "The Reed Torpedo Company," for the purpose of pirating the complainant's invention and supporting the expense of litigation, and thus defraud him of its fruits. They have persevered, even after the preliminary injunction very properly granted by the District Judge.

Let a decree be entered for complainant for a perpetual injunction, and a master appointed to take an account according to the prayer of the bill.

R. C. GRIER, Circuit Judge.

NOTE.—The passage referred to by Judge Grier in his former decision, 2 Wallace, p. 299, adopted as applicable to this case, was as follows:

"It is usually the case, when any valuable discovery is made, or any new machine of great utility has been invented, that the attention of the public has been turned to that subject previously, and that many persons have been making researches and experiments. Philosophers and mechanicians may have in some measure anticipated in their speculations the possibility or probability of such discovery or invention; many experiments may have been unsuccessfully tried coming very near, yet falling short of the desired result. They have produced nothing beneficial. The invention, when perfected, may truly be said to be the culminating point of many experiments, not only by the inventor, but by many others. He may have profited indirectly by the unsuccessful experiments and failures of others, but it gives them no right to claim a share of the honor or the profit of the successful inventor. It is when speculation has been reduced to practice, when experiment has resulted in discovery, and when that discovery has been perfected by patient and continued experiments, when some new compound, art, manufacture, or machine has been thus produced which is useful to the public, that the party making it becomes a public benefactor and entitled to a patent.

"And yet when genius and patient perseverance have at length succeeded, in spite of sneers and scoffs, in perfecting some valuable invention or discovery, how seldom is it followed by reward! Envy robs him of the honor, while speculators, swindlers, and pirates rob him of the profits. Every unsuccessful experimenter who did or did not come very near making a discovery now claims it. Every one who who can invent an improvement, or vary its form, claims a right to pirate the original discovery. We need not summon Morse, or Blanchard, or Woodworth to prove that this is the usual history of every great discovery or invention.

"The present case adds another chapter to this long and uniform history."—2 Wallace, C. C. Reports, p. 299.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

BOLT FEEDER.—Oscar Van Tassell, Naperville, Ill.—This invention has for its object to furnish an improved device, by means of which the flour or meal is fed faster or slower to the bolt, as may be desired, and which shall, at the same time, be simple in construction and easily operated.

SPRING BED BOTTOM.—D. M. Bye, Roanoke, Ind.—This invention has for its object to furnish an improved adjustable spring bed bottom, which shall be simple in construction, strong, durable, and elastic in use, which can be readily attached to any bedstead and which can be made and sold for a comparatively small amount.

PLOW.—J. C. McVutt and A. B. Furman, Strattonville, Pa.—This invention has for its object to furnish an improved plow, which shall be so constructed and arranged as to be of lighter draft, and more efficient in operation than the plows constructed in the ordinary manner.

WHEELBARROW.—B. W. Tuthill, Oregon City, Oregon.—The object of this invention is to construct wheelbarrows with metallic frames, metallic boxes, or trays, and also with certain improvements in the construction and arrangement of the hubs of the wheels, all designed to provide cheaper and more durable wheelbarrows than when made of wood in the common way.

FEEDING APPARATUS FOR CARDING MACHINES.—A. A. Dow, Glenham, N. Y.—This invention consists in providing the toothed or spiked feeding strap, on the short side of the said feeding device, with operating devices having "positive" movements; also, in providing the rollers of the traveler, which lays the roping, with means for operating them positively.

PRESS.—W. J. McDermott, Covington, Tenn.—This invention relates to improvements in presses for hay, cotton, and the like, and has for its object to provide a simple and convenient arrangement for changing the application of the power when the resistance increases to give a greater force the speed being decreased.

STOP VALVE.—John Paterson, Troy, N. Y.—This invention comprises a pair of sliding valves, suspended from a screwed stem working up and down in a chamber at the ends of two pipe connections, and a cam arrangement between the saw valves, by which, when they have arrived at their seats on the ends of the said pipes, they are pressed down tightly thereon, and which releases the said pressure as soon as the valve stem is raised a small amount in the direction for opening the valves.

CORN HUSKER.—Elihu Field, Geneseo, Ill.—This invention consists in the arrangement of the shank of a bent pointed metallic instrument, to be held in the hand so as to pass in a straight line across the inside of the fingers and terminate in a bow for taking in the three fingers, beginning with the little finger, leaving the fore finger free for independent action with the thumb.

