SCIENTIFIC AMERICAN

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

Vol. XXII.--No. 3. [NEW SERIES.] | NEW YORK, JANUARY 15, 1870. | $3 per Annum [IN ADVANCE.]

Machine for Branching Artificial Flowers.

Few people outside of the trade are aware of the extent of the manufacture of artificial flowers. It has been estimated that ten thousand people, mostly girls, are employed in this business in New York. These girls are chiefly employed in what is called "branching," that is, the arrangement of stems, leaves, flowers, and fruits, previously made in large establishments, upon stems, the length of which is limited on account of the inconvenience in turning them when wound by hand.

The basis of the stems is wire, and two threads of suitable material are laid along this wire to prevent subsequent slipping of the colored thread, which forms the outer covering of the stems. The ends of the short stems of leaves, flowers, buds, and fruits, being laid against the wire are wound under the outer covering, and are thus fastened to it.

The process is a slow one, and, as we have said, is limited to such length of the main stem as can be conveniently manipulated.

Our engravings illustrate a very ingenious machine for performing the latter kind of work. The general features of the invention being admirably shown in Fig. 1, and portions of the device in Figs. 2 and 3.

The wire being fed from a spool, A, Figs 1, 2, and 3, then passes through a hollow spindle, B, Figs. 1 and 2, and lies upon an endless feed belt, C, to which it is clamped by small pincers, D, Figs. 1 and 2. The small pulleys upon which the feed-belt, C, is carried, are actuated by a train of gearing receiving its motion from gearing and pulleys underneath the table, not fully shown in Fig. 1.

The motion of this belt carries with it the wire stem which is slowly unwound from the spool, A. Two threads passing through an eye, E, Fig. 3, are also drawn through the hollow spindle, B, in conjunction with the wire, by the motion of the endless belt. These threads are unwound from the spools, F, Fig. 1. At the same time a rapid rotary motion is given to the hollow spindle by a small belt from the driving pulley, G, Fig. 1. Motion is imparted to G, from gearing not fully shown in the engraving, but which the imagination can easily supply, the form of this gearing being wholly immaterial to the claims of the inventor.

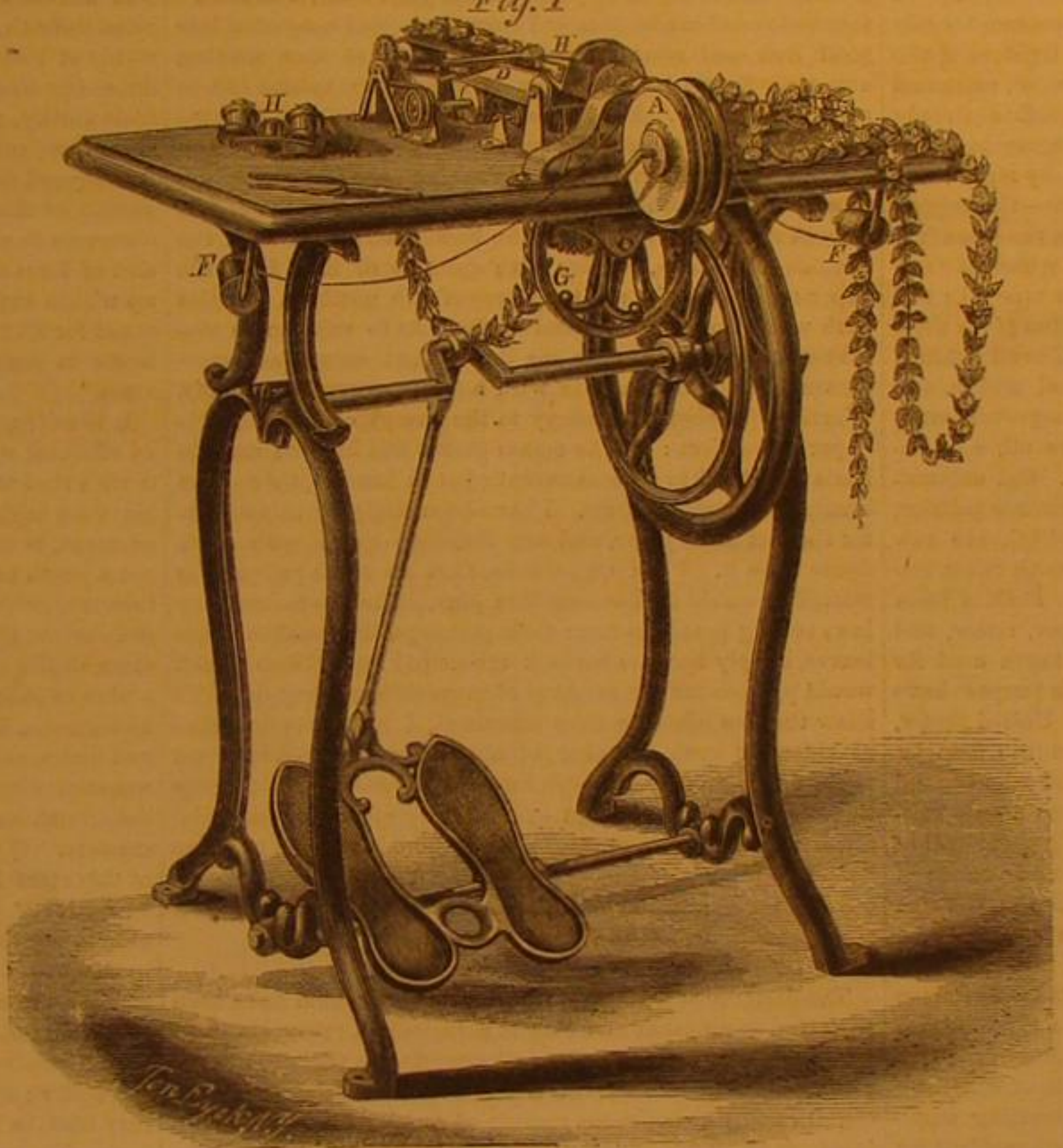
On the revolving hollow spindle, B, is fixed a spool frame, H, which carries a single spool when formed as in Fig. 2, and two spools when formed as in Fig. 3. The covering threads are led from these spools through the loop of a small flyer on the end of the hollow spindle, B, and being held in contact with the wire as the latter is slowly fed through the spindle, are wound rapidly and uniformly over its surface, the spool frames revolving with the spindles.

The ends of the stems of leaves, fruits, or flowers being thrust into the end of the hollow spindle, are at once caught, and firmly wound under in a manner far superior to hand work, and so much more rapidly that a girl may perform in two hours as much work as she could do in ten hours by hand.

It is also obvious that by readjusting the pincers on the endless belt a wire of any length may be wound and branched which cannot be done by hand labor. Friction springs are provided to prevent the spools from turning too easily, and thus the requisite tightness in winding is secured. This is a beautiful and unique machine, and to be fully appreciated it needs to be seen in operation.

Patented through the Scientific American Patent Agency, November 9, 1869, by Ambrose Giraudat, whose place of business is at 16 Wooster street, New York, where the machine may be seen in practical operation.

Fig. 1



GIRAUDAT'S MACHINE FOR BRANCHING ARTIFICIAL FLOWERS.

