16 Ounces

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A LARGE STEAM CRANE.

Messrs. Appleby Brothers, of London, England, have sent to Vienna three steam cranes, for three, five, and seven tuns respectively, of the same general design, the difference being only in proportion. We illustrate the largest of these cranes, in which, as in the others, the carriage is cast in one piece, the horns being provided with bearings for the traveling wheels. The central post is of wrought iron, and the top of the carriage is recessed for a spur wheel fitting on the column, and made fast or loose with it, and there is a raised roller path truly turned on the outer edge of the recess. A base plate, fitted with three friction rollers, revolves on the central column, two of the rollers being placed directly below the jib, and one at the back to take the weight of the boiler and tank. The engines are carried on this base plate in a pair of A frames, the feed water tank and the boiler being placed some distance from the center of the crane post, and forming a counterbalance to the weight to be lifted. The boiler is vertical, and is fitted with two cross water tubes, which system, although not so economical as the multitubular as regards fuel, works out better in practice, as cranes are so often fed with the worst kind of water. The work is done with a pair of direct-acting steam cylinders placed slightly on the incline, one outside each side frame, the crank pins being fitted into a pair of balanced disk plates. In addition to the usual lifting and turning motions, each crane has a neat arrangement for traveling by steam and for altering the radius of jib by the same agency. The engine shaft between the side frames carries a bevel wheel made fast or loose on the shaft by means of a toothed clutch, for driving an oblique worm shaft gearing into a tangent wheel on the derrick chain barrel for raising or lowering the jib, the worm wheel securely locking the jib in any position. A broad spur wheel is geared on the crank shaft, and works a narrow wheel below it on a weigh shaft, which has a small crank pin at each end equal to the stroke of the slide valves. The narrow wheel can be moved by a hand lever laterally about four inches on a spiral feather, thus reversing the valves for running the engines in either direction. This arrangement answers well, and is found to be more durable than a link motion. A pair of spur wheels are placed on the left side of the crank shaft, and which gear into wheels on the countershaft below. One pair of these wheels are of equal, and the other of unequal, diameters, and either pair can be made drivers by means of a double toothed clutch. Provision is made for working the crane by hand if necessary through this shaft, which also carries a set of bevel wheels and double friction cones for driving the slewing and traveling motions. As this shaft has two speeds communicated to it from the engine shaft, it will impart two speeds to the slewing and traveling motions. The motion from this set of wheels is transmitted through a train of wheels to the spur wheel on the column, and which is twice the depth of the pinions gearing into it. The pinions are placed at different hights, so that the slewing pinion clears the pinion driving the traveling gear, and which is fixed. To travel the crane the body is fixed to the carriage, and the wheel, revolving on the crane post, drives the traveling motion. The friction cones are operated by an eccentric lever, and can be thrown in contact while the engine is running, the jib being put in motion gradually without slack. On the cones being reversed, they act as a brake, and arrest the motion of the jib. A pinion sliding on a feather in and out of gear, with a spur wheel on the barrel shaft, conveys the lifting motion from the countershaft. This pinion is withdrawn for lowering, and the descent of the load is controlled by a strap brake worked from a foot lever, which is fitted with a pawl and ratchet, so that the load can be left suspended at any point of its descent.

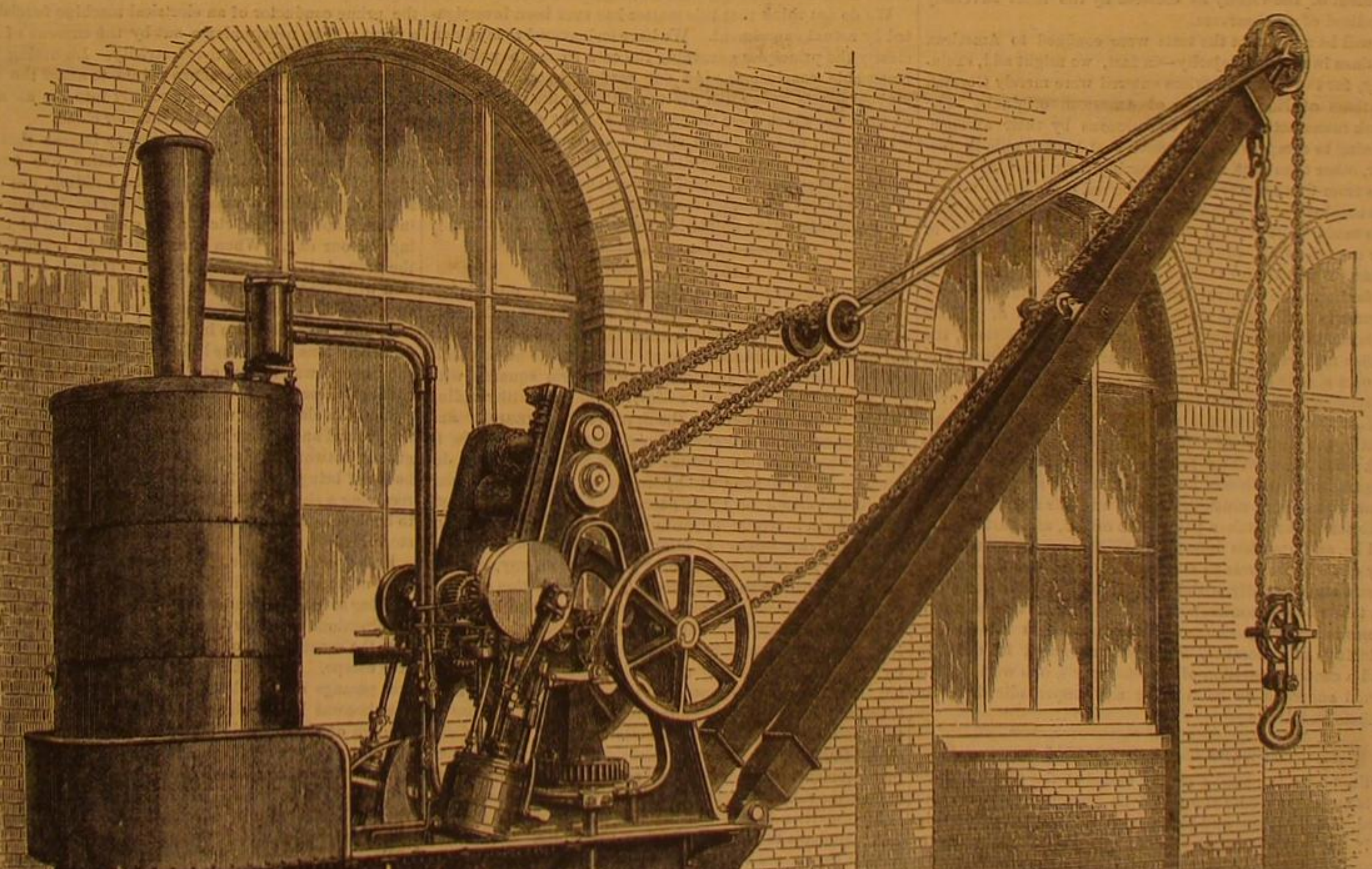
As the slewing motion can be put into action through the cones while a load is being raised or lowered, a considerable saving of time is effected. It will be seen that the speeds of working are in direct relation to the loads; as many as 60 or 70 loads may be lifted and turned round in an hour with the quick speed, while heavier loads, which necessarily require more time to manipulate, are dealt with at a correspondingly lower speed.

The details of construction, says *Engineering*, to which journal we are indebted for the illustration, are well carried out in these cranes, which are well got up, without the superfluous finish too often given to machinery for exhibition.

One of these machines did good service in unloading and transporting the heavy machinery sent to Vienna from England.

Clarifying Beer.

Of the thousand and one methods proposed for this purpose, one of the latest is that of Mr. Garton, and consists in the use of phosphate of lime. The process is as follows: A very concentrated solution of phosphate of soda is first put into the wort, and then gypsum or chloride of calcium and slaked lime are added. Instead of the soda salt, phosphoric acid or some soluble phosphate of lime may be employed. This clarifier can be used at any stage of the process, either before or after fermentation. The same process is also recommended for other fermented liquors.



STEAM CRANE AT THE VIENNA EXHIBITION.

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Contents.

(Illustrated articles are marked with an asterisk.)

TRIUMPH OF AMERICAN HARVESTERS IN AUSTRIA—THE ENGLISH EXHIBITORS BACK OUT OF THE COMPETITION.

The result of the trials of the mowing and reaping machines, recently held at the Vienna Exposition, is a substantial and unequivocal triumph for the American inventions. We print elsewhere a full account of the experiments, extracted from the pages of our English contemporary *Engineering*, a report which we have purposely selected in preference to many at hand from American correspondents, in order that our readers may have before them the acknowledgement of the victory as dictated by the most adversely prejudiced of all observers.

It will be noted that the tests were confined to American machines in a large majority—in fact, we might add, exclusively, for the German devices entered were merely German imitations of English copies of American originals. The British manufacturers were conspicuous by their absence, declining to compete for no reason that we are able to discover, other than that, after comparing their machines with those from this country, they considered their defeat a foregone conclusion. Their machines, presumably of the best types made, were entered for competition; and according to their own showing, the circumstances of the trials were particularly favorable for them. But in spite of all their facilities for improved construction, in spite of their much vaunted progress in agricultural machinery, and in spite of medals and honors innumerable, won in domestic expositions, the English makers have fairly and squarely backed down, and this on a simple inspection of the American exhibit.

Engineering makes an ineffectual attempt to gloss over the fact by disparaging the nature of the trial and consequently the ability of our machines to perform difficult work; but conveniently forgets that the same conditions were free to the devices of its own country. It seems to us that it would have been much more just and fair for the English exhibitors to have taken part in the ordeal, and sustained, if need be, an honorable defeat,rather than to permit the inferiority of their products to stand publicly confessed by a deliberate and cowardly withdrawn from the contests. The part taken by our contemporary in decrying an honestly won success is neither generous nor graceful, nor is the clumsy subterfuge of ignorance, manifestly advanced in order to avoid a candid admission of superior merit, one worthy of a journal supposed to be upright and unprejudiced in its opinions and dealings.

TOWING SAILING VESSELS.

"Suppose a tug tows a sailing vessel at the rate of three knots an hour: would the vessel be propelled at the same speed, if the engines and propeller of the tug were placed in her?" This is a question recently asked by one of our correspondents; and we propose to give the answer at greater length than would be convenient in the columns devoted to "Answers to Correspondents."

When a vessel moves through the water, it encounters resistance: 1st. The resistance of the midship section, which is influenced by the form of the bow lines, it being a well known fact that a wedge-shaped body is more easily forced through the water than a blunt ended one with the same immersed cross section. 2nd. The skin resistance, which depends upon the amount of immersed surface of the vessel. Both forms of resistance are also dependent upon the speed of the vessel, the resistance offered by the water to the vessel's passage varying about as the square of the velocity. It will be seen, then, that however the vessel is forced through the water, whether by power applied at the bow, such as the action of a tow rope, or by the motions of a wheel connected with itself, there is a definite amount of resistance to be overcome, to produce any given speed. If the vessel is being towed by a tug, the motive power must overcome the resistance of the tug, in addition to that of the vessel; so that, if the engine and propeller were removed from the tug to the vessel, the resistance to be overcome would be lessened by the amount offered by the tug. It does not follow, however, that the vessel would go faster than before, or even as fast, under these new conditions. The propeller works in a yielding medium, and does not utilize all the power imparted to it by the engines. Part of the power goes to propel the vessel, and part is expended on slip, which produces no useful effect. It is well known that the propeller must be adapted to a vessel; and it might happen that, in changing the machinery from the tug to the sailing vessel, we should give the latter a propeller that was not suitable; so that the slip of the wheel would be increased, and she would not go as fast as before, with the same expenditure of power. In general, the propeller would not be adapted to its new position, for there is ordinarily a great difference in the hulls of steamers and sailing vessels. Tug boats, as usually constructed, have another advantage over sailing vessels, in their capacity for utilizing the power imparted to their wheels. Our readers have doubtless noticed that the stern of a tug is constructed to overhang the immersed hull. The effect of this projection is to partially confine the water thrown up by the propeller in its revolution, thus creating a more solid medium for the action of the screw. The under part of the overhanging portion is also made in the form of an inclined plane, and the effect of the concussion of the water thrown up is to force the tug ahead. If the propeller were transferred to the sailing vessel, and given the same immersion as before, the loss of this overhanging portion would be perceived at once by the increased slip. We conclude, then, that, under the ordinary circumstances which occur in practice, the effect of changing the motive power and propeller to the sailing vessel would be to decrease the speed. It may be interesting to consider whether there are any conditions under which this transfer could be made to advantage.

Suppose the tug were secured behind the sailing vessel so as to form virtually an addition to the length of the latter: it is evident that it would propel the vessel quite as well as if it were in advance, and employed a tow rope. Now conceive the stem of the vessel to be cut down, so as to be exactly similar to the stem of the tug, and a transfer of machinery to be made. Then it is reasonable to assume that the propeller would be as effective as before, and that the vessel would now go somewhat faster, since the resistance to the motion of the tug would no longer be encountered.

We do not think that this matter has ever been investigated by actual experiment. We have endeavored to lay down clearly the principles governing the case so as to point to reasonable conclusions. As our readers know, however, stubborn facts have often overturned many finely constructed theories, which were defective on account of not noting all the data; and we do not claim to give an infallible opinion. The question under discussion has been often propounded, eliciting a variety of answers; and we have thought it well to treat the matter somewhat at length on account of the many interesting points involved in its consideration.

LIGHTNING RODS.

Perhaps one of the most fruitful sources of mischief is found in the practical application of imperfectly understood or incorrectly interpreted scientific theories. Inventors are not unfrequently misled by what they take to be scientific truths, because their understanding of them squares with some favorite idea. Take an illustration. Notwithstanding the reiterated statement, in the SCIENTIFIC AMERICAN and other exponents of practical science, that it is impossible to utilize water as a fuel, because it takes as much heat to decompose it into oxygen and hydrogen as one can get from the recombution of these gases, men continue to waste their time in inventing apparatus to accomplish it. In other cases again, a misunderstanding of the principles involved may cause not only the waste of time and energy, but the destruction of life and property. The construction of lightning rods is a case in point. If the reader of the literature on the subject happens to find the experiments of Professor Henry and others, he will note their conclusion that electricity of high tension passes along the surface of bodies and not through their substance, and this will suggest to him to increase the surface of his lightning rods at the expense of their solidity, by making them hollow tubes of greater diameter. Or, perhaps, he will recollect that in all electrical measurements of conductivity, as for example in testing submarine cables or telegraph wires, the conducting power is in proportion to the thickness of the wire, and he will find it difficult to reconcile the two principles. The difference in the nature of the two kinds of electricity, however, will easily explain it. By means of an electrical machine we obtain a very small quantity of electricity at a time, but it is under great pressure; the moment it is delivered therefore, its self repellent nature causes it to fly off towards the surface of any conductor. This was the kind of electricity experimented upon by Professor Henry. On the other hand we have means for developing large quantities of electricity having very little tension or pressure, which will consequently flow quietly through a wire in a mass sufficiently great to permeate its whole substance. Professor Morton very aptly compares the former kind to the water in a hydraulic press; it is under enormous pressure, but extremely little is delivered at every stroke of the pump. The latter kind, on the other hand, would resemble a large mass of water, such as a river or a canal, slowly flowing along with so little "head" as to be incapable of breaking down the slightest obstacle or projection of its banks. Now of which kind is the electricity of a thunder cloud? Manifestly of both; it is there under high pressure, and at the same time a cloud, say a square mile in area, would contain a vast quantity. It follows from this that, although considerable surface is an advantage, it should not be obtained by a sacrifice of solidity.

In 1823, Gay Lussac presented a report to the French Academy of Sciences, in which the most advantageous manner of constructing lightning rods is described in detail. It is from this source, and from a subsequent report by Pouillet in 1854, that the text books on the subject have chiefly drawn their information. The following are the principal points of interest there stated and subsequently developed by experience:

The object being to make so good a passage for the lightning to the ground as to remove all danger of its leaping to some conductor in the house, the end of the rod should be sunk deep enough to reach moist soil. The greatest care must be taken not to have any break in the conductivity. As it is inconvenient to manufacture or transport the rods in one piece, the different parts must be in intimate connection when they are put up; it is best to have them soldered and the joints protected from the air and moisture.

If moist soil cannot be struck, the end of the rod should branch out in various directions to insure a speedy dissemination of the electricity in the ground. The material most generally used in constructing the rods is iron, but the point is best made of copper. Platina was at first recommended, because it is unaltered by the action of the atmosphere; but copper is so much better a conductor of electricity that it is now preferred. Whenever a thunderbolt struck a platina joint, it almost invariably melted it, while copper would mostly conduct the electricity so fast as to prevent melting. Its greater cheapness is, of course, another and not inconsiderable advantage. Sir W. Snow Harris, F. R. S., states that a copper rod of one inch in diameter, or an equal quantity of copper under any other form, will resist the effect of any discharge of lightning hitherto experienced. The reason for terminating lightning rods in a point is as follows: When a thunder cloud highly charged with positive electricity comes up, it repels the positive electricity of all bodies on the surface of the earth coming within its influence, and causes negative electricity to accumulate in them. This is called induction, and it always takes place before a discharge. Now, it has been discovered that, when electricity is accumulated in a body in this manner, it can most readily escape by sharp points because in them it meets with the least resistance. A lighted candle held near the prime conductor of an electrical machine furnished with a point will be nearly blown out by the current of air produced by the escape of the electricity. Lightning rods are therefore provided with sharp points to allow the accumulated negative fluid to pass off readily into the air and neutralize the positive fluid of the thunder cloud.

It was supposed by Charles and Gay Lussac that a lightning rod protected an area whose radius was double the hight of the rod extending above the building, but this rule is no longer reliable by reason of the extensive use of metals in the shape of pipes, etc., in the construction of the buildings of our day. When electricity finds several paths to the ground, it will prefer the best, it is true; but some portion will also pass along the poorer conductors. If, therefore, any metallic substances lie within the area supposed to be protected, they are in danger of being struck. This is especially true where the lightning has a chance to jump to the gas and water pipes of a building. It is a good plan to connect these pipes with the lightning rod; if the rod is struck, the electricity will then have an excellent path into the ground and will be rapidly diffused over the vast underground network of pipes. The danger to the inmates of the house of being struck from these pipes is less than that of receiving a shock from the powerful induced currents, liable to be developed in them, if unconnected, during a thunderstorm.

Houses constructed entirely of iron manifestly stand in no need of lightning rods at all, because the electric fluid, on striking so good a conductor, would rapidly diffuse itself in all directions and flow into the ground, provided, of course, that the construction of the building is such as to allow its free escape. If on the contrary any obstacles oppose the free passage of the electricity into the ground, such buildings become highly dangerous and utterly unsafe, for the storage of inflammable material, from the tendency of the lightning to leap across the interior of the rooms. Whenever, therefore, the iron portion of the building does not extend clear down into the ground, prudence would command the establishment of a sufficient ground connection on every side by means of metallic rods.

People are apt to be indifferent whether their houses and stores are provided with lightning rods or not, and are always ready to give an example where some building so provided was struck in spite of its protection. Such cases have undoubtedly occurred,and they are often quoted by the old fashioned "practical men" with much satisfaction, because they hail in them what they are pleased to call the victory of their sound common sense and the discomfiture of the scientific man. This class is, however, rapidly diminishing in numbers under the influence of the extensive diffusion of scientific education among the people by popular lectures and by the press. It may be well to assure unbelievers that the efficacy of the lightning rod is no longer an open question, and that any failures are attributable to bungling or ignorant construction. It would be an easy matter to multiply statistics in proof of the assertion; but none would carry with them more force than the following statement obtained from the records of the British navy:

Formerly the annual damage to ships by lightning involved an expense of $30,000 to $50,000. Between 1810 and 1825, no less than thirty-five sail of the line and thirty-five frigates and smaller vessels were completely disabled; and in 200 cases recorded, 300 seamen were either killed or injured. When the lightning rod was introduced, every mast was furnished with a capacious conductor permanently fixed and connected with bands of copper passing through the sides of the ship under the deck beams, and with large bolts leading through the keel and keelson, and including, by other connections, all the principal metallic masses employed in the construction of the hull (Harris). Since the adoption of this arrangement, "it appears that damage by lightning has positively vanished from the records of the navy." In one case, while the small frigate Conway was under refit in the harbor of Port Louis, the topgallant masts were down on the deck, and a small spar, not having a conductor, was substituted for the time to support the pennant. A thunderstorm came up and the spar was shivered to atoms. No further damage was done, however; for the conductor on the topmast below the spar immediately carried off the terrific flash. No further examples are needed to prove that a lightning rod, constructed according to the principles set forth, is a protector to life and property.

RECENT METEORIC INVESTIGATIONS.

On the tenth of the present month, the earth passed through the first of the two great rivers of meteors which intersect its orbit; and on November 13 or 14 it will encounter another shower of shooting stars, of equal magnitude. The band recently traversed, known in ancient times as the Tears of St. Lawrence, is about 10,948,000,000 miles in its greatest diameter, and 4,043,350 miles wide at the point of the earth's crossing.

Probably the most recent investigations into the nature of the erratic masses which constitute these vast belts are those made by Father Ferrari and others in the fall of last year, recently published in *Les Mondes*. They are based principally upon the observation of a remarkably brilliant aerolite, which fell near Orvinio, in Italy, during the latter part of August, 1872. The course of the body was from the southward and eastward, it appearing at first quite small and emitting a reddish light which gradually increased in brilliancy, leaving behind a misty train. Suddenly the bolide flamed up apparently as large as the moon, and then instantly disappeared, a long cloud, of serpentine form, remaining in its place. About three minutes after, a violent explosion was heard, followed by two others of less intensity. From the point of first observation to that of its disappearance, the meteor traveled over a trajectory of 62 miles, and its altitude at the beginning was measured at 30°, corresponding to an elevation of about 114 miles. The first detonation took place at a hight of 10·2 miles, and the final bursting into small fragments at a few hundred feet above the earth. The velocity of the mass was calculated at 32·2 miles per second.