HEATING FURNACE.—A. L. Otis, Normal, Ill.—This invention consists in certain improved arrangements of the covers of horizontal furnaces, calculated to secure the heating of the air as much as possible before passing off through the conducting pipes; also, certain improvements in the construction of the valves of the furnace, calculated to give out more heat by radiation and by convection; also, certain improvements in the arrangements of the grates, and, also, certain impovements in means for heating the air previous to supplying the fire.

SHAFT COUPLING.—Edward G. Shortt, Carthage, N. Y.—The object of this invention is to provide an improved mode of coupling shafts together, and comprises a pair of curved wedges, a sleeve, a pair of set screws, and radial pieces in the shafts, which are used by placing the wedges, which have semicircular grooves propelling the shafts, on the two sections to be joined together, and placing the sleeve over them, to which they are fitted, and then screwing the set screws through the side of the sleeve into conical recesses in the said wedges, to clamp them tightly between the shafts and the interior wall of the sleeve.

RAT TRAP.—J. Ward Fifield, Franklin, N. H.—This invention consists of a double walled vessel, which may be either square or round, with inclined passages between the walls leading from openings in the exterior wall near near the bottom of the interior chamber, through other openings in the inner walls, the interior openings being provided with doors which open readily inward to the animals seeking ingress, but close effectually against their efforts to get out.

LOCKING WHIP SOCKET.—W. S. Hill, Manchester, N. H.—The object of this invention is to combine with a whip socket, for carriages, a lock with a swinging hasp, similar to padlocks, in such a way that the hasp may be locked around the whip above the buttons, or enlargements at the ends, when not using it, to prevent it from being wrongfully taken away, and so that when driving and requiring it for use, the hasp being unlocked may be opened for readily inserting the whip in the socket or removing it. The invention also comprises an arrangement of leather, or other flexible substance, with the hasp and the lock to prevent chafing the whip.

HEATER.—Edmund Schwiedter, Hoboken, N. J.—The object of this invention is to construct a heating apparatus, in which the smoke will be to a very large degree consumed, so that with a comparatively small quantity of fuel a greater degree of heat can be obtained.

MULTIPLE EMBROIDERING MACHINE.—Hermann Berger, Marthalen, Switzerland.—The object of this invention is to construct an embroidering machine, which can be used on gauze, or other fabric, in such manner that one or more pairs of curtains, or other articles, can at once be embroidered thereon with the design in reverse. Thereby a very large amount of labor is saved, as in the machinery heretofore in use but one single piece could be treated, and as for the reverse position required on every pair of curtains new designs had to be gotten up.

CLOTH AND HAT BRUSH.—Joseph Marshall, New York city.—This invention relates to a new brush, which, when used on broadcloth, silk, felt, and other fabrics, will very thoroughly free the same of all dust and other impurities, and impart a polish to the surface to which it is applied. The invention consists in arranging a velvet, plush, or other cushion within the bristles, which form the outer part of the bush. This cushion will aid in removing impurities, and will, at the same time, polish and lay the fibers on the brushed surface.

Cane Stubble Shaver.—P. G. Kleinpeter, Plaquemine, Iberville Parish, La.—This invention consists in the use of a horizontal knife, which is attached to the landside of an ordinary plow to cut the stubbles while the plow is forced through the ground. The invention also consists in attaching a rake to the outer end of the knife for raking the cut stubble into the furrow.

Hoisting and Dumping Machine for Mines.—Geo. Martz, Pottsville, Pa.—This invention relates to hoisting water and coal from mines, and dumping the same into chutes.

Tire Bender.—Wm. Willhide, Fetterman, West Va.—The object of this invention is to provide a simple, convenient, and effective apparatus for the purpose of bending tires and other metallic bars.

Grain Sweater, Dryer, and Cleaner.—Wm. Hull and C. W. Hammond, Baltimore, Md.—This invention relates to that class of machines for cleaning grain, etc., in which a hollow rotating cylinder is employed, provided with oblique or "worm" flanges, partitions, or deflections for moving the grain longitudinally with the cylinder as the latter rotates.