Fig. 2

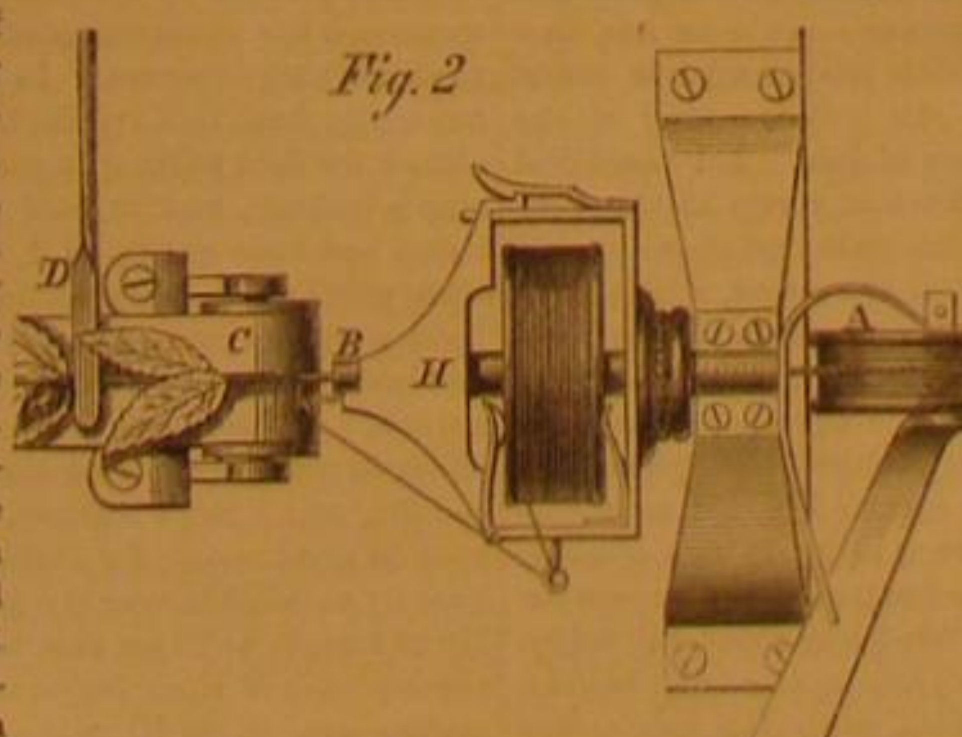
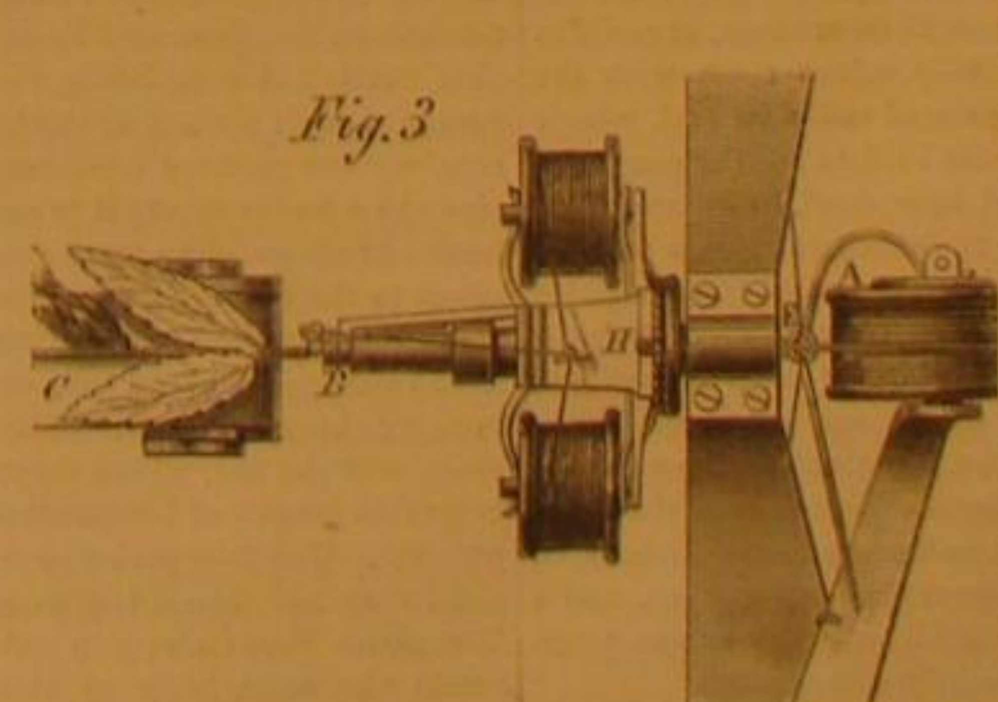


Fig. 3



WASTE NOT--HOW SMALL THINGS ARE UTILIZED.

(From Chambers' Journal.)

One of the blessings of modern science presents itself in the form of economy, frugality, utilization. Things which were formerly thrown away as waste are now applied to man's purposes, to an extent far beyond our general supposition. Dr. Lyon Playfair and Mr. P. L. Simmonds have frequently drawn attention to this subject, chiefly in illustration of the wonders of chemistry. Mr. Simmonds has recently collected a new budget of instances, which he has brought under the notice of the Society of Arts.

Before touching on these, let us refresh the reader's memory by a summary of results already recorded. Beautiful perfumes are produced from substances not merely trivial, but in some cases fetid and repulsive. Fusel oil, putrid cheese, gas tar, and the drainage of cow-houses, are thus transformed; the result is a triumph of chemistry; but it is commercially shabby and unfair to call perfumes thus obtained by such delightful names as "oil of pears," "oil of apples," "oil of pineapples," "oil of grapes," "oil of cognac," "oil of bitter almonds," "eau de millefleurs." Blue dyes are made from scraps of tin, old woolen rags, and the parings of horses' hoofs. Old iron hoops are employed in ink making; bones as a source of phosphorus for tipping Congreve matches; the dregs of port wine for making Seidlitz powders; the washings of coal tar for producing a flavoring condiment for *blancmange*. Old woolen rags are the foundation of the prosperity of Dewsbury and Batley, in Yorkshire; these musty, fusty, dusty, frouzy fragments being ground up into shoddy and mungo. Other relics of old woolen garments are made to yield flock for wall paper, padding for mattresses, and Prussian blue for the color makers. Chemicals are employed to destroy the cotton fibers in old worn-out balzarines, orleans, coburgs, and other mixed fabrics for ladies' dresses, and to liberate the woolen or worsted fibers for a new career of usefulness. Woolen rags, when even the shoddy maker will have nothing to do with them, are choice materials for the farmer as manure. That bones are used for knife handles we know very well; but it appears they are also used for bone-black by color and varnish makers, for size by dyers and cloth finishers, and for manure by farmers. Horns and hoofs are a very magazine of useful products in the hands of the scientific chemist. Whalebone cuttings yield Prussian blue; dogs' fat is (shamefully) made into sham cod-liver oil; wool scourers' waste and washings reappear as beautiful stearine candles; bullocks' blood is used in refining sugar, in making animal charcoal, and in Turkey-red dyeing; ox gall or bile is used by wool scourers and by color makers; fishes' eyes are used for buds in artificial flowers; bladders and intestines are made into air-tight coverings and into musical strings; all the odds and ends of leather and parchment dressing are grist to the gluemaker; calves' and sheep's feet yield an oil which is doctored up most fragrantly by the perfumer; stinking fish is always welcome as manure to the farmer; and a brown dye is extracted from those small bedroom acquaintances whom few of us like to talk about, and none like to see or to feel. At least fifty thousand tuns of cotton waste, the residue and sweepings of the mills, are annually utilized by being worked up into coarse sheeting, bed covers, *papier-mache*, and the commonest kinds of printing paper. Seaweed is used as a material for paper, as a lining material for ceiling and walls, and as a source whence the chemist can obtain iodine. Various kinds of seed, when the oil has been squeezed out of them, are useful cattle fatteners as oil cake. Grape husks yield a beautiful black for choice kinds of ink; raisin stalks constitute a capital clarifying agent for vinegar; bran or corn refuse is valuable in tanning, calico printing, and tinplate making; brewers and distillers' grains are fattening food for cattle. Bread raspings are in France sometimes used as a substitute for coffee, and as a tooth powder. Tan-pit refuse is valuable for the gardener's hot-house. Damaged potatoes, and rice and grain are made to yield starch. Ground horse-chestnuts are not unknown to the makers of cheap maccaroni and vermicelli. Cork cuttings and scraps are eagerly sought for stuffing and for buoyant purposes. Pea shells are used as a food for milch cows, and spirit may be distilled from them. Sawdust is now applied in a prodigious number of ways, for making paper, distilling oxalic acid, smoking fish, clearing jewelry, filling scent bags, stuffing dolls, etc. Tobacco ashes are made into tooth powder. The coal tar from gas works is made to yield sulphate of ammonia, sal ammoniac, printers' ink, lampblack, disinfectants, naphtha, benzole, paraffine, and the magnificent series of aniline colors for dyeing and calico printing. The sediment in wine casks is made into cream of tartar. Old kicked-off horseshoe nails yield the best of all iron for musket barrels. As for the shops in which gold workers, jewelers, and gold-beaters work, not only is the very dust on the floor precious, but a refiner will gladly give a new waistcoat or apron for an old one, for the sake of the auriferous particles thereby obtained.

Mr. Simmonds' new batch comprises many instances of substances recently transferred from the domain of waste to that of utility, and many suggestions for a similar transference in other quarters.