In order to determine the amount of heat developed by the aerolite after entering our atmosphere, Schiapparelli's investigations were employed. That astronomer has demonstrated that, if a meteor enters the limits of the earth's atmosphere at a minimum velocity of 9·6 miles per second, when it has arrived at a point where the atmospheric pressure is at ·36 inch, it will have already lost $\frac{10}{11}$ of its velocity, and $\frac{120}{121}$ of its *vis viva*. It is evident, therefore, that so great a proportion of lost motion must be converted into enormous heat. Applying suitable formulæ to the case in point and assuming the specific heat of the body to be ·22 of 1° centigrade, which is not far from the truth, it has been found that the augmentation of temperature, after plunging into the earth's atmosphere, would be 3,468,107·8° Fahrenheit, a degree far more than sufficient to explain the phenomena of light and heat, as well as of the explosion or total dispersion of immense masses.

A number of fragments of the meteorite above referred to, quite small in every instance, were picked up and subjected to careful examination. The mass was crystalline, and formed of various substances. An angle was polished with difficulty, owing to the extreme hardness. An abundance of malleable granules of nickeliferous iron were recognized. The interior of the fragments appeared porous, but outside they were covered with a pellicle of vitrified matter. Beyond the iron above mentioned, the greater part of the mass contained soluble silicates, principally those of magnesium and of iron. From the fact that it has been noted that the meteors of the August and November showers, traveling at the rate of from 36 to 40 miles per second, find an insurmountable obstacle in the atmosphere, Schiapparelli has pointed out that only bodies of an enormous magnitude would be able to penetrate it and reach the surface of the earth in a fragmentary condition. Ferrari observes that, from this, it may be considered that the meteor he describes, having a velocity nearly equal to the above, must have been of tremendous size, and he notes, as a remarkable fact, that an unusual number of these bodies, ten in all, fell in Europe between July and September of last year.

The author states the result of his observations to accord with the following conclusions previously enunciated by Schiapparelli: 1. The intimate correlation between the comets, shooting stars, and meteorites is now placed beyond doubt, and the immense velocity observed in some meteorites renders it impossible to ascribe to them a planetary origin; consequently the hypothesis of stellar origin is the most probable. 2. From this supposition, the masses come from no single body, since divers cases demonstrate the fact that they arrive from totally different regions in stellar space. 3. The hypothesis admitted, it must follow that the chemical and molecular structure of the bodies of the universe, situated in different positions, must be of similar nature to that of the meteorites themselves.

The below given views regarding the mineralogical structure and composition of aerolites are ascribed to Daubrée, and are the results of examination both by spectral and chemical analysis: 1. Hundreds of analyses by the most eminent chemists prove that meteorites contain no simple body unknown to our globe. 2. There have been recognized with certainty twenty-two elements, given below in the descending order of their importance: Iron, magnesium, silicon, oxygen, nickel, cobalt, chromium, manganese, titanium, tin, copper, aluminum, potassium, sodium, calcium, arsenic, phosphorus, nitrogen, sulphur, chlorine, carbon, and hydrogen. It is a very curious fact that the three bodies which predominate in nearly every meteorite, iron, silicon, and oxygen, are also those which predominate in the earth. 3. Meteorites have also many peculiar mineral compounds, principally native nickeliferous iron, sulphide of iron and of nickel (schriebersite) and sulphide of iron (troilite). There are also common to the meteorites of the earth a great number of combinations, similar not only in chemical composition but even in crystalline form. 4. Meteorites indicate in a measure the temperature at their formation, and that by which they are caused to disaggregate. 5. Lastly, these bodies demonstrate the existence of innumerable masses disseminated through the remotest regions of space, which would be completely unknown were it not for their sudden and splendid apparitions.

LEAD POISONING AND ITS TREATMENT.

Cases of lead poisoning are becoming more frequent now than formerly because there are more persons engaged in manufacturing this metal, who are, more or less, surrounded and enveloped by a lead-poisoned atmosphere. In a metallic state lead enters into alloys; its salts are used in paints and dyes; it is a constituent of enamels and cements. Lead pipes conduct our drinking water; and the purer the water that flows through it, the more danger there is; while, if the water contain certain salts, they are deposited on the sides of the pipe and protect the water from the metal. Zinc vessels contain lead, and while in some countries the law limits the quantity of lead to ten per cent, even six per cent is fraught with danger to health. Horse hair and silk are dyed black with lead; the laces worn by ladies, as well as their cosmetics and hair dyes, contain lead. No doubt many cases of colic, whose origin seems shrouded in mystery, were caused by lead in the solder of metallic vessels or the glazing of stone ones. The foil used in wrapping tea and tobacco causes lead poisoning, and so do the granules of lead that are sometimes left in tin cans and jars. An old soldier has been known to suffer severely from using leaden shot; and the workmen in glass houses where lead salts are used are similarly troubled. Even type setters are occasionally poisoned by handling type made of an alloy of lead. Many other ways may be mentioned in which lead is introduced into the human system, but these must suffice for the present.

Whatever may be the cause of lead poisoning, it is certain that it is generally observed in summer when the heat favors the colic. Lead may be taken up by the digestive and the respiratory organs and through the skin, principally by the former, even in the case of insoluble salts, which probably dissolve in the gastric juices. Indeed some writers claim that cases produced by lung absorption are caused by salts deposited in the pharynx. The most striking symptom of lead poisoning is the peculiar color of the gums, and this is not due, as has been supposed, to the deposit of little particles of lead which are then acted upon by sulphureted hydrogen. It is rather one symptom of the general phenomenon, for it appears whether lead is taken inwardly or lead water is used on distant parts of the body.

Lead colic is usually preceded by indigestion. The size of the liver diminishes; and after the use of powerful cathartics, it becomes normal, and then contracts again. The nervous symptoms caused by lead poisoning are of several kinds, such as paralysis of the muscles, sleepiness, convulsions, blindness, and pain in the back bone; while on the other hand, insensibility and deafness may result. The skin on the back of the hands swells up as in gout. Albumen in urine is a most common occurrence, but the most striking symptom is *anæmia*, or lack of blood. Distention of the veins is frequently observed, and ulceration of the bones is not an infrequent consequence of lead poisoning.

While lead has so many ways of entering the system, there are very few ways for it to pass off. Little or no lead is secreted in the urine, except when it contains albumen, and there is very little lead in the perspiration. It seems that the metal is deposited where it is absorbed. When soluble lead salts are taken, an albuminate of the metal is formed; while insoluble salts, as before stated, settle upon the walls of the organs and are protected from absorption into the system. This explains the fact that lead workmen are sometimes attacked with colic long after they have abandoned their dangerous calling, the accumulated lead being very gradually dissolved and absorbed.

When lead produces indigestion, it is due to the lead's stopping the action of the digestive fluid. When digestion ceases, colic begins, which is the result of the local action of the lead upon the intestines, for it does not occur when absorption takes place in another way. The change of size in the liver is dependent upon changes in the vascular system. Just as far as this whole system comes under the influence of the poison, *anæmia* takes place, with chills, loss of elasticity in the arteries, and diminished capillary circulation. Pallor of the skin, contraction of the liver, and diminished quantity of urine are all referable to these causes. The asthma with lead poisoning is characterized by pain in the breast bone and difficulty of breathing, which, however, is not because the entrance of the air is obstructed, but because the blood does not come in contact with the air. Paralysis is one of the effects of a disturbance in the blood vessels.

In the treatment of lead patients, the pain must be relieved by the use of chloroform or chloral; opiates are to be avoided, as they produce constipation. The lead salts must be expelled from the digestive canal, and the constipation relieved; both these are best accomplished by drastic purgatives. The incrusted particles of lead, which remain attached to the walls of the intestines, must also be removed; and for this purpose, the use of sulphur is recommended, after purging, so as to convert the lead into the insoluble sulphide of lead, which can then be removed by cathartics. Insoluble lead salts, which still remain in the system, are best removed by administering iodide of potassium, which carries off the lead through the urine. Lead workers whose skin absorbs the poison should protect themselves by the use of salt baths. In France, Labarraque's solution (hypochlorite of potash) is used for this purpose; and to this should be added an excess of carbonate of soda. These baths are more useful than mere soap baths; and the bather, while in the water, must rub himself thoroughly. Instead of Labarraque's solution the following may be employed: 15 ounces chloride of lime, and 30 ounces crystallized carbonate of soda, dissolved in 10½ quarts of water.

The Permeability of Cast and Rolled Iron to Gases.

Both these kinds of iron are permeable to hydrogen and carbonic oxide gases. This is an important scientific fact, and the mode of penetration is a beautiful example of what the late Professor Graham named "occlusion," the mass absorbing the gas at one surface, transmitting it to the particles of the interior, and finally allowing it to escape into another gas, in contact with the other surface. This action differs from that of filtration essentially, and it takes place at a very high temperature only, when wrought iron is softened, cast iron changed in crystaline structure, and meteorolites are heated nearly to the point of fusion.

In all these cases, the iron mass retains several times its volume of hydrogen, carburetted hydrogen or carbonic oxide.

While, on one hand, this action corresponds to that where blister steel is formed, on the other it closely resembles the so-called alloying of palladium with hydrogen, the gas assuming a new physical condition.

The writer has learned that this interesting fact has been misunderstood so far as to lead to the belief that cast iron is porous when heated, and allows these gases to pass through castings; and in case of furnaces in use for heating dwellings, the hydrogen compounds and carbonic oxide, produced in imperfect combustion, pass through the iron and enter the air chamber, flowing with the heated air into apartments.

Such conclusions are wholly destitute of proof, as this action takes place, in carefully conducted experiments, only at very high temperatures, and involves molecular changes in the iron. It would now be novel and disheartening to learn that cast iron gas retorts, heated red hot for months and constantly containing carbonic oxide and hydrogen compounds, allowed the gas to pass through the metal even under pressure. Those who have had chemical experience with cast iron vessels highly heated, holding these gases, will not believe that iron has of late gained new properties. Those who use cast iron furnaces for warming may sleep quietly, if they are assured that all joints are tight.

A. A. H.

ELECTRO-DEPOSITION OF ALUMINUM.—John A. Jeançon, Newport, Kentucky, is the author of the following process: Dissolve the desired salt of aluminum or a double salt of aluminum and potassium, sodium, etc., in distilled water, and concentrate to 20° Baume, (at 50° Fahrenheit.) The battery used is either four pairs of Smee's zinco-platinum or three Bunsen's zinco-carbon, the elements connected for intensity. The solution is heated to 140° Fahrenheit, slightly acidulated, and a plate of aluminum is attached to the negative wire in working.

At Mont Clair, N. J., recently, the rods on a dwelling house were struck by lightning and the fluid passed off into the ground, thence upon a gas pipe near the terminal of the rod, to an air gas carbonizer, located a short distance from the house. The gas apparatus was blown up, but no other damage was done.

OPERATIONS OF THE CANADIAN PATENT OFFICE.—From the 12th of February to the 8th of April, 1873, almost two months, one hundred and sixty-four patents were granted in Canada, of which eighty-five were issued to citizens of the United States.

DR. TOBIAS' VENETIAN HORSE LINIMENT.—According to the analysis of Schaedler, published in the Berlin *Industrie Blätter*, a bottle of this celebrated liniment contains 1 ounce ammonia, half an ounce camphor, 1 ounce tincture of Spanish pepper, 7 ounces alcohol, 2 ounces water.

AT the close of 1872, there were in operation in the United States 67,104 miles of railroads, operated by 436 different companies. Average cost per mile, $55,116. Average dividends, 3·91 per cent.

PAPER FEEDING MACHINE.

Our engraving illustrates the essential features of a novel mode of feeding paper to printing presses, recently patented by Messrs. C. E. Baker and S. Schofield. The form of machine depicted is of course not intended to represent the completed device, but simply to show sufficient mechanism to elucidate the novelty and value of the idea. The latter can best be understood by first referring to the small figures, 2, 3, and 4. In Fig. 2, A is a pressing pin or point made blunt at its forward extremity and flat beneath. This, by suitable mechanism, is brought down upon the top sheet of a pile of paper. If now this upper leaf be drawn along from right to left, it is evident that the blunt point of the pin will catch in the paper, as in Fig. 3, and that its motion, continuing the latter, will travel up the pin into the position Fig. 4. Furthermore, only a single sheet will be thus caught: for as the pin penetrates the first leaf, it forces out a small chip, which remains under the flat part of the instrument, effectually preventing it from entering the paper below. The pin then rests with its full holding power on the second sheet; and as the first sheet is drawn along as above described, the friction between the two is insufficient to move the former from under the point. The reader can practically demonstrate this for himself by pressing the flat side of a bevel-pointed piece of wire down upon a few sheets of paper, and then drawing the upper sheet back against the point by the friction of his finger or a piece of india rubber.

From Fig. 1 will be understood a combination of devices for operating the inclined pin and friction pad with each other, so as to raise the sheet from the pile in order to properly present it to the carrying grippers of the press. Motion is imparted to the elbow rod, B, which is carried to the left. The effect of this is first through the upright, C, right angled arm and connecting bar, shown to push down the frame, D, and consequently to press the point at E firmly upon the paper; then, when near the end of its motion, by means of the slotted arm acting on the crank, to rotate the rubber covered roller, F. The revolution of the latter for a very short distance draws, by friction, the upper sheet from right to left, causing it to catch upon the pin in the manner above described. The rod, B, then moves to the right and through the upright, C, raises the entire frame, roller, and all, clear of the paper, so that the relative position of the parts is indicated by the dotted outlines. The pin, it will be noticed,

Fig. 1

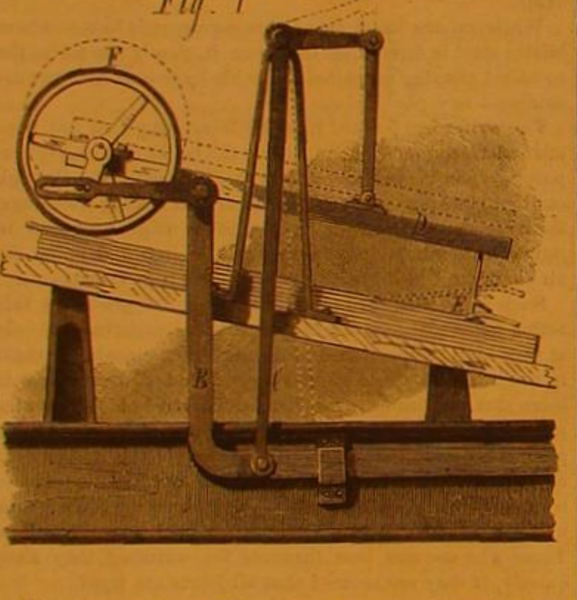


Fig. 2. Fig. 3. Fig. 4.

carries the top sheet up with it. At this juncture the grippers come up, seize the projecting edge of the paper, and, drawing the sheet from the pin, carry it down the incline to the press.

There is other mechanism for keeping the pile of paper at a uniform hight, as it is depleted, and also a new method for insuring accurate register, claimed to be perfect, which need not be entered into here. The principal feature is the holding by the pin, which makes a tear in the sheet no greater than that now caused by pointing, which it of course avoids. The puncture can be readily arranged to come in the fold of the sheet or near the edge to be trimmed off in the binding. The device is automatic in its action, and can be so fitted to a press as to require no attention, stopping of its own accord in case of accident or in event of the supply of paper becoming exhausted. The simplicity of the mechanism and its ready adaptability to all requirements enable the machine to be offered at a very moderate price.

Mr. Charles E. Baker, office of the *Independent* newspaper, New York city, will be happy to exhibit his apparatus to publishers interested in paper-feeding machinery.

PROGRESS OF STEAM CULTIVATION.

Mr. Max Eyth, of Messrs. Fowler & Co., of Leeds, England, in a paper recently read before the Council of the Society of Austrian Engineers and Architects, made the following interesting remarks regarding steam cultivation:

The great difficulty in steam plowing is the moving about of engines under all circumstances and conditions. Some twenty years ago, the idea of employing the portable engine, in connection with what is known as the roundabout tackle, was suggested; but although to a degree successful, the plan proved to be, practically, a mistake. It has lately found some encouragement by the introduction of self-moving anchors, but it is not able to compete with the now more perfect, though at first sight more expensive, systems. The introduction of Fowler's double English tackle, the first of which was constructed in 1863, made steam plowing that which it is today. The advantages of the system are simplicity of plan of working, minimum of hands employed, direct pull of the rope, shortest possible length of the latter, facility of shifting, etc. Steam plowing should not be measured by its cost but by its results, as deep cultivation by steam has a beneficial influence on crops by draining the soil in wet, and by keeping it moist in dry, seasons, by avoiding the footsteps of animals in fields, and by doing the work at the proper time. In hot countries it is in use, especially the West Indies and Egypt, and also in South America and the far East, where steam cultivation is being introduced on a constantly increasing scale, while Germany and Austria have, in the course of the last three years, started in the same direction. Not less than 56 double engine tackles are at present at work in the two latter countries, and the results are so strikingly favorable that the new idea appears to be now firmly established, especially in the beet growing districts of Central Europe.

IMPROVED FISHING ROD.

A common defect in fishing rods is the liability of the connecting portions to become worn by use, so as to be insecure and loosely fitting. This difficulty it is aimed to overcome in the invention represented in our illustration through the medium of the notched metallic cylinder, A, formed upon the smaller ferrule, B, which, when the rod is jointed together, as shown in Fig. 3, fits into the ferrule, C. Around the exterior circumference of the latter is a collet, D, Fig. 4, through which pass three set screws, as shown, which, when turned inwards, lock into the grooves of the notched cylinder. By this means, it is claimed, the separation of the parts of the rod and the annoyance resulting therefrom, while following the sport, are effectively prevented. Instead of the cylindrical grooved extension, a plain conical piece, E, Fig. 2, may be used, which serves the same purpose, and may be made of the same size at all the ferrules of the rod.

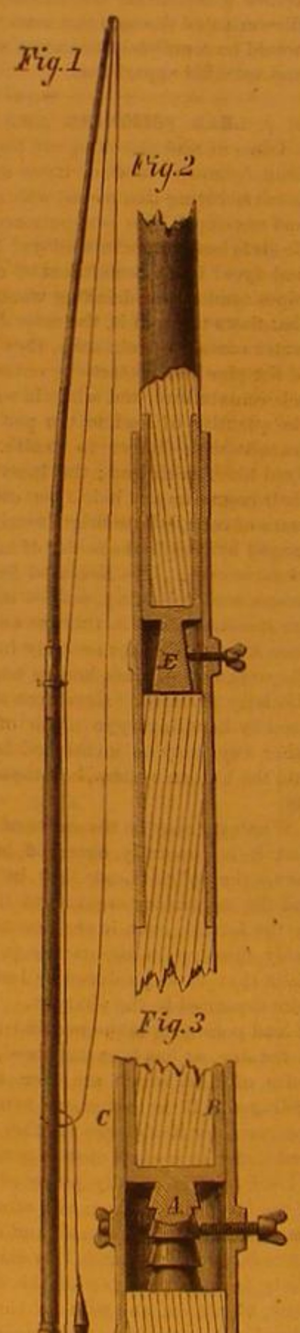


Fig. 1 Fig. 2 Fig. 3 Fig. 4

The locking screw heads may be formed of any ornamental pattern. A guide ring is attached to the collet, to serve for passing the line to the reel. Fig. 1 represents the rod put together, showing that these improvements occupy but little space, while rather adding to its neat and attractive appearance.

The device has the merit of simplicity, and it may be arranged in connection with any ordinary fishing rod, and may also be applied to jointed poles for all purposes for which such articles are required.

Patented through the Scientific American Patent Agency, July 8, 1873, by William M. Smith. For further particulars address Messrs. Smith & Ermentrout, 318 Penn street, Reading, Pa.

Novel Mode of Locating Obstructions in Pneumatic Tubes.

In London, as in Paris, the telegraphic executive make use, to a large extent, of pneumatic tubes for the transmission of messages, which, packed in suitable cases, are driven through the tubes under pressure; and it not unfrequently happens that one of these cases becomes arrested in its course, causing an obstruction, the locality of which it is very difficult to ascertain.

M. Bontemps, director of pneumatic telegraphs in Paris, has, says *Engineering*, recently devised the following ingenious method of ascertaining with considerable precision the locality of the block:

At the free extremity of the tube an elastic membrane is placed, and its alternate distensions are registered on a revolving cylinder by means of electricity. A wave is produced in the tube by detonation of a pistol placed near the membrane. This wave travels through the tube at a speed of 333 meters (1,000 feet) per second, and strikes against the obstacle; there it is reflected back, passes through the tube in a contrary direction, and inflates the membrane; this places the first mark on the revolving cylinder. The sound wave sent back by the membrane against the obstacle is reflected a second time, and a second mark is obtained on the cylinder. To determine the distance between the membrane and the obstacle, it will only be necessary to know the interval of time that has elapsed between registering the two marks on the cylinder. The half of this interval (reckoned in seconds) multiplied by 333, gives the distance required. The time is calculated by an ordinary chronograph, with three tracing points worked by a magnetic needle.

The first is placed in the circuit, which is closed by the alternate distensions of the membrane.

The second answers to an electric governor, and marks the seconds on the cylinder.

The third divides the second into periods of equal duration to the second, by means of the pulsation of an electric needle.