Low-water Detector.—G. B. Massey, New York city.—This invention relates to a new safety attachment to steam boilers whereby an alarm will be instantly given as soon as the water sinks below a certain desired level, and it has for its object to construct an apparatus which will operate with with certainty at low as well as high pressure.

Railroad-car Journal Box.—J. B. Collin, Altoona, Pa.—This invention relates to a new journal box for railroad cars, which is so arranged that it can be conveniently opened or closed, but not spontaneously drop open during the motion of the car, and so that the oil, flowing over at the back of the box, cannot reach the wheel, and so that the packing within the box cannot be thrown forward against the lid to force the same open.

Cotton and Hay Press.—Joseph K. Davis, Monticello, S. C.—This invention relates to that class of cotton and hay presses in which the bale is formed at the top of the press, the platen being worked upward by means of two vertical screw rods. Such presses must of necessity have doors through which to get into the upper end of the press box, as well as a cover which can be removed when occasion requires.

Wagon Brake.—Milton Satterlee, Foreston, Ill.—This invention relates to that class of wagon brakes in which a lever is employed to throw a shoe or drag under one or both of the hind wheels, or remove it therefrom; and this improvement consists in a peculiar construction of such shoe, whereby it not only better adapts itself to the inequalities of the ground, but, also, prevents the sliding or sluing of the wagon on ice, or other smooth surface.

Ice Machine.—D. L. Holden, New Orleans, La.—This invention relates to that class of ice machines in which chimogene gasoline, rigoline, and other kindred substances are sprayed into a freezing chamber, or into freezing pipes, and consists in a new and improved construction of the spraying apparatus, whereby the cleaning and repairing are greatly facilitated, together with a new apparatus for purifying the gasoline, and during the process, and a new and improved arrangement and combination of all the parts, whereby the whole is greatly simplified, and its cost and expense of running reduced, while its effectiveness is increased.

Construction of Vessels.—W. A. Farley, St. Andrew's Bay, Fla.—This invention consists in producing patterns of two different curves taken from two radii; the one obtained by taking two thirds the measurement of the beam of the required vessel, and the other from a radius of one half the said measurement. Also, in the use of the said pattern, in a manner to obtain the required curves for any part of the sides and bottom of the vessel, by one pattern.

Hat Pouncing Machine.—John Rosencranz, Boston, Mass.—This invention consists of one or more pairs of conical rollers, and a vibrating brushing or rubbing device, arranged and adapted for imparting a rotary motion to the hat, by passing the brim through the rollers, which press it and move it against the brushing apparatus for brushing and finishing the brim.

Track Sighter.—Geo. W. Plumb, Milford, Conn.—The object of this invention is to provide a simple and efficient instrument whereby the rails of railroads may be sighted for adjusting and trueing without the labor and delay of placing the head down upon the rail, which is not only tedious but injurious to the physical condition of the sighter, when the rails are hot in warm weather.

Pump.—Chalkley Griscom, Lewis Griscom, and J. P. Griscom, Mahanoy Plain, Pa.—This invention relates to a new pump, to be used for mining and other purposes, and its object is to throw a continuous stream and to keep the water at an uninterrupted flow, so that when the column of water is once started, it will continue to move as long as the pump is in motion.

Feed Attachment to Carding Machines.—James Lawton, Glenham, N. Y.—This invention relates to a new attachment to carding machines, which is to be a substitute for the ordinary strap heretofore in use.

Hod Elevator.—Thomas M. Pelham, New York city.—This invention relates to improvements in hod-elevating platforms, such as are used by builders for elevating and returning the hods containing bricks, mortar, and other substances, and has for its object to provide an arrangement whereby the persons who take the hods from the platform after being elevated may do so without requiring to step on the platform in shouldering the hods, as they must now do, as the elevators are at present constructed, by which serious accidents occur by the falling of the platforms owing to the slipping of the hoisting gear, breaking of the ropes, and other causes. The invention also has for its object to provide an arrangement whereby a greater number of hods may be carried up in the same space or on platforms of equal size to others now in use.

Water Doors for Furnaces.—Joseph Philips and Davis Keeley, Phœnixville, Pa.—This invention relates to a new and useful improvement in doors for puddling, blast, and other furnaces, and consists in producing a circulation of water in a serpentine channel through the door by means of partitions.