First, for the animal kingdom. Horse flesh is certainly not waste so long as dogs and cats eagerly feed upon it; but the French say that we ought not to leave it to the dogs and cats, by reason of the excellent qualities it possesses for human food; however, we must leave this matter to the hippophagic admirers of "chevaline." Fish are applied to many more useful purposes than was customary a few years ago; shark fins are prized as food by the Chinese: shark liver is boiled down by them for oil; shark skin is dried and used for polishing wood and ivory; dried shark heads are given by the Norwegians to cattle as food; smoked and dried dogfish is eaten as food, as are also the eggs, while the skin and the liver are applied to the same purposes as those of the shark. The French procure useful medicinal oil from the liver of the skate fish, which used to be thrown away, but which is now found to be nearly as efficacious as cod-liver oil. A French firm, Messrs. Souffrie, make large quantities of useful tallow or fat out of the pickings and waste of slaughter houses, the dead cats and dogs found floating in the Seine, and the used-up grease of railway wheels; when doctored by means of steam and hydraulic pressure, this fat becomes available for stearine manufacturers. Leather scraps are made into "shoddy leather," by grinding and macerating them into a pulp available for the inner soles of shoes and such-like purposes. There is another leathery composition much used in America under the name of "pancake." Thin bits of leather, the odds and ends cut off by the tanner and currier from whole hides, are interlaid with paste until they accumulate to an inch in thickness, and then heavily squeezed between two iron rollers; the mass comes out as an oblong pancake twelve inches by four, and half an inch thick, looking very much "like a cross between a sheet of gingerbread and a cake of tobacco;" it is used for inner soles, heels, and stiffeners. The albumenized paper used by photographers is subject to much waste in its manufacture; this waste, instead of being consigned to the pulp vat, is now converted into beautiful marbled paper, by a peculiar application of aniline colors to the albumen.

Next, as to the vegetable kingdom. We are told that the using up of what was formerly considered waste, in the textile manufactures, now reaches the enormous quantity of a hundred thousand tuns annually in the three forms of cotton, flax, and hemp waste. If we include animal fibers, such as shoddy wool and silk waste, the aggregates becomes largely increased. The French make firewood or fire lighters of the cones of pine trees and the waste cobs of maize, saturated with any cheap resinous substance. Messrs. Souffrie (already named) buy all the waste and pickings of vegetables from the twenty-five hospitals of Paris, cook them by steam, and feed a piggery of seven hundred head of swine—the vegetables being enriched with the greasy slops from the same hospitals. The same firm also produce beautiful white fat from the black residue left after purifying colza or rape oil; and another residue from the treatment of *this* residue gives them a useful varnish for cheap out-door purposes. The oil retained in olive oil-cake is now extracted by chemical means, and converted into capital stearine; and by this improvement it is expected that seven million pounds of olive oil, now annually wasted at Marseilles, will be utilized. Old account-books, letters, invoices, envelopes, checks, insurance policies, and other kinds of *writing* paper (not *printing*), are now bought at about £12 per tun, and worked up with other materials into pulp for the penny newspapers. Besides linen and cotton rags, cotton waste, old writing paper, straw, and esparto or Spanish grass, wood is also now much used for making into paper. Large factories for this purpose have been established in Italy, Wurtemberg, the United States, and other countries; the wood is rubbed down into dust by friction against rapidly revolving roughened wheels, and then treated by chemical processes until it forms a pulp suitable for paper-making. There is one wood-pulp paper-mill in Pennsylvania that can work up thirty thousand pounds of of wood or of sawdust per day. Nearly all the German newspapers now have a percentage of wood in the paper on which they are printed. The *New York Daily Tribune* is said to be printed on paper made of bamboo; and other American journals are printed on paper made chiefly of a kind of wild cane that is found in vast abundance on the shores of the Mississippi. A German chemist has found a mode of distilling spirit out of a residue left after chemically treating wood-pulp for paper. A French manufacturer converts sawdust, by intense pressure, into beautiful little boxes and other ornamental articles. The seed in the cotton pods or tufts, which used to be an annoyance to the cultivators, is now most usefully employed as a gas fuel, as a source of oil for lamps, as a chief substitute for olive oil, as oil cake for cattle food, and as a source of good hard grease or stearine for soap and candles. The refuse molasses from beet root sugar, formerly used only as pig food, are now distilled to obtain alcohol, and the residue crystallized to obtain potassium salts. Spent dye woods, after the coloring matter has been extracted from them, are sold in France to a large manufacturer, who mixes them with tar refuse, and forms them into compressed cakes for fuel, which has a very large sale. The acicular leaflets of the pine tree are converted into what is called tree wool, in France, Sweden, Holland, and other parts of the continent; this wool is used for wadding, stuffing for mattresses, and other articles of furniture; a cloth made from its fibers is used for inner vests, drawers, hose, shirts, coverlets, and chest-preservers; the membranous fragments and refuse are compressed into blocks for fuel; the resinous matter contained in them is distilled for gas; while by various modes of treatment there are produced an essential oil for rheumatism and skin diseases, an etherial oil useful as a curative agent and as a solvent, and a liquid for a medicated bath—all useful substances from a material which not long ago was utterly disregarded.

And now for the mineral kingdom. Mr. Mill, and other thoughtful men, are cautioning us that, as our stock of coal cannot last for ever, we should do well to utilize the thirty million tuns of small coal and dust which is allowed to go nearly to waste annually at the pit's mouth; and attention is drawn to what Belgium is doing in this matter. Near Charleroi, eight hundred thousand tuns of coal dust had accumulated, a burden to the colliery owners, and an injury to the health of the work people. Whereupon a company was formed expressly to utilize this refuse. The coal dust is sifted, mixed with eight per cent of coal tar, heated to a paste by steam at a temperature of three hundred degrees, and pressed into blocks and cylinders about twenty pounds weight. These blocks form excellent fuel for locomotives and steam-boats, productive of great heat and very little ash. In various foreign countries where paving stone is scarce, the slag from iron furnaces is brought into use, by being run into pits eight or nine feet in diameter, and cooled into slabs for paving. The cuttings of tin plate, and worn out tin kettles and saucepans, are subjected to processes which yield pure tin, good weldable iron, ammonia, Prussian blue, and stannate of sodium; and as the make of tin plate in England and Wales amounts to more than half a million tuns annually, there must be a very large store of material available in the old tin plate which is replaced by the new. The waste flux, such as borax, used in galvanizing metals, finds a ready market among refiners and for making paint.

But there are mounds of things still waiting to be utilized, waiting for the day when some clear practical minds will find out what to do with them. The Cleveland iron sells for a comparatively low price in the market, because it is contaminated with phosphorus. Now, the iron would be worth seven shillings per tun additional if the phosphorus were out of it, while phosphorus itself is worth sixty or seventy pounds per tun; what would not be the national gain if the two could be easily and cheaply separated! Nearly a hundred thousand tuns of sulphur a year are wasted in our alkali manufactures; means have been discovered for recovering this sulphur, but the system has not yet been sufficiently adopted to prevent the sad waste of a vast quantity of spent liquor in which the sulphur exists. Cinders from refineries and puddling furnaces, and scale from rollers and hammers, contain from thirty to fifty per cent of good iron; it is known that the metal can be obtained from them, and converted into good iron and steel; and iron masters are now waiting anxiously for chemists to show how such extraction can be managed cheaply. Mr. Frank Buckland has pointed out that we destroy millions of wholesome fish every year, by poisoning the waters of the Tees, the Wear, and the Dovy with lead refuse, the Dee with petroleum refuse, the Usk with sulphuric acid refuse, the Camel and the Fowey with mud from the Cornish clay works, the Exe with chloride of lime from the paper mills, and many of the rivers of the northern counties with waste from the chemical works. As to substances useful for food, there can be no doubt that enormous waste occurs. We will conclude with a few observations by Mr. Warriner (teacher of cookery to the army) concerning this important subject: "The refuse grease and kitchen stuff in Paris is utilized to a great extent; but in London, there is an immense amount of waste. I have been studying this subject for the last three years, and can therefore speak with confidence upon it. I am quite sure that as much material is wasted as would feed one million pigs. There are sanitary laws telling people to burn their potato peelings and cabbage leaves, simply because we lack municipal regulations which would provide for the removal of these things every day. To show the loss which is thus sustained, I may mention that at Aldershot each regiment of about five hundred men get about four pounds per month for their refuse of this description. I calculate that from every family of twelve individuals, living at the rate of £300 a year, there is enough refuse to keep two pigs."

REPAIRED BOILERS.