These vibrations are not absolutely isochronous, but are sufficiently so for the object in question; or if it were thought necessary to have the isochronism perfect, the vibration of a diapason could be used. The following example illustrates the operation of the instrument: An obstacle is placed in a line at a known distance, say, of 186 feet. The needle oscillates 33 times per second, the interval included between the two marks determined by the pistol shot corresponds to 120 oscillations, and the distance of the obstacle will be

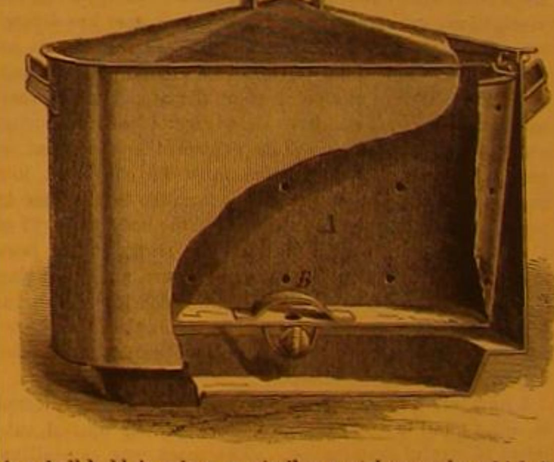
$$D = \tfrac{1}{2} \times 330 \times \frac{12}{33} = 60 \text{ meters (180 feet).}$$

The approximation obtained is thus 6 feet. But in practice this method gives approximation of 9 feet, and consequently only one opening in the pipe is required.

"THE PEOPLE'S" STEAM WASHER.

The principal advantage of the invention herewith illustrated consists in its ready adaptability to any ordinary cooking stove wash boiler, without regard to size or shape, so that the owner of one of the latter vessels need only procure an attachment thereto instead of incurring the expense of an entirely new apparatus.

The device consists in an inner receptacle, A, which fits tightly at its upper edge, and is thus sustained within the usual form of wash boiler represented. Its sides incline inwards toward the bottom, leaving an intermediate chamber between the two vessels, and are perforated with a number of holes. At the bottom is an aperture covered with a shield, B, to prevent its becoming clogged by the clothes; beneath



is a ball held in wires or similar contrivances by which its movement is limited. It will be noticed that the inner vessel, A, fits into the boiler steam tight, and that it may be readily lifted in or out, for cleansing or other purposes, by the handles, one of which is shown at C.

In operation, the clothes are folded and packed into the inner receptacle, which is then lifted by its handles into the boiler, a sufficient quantity of soap and water being previously placed in the bottom of the latter. On being set upon the range, the steam fills the intermediate chamber, being unable to escape through the orifice at the bottom and so enter the vessel, A, from the ball rising and closing the opening. The steam is therefore compelled to pass through the holes in the sides of the last mentioned receptacle, and thus reach and force its way through the clothes. When condensed, it passes down through the hole in the bottom of the washer, into the outer boiler, thus causing a constant circulation of steam and heated water, which, it is stated, speedily effects the cleansing of the garments.

Although this invention is based on the same principle as many that have heretofore been illustrated in our columns, it differs in construction from previous devices in the detachability of the inner washer, which can thus be purchased separately. The apparatus is therefore cheaper at the outset, and, besides, presents facilities for cleaning and repair which similar appliances made in parts inseparably connected necessarily do not possess.

Patented in Canada, May 5, 1873. Application pending in the United States. For further particulars address J. R. Davidson & Co. Halifax, Nova Scotia.

AIR PUMP FOR RAISING SEWAGE.

Mr. Ernst Hahn, engineer, of Stuttgart, exhibits at Vienna, says *Engineering*, a transportable air pump for the emptying of the open cesspools which are still in use in many of the continental towns. This sewage pump, of which we give illustrations herewith, is one of those adopted by the authorities of the city of Stuttgart; the *modus operandi* consists in pumping, by means of this machine, the air out of the wooden tubs or vessels in which the sewage has to be removed from the different houses; and, the tubs being brought into connection with the open cesspool by a flexible pipe provided with a screw valve, the sewage is forced into the tubs. The machine, as will be seen from the illustrations, is mounted on a wooden platform carried on two pairs of wheels and mounted on springs, and is arranged for being worked by manual power. In our engravings, E is the air pump, A is the safety vessel for preventing any liquid from entering the air pump, and B is a small furnace through which the air and gases, exhausted by the air pump, are passed before escaping into the atmosphere. The air pump, E, which works without dead space, is connected with the safety vessel, A, by means of the pipe, C, while the vessel, A, which, as we said, prevents the fluid sewage from passing from the tubs into the air pump, is provided at the top with a flange to which is fastened the suction pipe for the tubs. The air-discharging pipe, D, is connected to the furnace, B, as shown.

With the apparatus we have described, a vessel of 432 gallons can be filled, as stated by the manufacturer, within five minutes by two men. The machine, with carriage complete, weighs about 12 cwt.

FIG. 1.

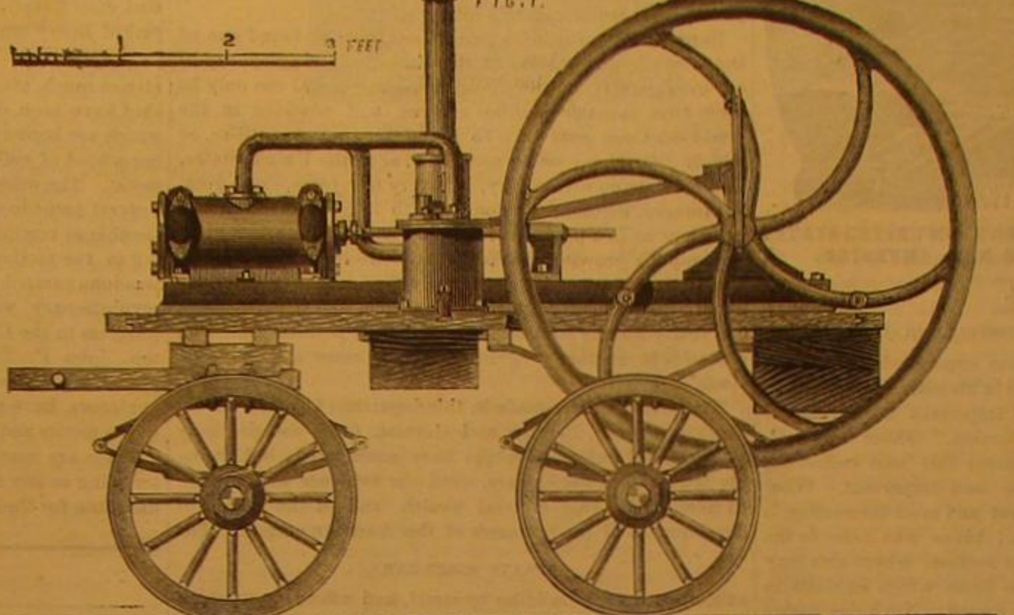
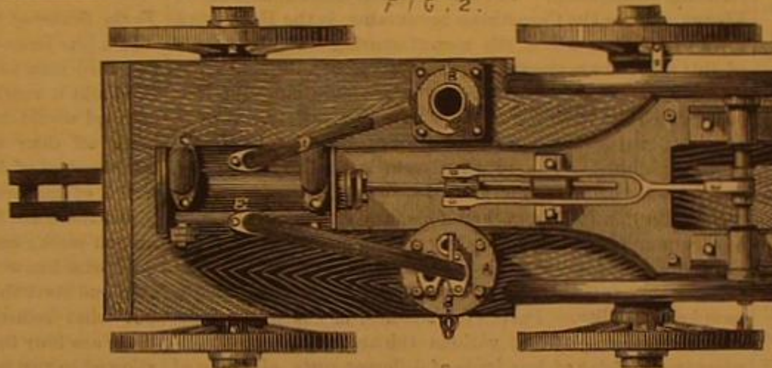


FIG. 2.



AIR PUMP FOR RAISING SEWAGE.

Photography at Vienna.

A correspondent of the *British Journal of Photography* awards to Kurtz of New York the merit of presenting the best specimens of portraiture that are to be found in the exhibition. He, however, finds fault with the practice of retouching the negatives, which he thinks is badly done by the Americans, and is seen in nearly all of their exhibited pictures. The prints of the magnificent series of the Yellowstone region and California are in some cases marred by the stopping out of the sky in the negative; in other examples, an imitation of cloud effects in the sky by painting on the negative has been attempted, with poor success.

On the whole, thinks this critic, the American exhibits, both in portraiture and landscape, evince a lack of fine artistic feeling.

[From Engineering.]

Reaping Trials at Vienna.

The great expectations originally created by the liberal programme, prepared by the Committee of the Agricultural Department at the Vienna Exhibition, have been doomed to disappointment. The determination at which the English makers had arrived, to decline entering into competition, entirely ended all chances of any valuable trials, and the only part of the programme which has been even partially carried out are the reaping and mowing trials at Siebenbrunn, which took place on Wednesday, the 9th of July. Of course, English implements were entirely absent; and with the exception of a few German "improved" copies, the reapers and mowers on the ground were American. Altogether there were eighteen reapers ready for competition, single and combined, and sixteen mowing machines, including nine of the combined implements, were tried. The site selected was upon the estate of a local proprietor, Herr Schwartz, at Siebenbrunn, about 20 miles from Vienna; and the ground, which was good and almost level throughout, improved from the stations occupied by No. 1 machine to the lots numbered 15 to 18, that lay on the opposite side of a small stream which divided the ground. Everything was so consistently favorable that the operations scarcely constituted a trial at all; the weather was dry and hot, the crop allotted to the reapers was a thih growth of rye, every stalk of which was set bolt upright in the field, while the mowers operated upon a mixture of peas, grass, green oats, etc., which might have sprung from an autumn sweeping of a barn floor, and, though close lying, was soft and moist in the stalk. An acre and four tenths of each crop was allotted to the reapers and mowers, the lots being of course divided by clearings made for the implements to take their first cut.

As we have said, eighteen reapers were entered for the trial, but only seventeen competed, the missing one being the chain rake reaper, manufactured by Walter A. Wood, of Hoosick Falls, New York. Of the German implements, one was an "improved" Samuelson, by Messrs. Hopherr & Co., of Vienna, and two by Messrs. Siedersleben & Co., of Bernberg, Anhalt; one of these machines was also an improved Samuelson, and the other, in which were combined selections from details of the leading English makers, broke down from some cause or another.

The American manufacturers were admirably represented and their presence at Vienna in such force shows how successfully they compete with English makers, especially in the corn-growing districts of east Europe. * *

One of the striking features of the American implements is the Johnston rake, of which many different varieties are used, the leading principle of course being the same in all, namely, the means of controlling the action of the rakes, and causing them in each revolution to follow the platform closely, and so clear off the grain continuously, or to throw one or more rakes up after they have passed the cutters, and then allow the grain to accumulate upon the platform till a sheaf of the desired size is obtained.

In most of the competing implements, the same general features present themselves, namely, the revolving rakes, or rake and reel, and the side delivery, leaving a clear track for the horses. * *

An ingenious arrangement of throwing off was exhibited by Messrs. Aultman, Millar & Co., of Akron, Ohio. This is a Buckeye implement, with a circular throwing-off table, mounted upon the platform, and carrying a short vertical rake; the table receives a slow rotary motion, and the grain, which is received upon the front of the platform, is swept round by the rake and table, and delivered at the side. The performance of this implement at the trial was fair, and the sheaves were deposited sometimes exceedingly well, at others in a very straggling style, so that, even with such a light standing crop, the action was uncertain, and would probably be entirely unreliable under unfavorable circumstances. The last of the exceptional deliveries to be named is the chain rake implement of Messrs. W. A. Wood, of Hoosick Falls, N. Y. In this implement one short rake is employed, which is attached at one end to a chain running entirely round the platform, and hinged at the other end to the frame of the implement, there being an intermediate hinged joint in the arm of the rake to give it the necessary motion, by which it is swept over the table constantly and slowly, but at a uniform rate, so that the sheaves delivered are of uniform size.

The Johnston Harvester Company, of Brockport, New York, who are doing a very large business in Russia, were represented by two implements, a reaper and a combined machine. This is, to our mind, the most useful implement that competed, although, where the shades of difference are so fine, it is difficult to draw a clear distinction, especially after so poor a trial. This Johnston implement, however, has horizontal gearing throughout, and is actuated with a bevel pinion from the highest point of the bevelled driving wheel; by this arrangement the gearing is far less liable to become clogged; a vertical instead of a horizontal crank is used for driving the cutter bar, and an under as well as an upper bearing is given it, so that considerable steadiness is secured. The arrangement for throwing up the rakes is also extremely ingenious and practical. The Buckeye combined implement of Adriance, Platt & Co., New York, is an excellent one, and shows good work, with high ingenuity in design. The Champion, of Warder, Mitchell & Co., of Springfield, Ohio, also fitted with the Johnston rake, is full of good detail and excellent workmanship; this implement was sold on the ground to Prince Schwartzenburg. Wood's New Champion, from the makers of the chain rake, also did good work. It is a well designed, well made implement, with four rakes coupled together in pairs, and which can be arranged at will to be thrown out of gear in pairs. The rakes are mounted on a revolving bonnet, which is driven by gearing, and beneath which is a fixed cam, against which the end rollers of the rakes take their bearing and direction. The McCormick implement was on the field, and worked well, but the pattern, so long and so deservedly celebrated, now looks very antique when compared with many of the later patterns.

Of the German competitors but little is to be said. Hopherr's copy of Samuelson's reaper made fair time on the ground, but it was very heavy, and open to the objection, common to the type of implement, that there is no seat for the driver, who must therefore walk—a very wearying operation. Neither do the Siedersleben implements call for any special remark.

The chief points upon which the jury were to decide concerning the merits of the implements were: The time occupied, the length of stubble, and the throwing off of the sheaves. As we have already said, the conditions under which the reapers, and equally the mowers, were tried were such as to make a proper comparison of merit quite impossible, but it was evident, with the exception of the German Samuelson, which being a copy could scarcely be considered in the decision, that the trial, such as it was, was purely American. Of these implements we should, judging from the performance, place that of the Johnston Harvester Company first, the Wood New Champion second, and the Warder, Mitchell, and Company's Champion, and the Buckeye (Adriance, Platt, and Company), third and fourth.

The mowing trial may be dismissed in a few words. There were altogether sixteen competitors, of which seven were simple mowers, and nine combined machines. Of the whole number there appeared little doubt that Wood's so called combined, but really single, mower did the best work. * * * *

Returning for a moment to the trials of Siebenbrunn, we learn from them, incomplete and imperfect as they are, that German manufacturers will have to make great changes before they can compete with the American trade. How far this can compare with English productions, the absence of the latter from the trial prevents us from forming any conclusion.

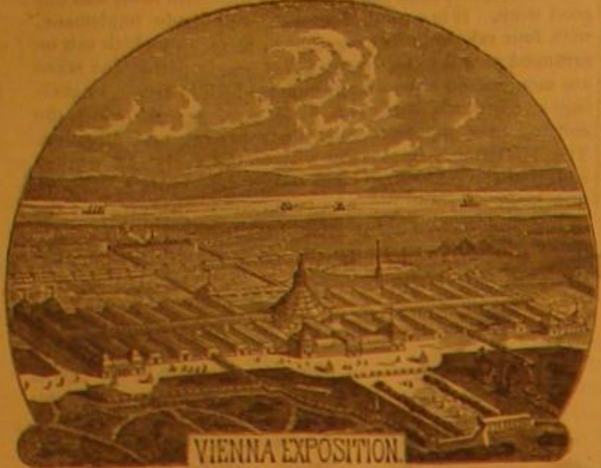
New Experiments with the Electric Current.

MM. P. and A. Thénard communicate to *Les Mondes* the following conclusions derived from recent electrical researches:

1. The vapor of water does not hinder the production of the current, which decomposes it into its constituent gases. 2. The current, while determining the combination of nitrogen and hydrogen, decomposes equally ammoniacal gas; but, in both cases and without absorbent bodies, there is found in the gaseous mixtures a quantity of ammonia quite feeble but sensibly equal. 3. Nitrogen, under the influence of the spark and the vapor of water, disappears to produce an undetermined body which is believed to be nitrite of ammonia. 4. Gaseous phosphoret of hydrogen is similarly incompletely decomposed by the current, and this decomposition is accompanied with phenomena which prove first the formation of liquid phosphorus, then solid phosphorus, and lastly a body supposed to be the same substance in its amorphous state. 5. The current acting on a mixture of gaseous phosphoret of hydrogen and bicarburet of hydrogen reproduces one at least of the phosphoric alkalies. 6. Under its influence, the bicarburet of hydrogen alone condenses rapidly into an odorous liquid, soluble in ether but insoluble in water. 7. On the other hand, the monohydrate of methylene is transformed in presence of water into marsh gas, into pure hydrogen, into a powerful acid soluble in water, and into a resinous body differing from the viscous substance furnished by the bicarburet.

W. S. M. says: "I notice that some of your correspondents mention trouble with pumps which they require to draw water almost farther than is possible. I have succeeded in such cases by letting a very small portion of air in at the bottom of the pipe, which, passing up in bubbles in the water, lessens the gravity of the column of water so that the pump can raise it."

C. H. S. says: "My two line advertisement in the 'Business and Personal' column brought me about one hundred letters."



THE GREAT EXPOSITION—LETTER FROM UNITED STATES COMMISSIONER PROFESSOR R. H. THURSTON.

NUMBER 5.

Vienna Welt-Ausstellung, June, 1873.

Probably every engineer who has come to visit the *Welt-Ausstellung* is greatly disappointed in his search for novelties in mechanism, or for evidence of important improvements in methods and processes of production. There seems almost nothing to be found, throughout this vast collection, which can be considered both new and important. What there is of machinery that is newest and most interesting is said, by the majority, if not all, of those who refer to the subject, to be in the United States section, where also may be found, frequently, the originals from which exhibits in other sections have evidently been copied. Not a day passes without some new example of imitation of American designs, and often of precise *fac similes* of our standard machines, presenting itself. Our own exhibit, with which we have been so greatly dissatisfied on the score of its small extent and its incompleteness, appears decidedly creditable in its marked characteristics of excellence and originality when compared with those of other nations. It is far in advance of them all.

GREAT BRITAIN

covers a larger area, in consequence of her requirements of space for textile machinery, but the number of her exhibits is less than those from the United States. Great Britain gives evidence, always observable in her departments at these exhibitions, that her mechanics are workmen of the very highest class, and that British machinery is as notable for its solidity, strength, and durability, and for excellence of workmanship, as is that from our own country for its originality and its ingenuity.

FRANCE

displays a considerable amount of machinery which, lacking preëminence in those qualities which distinguish the two great English speaking nations, is still excellent and highly creditable. In scientific apparatus, and machinery which must be classed by itself as intermediate in character between the industrial and the purely scientific, the French excel.

Other nations present exhibits which contain some exceedingly creditable examples of good design and workmanship, and which, particularly those of

GERMANY AND AUSTRIA,

are of great extent. They are almost invariably, however, very barren of really original designs, and, judging from this display, the observer is very much inclined to conclude that the talent for invention which is the leading characteristic of our mechanics is a very rare attribute among these people.

ITALY

has made a magnificent display in the Industrial Palace, and in the Fine Art gallery, where elegant textile fabrics, beautiful *bijouterie*, splendid paintings, and life like statuary prove that she is still foremost in all that most delights the artistic mind; but in the Machinery Hall she presents no single strikingly meritorious production, and the impression made upon the engineer who looks through the collection is that he is inspecting a museum of antiquities rather than of the newest and best machinery which that country has produced.

SWITZERLAND AND BELGIUM

exhibit some excellent examples of standard machines, neat in design, well built and well finished.

The most beautifully finished work in the whole exposition is probably that sent by the Creusot works, in the south of France. A small compound marine steam engine, of the Napier type, and a locomotive for heavy work, have been constructed of the best of materials, and have been given a finish which is simply magnificent.

Metal products, iron ores, and iron and steel particularly, are exhibited by all those nations which produce for the world—with the exception of the United States—in large quantity and of splendid quality. The steel is usually the product of

THE BESSEMER PROCESS,

and the facility with which every grade can be obtained is here illustrated, not only by beautiful specimens of every degree of carbonization, but by a wonderful variety of manufactured articles, in which every quality finds its most appropriate application. The fact that we are rapidly passing from the iron age to the age of steel is here most fully and convincingly exhibited. In truth, it would seem as though the transition had actually taken place.

The low grades of Bessemer metal, containing in the neighborhood of one half per centum of carbon, are vastly stronger than iron; and this strength, together with its ductility, malleability, and homogeneity, makes it vastly preferable, for almost every use, to any iron. Bessemer metal is already becoming nearly as inexpensive as the better grades of iron, and it cannot be long before the rapid extension of Bessemer manufactures, and the still rapid succession of improvements in the details of the method and of the apparatus, shall so far reduce its cost as to permit its substitution for iron for nearly all uses.

Here, it may be said in parenthesis, may be found one of the most promising signs of the times for the prosperity of our own country. Really good Bessemer metal can only be made from superior qualities of ores, and nowhere in the world can these good ores be found in such quantities, so widely distributed or so accessible, as in the United States. There seems no reason why, in a very few years, these great advantages, together with our wealth in good fuels, should not place us in a position to supply not only our own great and rapidly growing market, but even—improbable as the idea may appear—to export largely to countries which have but limited mineral resources, or which, like Great Britain, are yearly finding both the natural and the politico industrial obstacles to further progress becoming more and more serious.