Miter Vise.—Charles W. Wilson, Norfolk, Va.—This invention relates to an improvement in means for fastening miter joints, more especially designed for use in making picture frames, but applicable to other purposes.

Machine for Cutting Sheet Metal.—John A. Wells, Holly Springs, Miss.—This invention relates to a new and improved machine for cutting circles from tin and other sheet metal.

Hydraulic Dredging Machine.—R. S. Elliott, St. Louis, Mo.—This invention relates to improvements in machinery for dredging river bottoms and the bottoms of other water ways used for navigation, and is intended for removing bars of sand and other similar matter from navigable channels.

Burial Case.—J. A. Dandridge, Buffalo, N. Y.—In carrying out this invention the cases are constructed preferably of wood, and are covered with a metallic covering, formed by electro-plating upon wax or any other substance that can be easily molded into ornamental designs of raised figures, and to connect the said ornamental covering the back is filled with a cement impervious to wet, which will adhere to both wood and metal, and when so filled apply them to the exterior, thus uniting them together and protecting the cases from penetration by moisture, or the same may be applied to metallic cases as commonly constructed by the ordinary process of electro-plating or to cases of other substances capable of electro-plating.

Machine for Fastening the Bottoms to Polygonal Sheet-Metal Cans.—Reuben Brady, New York city.—This invention relates to a new machine for crimping the turned-up edges of sheet-metal plates to the sides of polygonal sheet-metal vessels so as to thereby securely fasten such plates or bottoms to the vessels.

Steering Apparatus.—Henry Edward Skinner, London, England.—This invention relates to a new steering apparatus, which, while it is of very simple construction, will develop much power, and give full control of the rudder. The invention consists in the application of two screws working one within the other.

High and Low-Water Indicator.—G. B. Massey, New York city.—This invention relates to a new alarm attachment to steam boilers, which will be operated when the water is a certain distance above as well as when it is below the proper hight, and which will also, when it is operated, indicate whether it is put in action by high or low water.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING Sept. 28, 1869.