The dangerous character of steam boilers which have been subjected to repeated mending is notorious to every engineer who has given even the slightest attention to the working of this class of machinery. His list of boiler calamities will contain many conspicuous records of serious disasters resulting from the incapability of many people who have had the practical oversight of boilers at ironworks, and collieries in particular, to detect when a boiler has been sufficiently patched. Those records will likewise strengthen him in his conviction that very many workmen to whom repairs are intrusted are altogether unfit for their duties.

There is hardly any operation connected with the repair of a boiler more productive of danger than that by which rivets are brought into a line. The day is gone by, we hope, when in new boilers the longitudinal seams are made to run in a continuous line from end to end, with the transverse seams also continued completely round the boiler, giving at the corner of each plate four thicknesses of iron. Yet unskillful repairs often produce continuous lines of rivets at the very place in a boiler where it is most desirable that there should be the brick-wall-like arrangement of the seams, which adds much to the strength, and also often prevents a rent from continuing forward to a dangerous point. A large externally fired tube boiler at an ironworks in Wolverhampton some time ago burst its shell. The first rupture took place in a seam over the fire, where frequent repairs had led to a considerable length of longitudinal seam being in one continuous line. The four plates over the fire parted and opened out until they had ripped two seams completely round the boiler. The plates were thrown in one flat piece upon a bank behind, while the main body of the boiler, with the tubes, was turned over and the front end blown away. More recently, at Newcastle-upon-Tyne, a plain cylindrical boiler was much torn up, and all the fragments thrown to the front of their original position. The boiler was very old and much deteriorated, so that it was unable to bear the ordinary pressure, a longitudinal arrangement of the plates contributing to the weakness. Shortly afterwards, in the same town, a similar boiler was much torn and scattered. Here, too, the plates had been arranged longitudinally, and the accident began at a patch lately put on. The boiler had become so deteriorated by nearly thirty years' wear that it was not able to do the moderate duty required of it. Very quickly afterwards, at Durham, another plain cylinder with plates longitudinally arranged, and which had been working twenty-seven years, gave way at an old fracture over the grate, and was torn into four pieces, which fell a great distance off; and on the 18th of October last a plain cylinder with round ends, 40 feet long and 6 feet diameter, made of half-inch plates, and set with a fire-grate at one end, and flash flue, exploded at the works of the Great Bridge Iron and Steel Company, in South Staffordshire. The front end, with three rings of plates, was thrown up to a sufficient hight to clear the buildings, and fell into a pool some distance to the right and slightly to the rear, the remaining part of the boiler being left near to its original position. The boilers on each side were thrown off their seats, that on the left knocking down a new upright boiler which was nearly ready to work. The first rent appears to have taken place at a seam over the left side of the fire-grate, where four new grates and a long patch had been inserted. This rent must have instantly extended across the front of the man-lid above and around the fourth transverse seam, near some patches, thus allowing the shell to open out, the reaction of the issuing contents sending the fragments upwards. There were so many patches in the boiler, especially around the part which gave way, that many seams were made in continuous lines without any break of joint, and a great number of rivets must have been removed from some of the seams more than once, thereby very much reducing their strength. "I believe," said Mr. E. B. Marten, from whose evidence at the inquest we have been quoting, "the cause of the explosion was simply that this frequent repair had so reduced the strength of the boiler that it was unable to bear even the usual working pressure. It is often difficult," he adds, "to convince those who have the repair of boilers, that the putting of patch upon patch reduces the strength of the boiler, until it is completely untrustworthy, although it may not leak; but several explosions this year, and very many in past years, have proved the fact beyond dispute. The great havoc caused by such an explosion as that now under investigation leads many casual observers to suppose they are caused by some sudden accession of force within the boiler; but the enormous force pent up within any high-pressure boiler is quite sufficient to account for all the mischief, when the balance of strain in the fabric is destroyed by the sudden giving way of a weak seam."

It is as true now as it was eighteen hundred years ago that an effectual way of destroying that which is old, is to patch it with that which is new. The danger is more in the patching than in the repairing. True, a boiler, any more than a garment, is as strong after repair as when new, even though not a patch but a new breadth be inserted; still the new breadth, properly put in, is much less likely to bring about destruction than the patch. Very little capital and hardly more ability is needed in the coal and iron districts to enable a man to pass muster as a "boiler maker." He should rather be termed a boiler mender. A portable forge, a few hammers and drifts, and he is set up. Small colliery proprietors, and sometimes ironworks-people, instead of sending for help to a boiler-making firm of standing, too often call in these small masters. When an accident happens the evidence of empirics of this class is too often gravely taken as the evidence of "practical" men. Invariably the proprietor of the boiler is able to say that he has given orders for everything to be done to the boiler the maker considered necessary. The boiler mender, knowing that because of its lesser first cost a patch would be far more in consonance with the proprietor's views than a whole plate, had patched, and not effectually repaired, the boiler; and he is always ready to declare to a coroner and jury that, in his opinion, all had been done that was necessary. Yet how frequently it turns out that the accident has happened almost immediately after the repairs have been done. In the case of a cylinder boiler at Dudley, not long since, this frequent patching over the fire had brought the longitudinal seams for several plates without break of joint. A patch had been put on a few days before the explosion, and as the rivet holes had badly fitted there had been much strain caused by drifting, and the rivets were much distorted. The frequent and badly executed repairs over the fireplace had so weakened the structure as to make it unable to bear the very high ordinary pressure. In the case at Great Bridge, which has called forth this article, the boiler maker had only at four o'clock finished putting in some sixteen rivets over the fire to stop a leakage, and at half past seven, half an hour after steam had been got up in it, the explosion occurred, killing three people. In this case the boiler maker acted up to the light which he promised, and the proprietors of the boiler had no reason to believe that it was not as much light as was needed. His evidence is that when called in he found the boiler in good repair with the exception of a few rivets over the fire, which were leaking. How should it be otherwise than in good repair, for during the past two years he had frequently mended it over the part where the fire was placed. He had never any idea that the boiler was rendered unsafe in consequence of these frequent repairs; and their instructions always were to do all repairs required. This man had no notion that the patching, in the manner in which it had been performed in this case, was the chief immediate cause of mischief. Mr. Marten, however, testifies—as every other competent engineer would have testified under similar circumstances—that "the rivets, which were put into the boiler in the very line of the seam where they gave way, had proved the great point of weakness. Immediately that the fire was put under, and the steam got up, the openings extended from rivet-hole to rivet-hole, and the boiler exploded."

A very practical view suggested itself to one of the jurors. If the putting of patch upon patch had reduced the strength of the boiler till it had become completely untrustworthy, although it might not leak, "some one ought to know whether it was worn out." Mr. Marten responded that "the experience of engineers, who saw so many cases of this kind was that, though boilers in such a condition as the one in question might last for many years, sometimes they burst at once after being repaired. The question was, whether those who saw the boiler thought it was safe or not." One of the managers of the works, it transpired, who had been there eight years, had never had any reason to believe it was unsafe; the boiler maker believed it safe; and the engine-tender, who had the charge of the six boilers at the works, believed the same—indeed, did not see that it leaked until his son pointed out that defect. At the testimony of these work-people no reader of the *Engineer* will be surprised. But the evidence of the secretary of the company was that all the boilers used by the company were insured with the Manchester Boiler Insurance and Steam Power Company, whose agents were accustomed to visit the works once in six months. On the 6th of October an external examination was made on behalf of the Manchester Company. "From that inspection he was led to believe that the boilers were in good condition." In May last the agent of the boiler company made an internal inspection, and suggested certain repairs, which it was not disputed were carried out. The secretary added, in reply to the coroner, that in May nothing was said as to the boiler being unfit for use, "or they should have condemned it." Yet, to replace this very exploded boiler, and also "any other which most required to be replaced," orders had been given for two new boilers. One of these Mr. Marten speaks of above. Even a Black Country juryman, when this last fact came out, wanted to know why, if the boiler was safe, it was to be replaced? The reply he obtained was, that "boilers, when they got to a certain point, might be considered safe, and yet want replacing."

The moral of all this must be tolerably patent to the reader. (1) When boilers need repair those repairs should be put into the hands of boiler-making firms who have a reputation to sustain. (2) The surest way to ascertain the true condition of a boiler is to examine it at frequent intervals in every part, both inside and outside. (3) When, as in this case such intimation has been conveyed to proprietors—whether by boiler insurance agents or others—that the time has come when a boiler should be replaced, it is the truest economy to lay it off at once. (4) It cannot be too strongly urged upon users of steam power that it is far safer and cheaper to renew a boiler than to resort to continual, expensive, and unsatisfactory patching.—*Engineer*.