The noble exhibits made in this department by well known English, French, Belgian, and German firms are precisely what the well informed might have anticipated; but probably few visitors were aware, until the evidence was presented here, of the vast mineral wealth, and of the degree of development of the resources of the Austrian empire. The

STAATS EISENBAHN

exhibit occupies a building by itself, and affords a most interesting illustration. Several hundred miles southeast of Vienna, among the Carpathian mountains, is the Hungarian town of Resicza, where the manufacturing establishments of this railroad are situated. There have been brought from thence and placed on exhibition some of the finest of iron ores, which are to be found there in great variety. A very excellent coal is obtained from a vein of which a large section is exhibited. The principal vein is said to be 29½ feet in thickness. Several immense ingots of Bessemer metal, made with this fuel from these ores, are exhibited, and also a large number of samples of every grade, broken to show the character of the material by the appearance of the fracture, or bent or tied into knots to exhibit its immense toughness and ductility. Parts of machines, as shafts and rods, difficult shapes, plates of various thickness, tools and manufactured articles of hundreds of different sorts, all made of steel, illustrate at once its wonderful power of adaptation to all purposes, and exhibit the extent to which the "Staats Eisenbahn Gesellschaft" have developed their Hungarian possessions.

Prince Schwarzenburg, who invited us to visit his immense estate at

WITTINGAU

a few days ago, and who there exhibited to our astonished republicans an illustration of the old feudal system in its most unobjectionable form, has also a *pavillon* of his own which is equally interesting. The most careless observer cannot fail to find the most interesting evidences on all sides of the magnificent, but as yet imperfectly developed, natural resources of this great Austro-Hungarian Empire. When the proprietors of this fertile soil shall have imbibed something of the energy and the enterprise of our venerable host of Horskysfeld, and shall have profited well by the opportunity which is now offered them of introducing the agricultural machinery which our inventors have brought to such perfection, and when these valuable mines shall have been developed, and manufactures shall have become well established here, the world is likely to see a national development which has been, as yet, quite unanticipated by foreigners generally.

There are still other illustrations to be observed here of the splendid future which may be secured to the country should a wise policy, liberalizing its government, wake up and educate its people and develope its natural advantages. The good work seems begun; and, if the management of affairs is allowed to remain in as good hands as those which have conducted the great enterprise which has now attracted representatives of all nations to Vienna, it may be confidently hoped that it will be uninterrupted.

GERMANY

is best represented by the contributions of Fred. Krupp, from his immense establishment at Essen. A block of crucible steel, weighing a hundred thousand pounds, illustrates the great capacity of the steel-making department. It has been worked into shape by the great fifty ton steam hammer, which is one of the wonders of Essen. A steel cranked axle for a locomotive is a splendid piece of work, and smaller straight axles, intended for cars and for tenders, are very fine examples of hammer finish; and a considerable number of specimens of locomotive work are of the same admirable quality. Some of these are of Bessemer metal. Krupp evidently takes much pride in his artillery manufacture, and if his exhibits here are average specimens of his work, he has most excellent reason for it. A considerable number of guns for both land and sea are exhibited. On one of the largest he has adopted the "Ericsson compressor," which is one of the most beautiful and effective contrivances of its inventor. The guns are generally breech loading, are rifled with a large number of narrow grooves, and are mounted on iron carriages. The largest gun has a caliber of 305 millimeters—twelve inches—and weighs 36,600 kilogrammes, 80,000 pounds. It has a magnificent finish, and is made of beautifully homogeneous metal. These are built guns, or, as the maker describes them, are constructed upon the "ring system" of Armstrong. In most cases, the recoil of the gun is taken up by a very neat form of "hydraulic" gear, which we should expect to work well, and which experiment is claimed to have proved satisfactory.

Among British exhibitors, Cammell & Co., John Brown & Co., Vavasseur, and Armstrong & Co. compete to some extent with Krupp. The two first named present fine examples of heavy work, and their

ARMOR PLATES

attract much attention. Several are shown which heavy shot have been driven against, making deep indentations which are bordered, in some instances, by a sharp fin, forming a kind of collar and showing well the fine quality of the metal. The other firms exhibit heavy and well built guns. Several torpedoes are exhibited, which are principally noticeable as reminders of the revolution which seems impending in the methods of naval warfare—a revolution which was inaugurated as long ago, at least, as the time of our revolutionary war, and which has exhibited its greatest progress in the United States, where Bushnell, Robert Fulton, John P. Taylor, and other inventors of an earlier period, and Ericsson, Lay, and others of our contemporary engineers, have proved that it promises to change completely the tactics and the *matériel* of navies at a very early date.

There are many special exhibits which are nearly as interesting as any already referred to, and we may be able to find time for their examination at some future period.

R. H. T.

Correspondence.

Testing Steam Boilers.

To the Editor of the Scientific American:

In a late issue of your paper, you mention the need of an iron clad man to take charge of old worn out steam boilers. No doubt it would be a money-making invention; but as the demand would be greater than the supply, we should be no better off than we are now. But why do we not have the same system of boiler inspection and testing, and the examination of engineers, on land as we have on the sea? In this place, there are four saw mills; in two of them there are 130 men at work; and the engineers in both of these mills are men who know nothing about their business, except how to stop and start their engines. One of the boilers is worn out; but what remedy is there? None. On the other hand, there are four tug boats in this harbor (two of them are only allowed to run inside the harbor); and on these, each engineer has to have a license, for which he pays $10. The boilers have to be tested once a year, and the engineers' certificates renewed. Now, have the engineers on those tugs (each carrying three persons) any more responsibility than those in the mills mentioned? What we want are a strict law in regard to testing boilers and a strict inspection of engineers, as we have on board boats. Let insurance companies refuse to take risks on buildings using steam power unless the owners have an inspector's certificate. Let a law be passed, compelling all men using steam power to employ no engineers but such as have passed the required examination.

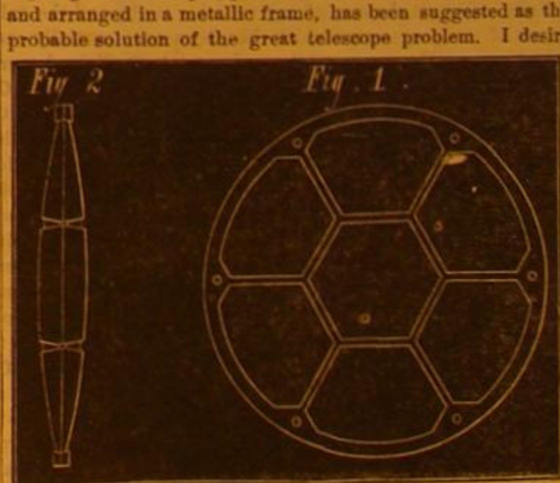
Who will set the ball rolling? We look to you to start it, and to all sensible men to keep it in motion.

Frankfort, Mich. ENGINEER.

The Million Dollar Telescope.

To the Editor of the Scientific American:

The plan, shown in Figs. 1 and 2, of constructing a large object glass, with polygonal lenses having the same focus and arranged in a metallic frame, has been suggested as the probable solution of the great telescope problem. I desire



to call further attention to this plan, and request those who have evidence of its impracticability to bring it forward. With means now at our command, an object glass of this kind can be constructed with a diameter of five feet, and very possibly six feet. If a 25 inch glass can be furnished for $50,000, one of 60 inches should not exceed $600,000. Of the proposed million dollars, this would leave $400,000 for machinery, mounting, etc., which would probably be sufficient, although it is no small task to build a tube 75 or 100 feet long, and mount it in the air so that it shall have sufficient stability and yet be easily managed. Of course the field would be divided by dark bands into polygonal sections similar to the object glass; but would this be a serious objection? I think not.

F. H. R.

New Britain, Conn.

The Lay Torpedo.

To the Editor of the Scientific American:

Your issue of July 19 has an article entitled "Recent Improvements in Torpedo Warfare," in which you give a description of the Lay torpedo. You also state that "experiments made at Newport some time since proved quite successful; but of late, we note that, from various causes, such promising results have not been attained." As this statement is made in your leading article, it has undoubtedly led the many readers of your valuable journal into an error, as well as committed a great injustice to Mr. Lay.

During the winter last past, there were two experimental trials which were unsuccessful, not on account of any fault in the principle of the boat. At one time, the rudder broke; at the other, the cable was defective. These defects were easily remedied; and on May 29, the final test of running one mile and returning was made, entirely to the satisfaction of the commission of naval officers appointed to witness it. The writer was present and knows that the whole run was a perfect success, and that the Lay torpedo boat has proved quite as successful as her inventor had ever promised. When I add that our government immediately accepted the boat, and has already paid Mr. Lay therefor, there can be very little question as to its success. I also have in my possession a letter from Captain Matthews, Chief of the Torpedo Corps, United States Navy, stating that, since such acceptance, he had made even a more successful run with the boat than that of May 29, and expressing himself highly gratified with the performance.

Please give this explanation a place in your paper, as I trust you are ever ready to make amends for any error, however slight, in your columns, especially when it takes from a worthy inventor the tribute of success.

W. W. ROWLEY,
Buffalo, N. Y. Attorney for John L. Lay.

The Causes of Boiler Explosions.

To the Editor of the Scientific American:

Having read of the appointment of a commission to investigate the causes of boiler explosions, I think it proper to assert boldly that no boiler has ever been exploded from gases generated from steam or water. A want of capacity or carelessness of the engineer, a defect of construction or general weakness of boiler, but mainly want of water is the cause of explosions. When any part of a boiler, from want of water, becomes heated, and water is let on to it, the water, striking that part, will assume a globular form; and the globules, in cooling the surface, suddenly become steam, and as a consequence the boiler explodes. Who has not seen globules form on stoves, red hot plates, etc., and suddenly expand? I have experienced this fact in boilers, upon two different occasions (accidentally); and to prove my assertions, I propose, to any party willing to bear expense of the ruination of the boiler, to fill said boiler with water to the usual hight (which is at best arbitrary); then build my fire, raise the steam to 70 pounds pressure, allowing it to escape, and then reducing water, pressure and fire, till the gage shows less than 5 pounds, with but a few gallons of water in the boiler; I will then introduce into the boiler from one to three gallons of water and raise the pressure to 70 pounds again in less time than I can write it, say from one to three seconds. I will be present at the boiler during the trial. The boiler is to be of the tubular or locomotive kind, to have a very large safety valve, and to be previously submitted to my thorough inspection. GEO. H. LENHER.

Elizabeth, N. J.

The Zodiacal Light.

To the Editor of the Scientific American:

T. R. L., in his explanation of the cause of the zodiacal light, on page 51 of your current volume, made, I think, the following mistakes:

1. There is no reason why the lune 1 I 2 G only, and not every part of the surface of the earth that is illuminated by the sun (the entire lower half), should reflect solar rays in the indicated manner. Why should the phenomenon, explained in the diagram, be seen only east and west and not north and south, and in every direction, the sun being in a vertical line below the observer?

2. A second reflection of the rays on the outline of the atmosphere can hardly take place, because the density of the gaseous envelope of our earth diminishes gradually, and hence does not exhibit a reflecting face. The air, however, does absorb and disperse some of the light which passes through it; and, therefore, "dispersion" should be substituted for the "second reflection."

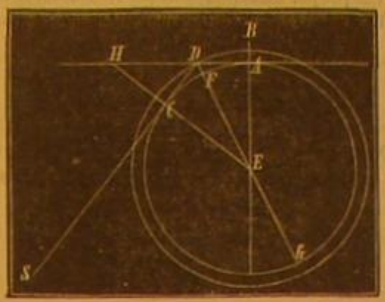
3. In the diagram, the atmosphere is supposed to be higher than the radius of the earth. Had T. R. L. made the diagram with better proportions, sketching the hight of the atmosphere as about $\frac{1}{80}$ of the radius of the earth, he would at once have seen that his theory cannot account for a "double light."

4. That section of the atmosphere, above the horizon of the observer, which is illuminated by the reflected rays is also illuminated by the direct rays of the sun, as the diagram clearly shows; and therefore, I fear, T. R. L. gives a theory, not of the zodiacal light, but of the ordinary twilight. HUGO BILGRAM.

Philadelphia, Pa.

To the Editor of the Scientific American:

Most of your readers, I am persuaded, will need no demonstration to convince them that the theory of your Mount Airy correspondent, which attributes the phenomenon of the zodiacal light to "reflection of the rays of the sun from the earth upon the atmosphere and thence to the spectator," as contained in your issue of July 26, is untenable. However, lest the diagram contained in the article alluded to may confuse some of your readers, I submit the following as a refutation of the position taken in that article.



Let E represent the center of the earth, S the point of the observer, A B the hight of the atmosphere (50 miles, we will assume), and S C an incident ray. Then, from the well known proposition (Euclid, 36, III), we have DG × DF = AD². Therefore, $AD = \sqrt{8,000 \times 50}$ = about 633 miles. Because the angles of incidence and of reflection are equal, the last ray of reflected light that can be seen at D corresponds with the incident ray, SCD, which is tangent to the earth at C, and consequently CD = AD. Now, AE : AD :: radius : tangent of the angle AED, whence we find angle AED = 9°. Therefore angle AEH = angle SDH = twice angle AED = 18°; and consequently the last ray of either incident or reflected light is seen when the sun is only about 18° below the horizon of the observer. But it is well known that the zodiacal light is seen when the sun is much lower; and, according to the testimony of Mr. Jones, it may sometimes be seen when the sun is 90° below the horizon, that is, at midnight.

Hence it is certain that the zodiacal light is not "caused by reflection of the rays of the sun from the earth upon the atmosphere and thence to the spectator," as is assumed by your correspondent F. R. L.

J. E. HENDRICKS.

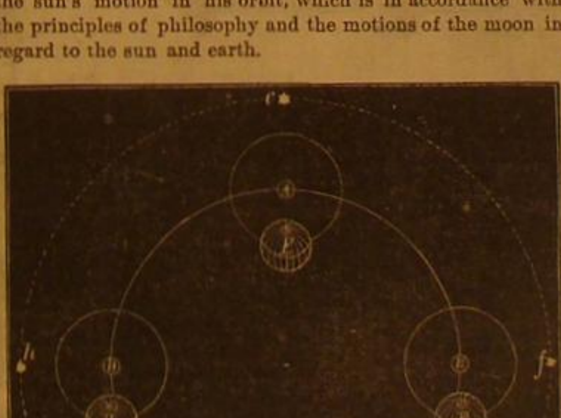
Des Moines, Iowa.

The Retrogression of the Sun.

To the Editor of the Scientific American:

One of your correspondents, on page 51 of your current volume, argues that the precession of the equinoxes is owing to the motion of the sun in an orbit, and he gives a diagram of the position of the sun and the earth at the summer solstice, in four different points of the supposed solar orbit.

Now his figure is incorrect, because, if the sun had such a motion in such an orbit, it would not change the direction of the earth's axis in the manner which he represents, or in any other manner; and the earth at the summer solstice would not be in the positions, which his figure indicates, in the given places of the sun in its orbit, but would be in the positions indicated in the diagram which I send you. This diagram is a correction of your correspondent's, with the lunar orbit left out as not affecting the question. This figure represents the direction of the earth's axis as unchanged by the sun's motion in his orbit, which is in accordance with the principles of philosophy and the motions of the moon in regard to the sun and earth.



Now such a motion of the sun as this might cause a precession of the equinoxes, but it would also cause a change in the angular distance from each other of all the stars in the heavens, which is not the case in Nature. For instance, if the sun had receded so far westward from A that it no longer appeared in conjunction with the star, *c*, but thirty degrees to the west of it (about the amount of the precession of the equinoxes since Hipparchus' catalogue), then the stars, *c* and *g*, would no longer be 180° from each other; while *c* and *h*, and *g* and *h*, would be nearer together, while *c* and *f* would be further apart than at first; besides, the motions of the stars near the poles would not be such as is observed in Nature. JOHN S. PLUMER.

Sandown, N. H.

To the Editor of the Scientific American:

Your correspondent Mr. Hepburn appears to labor under a singular delusion in regard to what is, in reality, a simple mechanical question; and thus, in trying to avoid a merely imaginary difficulty, he has fallen into a real one. For while a very slight excess of that retrograde rotation, which, in consequence of inertia, takes place in the earth as well as in all revolving bodies, is fully sufficient to account for the apparent retrogressive motion of the sun, it is equally clear that there could not be such a motion of the sun as is represented in the diagram on page 51, without such a counterbalancing weight on the other side of the center of revolution as would require a complete change in the arrangement of the solar system.

If astronomers were but able to understand the simple fact that a body in free space, while rotating on one axis in one direction, can, at the same time, have a rotation in a contrary direction on another axis crossing the first at the center of gravity, they would find no difficulty in comprehending many of the so called anomalous motions of the planets which they have so long attempted to account for on the supposition that one side of a perfectly well balanced body may sometimes be heavier than the other. JAMES A. BAZIN.

Canton, Mass.

Hot Air Engines.

To the Editor of the Scientific American:

Having had considerable experience with hot air engines, especially with the Roper engine, I have been much interested in your correspondent F. G. Woodward's remarks and suggestions in regard to them. The design which he gives, on page 37 of your current volume, though possessing some advantages (especially the self-oiling device, which is good), has many defects which, I think, make it impracticable. Among these are the fire box and fly wheel, which must both be of great weight, being placed high; and the whole engine, as it stands on the air pumps, which must necessarily be small, renders the machine too topheavy for practical use. The location of the cylinders, also, seems to make them difficult of access for the purpose of packing, cleaning, etc. The fire doors being so high, also, make it inconvenient to fire up and rake out the ashes; and, the cylinder being placed beneath the fire box, the ashes and dirt, which are sure to arise when raking out the fire, would settle in the cylinder and cut out both it and the packing.

He does not give his proposed arrangement of valves, or the kind of valves which he supposes will stand when placed above the fire. After considerable and careful observation, my impression is that no successful hot air engine can be built unless the valves are placed outside. This is a subject which deserves discussion, and I am glad to see it agitated. Hot air possesses advantages over steam which, it seems, should eventually recommend it almost universally for a light power, and whosoever has the best engine will certainly have a large field for its sale. H. S. W.

New York city.

REMARKS BY THE EDITOR:—We are glad to draw out correspondence on so important a subject. Mr. Woodward did not send a working drawing of his proposed engine, but merely a sketch of moving parts, and he may have provided sufficient support for the cylinder. He also omitted to mention several details, to which we called attention at the time. We would be pleased to hear from him, if he cares to reply to any of the criticisms contained in this letter.

The Belief of Hippocrates.

To the Editor of the Scientific American:

In reading the article, on page 320 of your volume XXVIII, on "Medical Practice in Early Times," to the progress of which, as you justly observe, Hippocrates contributed not a little, any one not acquainted with the writings of the Prince of Doctors may be led to infer from the context of the article that good Hippocrates was nothing but a materialist; whereas he firmly believed that no disease can be ascribed to a material cause. He, in fact, says that it is impossible to discover the nature of ailments if they are not known in the indivisible (part of man) from which they proceed. By indivisible, we, of course, understand the soul of man. All matter is divisible; the soul, being immaterial, is indivisible.

That Hippocrates was devoutly religious, his life and writings furnish ample proof; in this characteristic, some of our doctors would do very well to imitate his illustrious example, particularly for their patients' sake.

PHILO-HIPPOCRATES.

Kingfishers and Fish.

To the Editor of the Scientific American:

Mr. Darwin in his last book states that the kingfisher always kills the fish before swallowing it. Dr. Charles C. Abbot, of Trenton, N. J., states that the fish is swallowed without killing and often while the bird is on the wing. So far as my observation goes, when a fish is large, or about two and a half inches long, it is killed before being swallowed. I once saw a kingfisher light on a limb close to the surface of the water in a creek; and the bird, having an eye to the business in hand, did not see me (I was about fifteen feet off); it presently dived into the water and returned to its perch with a fish in its bill, about the above stated length. The bird then began to beat the head of the fish against the limb on which it was standing; after a few beats it would stop to see if the fish was dead or not; this was done three times, when the head of the fish was bleeding, and the limb against which the head was beaten was stained with blood. The fish was dead, and it was then swallowed. Now the above named gentlemen may both to a certain extent be correct. The kingfisher may swallow the small fish without killing them; in my mind there is no doubt that they do.

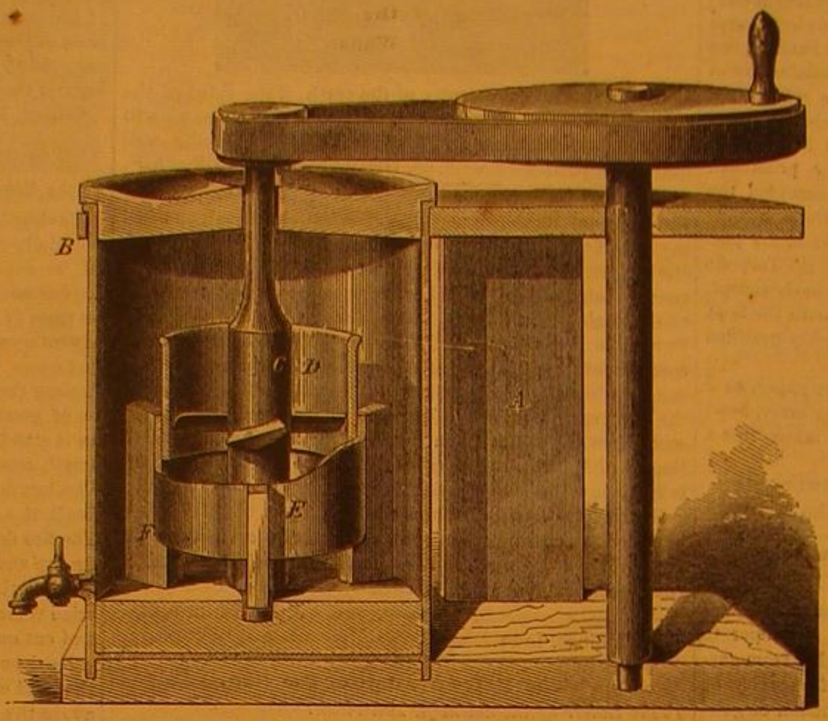
San Francisco, Cal. D. D. S.