Reported Officially for the Scientific American

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95,179.—Preserving Fish.—Reuben A. Adams, Cambridge, Mass.
95,180.—Sash Balance.—Orson Armstrong, Oshkosh, Wis.
95,181.—Permutation Lock.—Theophilus A. Auberlin, Detroit, Mich.
95,182.—Base-burning Stove.—Rodman Backus, Albany, N. Y.
95,183.—Baby Jumper and Rocker.—Burroughs Beach (assignor to J. R. Pease), Meriden, Conn.
95,184.—Miners' Safety Lanterns.—N. L. Beaufils and Jacques Rexroth, Paris, France.
95,185.—Basket.—L. W. Beecher, Westville, Conn.
95,186.—Embroidering Machine.—Hermann Berger, Marthalen, Switzerland.
95,187.—Harvester Guards.—James Birch, Corry, Pa.
95,188.—Harvester.—Olpha Bonney, Jr., San Francisco, Cal.
95,189.—Liquid Meter.—J. A. Bradshaw and W. H. Brown (assignors to themselves and Darius Whitbead), Lowell, Mass.
95,190.—Machine for Fastening Bottoms to Cans.—Reuben Brady, New York city.
95,191.—Harvester Rake.—Thomas S. Brown, Poughkeepsie, N. Y.
95,192.—Bed Bottom.—D. M. Bye (assignor to himself and H. Bash), Roanoke, Ind.
95,193.—Machine for Mitering Printers' Rules.—W. E. Cameron and A. A. Dettlaff, Green Island, N. Y.; said Cameron assignor to said Dettlaff.
95,194.—Plow Wheel.—E. A. Chubb, Ionia, Mich.
95,195.—Vise.—C. A. Cole, St. Louis, Mich., assignor to himself and J. L. Evans.
95,196.—Railway-car Journal Box.—J. B. Collin, Altoona, Pa.
95,197.—Let-off Mechanism for Looms.—D. M. Collins, Lowell, Mass.
95,198.—Loom Harness.—A. B. Corey, Providence, R. I.
95,199.—Method of Constructing Piles for Railroad Rails.—W. E. C. Cox, Reading, Pa.
95,200.—Yarn-tension Device for Knitting Machines.—John Crandell, Chicopee Falls, Mass.
95,201.—Manufacture of White Lead.—Jas. Cuddy, Pittsburgh, Pa.
95,202.—Burial Case.—J. A. Dandridge, Buffalo, N. Y.
95,203.—Hoop-skirt Fastening.—F. E. Day, New York city, assignor to himself and L. H. Day, same place, assignors to J. B. Loomis for one half their right.
95,204.—Seal Lock for Bags.—John Dewe, Toronto, Canada.
95,205.—Can Opener.—E. F. Dewey, San Francisco, Cal.
95,206.—Coal Stove.—R. S. Dillon, Detroit, Mich.
95,207.—Lath Machine.—Jacob Dobbins, Litchfield, Mich.
95,208.—Feeding Mechanism for Carding Engines.—A. A. Dow, Glenham, N. Y.
95,209.—Medical Extract.—H. S. Draper, Rochester, N. Y. Antedated Sept. 13, 1869.
95,210.—Boot and Shoe.—Charles S. Dunbrack, Swampscott, Mass.
95,211.—Manufacture of Shoes.—C. S. Dunbrack, Swampscott, Mass.
95,212.—Churn.—R. Elarton and W. J. Elarton, Hillsborough, Iowa. Antedated Sept. 16, 1869.
95,213.—Hydraulic Dredging Machine.—R. S. Elliott, St. Louis, Mo.
95,214.—Corn Harvester.—E. I. Eno, Springfield, Ill.
95,215.—Construction of Vessels.—Wm. A. Farley, St. Andrew's Bay, Fla.
95,216.—Rat Trap.—J. W. Fifield, Franklin, N. H.
95,217.—Stump Extractor.—Ira Flanders, Paw Paw, Mich.
95,218.—Curtain Fixture.—G. P. Fuller, Philadelphia, Pa.
95,219.—Mode of Hanging Window Shades.—G. P. Fuller, Philadelphia, Pa.
95,220.—Auger Handle.—D. W. George, Minnesota City, town of Rollingstone, Minn. Antedated Sept. 18, 1869.
95,221.—Harness Mechanism for Looms.—A. F. Gibboney, Bellville, Pa.
95,222.—Pump.—Chalkley Griscom, Lewis Griscom, and J. P. Griscom, Mahanoy Plane, Pa.
95,223.—Bedstead.—Jones Harding, Detroit, Mich.
95,224.—Headblock for Saw Mills.—J. F. Hartmann, Richmond, Ind., assignor to himself, Heinrich W. Morningstar and Eugene Movel.
95,225.—Direct-acting Steam Engine.—W. B. Hayden, Columbus, Ohio.
95,226.—Compound for Building Purposes.—Geo. Heim, Naperville, Ill.
95,227.—Railway-rail Chair.—G. A. H. Hertzer, Waterford, Mich.
95,228.—Whip Socket.—W. S. Hill, Manchester, N. H.
95,229.—Gang Plow.—H. R. Huie, Haywards, assignor to L. L. Treadwell and G. R. Carter, San Francisco, Cal.
95,230.—Suspended.
95,231.—Door Fastener.—Henry M. Jones, West Meriden, Conn.
95,232.—Spring Curtain Roller.—E. M. Judd, Wolcottville, Conn. Antedated Sept. 11, 1869.
95,233.—Ruffle.—Austin Kelley, Brooklyn, N. Y. Antedated Sept. 16, 1869.
95,234.—Hay Tedder.—J. B. Kelley, Brandon, Vt.
95,235.—Shoulder Brace.—J. E. Kent (assignor to W. J. Everett), Philadelphia, Pa.
95,236.—Peddlers' Wagon.—S. T. Lamb and G. A. Rankin, New Albany, Ind.
95,237.—Feeding Attachment for Carding Engine.—James Lawton, Glenham, N. Y.
95,238.—Machine for Dressing Stone.—T. H. Leavitt, Boston, Mass.
95,239.—Washing Machine.—G. A. Leigh, Springfield, assignor to himself and S. E. Leigh, Bloomington, Ill.
95,240.—Muff.—Bernard Levy (assignor to himself and W. H. Slocum), Boston, Mass.
95,241.—Seed Planter.—J. S. Lewis, Elkader, Iowa.
95,242.—Potato Digger.—Daniel Locke, Geneva, Wis.
95,243.—Sail Latchet.—John Mair (assignor to himself and H. W. Cranmer), Philadelphia, Pa.
95,244.—Cloth and Hat Brush.—Joseph Marshall, New York city.
95,245.—Low-Water Detector for Boilers.—G. B. Massey, New York city.
95,246.—High and Low-Water Indicator.—G. B. Massey, New York city.
95,247.—Washing Machine.—G. J. Matson (assignor to himself and S. F. Judd), Alma, Mich.
95,248.—Head Light.—H. S. Maxim and James Radley, New York city.
95,249.—Press.—W. J. McDermott, Covington, Tenn.
95,250.—Grate for Stoves and Furnaces.—J. B. McIntosh, Erie, Pa.
95,251.—Plow.—J. C. McVutt and A. B. Furman, Strattonville, Pa.
95,252.—Mill Pick.—Chas. Metzer and G. R. Roraback, De Soto, Mo. Antedated Sept. 17, 1869.
95,253.—Mode of Fastening Buttons on Shoes, etc.—C. C. Morgan, New York city.
95,254.—Horseshoe-Nail Clincher.—A. Morley, Addison Mich.
95,255.—Fernery.—C. L. Osborn, New York city.
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95,269.—Grain-Cleaning Machine.—James Rood, Beaver Dam, Wis.
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95,273.—Coal Stove.—Edward Schwiedter, Hoboken, N. J.
95,274.—Base-Burning Fireplace Stove.—S. B. Sexton, Baltimore, Md.
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95,401.—Churn Dasher.—Travis P. York, Terre Haute, Ind.
95,402.—Bridge.—Edward William Young, New Street, Spring Gardens, Great Britain. Patented in England, February 19, 1868.
95,403.—Paint Compound.—James Gould, Lexington, Mass.
95,404.—Steam Engine Slide Valve.—Thomas Adams, London, England.