For the Scientific American.

TO WASH LEATHER GLOVES.

BY DR. REIMANN.

Washing leather gloves, when rationally performed, is no laborious operation, being of so simple a nature, that it can be effected by any one. The principle is to remove the grease which has become deposited on the gloves by usage, and at the same time the dust which is incorporated with the grease. It must be observed, however, that the gloves are not to be treated with any liquid likely to destroy their color, or prove injurious to the leather when too long immersed in it.

Soap and solutions of carbonate of soda, or of caustic soda, are self-evidently unsuitable in this operation, because these substances must be dissolved in water, which evaporates so slowly that the shape of the gloves would be destroyed, while the caustic solution would exercise an injurious influence on the color of the leather.

It is necessary therefore to employ a liquid which, though able to dissolve the grease, does not yet contain water.

Substances possessing this property we have in benzine, petroleum-essence, ether, and other allied bodies.

Formerly, gloves used to be rubbed with a rag which had been wetted with one or other of the above liquids, particularly benzine. They were finally cleaned, but the surface of the leather was often injuriously affected in those places where there was more dirt than elsewhere. Then the washing could never be carried out quite regularly, so that gloves cleaned in this way were often unfit to wear again, or if worn again they soon began to smell of benzine, when brought in contact with the warm hand, and often indeed, so strongly, that it was quite impossible to go into society with such gloves, because every one was immediately aware that some one had entered the room, whose gloves had been cleaned.

The cause of this inconvenient circumstance was as follows: The glove makers, after cleaning the gloves, allowed them to hang some time in the air, whereupon all the benzine volatile at ordinary temperatures was certainly removed, but another portion less volatile than the former, could not be volatilized at ordinary temperatures, and was therefore retained in the gloves. When this retained benzine is afterwards warmed by the hand, it begins to volatilize in minute quantities, which are, however, sufficient to give annoyance to a large party.

But not only were the public sufferers by this simple but irrational method of washing gloves, but the glove maker himself was also a sufferer. He consumes large quantities of the volatile substances, which were entirely lost in the process of volatilization. Besides which, the vapor of the hydrocarbons caused headache, and proved highly injurious to his health.

All this inconvenience can be obviated by washing the gloves in a larger quantity of liquid, and in a closed vessel.

To effect this, the following process is resorted to:

A bottle, 2 feet high, and 1 to 1½ feet wide, the stopper of which is also made of glass, is filled with two pounds of benzine, petroleum-essence, etc. Then the gloves which are to be washed are put also into the bottle. On this account the neck of the bottle must be very wide, perhaps from ½ to ¾ foot in diameter. Such bottles are easily obtained, being much used in pharmacy. As many gloves may be introduced into the bottle as the liquid will cover. The bottle is then closed, well shaken, and allowed to stand some minutes. The shaking is then repeated, the bottle opened, and the gloves taken out with a pair of iron forceps.

To prevent the possibility of there being any smell, it is a good plan to open the bottle under a good chimney, which thus carries off all the vapor that escapes.

The gloves, when brought by the forceps to the mouth of the bottle, are taken out, one after the other by the hand, and wrung out, care being taken that the superfluous liquid runs back again into the bottle. It is highly advisable to perform this operation under a chimney, or the workman will soon suffer from the injurious influence of the volatile hydrocarbon.

Under the chimney is placed a cord stretched between two pins, and the gloves are hung upon this by means of small S-shaped hooks. After hanging a short time they will be dry.

The benzine contained in the bottle dissolves all the grease which adheres to the gloves, and the dirt which had been combined with the grease is consequently removed at the same time. The benzine remaining in the bottle assumes a dirty gray color during the process of washing.

When the benzine has become too dirty, it is put into a distilling apparatus, and distilled over. In this way the benzine is restored to its original purity and whiteness, so that it can be used again in further operations.

If the operation of distilling the benzine is disagreeable to the glove maker, he can have it purified at the apothecary's or chemist's. It is, however, an operation which he can readily perform himself.

The apparatus is neither complicated nor expensive. A small wooden pail, such as is used in every establishment, is furnished with two holes. The first of these is drilled near the upper margin of the pail, so that, when the pail is filled with water, the water runs out through the hole, until the surface of the water within the pail is on a level with the lowest portion of the hole, that is to say, just below the upper margin of the vessel.

On the opposite side of the pail another hole is made, but this time near its bottom, so that water would run through this hole, until the surplus of the contained water was within a short distance of the bottom.

A leaden tube, the thickness of which equals the diameter of the hole, is bent so as to form a distilling worm, the upper end of which is inserted into the upper opening, and the lower end into the lower hole.

The tube is tightly inserted into both holes, so that no water can run through the space between the tube and the hole.

The pail is then filled with cold water.

The upper and lower ends of the leaden tube must project a little beyond the outer surface of the pail, perhaps two inches.

The lower end is bent downward a little. The upper end is a little enlarged, so that the tube forms a sort of funnel above.

In this is inserted a glass retort, conveniently fixed in a holder

The space between the neck of the retort and the enlarged end of the leaden tube, is conveniently filled with moistened cotton, so that no vapors can escape through it.

It is a good plan to employ a glass retort with a tube, so that any fluid can be poured into it when the apparatus is already fixed.

Having placed the retort on a vapor bath, where it can be heated at 100° C., the pail is connected with the neck of the retort, as above mentioned, and in this way filled with cold water. The retort is then filled with the impure benzine or petroleum-essence which has been used in washing gloves.

After pouring in the benzine, the tube of the retort is closed by a stopper, and then the apparatus is completed by a bottle placed under the lower end of the leaden tube, which projects beyond the outer surface of the pail, so that the liquid running down this flows directly into the bottle.

The vapor bath is now heated, the retort soon becomes warm, and the volatile liquid begins to distil over, either quickly, or slowly, according to the way in which the heating process is conducted.

The vapor of the hydrocarbon condenses in the worm, and a stream of liquid flows out of its mouth. In a short time there remains behind in the retort only the grease which the benzine has extracted from the gloves.

The gloves when taken out of the bottle are often not quite clean, in which case it is necessary to rub them with a rag, moistened with benzine, in all places where they are still dirty.

Thus the last traces of dirt are removed, and the gloves become perfectly clean. In this state they may be hung on a cord under the chimney.

The gloves soon become dry, but a part of the benzine still remains behind, which is less volatile, and which, when the glove is in contact with the warm hand, causes a strong odor of benzine to be evolved.

To remove this also, the gloves are placed on a common plate, which is put upon an iron pot containing boiling water. The first plate is covered with a second, and the gloves between the two plates are heated at the boiling temperature of water, until the last traces of the unvolatilized benzine have escaped.

The gloves are now removed from the plate, and put upon a wooden glove-stretcher, or shape. In this way they are made to resume their original form, and are now ready for use.

The whole operation must be so conducted that no smell of benzine is perceptible. The smell of benzine is always a sign of carelessness on the part of the workman, who can readily conduct all the benzine vapors up the chimney.

Railroads in the United States.

It is difficult, with all our accumulated facilities to reach every part of our vast country, and ascertain the exact condition of the railroad interest in each State or section. And during the last year the development of this great interest of the nation has been so immense and so rapid, as to make it impossible to keep pace with its growth. The construction of the Pacific Railroads, indeed, has forced all parts of the country to railroad extension, and hence we find that the extent of mileage constructed, and improvement on old lines has been greater in 1869 than in any former year of our railroad history. When we state that there have been brought into use during the year no less than 6,588·37 miles of new road, this fact is fully proven. This is more than one eighth part of the total mileage in the country, the other seven eighths having taken forty years of varied fortune to establish. Yet still we are progressing, and the year now commencing promises to eclipse even the year just closed. We have now in use an estimated mileage of 48,860·55 miles, and also projected and in progress a mileage of 27,505·83 miles. Take all the world without the United States, and this is not equaled. Truly we are progressive, and see in all this development a destiny as grand as insured. With our railroads we scale mountains and span the uninhabited plains, which are still in possession of the Indian, and open up vast territories for human habitation, which, without the railroad, must forever have been closed against civilization. If we are going fast, we are going in the right direction, and the day is not far off which will give us the great benefits we seek in our headlong course. The railroad will unite us, and make us the great nation of the world, free and indissoluble.