IMPROVED CHURN.

The accompanying engraving is a sectional view of a new churn which, in addition to having various improvements in its construction, is claimed to produce and gather butter with great celerity. The apparatus rests on a base plate from which arise two standards, one of which is shown at A, which are surmounted by a top piece. The latter is cut to fit partially around the churn body, and is held in place by a detachable strap, B. The churn body is cylindrical in form and has a false bottom in which is pivoted the lower end of the dasher shaft, C. A number of radial arms or blades, made wide and inclined laterally, are secured to the dasher shaft, which is also surrounded by a curb or tube, D, in which it freely revolves. The curb, D, fits into a similar tube, E, which has radial flanges, F, attached to it, the outer edges of which rest against the inner surface of the churn body, so as to keep both curbs accurately centered and securely in place. The lower ends of the flanges, F, project below the lower end of the tube, E, supporting the same at a distance above the bottom so as to give a clear passage for the milk beneath. In operation, the curb, D, is adjusted so that its upper edge may be a little above the surface of the milk to be churned. Then, as the dasher is revolved, the blades raise the milk through the curb and project it outward over the edge against the sides of the churn body. A constant inflow of milk is thus caused beneath the lower edge, thus providing a continuous circulation and violent agitation of the contents of the churn, causing butter to appear in a very short time. The flanges, F, prevent the milk from receiving a circular motion from the dasher, by which its inflow beneath the curb would be impeded.

The cover of the churn is made in two parts, and has half round notches in the center, which, when the appliance is in place, form the upper bearing of the dasher shaft. To the upper end of the latter is attached a small pulley which communicates, by means of a belt, with a larger wheel provided with a handle to serve as a crank, as represented. The faucet shown at the base of the churn serves to draw off the contents when desired.

Patented April 22, 1873, by Mr. William H. Holdam, of Crab Orchard, Lincoln county, Ky., from whom further particulars may beobtained.



HOLDAM'S IMPROVED CHURN..

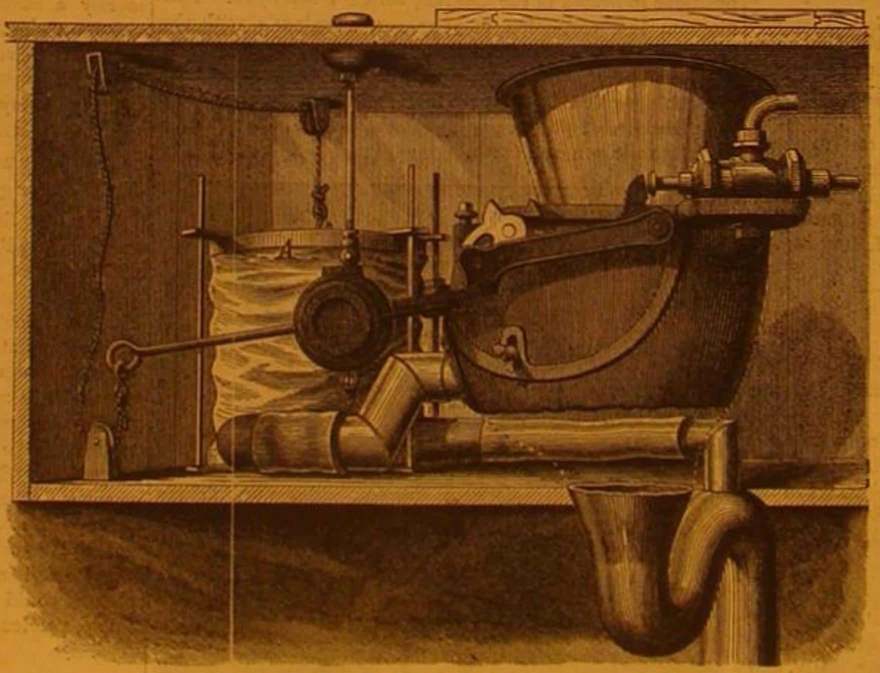
ODORLESS WATER CLOSET ATTACHMENT.

There is probably no more insidious cause of disease than the foul emanations from sinks and water closets. In city houses, the latter especially, through their close proximity to other portions of the dwelling, are often the source of serious nuisance.

In order, as it is claimed, entirely to obviate the disagreeable odor attendant upon the employment of these receptacles, the device illustrated in the accompanying engraving has recently been invented. It consists of a bellows, A, arranged with suitable inlet and outlet valves, the supply pipe of which connects with the upper end of the trap or the closet, and the pipe leading therefrom communicates with the lower part of the trap or the soil pipe, thus conveying the foul air from the bowl to the sewer conduits. The bellows arrangement is operated by a lever, cord, and pulleys in combination with the pull, as represented, or, in hopper closets, by the working of a cock.

The device is simple, and easily attached to ordinary closets. The inventor relates that he has tested it for some time in actual employment, with uniformly satisfactory results.

For further particulars address Mr. Philip C. Rowe, 203 Harrison avenue, Boston, Mass.



ROWE'S ODORLESS WATER CLOSET ATTACHMENT.

Improved Ship Signal Lights.

William Harvie, a coppersmith of Glasgow, Scotland, is the originator of an excellent improvement in this line, which has come into extensive use for steamships and sailing vessels. He employs lenses on the dioptric system, of pressed glass, and has succeeded in getting a paraffin light to burn brightly in any weather, without a glass chimney.

In order to accomplish this result, Mr. Harvie so divided the lamp that the inside chamber formed the chimney proper, the air for maintaining combustion passing down the upright tube, entering under a false bottom. The funnel by which the products of combustion escape from the lamp is so protected that no blow-down can take place; indeed, it seems that the Harvie lamp burns better in a storm than otherwise.

When subjected to a photometric examination in the public gas testing office Glasgow, the Harvie patent signal lamp was found to give, in front, a ray of light from the center of the lens equal in intensity to that given by ninety-eight standard sperm candles, and at the side a ray of light from the center of the lens equal to the light of sixty-seven candles; while the common lamp in front gave a light equal to eight candles, and at the side the light of three candles. And while the naked light of the patent lamp was equal to eight and a half candles, that of the common lamp was only equal to three candles. Hence, not only are the rays of light thrown in the proper direction, but the increased illuminating effect of the light is due both to the lens and the lantern itself.

The Australian Water Cooler.

In reference to this device, illustrated on page 371 of our volume XXIX, our excellent correspondent Mr. O. C. Woolson states that similar vessels are used in the West Indies; they are made in Spain, of a very porous earthenware from blue clay. "In no case must you touch your lips to the jar, but hold it above your head, anywhere from six inches to two feet, and let the liquor run into your mouth, or, rather, clear down your throat. It is a remarkable fact that, in quenching thirst in this way, you cannot drink one drop more than just what your stomach needs; and if you keep on pouring after that point is reached, you run in danger of choking yourself. There may be some of your readers and thinkers who doubt this, but I state it as a fact; and you may try again and again to swallow more than you really require, and you will be foiled every time; and for this reason I regard the practice of quenching thirst in this way the most healthy that was ever tried. In very warm weather, when one is inclined to drink often and much, to the injury of health, it goes beyond the practice of taking one swallow and two breaths, etc. It takes a little practice to accomplish the throwing the water in the mouth, and the first attempt will probably require a change of shirt and possibly one's whole attire; but that would only occur with those that are extremely awkward; generally the third or fourth attempt is successful, and then it is as simple as drinking from a glass. In some parts of Spain, they drink wine from these jars; and it is said that, when it is passed around the table for each person to drink, in case any one, not accustomed to the practice, allows his lips to touch the spout, the next in turn takes it and without a word throws it upon the floor and calls for another jar. That will do very well for Spain, but we do not handle wine in that way. I hope the time will come when these jars are generally used in this country. For rolling mill and furnace men they are very suitable, and would, for the reason above given, save many a fellow from the cramp. I am going to try the clay in this country, to see if it is suitable for the purpose."

What shall we do with our Boys?

It is as impossible to make a chemist, or an engineer, or a naturalist, of a boy, if he has no special taste or aptness for these studies, as to make a poet out of a Digger Indian. It is no unusual circumstance for parents who have boys just entering upon manhood to come to us desiring counsel in regard to placing them in a chemical laboratory, that they "may learn the trade," as, to their eyes, the business appears remunerative. They have no special genius, no training in preparatory studies, no decided leaning towards chemical manipulation or research, but the desire is to have them "made" into chemists. There is a mistaken idea, common to many parents, that their children are as well adapted to one employment as another, and that they only need opportunities to learn regarding this pursuit or that, to become proficients and rise to eminence. More than half the sad failures so commonly observed are due to being forced into the wrong road in early life. Young men are forced into pulpits, when they should be following the plough; forced into courts of law, when they should be driving the plane in a carpenter's shop; forced into sick rooms, as physicians, when they should be guiding a locomotive, or heading an exploring party into the Rocky Mountains; forced into industrial laboratories, when they should be in the counting room or shop.

It is a wise provision of Providence that nearly every boy born into the world has some peculiar distinctive capability, some aptness for a particular calling or pursuit; and if he is driven into channels contrary to his instincts and tastes, he is in antagonism with Nature, and the odds are against him. One of the earliest and most anxious inquiries of parents should be directed to the discovery of the leanings of their children, and if they find that their boy, who they earnestly desire shall adorn the bar or the pulpit, is persistently engaged in constructing toy ships, and wading in every puddle of water to test their sailing qualities; if he reads books of voyages, and when in a seaport steals away to the wharves, to visit ships and talk with sailors, it is certain he is born for the sea. Fit him out with a sailor's rig, put him in the best possible position for rising to the honorable post of ship-master, and you have discharged your duty. If, on the other hand, he is logical, discriminating, keen, fond of argument, let him enter the law; if he is fond of whittling, planing, sawing, constructing, and neglects his studies, turn him over to a good carpenter, to learn the trade. If he begins early to spend his pennies for sulphur, niter, oil of vitriol, *aqua fortis*, etc.; if he is such a persistent experimenter that you fear he will kill himself, or set your buildings on fire; if his pockets are full of abominable drugs, and his clothing so charged with the odor of stale eggs that you refuse to admit him to the table at meal times, why, the chances are that he is a "born" chemist, and it will be safe to start him off to some technical school for instruction.

The question is, not what we will make of our boys, but what position are they manifestly designed to fill; in what direction does Nature point, as respects avocations or pursuits in life which will be in harmony with their capabilities and instincts? It is no use for us to repine and find fault with the supposed vulgar tastes of our boys. We must remember that no industrial calling is vulgar; every kind of labor is honorable; and it is far better to be distinguished as a first class cobbler or peddler than to live the contemptible life of a fifth rate lawyer or clergyman.

There are thousands of boys born into the world possessing scarcely a trace of ambition. Such do not care for distinction, or even for wealth; if they can procure the humblest fare, by constant toil, the aspirations of their boyhood, and subsequently of their manhood, are fully met. They are negative characters, happy with nothing, and suffer no elation or depression, whether in sunshine or under a cloud. These boys, who often afford much mortification to ambitious parents, fill a most important niche in the world; in fact, the world could not do without them. They constitute the great army of men who build our railroads, tunnel our mountains, load and unload our ships, cut down our forests, and manipulate the red hot iron masses which come from our blast furnaces. We cannot alter the temperaments of such boys. Nature is stronger than we are, and well is it that this is so. We may hold them by the power of wealth or controlling influences, but when these fail they fall at once to their place, in obedience to a law as irresistible as that which Newton discovered in the fall of the apple. Study to learn what they are capable of doing for themselves; encourage them to do well whatever work is suited to their natures. Regard every calling as honorable, the labor of which is honorably performed, and thus insure happiness and prosperity to our offspring.—*Boston Journal of Chemistry.*

JAPANESE BIRDS.

We select the herewith illustration from a handsomely gotten up work on Japan, by the celebrated German traveler Wilhelm Heine. It represents birds of the heron and crane species, and was made from a sketch by himself personally. These birds are very numerous, and are diverse in their appearance and characteristics. They are not allowed to be hunted except by the nobles; and according to the popular belief, they are the symbols of happiness and good fortune, and are frequently represented as such in the plastic and pictorial arts.

The ibis (No 4) is a beautiful and rare bird, the first specimen of which was brought to Europe by Siebold. It is two feet six inches high; the bill is of a dark violet brown, red at the point. The skin covering the head and ears, and also that of the legs and feet, is of a brilliant red; and the nape of the neck is covered by a bunch of long narrow feathers extending to the base. The color of the bird is white.

The white crane (No. 2) appears in the southern part of Siberia as well as in Japan. The color of the young birds is of a reddish brown, which soon changes into white. The feet, the bill, and a piece of bald skin above the eyes, are of a brilliant red color.

The monk heron (No. 7) is two feet eight inches high, being covered with black feathers on the upper part of the neck and head. It has similarly colored legs, with a bill of a greenish gray, which changes towards its base into a rust-red color.

The great spoonbill heron (No. 3) is two feet nine inches high. It resembles, in general, the European species, with a small difference in the length of the feet and bill. The color is white, the bill being yellow and the feet black.

The small silver heron (No. 1) differs greatly from the European herons, and from those of Egypt and Persia. The specimen represented in our engraving measures two feet in hight. The feathers which cover the neck and back are long and thread-like, and are used in trimmings and other ornamentation, being of a resplendent white color. The feet are dark black.

The bittern (No. 5) does not differ from the kinds indigenous to Europe, Egypt, Nubia, Abyssinia, and Siberia.

The great kingfisher (No. 6) is frequently found in the presence of a company of herons; he appears to listen attentively to the chattering of the birds, with the air of a reporter to whom it is necessary that not a word should be lost.

The Cause of the Gulf Stream.

Mr. John P. Whipple, of Whitewater, Wis., sends us a pamphlet in which he argues that the Gulf Stream and all other ocean currents are produced by the tidal wave and the land with its peculiar formation. We fail to perceive the practical scientific value of our correspondent's suggestions, particularly as he observes that the land and tide are continually making the water unequal and that the tide and winds stir up the ocean. Some of the theories advanced are hardly in accordance with accepted views, especially those relating to the trade winds where "the sun is continually warming the air at the surface of the earth, which makes it lighter, and the night cools it and makes it heavier, so the cool air follows the sun around the earth and that is the cause of its keeping one direction:" and also the statement that the earth's rotation is due to "the sun continually expanding the side nearest it, making it lighter; night condenses and makes the opposite side heavier, and its motion round the sun forces it to rotate."

As the inventor of these novel ideas naively remarks that his Gulf Stream theories depend on the fact of the water on the east shore of the Isthmus of Panama being on a higher level than that on the opposite side, he probably will abandon them on learning that the mean hight of the two oceans is precisely the same. The old idea that the Atlantic is many feet higher than the Pacific has long since been exploded.

Iron Shipbuilding in Iowa.

A correspondent, J. H., states that two iron steam yachts have recently been built in Dubuque. They are built on the same style as the Cunard steamer China, built on the Clyde. The building of the yachts was done under the superintendence of a man who worked on the China. The dimensions of each yacht are: Length of keel 47 feet, width of beam 7 feet 6 inches, depth of hold 4 feet. They are propelled by screws which make 300 revolutions per minute and propel the boats at a speed of 12 miles an hour. The screw of each boat is driven by a twelve horse power upright boiler, and engines of unique pattern, which will soon be patented. Everything aboard each yacht is so arranged that she can be entirely managed by one person. They can be used as sail boats and are capable of carrying 50 passengers each. They are the fifth and sixth iron steamboats built in this city (one of which, the Clyde, has a 150 horse power engine and is one of the fastest tow boats on the Mississippi river). She was the first built west of the Alleghany mountains. Except the masts and seats, there is no woodwork on the two yachts. Their names are the Island Queen and the J. D. Eddy. They cost $2,000 a piece, and are built by Rouse & Co., proprietors of the Iowa Iron Works.

JAPANESE BIRDS—HERONS AND CRANES.

SCIENTIFIC AND PRACTICAL INFORMATION.

TUNGSTEN IN THE ARTS.

In the last few years the consumption of tungsten and its compounds has vastly increased. It is now used for improving the quality of puddled iron and steel as well as cast steel, and is one of the constituents of Mushet's special steel. Its addition to German silver renders it tougher, and it is employed in many other alloys with gold, silver, lead, etc. One alloy called minargent contains 100 parts copper, 70 nickel, 5 tungsten, and 1 aluminum. Bartels in Hanover makes a large number of tungsten preparations for use in dyeing and printing; the tungstate of soda serves as substitute for tin salt, for fireproofing fabrics, and for the manufacture of bronze powder and blue carmine. In cosmetics, tungsten is taking the place of white lead and zinc. Tungsten in steel gives it the property of retaining magnetism for a longer time and makes it useful for magnetic needles.

CONVERSION OF STARCH INTO SUGAR.

The conversion of starch, cellulose, and the like into glucose or grape sugar has usually been accomplished by the use of dilute acids in open vessels. Some Parisian chemists, Gibon, Dusart, and Bardy, now propose to conduct this operation in closed cylinders under a pressure of 3 to 4 atmospheres. The proportions taken are 35·3 cubic feet water and 4·4 pounds sulphuric acid to 4,400 pounds dried starch, and the operation lasts two hours. If a thicker sirup is desired, it is only necessary to diminish the amount of water taken. Some other acid may be used than sulphuric. The advantage of the process consists in obtaining the desired product by a single operation, since neither concentration by evaporation nor filtration is necessary.

DETERMINING THE QUANTITY OF ALCOHOL IN FUSEL OIL.

When fusel oil is imported into England, it is admitted free of duty, provided that it does not contain over 15 per cent of alcohol of 0·92 specific gravity. The method employed in the London custom house for determining the amount of alcohol depends upon the insolubility of fusel oil in water. A certain quantity of the liquor to be tested is shaken with an equal volume of water and left standing for 12 hours. At the end of that time two layers are formed, the upper one of fusel oil, the lower of alcohol and water. The specific gravity of the latter is taken, and from it the percentage of proof spirits is calculated.

This method, according to Dr. G. L. Ulex, gives too high a percentage of alcohol, for crude fusel oil contains not only amylic alcohol, but also ethylic, propylic, and butylic alcohols, which are more soluble in water. Ethylic alcohol is soluble in every proportion, propylic alcohol is very soluble, butylic alcohol dissolves in 10 parts of water, amylic alcohol is as good as insoluble.

From some experiments by the author, he found that fusel oil from beets consists of 2 parts of soluble alcohols and 1 part insoluble alcohol, and that only a small part of the former is wine alcohol. Although this liquor contains only 3 to 4 per cent of proof spirit, according to the custom house rules it would seem to contain 40 per cent of proof spirit and be taxed accordingly. This leads to very great injustice in English import duties, and although this law is not in force here, we give the following more accurate method of making the determination:

The boiling point of absolute (ethylic) alcohol is 173·12° Fah.; that of propylic alcohol, 206·6° Fah.; butylic alcohol, 228·2° Fah.; amylic alcohol, 269·6° Fah., so that this difference can be employed in separating them. If wine alcohol is present in considerable quantities, it alone will be found in the first portion of the distillate. Three and two fifths ounces of the fusel oil to be tested is placed in a retort and 1·35 drams distilled off. This distillate is mixed with an equal quantity of a saturated solution of common salt, and, after shaking, left to settle. If the quantity of fusel oil then found floating on the top is 40 minims or more, it is certain that less than 15 per cent of proof spirits is present, and hence it is free of duty. If the quantity of fusel oil is less than that, the liquor is tested by mixing it with an equal quantity of salt solution, shaking, and allowing to rest.

The salt solution is then separated and distilled by itself, and the quantity of proof spirit determined in the distillate by taking its specific gravity.

THE VELOCITY OF LIGHT.

Olaf Roemer, an eminent Danish astronomer, while observing the eclipses of Jupiter's satellites, in 1676, found that light occupied about 16 minutes and 26 seconds in passing through the diameter of the earth's orbit, and assuming the distance of the earth from the sun to be nearly 95,000,000 miles, he determined the velocity of light to be 192,500 miles in a second.

In 1723, Bradley, an English astronomer, discovered the aberration of light, and determined its velocity to be 191,515 miles per second.

In 1849, M. Fizeau invented an apparatus for measuring the velocity of light between terrestrial stations, and determined it to be 194,677 miles a second.

M. Foucault, with substantially the same apparatus, determined the velocity to be 185,177 miles per second, and showed that this result was correct to within $\frac{1}{500}$.

Quite recently M. Fizeau has published the particulars of a long series of experiments, made between stations about 6 miles apart, using the rays from a oxyhydrogen light; and he gives, as the mean of 650 good observations, a velocity of 186,363 miles per second. The result obtained by Roemer is usually given in test books, and in fact is commonly quoted as the correct velocity of light. But the close agreement of the more recent researches of MM. Foucault and Fizeau, and the elegant methods used by these philosophers in their researches, render it nearly certain that the velocity of light in the air is between 185,177 and 186,363 miles per second.

SULPHITE OF SODA AS AN ANTICHLOR.

The term antichlor, which applied originally to any substance employed to destroy the free chlorine remaining in fabrics bleached with it, is now almost entirely limited to hyposulphite of soda, $Na_2S_2O_3$. During the reaction of this salt upon chlorine, free sulphur is deposited upon the fabrics, much to their detriment. The probable reason, that this has never before been observed, is because its injurious effects have been attributed to overbleaching. This finely divided sulphur, when deposited in the fiber of paper, gradually oxidizes to sulphurous and sulphuric acid, which renders the paper brittle, and, if written upon with iron ink, bleaches or fades it. This effect upon paper has sometimes been attributed to its containing too much wood fiber.

A larger quantity of active sulphurous acid can be obtained from a given weight of sulphite of soda, Na_2SO_3, than from an equal weight of the hyposulphite, and from this no sulphur is deposited, so that it ought most certainly to be preferred for use as antichlor on a large scale. We are informed by large manufacturers of chemicals that sulphite of soda can be made at a price not higher, in proportion to its efficiency, than the hyposulphite.