REISSUES.

83,182.—Printing Certain Textile Fabrics and Yarns.—Dated October 20, 1868; reissue 3,647.—American Print Works, Fall River, Mass., assignees of John Lightfoot.
86,273.—Pump Device for Steam and other Enginery.—Dated January 26, 1869; reissue 3,648.—Charles Edward Blake, San Francisco Cal.
56,525.—Cooking Stove.—Dated July 24, 1866; reissue 3,649.—Esek Bussey, Troy, N. Y.
63,802.—Gas Burner.—Dated April 16, 1867; reissue 3,650.—Benjamin Collins, New York city, assignee, by mesne assignments, of Richard B. Locke and Wm. B. Ulrich.
67,682.—Detachable Saw Teeth.—Dated August 13, 1867; reissue 3,651.—Henry Disston and Hamilton Disston, Philadelphia, Pa., assignees by mesne assignments, of Joseph W. Strange.
74,060.—Washer for Lock Nuts.—Dated February 4, 1868; reissue 3,652.—D. Elliot and E. Seely, New York city.
33,560.—Breech-loading Firearm.—Dated October 22, 1861; reissue 3,653.—Alfred B. Ely, Newton, Mass., assignee of Francis J. Vittum and Edgar M. Stevens.
72,031.—Machine for Refitting Valves.—Dated December 10, 1867; reissue 3,654.—Charles F. Hall, for himself and Charles S. Hall, assignee of Charles F. Hall Brooklyn, N. Y.
38,202.—Bedstead.—Dated April 14, 1863; antedated October 14, 1862; reissue 3,655.—David Manuel, for himself Dedham, and Frederick K. Ballou, assignee, by mesne assignments, of David Manuel Foxborough, Mass.
67,900.—Adjustable Stove-pipe Shelf.—Dated August 20, 1867; reissue 3,656.—O. B. Olmsted, Beloit, Wis.
79,907.—Milk Can.—Dated July 14, 1868; reissue 3,657.—H. W. Shepard, Mannsville, N. Y., assignee of George A. Huggins.

DESIGNS.