The following tabulation shows the distribution of mileage and cost to the several States and Territories:

States, etc.	Miles of road—Total.	Miles of road—Open.	Cost of road and equipment.
Maine	940·79	672·07	$21,182,116
New Hampshire	783·22	685·32	22,642,080
Vermont	658·69	613·69	28,787,186
Massachusetts	1,769·75	1,488·70	74,619,463
Rhode Island	124·47	121·47	5,182,672
Connecticut	806·94	698·57	27,250,017
New York	4,735·91	3,636·23	209,001,671
New Jersey	1,028·65	189·65	74,602,785
Pennsylvania	6,878·36	5,014·45	300,526,508
Delaware and E. Maryland	455·50	292·50	8,772,637
Maryland other than above	770·02	488·32	31,814,659
West Virginia	723·75	364·75	[illegible]
Virginia	2,049·11	1,482·94	49,896,461
North Carolina	1,552·97	1,129·67	29,566,486
South Carolina	1,439·17	1,089·97	[illegible]
Georgia	2,095·41	1,694·70	36,875,852
Florida	613·29	440·29	9,882,981
Alabama	2,039·80	1,036·00	36,421,163
Mississippi	900·20	900·20	34,919,204
Louisiana	928·30	414·50	17,255,323
Texas	2,829·35	572·25	17,000,000
Arkansas	897·00	86·00	4,310,000
Tennessee	1,876·53	1,485·33	46,918,448
Kentucky	1,402·85	849·55	22,511,746
Ohio	4,613·36	3,728·89	190,424,267
Michigan	2,296·26	[illegible]	43,790,418
Indiana	5,331·10	2,977·10	131,152,301
Illinois	7,186·45	4,707·95	[illegible]
Wisconsin	2,779·60	1,490·60	[illegible]
Minnesota	1,300·00	833·00	27,800,000
Iowa	3,219·38	2,140·83	[illegible]
Nebraska	449·00	449·00	26,450,000
Wyoming Territory	560·00	560·00	45,200,000
Missouri	3,361·79	1,827·00	88,272,121
Kansas	1,601·50	980·50	29,629,200
Colorado	350·00	150·00	6,000,000
Utah Territory	365·00	365·00	18,000,000
Nevada	390·00	390·00	19,200,000
California	2,397·60	810·60	46,650,000
Oregon	2,019·50	119·50	5,700,000

The annual progress of railroad building since in 1827 the commencement was made in the construction of the Granite Railroad at Quincy, Mass., to the present time is shown in the following table:

Year.	Miles.	Year.	Miles.	Year.	Miles.	Year.	Miles.
1828	3	1839	1,920	1850	7,475	1861	30,593
1829	28	1840	2,197	1851	8,589	1862	[illegible]
1830	41	1841	3,319	1852	11,027	1863	[illegible]
1831	51	1842	[illegible]	1853	13,497	1864	33,860
1832	131	1843	4,174	1854	15,672	1865	34,442
1833	576	1844	4,311	1855	17,398	1866	[illegible]
1834	762	1845	4,522	1856	19,330	1867	[illegible]
1835	918	1846	4,870	1857	22,625	1868	[illegible]
1836	1,102	1847	5,336	1858	25,090	1869	[illegible]
1837	1,431	1848	5,682	1859	26,755	1870	48,860
1838	1,843	1849	6,350	1860	28,771		

City passenger railroads are not included in the above summary. These are now in general use in all considerable cities, and in numerous instances in places where population is less dense. Their economical bearings are fully recognized, and their popularity is increasing. Boston New York, Brooklyn, and Philadelphia count their street railroad tracks by hundreds of miles. Probably the total is not less than 3,500 to 4,000 miles.

Nor have we included in our statement any account of the second tracks with which most of the leading lines are supplied, nor the sidings and turnouts on all the lines. These may be estimated at 25 per cent of the length of road, and are being added to yearly. Adding these supplementary tracks to the tabulated mileage, we find that the total length of equivalent single track in use is about 60,000 miles, and if we add to this the equivalent for the city passenger tracks to nearly 65,000 miles.

It is now about forty years since we began to build railroads, and in that time, as before intimated, we have built a greater length than is to be found in the whole of Europe. Progress leads but to new demands and new enterprises.—*American Railroad Journal.*

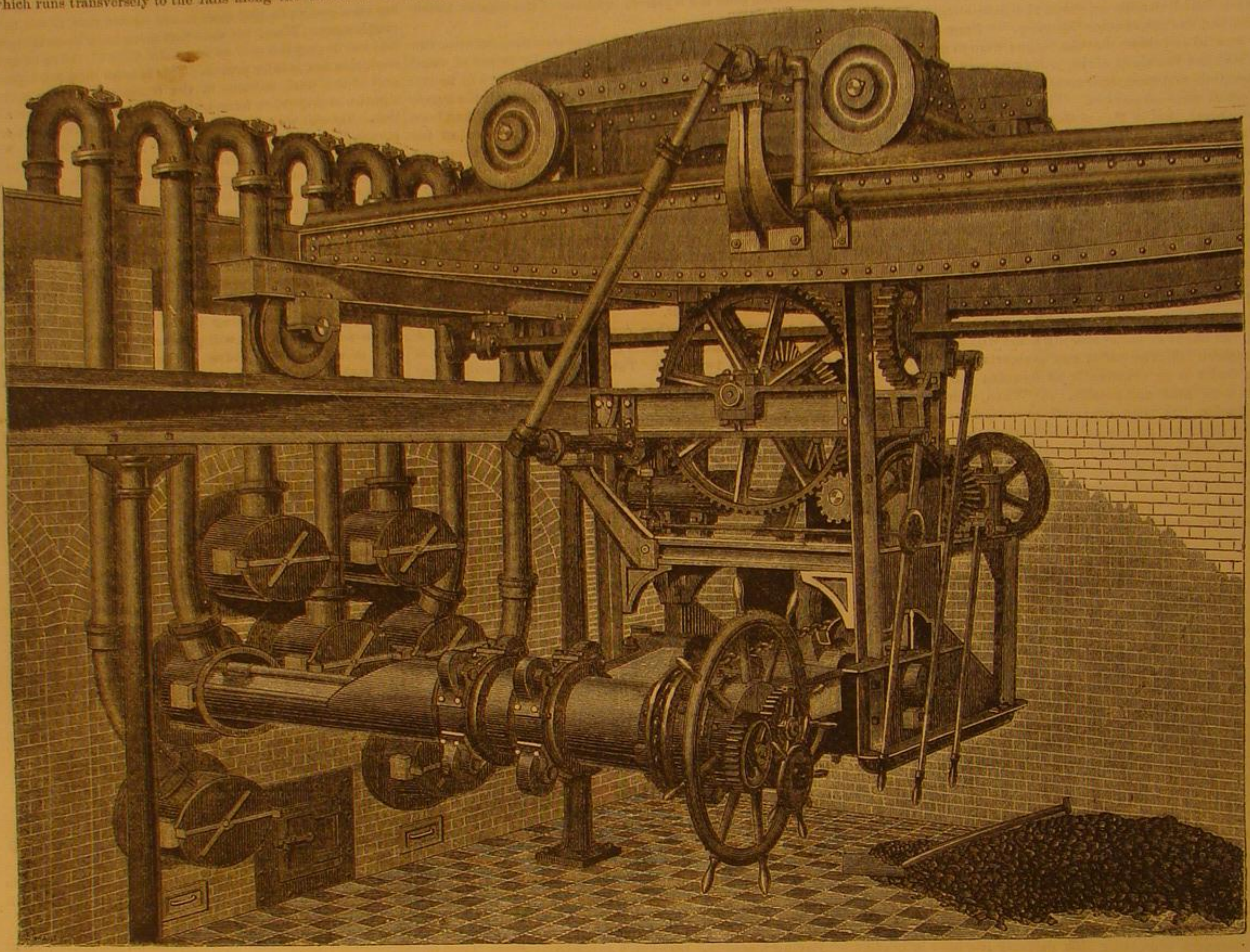
IF Dr. Livingstone has really discovered that one of the sources of the Nile rises ten degrees south of the equator that river becomes the longest in the world. The distance from such a southern latitude to Cairo is about equal, in an air line, to the distance from the mouth of the Mississippi to Sitka, in Alaska, or to Uppernavik, in Greenland, or from the Isthmus of Panama to the mouth of the St. Lawrence river.

THE plans of the new Steam Flying Ship *Avitor* have been submitted to a thoroughly competent engineer who, it is said, has pronounced favorably upon them.