Jet—How and Where it is Obtained.

A writer in the *Practical Magazine* gives the following interesting particulars regarding jet, a material much used for the manufacture of mourning jewelry. In this country, we may remark, the substance is largely imitated by vulcanized rubber, which, when new, closely resembles the genuine article. Real jet jewelry mounted in gold is worth from five and six to as high as seventy dollars per set, the price, however, depending principally upon the quantity of precious metal used. It is very serviceable, and, unlike rubber, it retains its brilliancy.

Jet is of two distinct species—hard jet and soft jet—but the latter is of very minor importance and will be referred to hereafter.

The hard jet is found in the strata known as the jet rock, which appears to be a deposit of sea anemones, and some years ago a patent was taken out to distil petroleum from it.

The jet rock occurs in the lias formation, some thirty yards above the main band of Cleveland ironstone, and is discovered in compressed masses in layers of very different sizes, being generally from half an inch to two and a half inches in thickness, from four to thirty inches wide, and four or five feet in length. It invariably tapers away, running, as the miners say, to a "feather edge."

These jet layers are always protected by a skin, the color making another division; for that found in the cliffs by the sea has always a blue skin, while that discovered in the inland hills has a yellow coating. The jet found in the same mine varies very much in quality; its worst specimens, those which are quite brown and will not take a polish, are termed "dazed jet."

The soft jet is confined to the lower oolite—in the sandstone and shale—some 160 yards higher than the hard jet, and is undoubtedly of a pure ligneous origin, the fiber and the branches of trees being more or less distinctly marked.

The most valuable finds of jet have been washed down by the sea's action, where the jet rock crops out in the cliffs, and on the cliffs, where the seams are exposed. The dealers of the town of Whitby, in Yorkshire, England, where the principal deposits of the material exist, rent these jet cliffs and inland seams from the owners, generally for a fixed lump sum paid in advance—not for a royalty—for the right to work a certain number of yards. Nearly all the jet now obtained is found inland, but in former days tales are told of men being swung by ropes over steep cliffs like the eider-down hunters of Norway. At present, cliff jet is worked with the same mining operations as that lying under the inland hills.

The process is very simple, and, to those acquainted with the intricacies of iron and coal mining, of no very great interest. A mine is commenced by drifting into the face of a rock a passage of seven feet by five. A tramway is then laid down, and the shale is tilted from the mouth of the mine, the drift continued for about forty yards, at the rate of from two to four feet *per diem*; then cross drifts are started in a variety of directions. As soon as the rock becomes too hard, the miners retire, pulling in the roofs as they recede, for the bulk of the jet is found generally in the falling top rock.

There are at present twenty-three jet mines in full work, only one of these being of soft jet. The average number of men employed in each mine is six, and there are now some hundred and fifty miners engaged in this industry. The men are generally paid by the week, and only earn from twenty-four to twenty-six shillings—a sorry contrast to the high wages of the iron miners.

Hard jet varies in prices from 75 cents to $3.50 per lb.; soft jet from $1.37 to $7.50 per stone, according to size and quality, and sometimes also according to the fluctuations of the market. For instance, when the Prince of Wales' life was in danger, Whitby was thronged with buyers for both the raw and manufactured article at any price, and some speculators were severely bitten by his happy recovery.

It is stated that the turn-over in rough English hard jet amounts to $200,000 annually.

The material is manufactured as follows: The jet is first peeled and stripped of its skin, be it blue or yellow, by means of a manual chipping process with a heavy iron-handled chisel. It is then sawn up into the exact sizes for the object for which it is intended, the saw being guided by an ingenious arrangement of little wooden directors. Much care is taken in this process of "sawing up," for great economy can, by rigid supervision, be effected, one manufacturer stating that by a very simple arrangement he was able to make his raw material go a fifth further than any of his rivals. The little fragments are then delivered to workmen, who, with the aid of small grindstones driven by a foot treadle, take off the angular portions and reduce them more nearly to the required dimensions. They then pass into the hands of the carvers who, with knives, small chisels, and gouges, soon, if it be rough work only, cut them into the desired pattern. If the work, however, be really artistic, the carving is of course a much more artistic process; and it is curious to see lads and men, who one might fairly think had not the slightest knowledge in the world of art principles, cut deftly and rapidly cameos that in their beauty of profile resemble the old masterpieces; flower scrolls and groups of fruit that have a marvellous fidelity to Nature herself; and crucifixes and pendants that rival all the ingenuity and patience of the "heathen Chinee." Sometimes you notice them with a pattern placed before them, or with a rough design scratched by a knife's point upon the material itself—oftenest, however, it would seem as though the work were altogether original.

After being carved, the goods are removed to the polishing room, where the first process, in the case of rough goods, again takes place, upon a treadle grindstone fed with oil and "rottenstone." Then the finish and the polish are given by what is termed "rougeing." Here the articles are held against quickly revolving wheels, covered with chamois leather for the larger portions and with strips of list for the indented parts of the pattern, the beautiful polish being given by means of a composition of a red pigment and oil. They are then set (the settings all coming from Birmingham) and taken to the warehouse, where they are carded, or strung if necessary, and priced and packed by young women, being then stored for the inspection of the buyers.

NEW BOOKS AND PUBLICATIONS.

The Commercial Agency Register, published by the McKillop & Sprague Co., 109 & 111 Worth Street, New York.

We are pleased to learn that our old neighbors and friends, Messrs. McKillop and Sprague, continue to prosper, and to issue their semi-annual volume, improved and enlarged. Their present premises are much better and larger than those they occupied at 37 Park Row; and are, we believe the best and most commodious offices in the United States used in that business. The up town movement, however, has not disconnected them from their down town subscribers, as they have established a branch office at 128 Pearl Street, near Wall, connected with the office 109 & 111 Worth Street by telegraph; they can also, from their own office, telegraph to their correspondents at any point. Their Register is a large volume, full of information such as every dispenser of credit requires, be he machinist or manufacturer: while their weekly circular gives the important changes occurring from day to day. On their circular they indicate the change, the Private Key to which is printed in front of the Register. To us this appears a most valuable feature, and it enables every holder of a book to mark off the changes, weekly.

The Unity of Natural Phenomena, a Popular Introduction to the Study of the Forces of Nature. From the French of Emile Saigey, with an Introduction and Notes by Thomas Freeman Moses, A.M., M.D., Professor of Natural Science in Urbana University. Price $1.50. Boston: Estes and Lauriat, 143 Washington Street.

In this work, M. Saigey has collated some of the more strikingly similar natural phenomena, and applied them to furthering the belief in the great truth that all Nature is one harmonious system. Although the doctrines of the correlation and conservation of force, and of the unity of all the sciences, have been already promulgated by higher authorities than our present author, there is much food for reflection and pleasant reading in this work, which aspires rather to popularize facts already ascertained than to startle the world by its originality.

Breech Loaders. By "Gloan." Price $2. New York: G. E. Woodward; Orange Judd & Co., 245 Broadway.

The author of this readable little book has given, in addition to a practical description of the construction, mechanism, and treatment of a breech loading shot gun, a very curious historical account which will surprise many readers, as it demonstrates the origin of the breech loading system to be at least four centuries old. The book is written in a chatty, pleasant style, and will be acceptable to the numerous votaries of outdoor sports.

Report of the Minister of Public Instruction for the Province of Quebec, for the year 1871. Montreal: *La Minerve* Press.

This pamphlet gives the reader a favorable impression of the state of education among our Canadian neighbors, and explains the system, of imparting instruction in all branches of knowledge, now used in the British provinces on this continent.

On Yeast, Protoplasm, and the Germ Theory. By Thomas H. Huxley, F.R.S.

The Relations between Matter and Force. By John H. Tice, St. Louis, Mo.

Price 25 cents. Boston: Estes and Lauriat, 143 Washington Street.

The first of the papers in this pamphlet is most welcome, as it gives us one of the most striking of modern theories on the mystery of the origin of life, as explained by one of the creators of contemporary science, in a popular and accessible form. The second essay is full of thought and sound argument, and will be widely read as a new contribution to our knowledge of the question of all questions in the world of physics.

A Table of Change Wheels for the Screw Cutting Lathe. Camden, S. C.

This heading is all the information we possess as to the origin of one of the most handy little books we have ever seen. We have, dozens of times, answered queries on the proportions of screw cutting gear, and here we have, neatly printed, the whole subject reduced to tabular form and giving the figures to three places of decimals. We regret we cannot give the author and publisher due credit for this practically useful publication.

Digestion and Dyspepsia; a Complete Explanation of the Physiology of the Digestive Processes. By R. T. Trall, M.D., Author of "The Hydropathic Encyclopædia," "The Hygienic Handbook," etc. New York: S. R. Wells, 389 Broadway.

Accurate information on health and dietetics is a public necessity; and we have here a fresh contribution to the voluminous literature on the subject. The book is copiously illustrated.

DECISIONS OF THE COURTS.

United States Circuit Court---Southern District of New York.

PAINT CAN PATENT.

JOHN W. MASURY *vs.* WILLIAM ANDERSON AND FREDERICK O. PIERCE.

BLATCHFORD, *Judge:*

This suit is founded upon the same letters patent upon which the suit of the same plaintiff against Daniel F. Tiemann and others was brought. (8 *Blatchf. C. C. R.* 436.) The opinion in that case describes the invention and sets out the specification and claim. It also states, at length, the value and use of the patented can.

In this suit the infringement charged in the bill is the same as in that suit, namely, "that the defendants have made and caused to be made, for their use, cans embodying the patented invention, and have vended paints and colors put up in cans so constructed." The defendants are shown to have sold cans containing paints made liquid with oil, put up by them in such cans.

The answer in this suit sets up the defense of want of novelty in the invention, as did the answer in the former suit, but adduces, to support such defense, matters not set up in that suit. It avers, among other things, that the plaintiff's invention is described in letters patent No. 11,592, granted in England to Jules Jean Baptiste Martin de Lignac, and dated October 7, 1847. In the specification of the Lignac patent, which was enrolled April 3, 1848, the following language is all that is material to this case: "The concentrated milk is then, as quickly as possible, to be filled into vessels made of plate tin, or other suitable material, which will allow of being closed hermetically, and also allow of being treated by heat, as hereinafter explained. The vessels I prefer for this purpose are cylinders, and in order that the upper end or cover may be readily removed by the simple act of cutting, I prefer that lead should be used all around. These vessels, being filled quite full with concentrated milk, are allowed to stand for twenty-four hours, when the vessels are soldered all around, so as to hermetically close them." An exhibit, introduced in evidence by the defendants as being constructed in accordance with such description, is a cylindrical can, made of ordinary sheet tin some five inches in depth and four inches in diameter, one end of which is composed of a circular shaped piece of tin, formed with a flange something less than a quarter of an inch deep, turned down at the outer circumference of such end. The lower edge of such flange is connected with the outer wall or side of the can by a band of sheet lead, a little over one half of an inch wide, encircling the circumference of the can, the lower part of the band being soldered to the top of the wall or side of the can, and the upper part of the band being soldered to the lower edge of such flange, so as to leave a width of lead of about one quarter of an inch between the upper edge of the wall or side of the can and the lower edge of the flange and allow the lead to be penetrated and cut in such width around the circumference of the can, and thus the top or end of the can to be separated from the body of the can. This arrangement differs from the plaintiff's invention. The latter consists in placing in one end of the can, and adjacent to the edge of the wall or side of the can, a rim or ring of thin brass or other soft metal, such rim or ring thus forming part of the end of the can. It is shown, by the evidence, that lead is a much more difficult metal to solder than thin brass, owing to the fact that especial preparation is required in order to enable the solder to adhere to the lead, and that the lead is liable to melt when the soldering iron is brought in contact with it in the process of soldering; and that for these reasons it would take a workman a much longer time to manufacture a given number of cans constructed according to the Lignac specification with a lead band, than it would to make the same number of cans constructed in the same form, but with a brass band in the place of one of lead. It is also shown that the use of thin brass instead of lead, in such form of can, admits of a neater and more perfect finish. Independently of this, the testimony shows that the plaintiff's can presents several advantages over the Lignac can. First, the plaintiff's can, in the size and number of the pieces of which it is composed, and in the labor of preparing them and putting them into the form of, and securing them together as a can, does not differ materially from the simplest form of can used; while in the Lignac can the band of lead constitutes a separate and additional piece, requiring additional labor in preparing it and inserting it in the can, and the seams cannot be soldered by machinery as in the plaintiff's can; second, in the plaintiff's can the force necessary to cut the metal in the end of the can can be applied in an oblique or vertical direction, and is not required to be applied laterally, as in the Lignac can. The former mode of cutting affords a freer passage to the knife, for the reason that it causes the lips of the opening to spread in different directions, while in cutting the lead band in the Lignac can, by lateral pressure, both lips of the opening are forced inward, and they, in turn, bind upon and obstruct the passage of the knife blade, so as to render the process of cutting more difficult. Third, cutting one end, with the can standing on the other end, permits the can to be filled to its entire capacity, while in the case of the Lignac can, if it be filled above the center line of the inserted band, the contents will run out in the process of cutting through the band.

If the Lignac can be an improvement on the ordinary hermetically sealed can, these advantages make the plaintiff's can a material improvement on the Lignac can; and the advantages thus shown to result from changing the position of the soft or thin metal from the side to the end are sufficient, in my opinion, to sustain the patent as against the Lignac can.

The defendants prove that the plaintiff made cans in the form of the Lignac can, but having in place of the band of lead a band of brass, and that he placed on such cans labels claiming them to be within his patent. It is urged that, by reason of this, the plaintiff is estopped from denying that the Lignac can is the equivalent of his invention. But this view is not tenable. The rights of the plaintiff depend upon the claim in his patent, according to its proper construction, and not upon what he may erroneously suppose it covers. If at one time he insists upon too much, and at another on too little, he does not thereby work any prejudice to the rights actually secured to him. The evidence shows that a can constructed according to the Lignac patent does not accomplish the end sought by it, and is not a can which can be easily opened; and that even when the plaintiff substituted in it a brass band for one of lead, his customers found it more convenient to open the can by cutting out the hard top by the use of a hammer and a knife, than to do so by cutting through the brass band. Although the inventor of the Lignac can had the general idea of enabling a can to be opened by cutting more easily through a softer or a thinner metal, while the body of the can should have the strength of the harder or thicker metal, he did not embody his idea in a form which was practically of any substantial utility, and the means he adopted were substantially different from those adopted by the plaintiff.

The defendants also introduce in evidence, on the question of novelty, a can made wholly of tagger's iron—that is, sheet iron rolled so thin as to be easily cut by a pocket knife—and claim that similar cans had been used by the Pennsylvania Salt Manufacturing Company, for putting up caustic alkali, for some years prior to the date of the plaintiff's patent. These cans were filled by pouring in the alkali in a molten state, and it solidified on becoming cold. The only reasons given for using tagger's iron, by the witnesses who testify to the use of those cans, are, that when tin was used, the heat the cans were subjected to caused the tin to melt, and that iron was less expensive than tin. It also appears that, previously to July, 1857, while tagger's iron was used for the sides, sheet tin was used for the bottom and top, showing that the original use of tagger's iron was with no purpose to facilitate the opening of the cans. One witness testifies that the company put up the alkali in broken pieces in cans made wholly of tagger's iron, but he does not state that they did so previous to the date of the plaintiff's patent, or that he knew of its being put up in that condition in such cans prior to such date. The defendants, at the hearing, asked leave to put in further proof on the question whether the tagger's iron was used with a design to facilitate the opening of the cans, and on the question whether it was practicable to open the cans, when filled with the alkali, by cutting out the top; leave was given to both parties to put in further proofs on those points. The defendants, however, failed to avail themselves of the leave so granted, but the plaintiff has furnished evidence which conclusively puts to rest all pretensions in favor of such can. He has produced, in evidence, sheet iron cans containing caustic alkali of the manufacture of the said company, the same being put up by said company in such cans, and sold by it, together with the circulars in which the cans were enveloped when sold. These cans are made of sheet iron not capable of being easily cut with a knife; and their contents consist of a solid mass of alkali, apparently conforming in shape to the capacity of the can. But the circular furnishes conclusive evidence against the claim set up in behalf of this can in the directions it gives for opening the cans, which directions are in these words: "Break up one box of the saponifier into fragments, by striking upon the side of the box;" and again, "Knock off either end of a pound box of concentrated lye." Moreover, on the whole testimony, it is doubtful whether the tagger's iron actually used by the company before the date of the plaintiff's invention was so thin as to be capable of being cut to facilitate the opening of the can. It is, therefore, not shown that the use of tagger's iron, in the manufacture of such cans by said company, was a prior use of the plaintiff's invention.

The defendants admit, by stipulation, that they have made and used, for putting up paints and colors, and vending paints and colors put up therein, "cans with one end made wholly of thin tin, which can be easily cut at the outer edge of such end." The plaintiff claims such cans to be an infringement of his patent. In the view I take of the patent, if one end of the can is made wholly of thin tin, and thereby the location of the thin or soft metal in such end is secured at the outer part of the end where, by the patent, it is required to be, or where it is essential it should be, namely, at the part of the end nearest its outer edge, it is not material whether the metal in the other parts of the end be thick or thin, so far as the plaintiff's patent is concerned. The use of a plain end of thin metal secures what the patent is designed to accomplish, and in the mode specified in it, by enabling the end to be removed by cutting it out near its outer edge with a knife, while the body of the can may be made of a thicker metal and thus strong, and the thinness of the metal left thin to be cut does not interfere with the safe handling and transportation of the can.

There must be a decree for the plaintiff for a perpetual injunction, and an account of profits, with costs.

W. Howard Wait, complainant's solicitor.

George Harding, defendant's solicitor.

United States Circuit Court.---Southern District of New York.

PATENT FOR BURNING WET TAN BARK AS FUEL.—CHARLES N. BLACK, *administrator, etc., vs.* SAMUEL THORNE, *et al.*

Kenneth G. White, the Master to whom it was referred by a decretal order of this Court, dated July 1, 1872, to take, state, and report to the Court an account of the profits, gains and advantages which have accrued to or been made by the defendants from the use of the patented invention upon which this suit is brought, reports as follows, namely:

First, that the complainant is entitled to receive from the defendants, as profits made by them from the infringement of the patented invention upon which this suit is brought, the cost or value of all the wood which, but for the use of said patented invention, they would have burned in the tanneries owned and operated by them and referred to in the bill of complaint.

Second, that the proofs taken before me on the part of the complainant, and not contradicted or disproved on the part of the defendants, show that the saving of wood to the defendants by the use of said patented invention, was one cord of wood for every ten hides tanned by them, less per 100 cords per year for a tannery tanning 15,000 hides per year, and a like proportion for a tannery tanning a less number of hides; also less ten cords per year for each tannery, used in the starting of fires.

Third, that, according to the account furnished by the defendants by direction of the Master, it is shown that the number of hides tanned by them while using said patented invention was as hereinbefore stated in the account hereunto annexed and made part of this my report.

Fourth, that the proofs show that the cost or value of wood per cord to the defendants at the several tanneries owned and operated by them and specified in the bill of complaint, and the cost or value of which was saved to them by the use of said patented invention, was as hereinafter stated in in the account hereunto annexed and made part of this my report.

Fifth, that the complainant is also entitled to recover from the defendants interest at the rate of seven per cent per annum upon the gains and profits made by them from the use of said patented invention in each and every year, said interest to be calculated from the close of each year to the 12th day of July, 1873, the date of this my report, and which interest appears in the account hereunto annexed and made part of this my report.

The report then gives a tabulated statement of the several years of infringement, and finds that the total amount due to the complainant up to July 2, 1873, is $44,975.

The Master has made a like report in the case of the same complainants *vs.* Daniel T. Stevens for the sum of $23,757.47.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From July 12 to July 17, 1873, inclusive.

COPYING BRUSH.—W. Shriver, New York city.
FEEDING BOILERS.—W. Sellers *et al.*, Philadelphia, Pa.
GRATE BAR.—W. B. Rogerson, Paterson, N. J.
HARNESS CONNECTOR, ETC.—S. Reynolds, Pittsburgh, Pa.
METALLIC CARTRIDGE.—H. Berdan (of New York city), Berlin, Germany.
PRESERVING IRON AND STEEL.—R. A. Fisher, San Francisco, Cal.
PRINTING TELEGRAPH.—G. M. Phelps, Brooklyn, N. Y.
RAILWAY RAILS AND SPIKES.—W. B. Rogerson, Paterson, N. J.
TOOTH BRUSH.—W. O'Donoghue *et al.*, New York city.

Recent American and Foreign Patents.

Improved Shirt Bosom.

John Pagan, Yonkers, N.Y.—This invention consists in folding the cloth of which the bosoms are made in such manner as to re-enforce the portions between the plaits with one or two webs to strengthen it where it wears out soonest, and to do it without sewing on extra strips, as has been done in some cases. The single web is re-enforced between the plaits of a shirt bosom by means of narrow plaits formed of the cloth of which the wide plaits are made, and by overlapping the edges of the wide plaits.

Improved Belt Guide for Paper Machine.

Robert Hutton, Holyoke, Mass.—The endless wire belt carriers of paper making machinery are very difficult to keep in the true course on the rollers over which they are carried, owing to the variations of the tension caused by the shifting of the wires, and they cannot be kept in place by having the edges run against stationary guides, because the wires bend and double over at the edges and wear out rapidly. It is proposed, therefore, to have one of the bearings of one of the rollers arranged so that it can be shifted, so as to vary the tension at the edges of the belt, and provide mechanism in connection therewith, whereby the belt itself will cause the bearing to be shifted automatically whenever it runs out of its true course so as to correct it. Supposing the tension to be greatest on the left hand side of the belt, by which it would be caused to run to the left and come in contact with a plate and move a bar in the same direction, the bell crank would be shifted thereby, so as to move wheels toward the front, so that a blade would act on the front wheel and turn it so that a screw shaft would draw the bearing toward the front, which would lessen the tension on the left hand side of the belt and prevent it from running in that direction. If the tension be greatest on the right hand edge of the belt, the shaft would be shifted in the other direction, so that the blade would act on the other wheel and cause the screw to move the bearing in the other direction.