3,667.—Bust of Alexander Von Humboldt.—Henry Berger, New York city.
3,668.—Carpet Pattern.—Jonathan Crabtree (assignor to James Bromley & Brothers) Philadelphia, Pa.
3,669.—Stove.—Addis E. Chamberlain and John B. Crowley, Cincinnati, Ohio, assignors to Addis E. Chamberlain, O. N. Bush, and F. V. Chamberlain.
3,670.—Railway Car Ventilator Case or Shell.—M. T. Hitchcock, Springfield, Mass.
3,671.—Cap of a Fruit Can.—Julius I. Livingston, Pittsburgh, Pa.
3,672.—Clock Case.—George B. Owen, Winsted, Conn.
3,673.—Face-plate of a Latch.—Emery Parker, New Britain, Conn.
3,674.—Harness Mounting.—James Patterson Robbins, Philadelphia, Pa.
3,675.—Stove.—Watson Sanford, New York city.
3,676.—Plate of a Stove.—Robert Scorer and Robert Ham, Troy, N. Y.
3,677.—Carpet Pattern.—Isaac Starr, Jr., Philadelphia, Pa.
3,678.—Trade Mark.—Geo. W. Tucker, Manchester, N. H.
3,679.—Fireplace Heater.—Samuel L. Utter, Brooklyn, N. Y.
3,680.—Stove.—Samuel L. Utter, Brooklyn, N. Y.
3,681.—Stove.—Nicholas S. Vedder, Troy, and Thomas S. Helster, Lansingburg, N. Y., assignors to John H. Herron & Co., Pittsburgh, Pa.
3,682 to 3,684.—Floor Oilcloth.—John T. Webster, New York city., assignor to Page, Wilder & Co., Hallowell, Me. Three patents.
3,685.—Felt Border.—John T. Webster, New York city., assignor to "Crossley Company," Bridgeport, Conn.
3,686.—Reflector.—August Wilhelm, Philadelphia, Pa.

EXTENSIONS.

Corrugated Beam.—Richard Montgomery, New York city. Letters Patent, No. 13,599, dated September 25, 1855.
Gang Plow.—Thomas J. Ball, Bryan, Texas.—Letters Patent No. 12,791, dated May 1, 1855.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,386.—Sewing Machine.—C. Lockman, Hamilton, Canada. August 10, 1869.
2,590.—Railway Chair.—F. Nicklin and R. Willis, Troy, N. Y. September 2, 1869.
2,598.—Steam Boiler.—H. W. Lüders, Philadelphia, Pa. September 3, 1869.
2,600.—Transmitting Power by Means of Air or Fluid.—R. Spear, New Haven, Conn. September 3, 1869.
2,622.—Reaping and Mowing Machine.—William Allen, Auburn, N. Y. September 6, 1869.
2,632.—Means for Utilizing the Force of the Waves.—F. Ellerhausen, Ellerhouse, Nova Scotia. September 7, 1869.
2,634.—Telegraphic Apparatus.—George Little, Rutherford Park, N. J. September 7, 1869.

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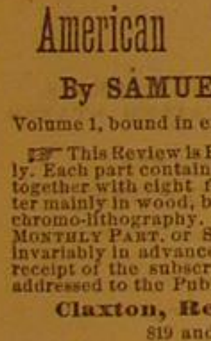

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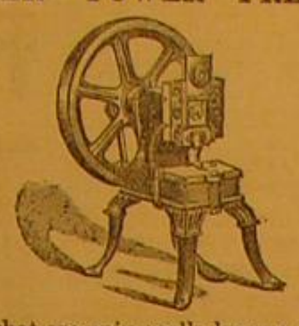

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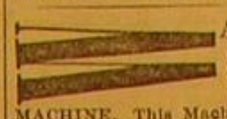

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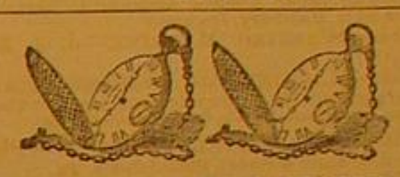
$15.00  $20.00

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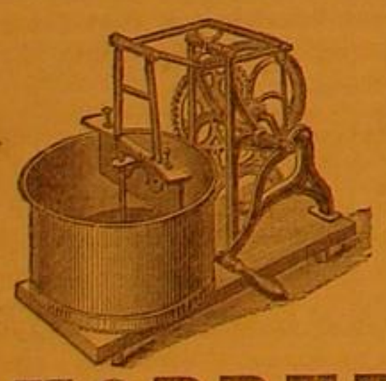

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