Gas-Retort Charging and Drawing Machinery.

The machine, an engraving of which we herewith reproduce from *Engineering*, is a new English invention worthy of attention, as it demonstrates the practicability of adapting machinery to the performance of labor hitherto supposed to be almost beyond the scope of mechanical appliances except such simple tools as are employed in manual operations.

On reference to the engraving (it almost speaks for itself), it will be seen that the retort house is fitted with two parallel over-head rails, which extend longitudinally and parallel to the range of retort mouths. These rails support a traveler, which is provided with wheels, running along the longitudinal rails; other wheels are mounted on a carriage or cradle, which runs transversely to the rails along the traveler. It



GAS-RETORT CHARGING AND DRAWING MACHINERY.

will thus be seen that the cradle may be moved horizontally towards or from the mouths of the retorts, and may be brought opposite to any retort in the series.

The movement of the cradle along the rails of the traveler is effected by means of the steam engine giving motion from a pinion on the crank shaft, which is geared to the spur wheel on the counter shaft. On this counter shaft are two miter wheels with a double frictional cone clutch working between them on a feather. Into these two wheels is geared a third, which is placed and keyed on the lower end of the inclined shaft, the upper end being fitted with a bevel pinion gearing into a wheel on the forward axle of the running wheels of the cradle. The engine being always in motion, the clutch has only to be thrown in gear on either side to obtain either the in or out motion without reversing the engine. The motion to the main traveler for traveling longitudinally is taken from the crank shaft of the engine, which is fitted with miter gearing and frictional clutch (for reversing motion); these wheels give motion to a vertical shaft fitted at the upper end with a continuous screw or worm, which is geared into a worm wheel that is held in a bracket secured to the T framing of the cradle. A square shaft passes through the center of the worm wheel, the latter sliding on it; this square shaft is carried by bearings at each end from the traveler framing. On one end of this shaft is fitted a spur pinion, which gears with a spur wheel fast on the axis of one of the running wheels of the traveler, thereby imparting motion to it.

From the cradle or carriage are suspended wrought-iron T frames, which support the combined scoop and rakes. The outer end of the scoop, or that which is furthest from the retorts, is made cylindrical, and this portion forms the journal on which the scoop turns.

Radial lever arms are provided for supporting the scoop, these arms being fitted with frictional rollers, which are fitted so as to form the bearing, and allow the scoop to turn over freely. These arms are balanced and keyed on to a rocking shaft carried in bearings in the lower end of the suspended frames. The said rocking shaft carries a segment of a worm wheel into which gears a worm on a shaft, which is actuated by miter wheels on the counter shaft and frictional clutch, as before described.

The attendant in charge of the machine stands on a small platform in front of it, and by maneuvering the handles as may be required he produces all the movements requisite for introducing and withdrawing the scoop into and from the retort, and transporting it, either in a horizontal or a vertical direction, from one retort to another.

On rotating the endless screw the rocking shaft rotates partially, by which means the radial lever arms will be brought to different positions, thus raising the scoop to the hight of any one of the retorts in the bench or setting. In order to maintain the upper surface of the scoop perfectly horizontal during this movement there is a parallel motion given to it by the aid of an endless chain passing over two equal sized chain pulleys, the one being held stationary on the rocking shaft, and the other fitted loosely upon the cylindrical part of the scoop, but coupled therewith by the intervention of the well-known arrangement of detent and ratchet wheel. The object of the detent and ratchet arrangement is to enable the scoop to be reversed or turned over in its bearings for the purpose of discharging the coal into the retort (without interference from the chain wheels) after it has been introduced into such retort; while the detent serves to couple the chain wheel with the scoop when imparting the necessary parallel motion to the scoop for keeping its open side upwards or horizontal. This endless chain is also used for turning the scoop over in its bearing. The chain wheel or rocking shaft has a worm wheel attached to it, which is driven by a screw worked by frictional gearing from the engine shaft.

With the feeding scoop is combined one or more movable blades or series of movable blades or rakes, these blades answering the purpose for withdrawing; by this combined apparatus the two operations are performed, namely, feeding of the retorts with coal and withdrawing the coke.

In withdrawing the coke or residual products of the destructive distillation the combined scoop is introduced in an inverted position into the retort, the rakes being well within the hollow of the scoop, so as to pass freely over the surface of the coke until the scoop has entered a sufficient distance therein. In this position the rocking shafts with rakes are partially rotated in their bearing by the action of a hand-wheel with spur pinion and spur gearing fast on the outer ends of the rocking shafts when two are used. The hand-wheel and pinion work on a stud pin on the cap that forms the end of the scoop as well as the bearings for rocking shafts thereby causing each rake to describe an arc of a circle in a downward direction, so as to cut transversely across the mass of caked fuel or coke in the retort, from side to side, at each point where a rake or pair of rakes occur. In this position the scoop is withdrawn from the retort by running back the cradle, and the entire contents of the retort will be drawn out with it at one single stroke or traverse, leaving the retort ready for a fresh charge. The hand-wheel is now turned in the reverse direction, which has the effect of turning the blades or rakes inside the scoop again, the scoop being turned over by the endless chain that also acts as the parallel motion.

The steam is supplied from a stationary bolier to steam pipes running along the wall of the retort house. To this pipe is attached a flexible steam pipe (fitted with universal joints) in connection with the steam pipe or traveler which runs along the side of the girders that carry the cradle with the engine. On the girder there is a bracket placed, and through the upper end of this bracket the steam passes into the radial and telescopic pipes that connect to the steam casing of the cylinder. On reference to the illustration this will be readily understood.

The scoops may be filled with coal either by manual labor from the retort house floor or from a traveling tender, which consists of a coal-box or bunker suspended from a frame mounted on running wheels, with traverse longitudinal rails in company with the traveler, so as to be always in readiness for filling the scoops.

The same machinery, as illustrated and described, may be made to travel upon rails laid down upon the retort house floor, where such floor is not used as a coal store.

Death of an Eminent Chemist.

Otto Linne Erdmann, Professor of Chemistry at the University of Leipsic, born in Dresden, April 11, 1804, died after a protracted illness, on the 9th of October, 1869. He was particularly famous as the founder of *Erdmann's Journal of Applied Chemistry*, which he started in 1828, but he has also been an original contributor, to our knowledge, of many chemical substances, and there were few teachers in Europe more successful and popular than he. Fears were entertained that at his death the journal would cease to appear, but the publishers announce on the cover of the last number that they have made arrangement for its continuation.

A Dog's Bed.—The best bed which can be made for a dog, consists of dry newly-made deal shavings; a sackful of these may be had for a shilling at almost any carpenter's shop. The dog is delighted in tumbling about in them until he has made a bed to suit himself. Clean wood shavings will clean a dog as well as water, and fleas will never infest dogs that sleep upon fresh deal shavings. The turpentine and resin in new pine soon drive them away.—*Septimus Piesse.*

New Method of Piling Fagots for Rolling Rails.