Improved Tooth Brush.

James D. O Donoghue and William O'Donoghue, New York city.—This invention consists of an ordinary tooth brush having a convex brush arranged at the end of the handle, crosswise to it, in a different plane and fronting the other brush, so that, holding it by the end whereon the latter is arranged, and placing the convex brush in the mouth inside of the teeth, the convex form will apply to the concave wall of teeth in a manner calculated to brush the teeth at the inside more efficiently than can be done by the ordinary brushes.

Improved Well Bucket.

Charles F. Stiles, Cincinnati, Ohio.—This invention consists of an improved self emptying or dumping well bucket, composed, essentially, of a metal cylinder and wooden bottom, and provided, on the upper end, with a metal tilting buffer cast into a slotted part, which embraces the top of the bucket, and is secured thereto by rivets. These buffers are employed to tilt the bucket, by arresting one side of it under a stop projecting beyond the water spout from a point a little above it. By this means the emptying of the bucket is facilitated, and the injury to the bucket by striking the object which stops it is much less than when the buffers are not used.

Improved Apparatus for Treating Cane Juice.

George C. Taylor, Thibodeaux, La.—The object of this invention is to construct an improved condensing machine for sugar plantations and chemical establishments, by which cane juice and molasses may be rapidly bleached without allowing the escape of sulphurous gases from the machine to the other parts of the building. By a fan wheel the required supply of gas is regulated, and the action of the same on the juice effected by a centrifugal or spray wheel in connection with a reacting arch and absorbing shelves, producing a thorough contact of the gas with the greatest surface of juice.

Improved Saw Filing Machine.

William B. Bizzell, La Grange, N. C., assignor to himself and W. H. Hardee, of same place.—This invention has for its object to furnish an improved machine for use in filing saws, which will enable the saw to be filed quickly and accurately, and will render the operation of "striking" unnecessary. In using the machine the saw is secured in clamps, with its toothed edge projecting about one and a quarter inches above said clamps, which are then placed upon the saw and another clamp. The guide frame is placed upon the clamps and the file handle is placed in the groove of the guide frame. The guide frame is adjusted to bring the file to the desired angle across the saw, and is secured in place by a set screw. The clamps are adjusted to bring the file to the first tooth, and the screw is tightened. The screws are adjusted to file the teeth to the desired depth. A rule is adjusted to bring the appropriate notch in the circular frame of the clamps to a division mark of the proper scale. After filing one side of the teeth, the machine is again adjusted and the other side of the teeth is filed.

Improved Cloth Holder for Sewing Machines

Lewis Aladin Dupré, Donaldsonville, La.—This invention has for its object to furnish a neat, simple, and convenient device for holding cloth while being sewn upon a sewing machine, to avoid the necessity of basting the work before sewing it. The invention consists of the device formed of a strip of thin sheet steel, made wider at one end and narrower at the other end, having a single bent point at its narrower end, two bent points at its wider end, and a short slot in its wider end, and bent so that its narrower end may be passed through the slot in its wider end, and the two ends may project parallel with each other.

Improved Sewing Machine.

Edwin D. Smith, New York city.—It is proposed, in this invention, to cast the head for the needle and presser bars on the branches of the supporting arms, then saw the lower arm off from the head close to the latter, and fit in an adjusting screw to spring the head toward the arm thus separated from it, and to utilize the elasticity of the upper branch of the arm, together with the adjusting screw, to adjust the needle toward and from the shuttle, and thus save considerable labor heretofore expended in fitting a head made separately to the overhanging arm. It is also proposed to arrange the lever for lifting the presser bar on this adjusting screw between the head and the end of the arm sawn from it to utilize said screw from the pivot.

Improved Saw Set.

Gustaf Swenson, Hackensack, N. J.—This invention relates to an improved combination of parts or devices for setting teeth on both sides of the saw at the same time. To the opposite sides of the forward part of the handle are attached two plates, which are kept at the proper distance apart by a bar which also serves as a stop for the points of the saw teeth to rest against while using the machine. The saw teeth to be operated upon pass between two bars, one of which, when the machine is in use, is stationary, and may be adjusted according to the size of the saw teeth. The other bar is formed upon the side of the lower edge of a plate, to the upper part of which is attached a pin, which passes in through a hole in another plate and rests against the inclined side of a cam wheel, so as, at the proper time, to clamp the saw against the bar while a tooth is being operated upon. The teeth are set by the punches, which pass in through holes in the forward parts of the bars, and which are so arranged as to operate upon two consecutive teeth and set them at the same time. The punches are forced in to set the teeth by the levers by the revolution of the cam wheel. The length of the feed may be adjusted according to the size of the teeth. By suitable mechanism, as each pair of teeth is set, the machinery is drawn forward into such a position as to operate upon the next pair of teeth. As described, the machine is designed to move along a saw secured in a vise; but, if desired, the machine may be inverted and secured in a vise, the saw moving along the machine as the teeth are set.

Improved Dash Board Bag.

Samuel Hipkiss, Charlestown, Mass.—The object of this invention is to furnish to the public a neat, strong, and waterproof bag for dash boards of carriages of all kinds, which may be readily taken off and placed on another vehicle as required, and which will not interfere at all on entering the carriage, being an ornamental appendage to the same. The invention consists of a strong main piece of leather, to the upper part of which strong spring hooks are attached, which are slipped over the dash board. The bag is applied below the hooks, with suitable elastics to prevent the bag from expanding too much and protruding too far into the carriage.

Improved Stamp for Crushing Ores.

James M. McFarland, Golden City, Col. Ter.—The most essential part of this invention consists of a novel mode of operating stamps for crushing and pulverizing ores, etc., by a horizontal revolving cylinder, through which a series of bars, with a stamp head at each end, are arranged diametrically, so that they can slide endwise a short distance. The cylinder is arranged a suitable distance above the bottom of the bed containing the ore, and caused to revolve slowly; the stamps, as they approach the vertical line, slide in the cylinder and strike a blow on the ore, and are then forced around by the cylinder, and have a grinding or crushing effect. They strike two blows at each revolution. They are arranged as close together, both lengthwise and circumferentially, as they can be and work well, and they strike a great number of blows to each revolution. Another part of this invention consists of a hollow cylindrical rotating ore holder, into which the ore is fed at one end and caused to work along slowly to the other end during the progress of the work, and discharge through holes on to a screen, which is arranged to separate the fine particles and carry the coarse portion back to the head of the ore holder, to be delivered into it again for reworking it. Another part of the invention consists of spiral ribs in the hollow revolving ore holder, to work the ore along the cylinder as it is gradually reduced by the stamps.

Improved Method of Enlarging Oil Wells.

Martin Gillespie, Smith's Ferry, Pa.—This invention relates to a novel method of enlarging the bore of an oil or analogous well, and in peculiar means for carrying out this method.

Improved Portable and Adjustable Hoisting Apparatus.

George A. Myers, Williamsburg, N. Y.—This invention has for its object to furnish an improved hoisting apparatus for tiering or stacking goods in storehouses, and which shall be so constructed that it may be readily moved from one part of the room to another and swung around to work in any desired position. To the stanchions of the room are attached one or more clamps which are so formed as to fit upon the stanchions. The clamps are hinged so that they can be readily detached from one stanchion and attached to another in some other part of the room. To a frame, made in U form, is pivoted the drum, around which the hoisting rope is wound, and to the ends of its journals are attached a larger and a smaller gear wheel. In the frame also works a shaft, to which are attached a smaller and a larger gear wheel, in such position that when one of the gear wheels meshes into the other the second pair will be out of gear, so that by sliding the shaft longitudinally the apparatus may be adjusted to work with speed or power, as may be desired. To the ends of the shaft are attached the cranks by which the power is applied. The frame may be swung around so as to work in various positions, as may be required in tiering the goods. In using the apparatus the rope from the drum is passed around the pulley of a block, which is connected with and supported from the joists or rafters by means of a clamp something like an ice tongs, so that, the greater the weight of the package being handled, the firmer the said clamp may hold. With this apparatus the goods may be tiered rapidly and with a comparatively small amount of labor, the apparatus being readily adjusted as the position of the tiers may require.

Improved Reciprocating Churn.

William M. Thompson and John L. Mahurin, Rockfield, Ind.—This invention consists in the arrangement of perforated dashers, sliding in grooves within the churn, which are moved and operated against by similar perforated dashers fixed to a plunger rod passing through the sliding lid, which prevents the splashing of the cream.

Improved Sky Light Bar.

Charles Sellman, New York city.—This invention is an improvement in the class of sky light bars formed hollow or of sheet metal; and consists in forming the bar with a central, vertically projecting part, inclined side supports for the glass panes, and inclined gutters. The long and narrow shape of the bar is favorable to the admission of the light—more so than the bars with projecting gutters and parts. In a modification designed for lighter structures, the main support is bent of one or two pieces, and the gutter part projects sidewise instead of approaching toward the central axis.

Improved Driven Well.

Alphonso Wilson, Plainfield, N. J.—This invention has for its object to improve the construction of drive well tubes so that the wire gauze cannot be cut or torn off, by stones or other obstructions, while the tube is being driven. The invention consists in a water section of a drive well tube cast of malleable iron with a conical point, alternate contracting and expanding ring sections, and a tubular top section, and having its contracting sections perforated and covered with wire gauze, and a screw thread cut upon its tubular top section.

Improved Combined Refrigerator and Beer Cooler.

George Nuss, New York city.—This invention is designed to furnish an improved device, so constructed as to hold a beer cask and keep it cool, and which may also serve as a refrigerator for preserving various articles. The invention consists in the box provided with a cooling chamber, an ice-chamber, and one or more downwardly projecting recesses, projecting downward into the ice chamber, which keep the cask and its contents cool until said contents may be wholly drawn off.

Improved Window Weather Strips.

Giles P. Potter, Coventry, R. I.—This invention consists in providing the battens or vertical guide strips of sash windows with india rubber strips set obliquely into the battens to project with their opposite ends and act like spring packing on the window sash. Suitable recesses in the battens allow the receding of the strips on opening or closing the windows.

Improved Surgical Splint.

Ara Wheat, Canaan, N. H.—This surgical splint for the lower limbs consists of a thigh piece, leg piece, and a heel and foot piece in three separate sections, of light wood, curved or concaved both lengthwise and crosswise, suitably to fit the different parts, the thigh and leg piece being connected by a hinged joint, the foot and leg piece by an extension joint, and the lower joint and upper section provided with extension screws.

Improved Door Spring.

Charles W. Oldham, Leipsic, Ind.—This invention consists of a hollow vertical cylinder partly filled with liquid, and containing a piston with a valve which opens freely to allow the piston to rise unobstructedly when the door opens, and raises the arm of an elbow lever, to which the piston is connected by a rod, but which closes the passage, except a small orifice, when the door closes and forces the piston down, so that the closing of the door by a spring attached to the arm to which the piston is attached is retarded so as to prevent slamming.

Improved Coal Car Elevator.

Philip H. Lamey, Wiconisco, Pa.—This invention relates to car elevators generally, but more particularly to such as are employed to transfer coal from the bottom of the mine up a slope and to the landing from which it is to be discharged. It consists in several improvements upon the patent granted to the same party February 4, 1873.

Improved Stool.

Cevedra B. Sheldon, New York city.—This invention consists in a ring constructed with journals that are arranged at intervals and provided with friction wheels to allow the cap to be dispensed with altogether.

Improved Glove.

Remus D. Burr, Kingsboro, N. Y.—This invention consists, 1st, in a glove or gauntlet in which the bray back of the hand is formed or cut without fingers, and with which, in a gauntlet, the back or portions of the front of the wrist are all in one continuous piece of material. 2. A gauntlet, the front of whose wrist is gore shaped, is so arranged and combined with the remaining portion of the wrist that, when folded or made, the seams are brought on the inside of the wrist. 3. A glove or gauntlet having the parts that form the palm and the front, back, and side portions of the fingers made of a separate piece or pieces from the body of the back. 4. A glove or gauntlet finger back composed of or wholly reinforced with leather when combined with a back composed of cloth or other textile fabric. 5. A glove or gauntlet in which those pieces, portions or parts that form the side of the palm and back portion of the fingers are connected, joined to, and closed on the body of the back with a continuous stitched seam.

Improved Bee Hive.

David Latchaw, Barkeyville, Pa.—This improvement relates, 1st, to a mode of preventing robber bees gaining access to the brood or honey chamber, and also entrapping them by means of adjustable pivoted guides arranged in the bee entrance, and of a cage or prison placed at one side of the comb frames, both the guides and cage serving for other useful purposes in the ordinary economy of the hive when not thus utilized. 2. To providing the comb frames with removable guides, thus enabling the filled comb of one frame to be removed and transferred to an empty frame or to a box for transportation to market or elsewhere without removing the frame itself. 3. To a cloth or flexible guide plate for forming a division between comb frames and thus compelling the bees to build comb the whole length of one frame instead of building it in one end of several adjacent frames, as they will often do if left to themselves. 4. To devices for closing the bee entrance, which are adapted to co-operate with the guide strips above mentioned.

Improved Fire Place.

John L. Garlington, Snapping Shoals, Ga.—This invention is an improved grate, which may be adjusted to any chimney place, allowing full control of the fire and increasing the heating properties of the same. It consists of a grate with inclined back plate and sliding dampers to throw forward the heat and regulate the same. It also consists in adjustable side plates to fit the grate into a chimney.

Improved Subsoil Plow.

Augustus L. P. Vairin, Ripley, Miss.—This invention consists in an improvement of subsoil plows. The front of the standard is made upon the arc of a circle, and is made sharp from near the beam to its junction with the cutter of the share, forming with the said cutter of the share a continuous colter from the beam to the point. The back part of the standard is made of such a form and thickness as to give it the strength necessary for the particular kind of work for which the plow may be intended. By suitable construction the bottom of the furrow is cut flat, and the slice is gradually raised from its old position and is broken to pieces by its own weight as it falls over the raised rear edge of the share, pulverizing the ground as deep and wide as the furrow is cut. The standard and share, presenting three cutting edges, go easily through the ground, making the draft light. The concavity of the share, raising the middle part of its bottom from the bottom of the furrow, diminishes the friction, causes the plow to run steadily and makes it self-sharpening.

Improved Washing Machine.

William K. Flietstra, Holland, Mich.—This invention is designed to furnish an improved washing machine in which the clothes are washed by being projected from end to end of the machine as it is rocked upon its pivots, the labor of rocking being lessened by a balance weight connected with it. To the sides and bottom of the box are attached ribs or cleats, against which the clothes are rubbed as they slide back and forth; and in one or both ends of the box are secured a number of plates, the upper edges of which are formed with rounded projections, gradually increasing in hight toward the end of the box, and which are designed to catch upon the clothes and turn them over as the box is oscillated.

Improved Farm Gate.

Mahlon Burtless, Seneca Falls, N. Y.—To open the gate a latch is turned up so that its rear end may enter the space between the parts of the front vertical bar of the frame, which allows the gate to be slid back upon wheels for half its length or less. The gate and frame may then be swung around upon hinges to fully open the gateway.

Improved Cutter Head for Moldings.

Elde H. Hinners, New York city.—The object of this invention is to produce a rotary cutter head for making moldings with a rabbet at one side, separated from the molding by a narrow strip too thin and weak to sustain the strain to which it would be subject if the rabbet was formed with the ordinary rotary planing cutter; and it consists of a staggered saw attached to the cutter head of the molding planer to form the rabbet.

Improved Washing Machine.

Francis B. Preston, Fayette, Mo., assignor to himself and William H. Stapleton, of same place.—In using the machine, levers are raised into an upright position, the clothes are inserted between the beaters, and the cover is closed. As the levers are lowered the beater moves forward, pressing the clothes against a forward beater, forcing the water and dirt out of said clothes and through the perforations of the said beater. As the levers are again raised the beater moves back for another stroke, and the forward beater is rocked, its upper edge moving rearward and its lower edge forward, so as to loosen and detach the clothes.

Improved Blasting Plug.

Julius H. Holsey, Butler, Ga.—This invention consists in having the meeting edges of a hollow blasting plug made in sections, rabbet-jointed together to prevent the escape of the blast until it has nearly expended its force on the object to be blasted or wholly separated it. It is also proposed to provide the plug with strong spurs on the sides, to be forced into the wall of the hole of the object to be blasted, to prevent the plug from being forced endwise out of the hole.

Improved Horse Power.

Zachariah P. Landrum, Columbus, Miss.—This invention is an improvement upon the horse power for which letters patent No. 136,075 were granted, and consists in a novel mode of combining certain parts so as to facilitate the draft and simplify the general construction.

Improved Table Caster, etc.

Cevedra B. Sheldon, New York city.—This invention relates to casters and analogous devices having a seat or holder that is allowed to rotate on its stand or support. It consists in converting nearly all the sliding friction which is usually created by the surface contact of the holder and the bolt into rolling friction, by making the guide tube bear against the bolt only at the top and causing the enlarged bottom to bear on the outside of the bearing plate that moves on and with subjacent anti-friction rolls. It consists also in a peculiar construction of the bearing plate to enable it to embrace and work against the outer side of the balls, whereby the plate itself is prevented altogether from contact with the bolt, and therefore from all sliding friction.

Improved Pump Valve.

Wilson Barnes, Maquoketa, Iowa.—This invention relates to the lower or check valve for pumps, which are liable to break off, to twist out of position, get out of shape, retain sand or grit, and become useless in a short time. The invention consists in constructing a valve with a series of wings to which is screwed a cap, while between the two is compressed a leather, rubber, gutta percha, or other suitable packing, and in forming the valve seat upon a raised and tapering tube with a bottom flange.

Improved Extension Hat Brim.

I. Ygnacio Cassiano, San Antonio, Texas.—For an extension sunshade attachment to hat brims, to be extended for use or folded back at will, it is proposed to have a wide annular piece of cloth, having an India rubber cord sewn to the outer edge of the ordinary brim, and stationary arms projecting from a supporting ring at the base of the crown under the ordinary brim to the edge, with branched extension arms pivoted to them, so as to swing outward and engage with socket clips on the flexible cord to extend the brim. These clips, with which the extension arms connect detachably, engage with hooks at the base of the crown, when the extension brim is folded back under the principal brim, to hold it up close to the under side of the latter. At the same time the rubber cord shirrs the edge of the reversed extension brim around the opening of the crown in a manner to dispose it completely and neatly when it is not required to have it extended. The same inventor has also patented a similar device, which consists of an annular extension brim of cloth, sewn to the outer edge of the permanent brim, with folding arms for extending it, which are mounted on sliding arms for moving them out or in for extending the brim more or less, and elastic straps on the extension brim, in combination with the sliding extension, to control the extension brim when not wholly extended. The sliding extension arms have spring catches combined with them in such manner as to hold them in any position to which they may be adjusted.

Improved Harrow.

Alexander C. Carnes, Smithville, Tenn.—This invention consists in constructing a harrow frame of longitudinal and cross pieces, the first on edge while the second are flat, and the first notched underneath so as to receive and brace the second. This forms a very strong, durable, and cheap harrow frame, which any farmer can construct for himself. The harrow may be made larger or smaller, according to the work for which it is designed; or two of them may be connected together for cultivating both sides of a row of plants at the same time.

Improved Plow.

Levin B. Richardson, Carrollton, Ill.—This invention has for its object to furnish an improved attachment for plows, to roll down stubble and weeds, and hold them until turned under by the plow so as to wholly cover them and leave the ground clean. An iron roller revolves in the bent down ends of a bar which extends along and parallel with the said roller. To the bar is attached another bar, the upper part of which is bent twice at right angles, or into U shape, to pass over the beam to keep it in place, and at the same time allow the roller to rise and fall to conform to the inequalities of the ground. Several holes are formed in the rear part of a brace bar to receive the bolt that secures it, so that by shifting the said bolt from one to another of said holes the roller may be moved toward or from the plow to adapt it for use with short or long grass or weeds. A rod projecting forward and bent upward, rearward, and inward, is designed to prevent the stubble or weeds from falling down toward the plowed land, so as not to be rolled down and held by the roller, and consequently not fully covered by the plow.

Improved Boot Blacking Kit.

Somers Van Gilder, Knoxville, Tenn.—This invention consists of an ordinary polishing brush with a blacking box attached to the back, and a daubing brush attached to the handle, so that all are collectively combined in one article so as not to interfere with the use of the polishing brush, and thus preventing accidental separation and misplacement of either of the articles. The daubing brush is detachably connected to the handle of the polishing brush, so that it can be taken off to use.

Improved Traction Wheel.

John G. Gallet, St. Augustine, Ill.—This invention consists in the means for holding the rubber sections of a tire on the wheel, so that they will be held securely and yet be easily detachable. The solid plate or spoke wheel, of suitable metal, is provided with two projecting rims. The outer rim is flanged to keep the rubber in place, and the latter is of two or more pieces, placed around the periphery of the wheel. The rubber tire is firmly sustained on the wheels by guard plates. By tightening the bolts in slots or holes in the rim, the rubber tire will curve out slightly between the interstices of the guard plates, forming, instead of a polygonal, an almost circular, periphery, avoiding thereby, in connection with the elastic washers, the noisy concussion of the old wheels. The breaking strain of the rubber tire is, by means of the strong support of the guard plates, obviated, and the elastic material applied so as to give bearing surface and spring action against concussion.

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Inventors who desire to have their inventions and patents introduced and represented in Europe by a gentleman of experience and integrity, should address K., Box 2979, New York Post Office.

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Steam Fire Engines, R.J.Gould, Newark, N.J.

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Notes & Queries

J. M. C. asks: How can I make a permanent and brilliant green for the edges of blank books?

C. R. C. asks: Are buttons made from rice in imitation of pearl?

H. R. asks for a recipe for a composition marble, and for tinting and veining the same.

W. H. asks: How can I make some sort of alarm to wake me at night which will not make sufficient noise to wake the rest of the family?

D. & M. ask (1) how to prepare zinc so that it will hold paint without breaking or scaling, and receive a fine finish. 2. How are ornaments fastened on metallic cases without screws or tacks?

Answers to Correspondents

B. S. asks: 1. Where is the crank pin of a locomotive when the cross head is exactly midway in its travel? 2. I have heard of instances of the lower flues in a locomotive boiler being burned while the upper ones were unharmed. What is the cause of that? 3. When an engine is pulling a train, where is the actual center of the drivers? I have been told that it was at the point where they came in contact with the rail. Answers: 1. It depends on the length of the connecting rod. When the cross head is at the center of the stroke, the connecting rod, if detached from the crank pin, would swing to the center of the driving wheel, so that you can lay down any particular case to scale and determine what you want to know. 2. Probably on account of scale or mud. 3. So far as we know, the actual center of a driving wheel is always the same.

C. H. M. asks: Having an ordinary steam gage, showing pressure of 70 lbs. per square inch, would a steam gage representing 2 square inches show double the amount of pressure? Answer: It would, if graduated in the same manner, and having the same sized spring as the first. But in practice, as steam gages are made, both would register alike.

W. W. A. says: We have trouble with the gate to our reservoir. There is 25 feet head. Will a gate, substantially like the circular dampers sometimes seen in stoves, answer a good purpose? If not, what will be better? Answer: If the moving parts are inside, it would be difficult to open the gate; and if they are on the outside, a great deal of water will leak through, when the gate is closed. There are several good gates in the market, and you can obtain particulars by communicating with a plumber or hydraulic engineer.

H. C. M. asks whether a photographer is liable to suffer in health in consequence of handling the necessary chemicals; and if so, are there any means of avoiding this by filtering the air inhaled while using the poisonous chemicals? Answer: There is nothing about the practice of photography that is necessarily injurious to health. The handling of the chemicals, if ordinary care is taken, is not deleterious. The apartment should of course be ventilated.

S. M., Jr., says: I claim that, if two balls of the same diameter, one made of wood or any other light substance, and the other of a heavy substance such as iron or lead, are dropped from the same hight at the same time, they will reach the ground together, while my friend claims that the iron or lead ball, being the densest, will reach the ground first. Which is right? Answer: You had better try the experiment. We think the lead ball will reach the ground a little the sooner; though in a vacuum, they would both fall together.

J. H. K. asks: What is the cause of water gathering on the outside of a pitcher filled with ice water? Is it the water passing through the pitcher, or is it the moisture of the atmosphere condensed upon it? Answer: When the water in the pitcher is colder than the surrounding air, the moisture in the air is condensed in the form of dew upon the outside of the pitcher. If the water is as warm or warmer than the air, no condensation takes place.

T. H. and J. P. D. ask what phosphorescence is, its cause, etc. Answer: There exists some difference of opinion among scientific men, but the best authorities consider it a slow oxidization of phosphorus, since experiments prove phosphorescence impossible in a vacuum. Phosphorus, in the state of slow combustion which takes place on exposing it to the air at ordinary temperatures, gives off acid vapors, which shine in the dark with a faint bluish light, hence the term phosphorescent has been extended to all bodies which exhibit a similar luminosity, from whatever cause it may arise. Familiar examples are phosphorescence of dead and decaying wood (fox fire) and of putrid fish. Some plants also emit in the dark a faint continuous light, probably arising from the combustion of some substance, such as a hydrocarbon, emitted from them. A more familiar kind of phosphorescence is that exhibited by many living animals, as by the glow worm and fire fly, and the numberless small marine animals which give rise to the phosphorescence of the sea at night. In nearly all phosphorescent plants and animals, the phosphorescence appears to be due to chemical action, in fact to a slow combustion; for it increases in brightness in pure oxygen gas, and ceases altogether in a vacuum. The female glow worm (*lampyris noctiluca*), whose abdomen is divided into 6 segments, shines on the under part of the last three abdominal rings. Within these is found the luminous matter, a yellowish white transparent substance, consisting of ramifying fibers and granules of an organic structure, heavier than water, yellow and opaque when dry, and consisting principally of a material which exhibits the chemical properties of soluble albumen. Dr. T. L. Phipson has given the name of noctilucine to this substance, and we published his description on page 257 of our volume XXVIII.

T. C. W. asks: What will soften hard water, in order to make it fit for washing clothes without injury to the fabric? Answers: You can soften the water by adding carbonate of soda—washing soda—as long as a whitish precipitate is formed. Let it settle and draw off the clear water above. Sometimes simple boiling will render the water after settling fit for washing.

F. R. asks: What is zopissa? Answer: Zopissa is the patent name of a patented compound in which we believe that pyroxylin or gun cotton is a prominent ingredient. In the opinion of the inventor, it is a marvelous substance.

A. asks for a touchstone for testing gold. Answer: The material commonly employed as a touchstone, and generally known by that name, is a species of quartz, colored dark by bituminous matter, of which large quantities are found in Saxony, Bohemia, and various other localities. Black flint slate will serve the same purpose. A set of needles or bars, of various degrees of fineness, are rubbed on the stone, and acid is applied to the streaks made by the needle and by the piece of jewelry to be tested. If the jewelry is not so good as the test needle, the streak made by it will dissolve first. Nitric acid of a specific gravity of 1·2 is commonly employed for testing gold.

H. M. asks: 1. Will a type setting machine that will only set two sizes of type be useful, and how many type should it set per hour? 2. On a locomotive, why do they have two eccentrics to each valve, when, by fastening the slotted piece on a pivot in the middle and the eccentric rod at one end, and by moving the valve rod up or down, the slot would produce the same effect with greater simplicity? 3. Are all the advertisements in the SCIENTIFIC AMERICAN of reliable parties, and are we sure of getting the worth of our money by sending to them? 4. Please give me a good recipe for making ice cream. Answers: 1. A good workman sets about 800 type ems per hour. A machine should beat that. If it sets two kinds of type, all the better. It depends upon the kind of work you wish to do. 2. If only one eccentric is employed for the forward and backing motion, it must be free to revolve partially upon the shaft. It is not enough to move the valve to the backing position; the eccentric must be shifted also; and it is generally considered more convenient to have two eccentrics. 3. We endeavor to exclude all advertisements from unreliable parties, but some little latitude is given to advertisers, every manufacturer thinking his own goods the best. In buying articles with which you are not practically acquainted, it is best to obtain advice from some reliable agent. 4. The best ice cream is said to be made of pure cream, sugar, and flavoring extract. We consider ourselves good judges of the quality of the manufactured article, but do not know much of the details of making it.

A. B. L. says: In the engraving of the Scott & Morton revolving steam engine (in your issue of April 5) I see a bearing on both sides of the cylinder in which the cylinder revolves. I would like to know how the bearing between the cylinder and fly wheel is supported, seeing that all means of supporting it is cut off by flywheel, crank pin, and piston? Answer: This bearing is attached to the hub of the flywheel, and is supported by the wheel bearings.

E. B. says: In view of the coming aerial voyage of Messrs. Wise and Donaldson, I submit to you the following propositions: 1. That a rocket shoots up when fired. 2. That a cannon, when fired, is thrust backward. 3. That at a recent trial with a new fire ladder (as stated in your paper) the same was driven backward by the stream of water, suddenly issuing from the hose on the top of the ladder. The moving effect in these 3 cases is caused by pressure against the atmosphere; and if such heavy bodies are moved by it, how much more would this be the case with aerial crafts, which are floating in the air, and are thus without any weight? It would be difficult to apply steam or gas, but I believe that a rotary blower, built of as light material as possible, would produce a stream of compressed air, strong enough at least to serve as a rudder. A spherical form of the balloon would, however, not be practicable, as any propelling power ought to be concentrated, and should govern the craft equally. I therefore would suggest a form wherein the balloon consists of two separate gas bags, the boat being between them. This scheme of course can be worked out in many different ways, but I believe that a rotary blower driven by hand with the help of a flywheel would answer the purpose admirably. Answer: The power that could be produced in this way would be entirely inadequate. We have heard a much better plan proposed. It is to produce frequent discharges of some light and powerful explosive, such as nitro-glycerin, and thus guide the balloon in any desired direction.

T. B. Jr. says: 1. I have a small steam engine cylinder 3 inches in diameter and 6 inches between ports. What boiler and what sized feed pipe will it require? 2. What power would it have, and (3) would it be enough to run a small lathe? 4. I also wish to know what a pattern for such a cylinder would cost. Answers: 1. About 25 square feet of heating surface, steam pipe about ¼ inch area. 2. About one horse power. 3. Yes. 4. Write to a model or pattern maker.

W. S. M. asks: 1. What is the best plan of annealing cast steel, to make it very soft without injury? 2. Suppose a well formed boat runs at 10 miles per hour with 10 horse power, how many horse power would be required to drive it at 15 miles or 5 miles per hour? Please explain the increase of power required for the increase of speed. 3. I would like to have directions as to the proper size, power, and speed of well shaped boats. Answers: 1. Heat to a cherry red, and allow the steel to cool very slowly, either covering it with hot ashes, or keeping it in the fire in which it was heated, allowing the fire to die out gradually. 2. The general law is that the horse power varies as the cube of the speed. On this assumption, the horse power required will be: For 15 miles an hour, 33¾; for 5 miles an hour, 1¼. 3. We will probably soon give some general proportions for small boats, and would be pleased to hear from such of our readers as have been building small steamers.

C. P. T. asks: What can I put into tonic beer to make a heavy foam when poured into the glass from the bottle? I put it up with carbonic acid gas, like soda water. I have tried gum arabic, isinglass, eggs, hops, etc., but they do not give the foam that I wish for. Answer: Try adding enough sugar or sirup to give it consistency. We would not advise adulterating with any chemical.

S. G. Jr. says: I have seen some specimens of paper which had been made extremely hard. It was said to have been done by soaking the paper in a solution of chloride of zinc. I have tried it, with weak and strong solutions, and on different kinds of paper, but have failed to get any hardening results. I also saw some pieces of gas pipe, with screws and sockets, which was made out of paper. Answer: The property that chloride of zinc has of hardening paper was first discovered accidentally by Dr. R. Böhme in 1849. This gentleman was filtering a concentrated solution of chloride of zinc through filtering paper, when he noticed that the paper became thick and strong. He suggested that it might be rendered very useful, but little attention was paid to it until 1859, when T. Taylor took out an English patent for its use in making parchment paper. The solution used was as thick as sirup, and made perfectly neutral by adding the oxide or carbonate of zinc. The specific gravity is then 2·10. The action on the paper is stronger when heat, from 60° to 212° Fahr., is employed. When several sheets are prepared and pressed together they unite to form one. The ammonia sulphate of copper is now highly recommended.

C. F. E. says: Our water contains iron, calcium, sodium, potash, alumina, silica, and magnesia, as basic elements, with chlorine, sulphuric and carbonic acids as non-basic. One gallon of the water, as it flows from the well, contains 480 grains of solid matter, after evaporization by heat. This residue, after reaching a certain point of condensation, gives up a portion of the carbonic acid which is held in the water in combination with bases as bicarbonates. Can it be used with safety in a fire engine? Is it a good way to blow off a certain portion with a surface blow-off, say, every five minutes while running, and after stopping blow off all the water and fill up with fresh water from river? Answer: We are afraid to recommend the use of this water. Still, with some good scale preventive, such as the tannate of soda, it might be safely employed. But in the boiler of a steam fire engine, the spaces are so small that it is always best to use pure water, when practicable.

C. R. C. asks how chalk crayons are made; what amount of pressure is necessary, and if any substance other than pure chalk is used? Answer: There are numerous recipes for the manufacture of chalk crayons. One of the simplest is as follows: Pipe clay and the finest prepared chalk, equal parts, or pipe clay alone. Coloring matter according to tint desired. Mix into a paste with mild pale ale. Various substances are sometimes used to give the chalk a clay consistency, as Castile soap, shellac, gum arabic, etc. To give the crayons solidity, manufacturers use a cylinder two or three inches in diameter, open at the top and bottom, the lower end being secured over a perforated plate, having holes of the size of crayon desired. A tight fitting solid piston, moved equably by a screw, forces the soft mass through the holes in long fingers, which are afterwards cut into pieces and dried. The coloring matters used are indigo, Prussian blue, yellow ocher, carmine, vermilion, etc.

S. G. asks: Was the meteoric display, which occurred last August, at midday, and seen by most of the citizens of Lexington, Ky., noticed at any other place? Have astronomers or scientists given an explanation of the phenomenon? Was it connected with Biela's comet, which must have been near the earth at that time? Answer: Meteors are comparatively rare between August 11 and September 4. A shower "on the 29th and 30th of August at midday, lasting from noon until four o'clock," is very unusual. We have not heard of such a display elsewhere. If seen again this year please let us know.

S. B. D. asks: 1. Is it possible to make any use of iron after it has been burnt, such as old grate bars? 2. Is there any way of reducing old rusty scraps of sheet iron into cast iron? 3. Could a blast furnace be worked on a small scale with a hand bellows, profitably, if coal and ore were plentiful and cheap? Answers: 1. It can be re-melted. 2. Yes, in an ordinary blast furnace. 3. Not unless labor were very cheap, also.

E. C. B. says: An amount of oxymuriate of tin has become much diluted with water. How can it be precipitated and returned to its metallic state? Answer: The protochloride of tin, commonly known by dyers as tin salt, is soluble in water, but by contact with the air a white precipitate of oxychloride of tin is formed, which remains suspended in the solution, giving it a milky appearance. If this is the oxychloride that you refer to, you will find that it is soluble in an excess of hot muriatic acid. From this solution tin may be precipitated in the metallic state by a strip of zinc, the tin forming gray laminæ or a spongy mass. Some manufacturers of tin salt mix sal ammoniac with it to prevent the precipitation of the oxychloride.

Ig. asks: 1. Is there any reward offered by this or any government for the discovery or invention of perpetual motion, and if so, how much? 2. Would the inventor of such a device derive any great benefit therefrom? Answers: 1. No reward is offered. 2. We think not. But you may try it practically. Put yourself within a tub and pull steadily at the handles. This is the simplest form of perpetual motion. In other forms, cog wheels and levers are arranged to pull against themselves. This is the "idee" in all perpetual motion machines, and no advantage can result.

H. asks: If a tug boat can tow a ship at a certain rate, can the same engine, being placed in the ship, be made to propel her at the same rate? Or does the engine, by being in the tug, have more power to move the ship than if it were in the ship itself? Answer: See our editorial columns in this issue.

A. B. says: I claim that a solid column of metal is stronger than a hollow one of the same diameter. My opponent claims it is not. Which is correct? Answer: The solid column is the stronger, the diameters of the two being the same.

J. Y. of Leeds, England.—The Science Record has been published two years. We can send you the two volumes, postage prepaid, for $1.

J. H. H. says in answer to J. S. C.'s query about oil of rhodium: "Oleum rhodii" from rhodium wood (the root), *genista canariensis*; 80 lbs. of old resinous wood yields 3 ounces of oil. Color of oil, light yellowish, by age turns red. Odor, of roses. Wood used for fumigation. Cordial and cephalic. Imported from the Levant.

W. W. A. replies to T. W. S., who asked how to keep paste from souring: Stir in pulverized alum while cooking, about a teaspoonful to a pint of paste. The alum will also keep the flies out of the paste pot.

S. P., Jr., asks how to proceed with a drive well after driving down a certain distance and not obtaining water. "I have driven down into the ground 22 feet of 1¼ inch tubing and attached my pump thereto, but am unable to start her. I do not think that it is for want of water, as water can be obtained here almost at any time at a depth of from 1 to 2 feet from the surface of the ground. I had to dig a hole 4 feet deep in order to put down the set length which is attached to the pump, and before I could screw the set length on to the tubing I had to dip out the water that had accumulated in the hole, which was half full." Answer: We can best answer this question by relating a little anecdote. "Suppose," said an examiner to a competitive in engineering, "you should build an engine yourself, perform every part of the work without assistance, and know that it was in complete order; if, when put into a vessel, the pump would not draw water, what would you do?" "Go to the side of the vessel and ascertain if there was any water in the river," answered the competitive.

A. K. S. says, in answer to B. A. O.'s queries on page 27, current volume: Girdle trees as early in the season as the bark will peel, in the following manner: Commence three or four feet from the ground, cut the bark entirely around the tree; then strip the tree down to the ground, leaving the bark intact at the base of the trunk. This will kill most kinds of timber so that the stump or roots will not sprout. Honey locust is an exception. I never knew or heard of one of these trees being killed (except by fire) so that it did not sprout from roots. A few times grubbing of the sprouts will end this. In answer to query 4, I would say that iron is a permanent cure for nose bleeding and for boils. The best preparation is the tincture of the muriate (*tinctura ferri muriatis*). Take 20 drops in a wineglass of water twice a day for three weeks. The above is a dose for an adult. I have known it to cure several severe cases. A solution of alum sometimes gives a temporary relief.

MINERALS.—Specimens have been received from the following correspondents, and examined with the results stated:

A. R. G.—The substance enclosed is peat, used as a fuel.

M. M. G.—The mineral is felspar.

J. T. C.—No. 1 is felspar, used in the manufacture of pottery and porcelain. No. 2 is copper pyrites, iron pyrites, and galena, all valuable if in large quantities and near to means of transportation. No. 3 is hornblende; of no value; it occurs with copper pyrites, and is known as "dead rock." No. 4 is copper and iron pyrites in quartz rock.

W. M. A.—The specimens you send are kaolin and felspar, the kaolin evidently resulting from the disintegration of the felspar. The kaolin contains too much grit, or undecomposed felspar, to be of use without washing. You may find some, however, as the deposit is so large, that is free from grit. This is easily determined by crushing a small piece between the front teeth. The specimens of felspar are good. It is used by the potters under the name of "spar;" and kaolin is even more extensively applied to the same purpose.

W. C. A.—The sample enclosed is ferruginous sand, consisting of the protoxide and sesquioxide of iron or magnetic iron ore mixed with some silica. It sometimes contains a considerable quantity of titanium. If found sufficiently pure and abundant, it might pay to smelt.

S. K.—1. Quartz, and iron pyrites. 2. Pyrites. 3. Copper pyrites. 4. Galena and quartz. 5. Galena. 6. Pyrites. 7. Quartz. An assay or analysis for silver or gold will cost $10 for each specimen.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Crewe Engine Works. By J. R.
On Meteors. By S. G.
On the Origin of the Earth and Stars. By C. B. Jr.
On French Telegraphy. By T.
On Retrogression of the Sun. By C. H. B.
On Solar Reaction. By R. B. S.
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On Turbine Wheels. By J. H.
On Navigation of the Air. By C. B. S.

Also enquiries from the following:

W. E. S.—A. B.—C. M. H.—J. M. A.—J. W.—E. A. H.—A. G.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

25,573.—BOOT LASTING MACHINE.—J. Purinton. Sept. 17
25,602.—SEWING MACHINE.—K. Vogel. September 17.
25,701.—SKELETON SKIRT.—J. Draper. September 17.
25,783.—DOUBLE FRICTION COUPLING.—J. Hendy. Sept. 24.
25,784.—MAKING BARRELS, ETC.—G. W. Banker. Sept. 21.
25,797.—HARVESTER.—E. Ball. October 1.
25,807.—HEM FOLDERS.—L. Clark. October 1.
25,862.—WEEDING HOES.—J. M. Adams. October 1.

EXTENSION GRANTED.

24,823.—PUMPING ENGINE.—H. R. Worthington.

DESIGNS PATENTED.

6,771.—BURIAL CASKET.—B. F. Heimbach, Allentown, Pa.
6,772.—BURIAL CASE.—B. F. Heimbach, Allentown, Pa.
6,773.—JEWELRY BOX.—E. C. Moore, Yonkers, N. Y.
6,774.—FAN.—J. T. Brundage, Niagara Falls, N. Y.
6,775.—DRAWER PULL.—O. F. Fogelstrand, Kensington, Ct.

TRADE MARKS REGISTERED.

1,361.—LICORICE PASTE.—D. V. Arguimbau, N. Y. city.
1,362.—QUILL BOBBINS.—D. Bass, Jr., Woonsocket, R. I.
1,363.—COFFEE.—Dilworth Brothers, Pittsburgh, Pa.
1,364.—PACKAGES OF WHISKY.—Howe & Co., Cincinnati, O
1,365.—CIGARS, ETC.—F. S. Kinney, New York city.
1,366.—SADDLE TREES.—S. E. Tompkins & Co., Sing Sing, N. Y
1,367.—RAZORS, ETC.—Friedmann & Co., New York city.
1,368.—VARNISH.—L. L. Mandel, New York city.
1,369.—HOMEOPATHIC GLOBULES.—Smith & Co., Cinn., O.
1,370.—CYLINDER STOVE.—Southard & Co., N. Y. city.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
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On an application for Design (14 years)	$30

CANADIAN PATENTS.

OFFICIAL LIST OF PATENTS GRANTED IN CANADA FROM FEBRUARY 14, 1873, UP TO AND INCLUDING APRIL 7, 1873.

Patents taken by citizens of the United States are marked U. S.

[NOTE.—Under the new patent law, now in vogue, American citizens may patent their inventions in Canada on favorable terms. For full particulars, address Munn & Co., Office SCIENTIFIC AMERICAN, 37 Park Row, N. Y.]

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