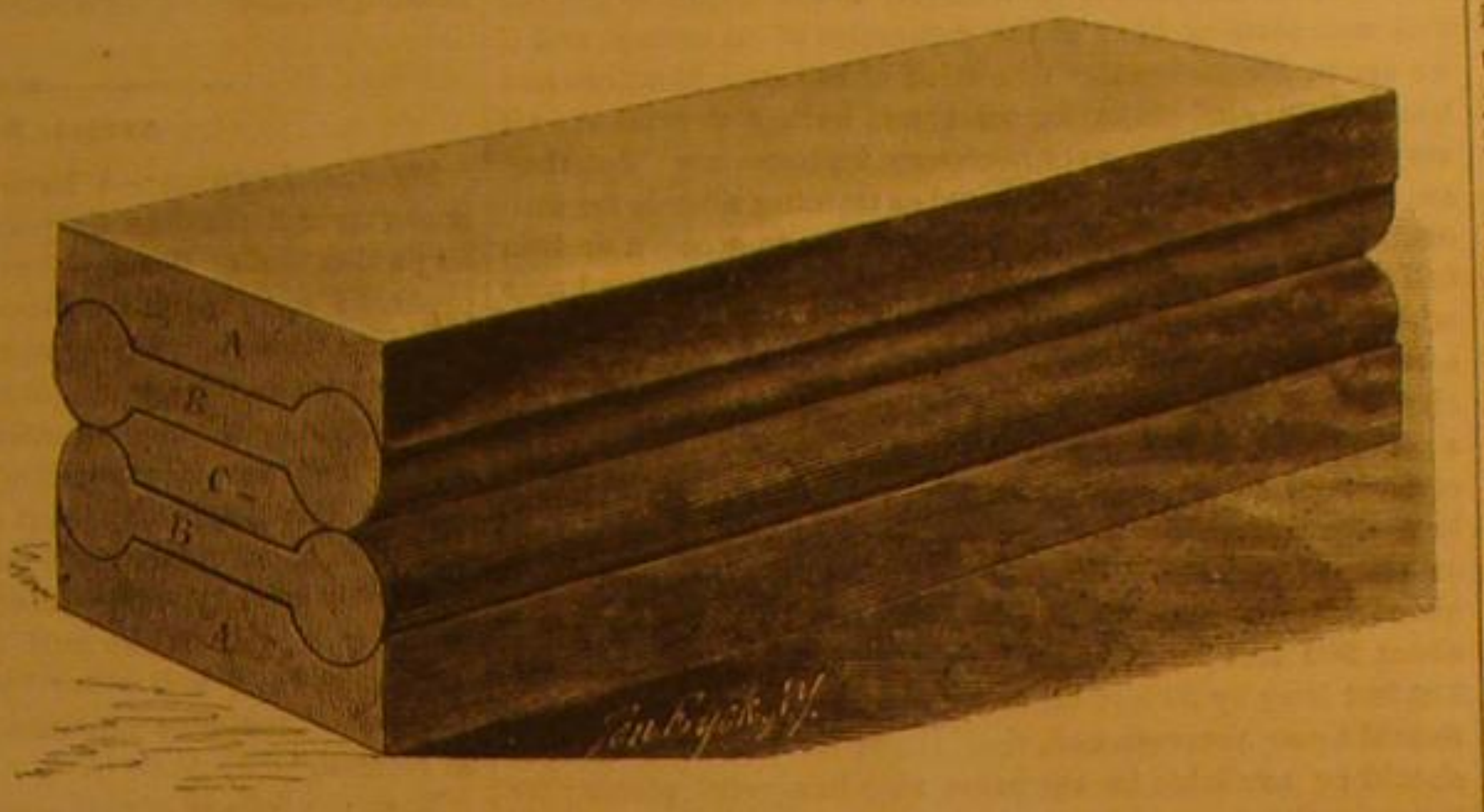
Our engraving illustrates a new method of forming the fagot or pile in the manufacture of railroad iron, by which it is claimed a rail is produced much superior to those made by the ordinary method, and the process of rolling is also greatly facilitated.

By this plan it is claimed a superior weld and more homogeneous rail is obtained, while the tendency of the head of the rail to split under wear is almost entirely eliminated. The rails are also claimed to be more elastic than those formed by the ordinary method, while they can, also, be made longer than at present, reducing the number of joints and the labor of constructing the permanent way.

Our engraving is a perspective view of the fagot. Three different sorts of bars, A, B, and C, are rolled and laid together as shown. Thus the pile may be laid up as high as desired, while each piece will be held to its place by the pieces with which it is combined. The pieces, A, may be omitted if desired, and only those marked B and C retained.

Different qualities of iron, or iron and steel, may be combined in this manner, so that when the pile or fagot is rolled a superior quality of iron or steel may form the face of the rail, while the less important parts are of inferior metal.

A trifling cost suffices for the slight alterations necessary in the rolls, and both the process of manufacture and the laying of the rails after they are made, are greatly facilitated.



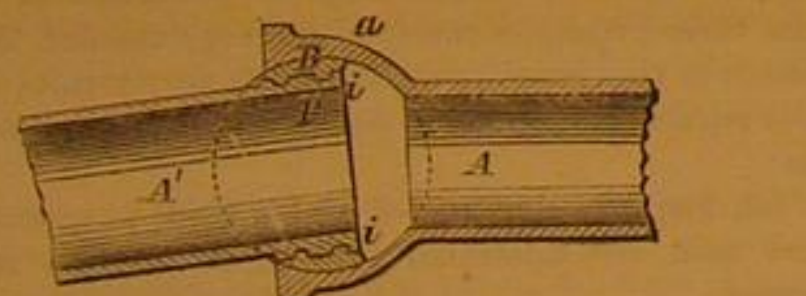
HAYWARD & LEES' IMPROVED RAIL FAGOT.

The object of the heads on the bars, B, is, besides the purposes already described, to envelope or surround the bars, C, for the purpose of securing the greater elasticity claimed for rails formed in this manner. The parts marked A form the head and bottom flange of the rail when the rolling is completed, and the upper of these pieces assumes such a form in the head of the rail, when rolled, as to resist the splitting tendency of the subsequent action of the wheels.

This method of making a fagot was patented through the Scientific American Patent Agency, July 14, 1868, by William Hayward and John Lees. For further information and terms address the above patentees at Brazil, Ind.

LAYING CAST IRON PIPES UNDER WATER.

John F. Ward of this city, has recently completed his contract with the Croton Aqueduct Department, of New York, for the laying of an eight inch iron pipe under the Harlem river from Manhattan Island to Wards Island. The pipe extends from the foot of 121st street on this city side, directly across the river to the landing house opposite, a distance of about 850 feet. The pipes are cast in 8-foot lengths, and united by means of a ball and socket joint, formed by providing one end of the pipes with a concave flange, which receives the conjoining pipe end, having annular ribs upon it. The space between the pipe end and the flange is packed with lead. The joint is thus rendered perfectly secure; while it is



also flexible and economical, as no screw bolts are required. This joint was patented by Mr. Ward, Aug. 25th, 1863, and will be readily understood by a glance at the diagram.

The method adopted by Mr. Ward for laying the pipe was both novel and simple. A large open boat was provided, in which was carried a supply of pipes and melted lead. At the stern a small supporting frame was placed. The pipes were jointed together in the boat, and, as fast as completed, pushed out over the stern into the water, thus forming a flexible string of pipes, which sank and rested upon the river bottom as the boat progressed. The work was easily and quickly accomplished. The depth of water in the Harlem river where the pipe lies is 40 feet.

Mr. W. has recently laid a water pipe of three feet diameter, on the same plan, under the Hackensack river, N. J., for the Jersey City Water Works. The simple and effective manner in which the work was done reflects the highest credit upon Mr. Ward's skill as a civil engineer. He projected some time ago a plan for a pneumatic tube to pass under the East river between New York and Brooklyn; and of its feasibility, in view of his successful experiences elsewhere, we entertain no doubt. By means of such a tube, letters and parcels might be transported between the cities in two minutes.

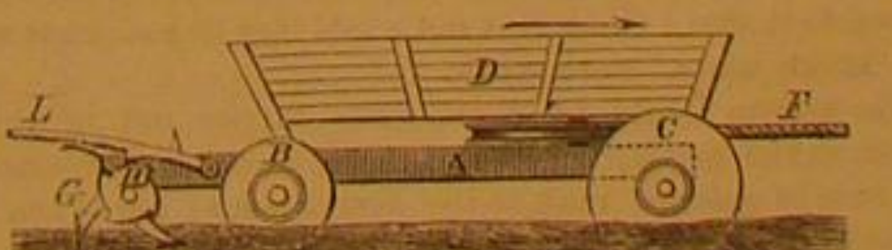
Improved Locomotive Alarm Bell.

There has been a recent trial on the Detroit and Milwaukie Railway, of an invention or device for ringing the locomotive bell continuously. The device consists of placing an ordinary bell, weighing about 100 lbs., on the front of the locomotive just over the cow-catcher. A rod attached to the eccentric shaft causes a clapper to strike the bell each turn of the driving wheel. The bell is suspended loosely, and revolves from the force of the stroke it receives, so that all parts of its surface are equally exposed to wear.

The advantages of this arrangement are a continuous sound, slow or rapid in proportion to the speed of the engine, each revolution of the wheel producing a stroke of the bell. In case of accident the railway company can always prove that their bell was ringing according to law, that being the point most difficult to convince a jury, and the one which railways have the greatest difficulty in proving. Owing to the position in which this bell is placed—in front of the engine and about three feet from the ground—the sound can be distinctly heard about three miles in the day time, and by night four miles or more, the ground and the continuous rail, both excellent conductors of sound, assisting in carrying the vibrations. The bell may also be rung, if necessary, by a cord from the foot-board when the engine is at rest. Quite a number of these bells have been placed on the engines of the Detroit and Milwaukie Railway, and several other companies are giving them a trial.

SELF-MOVING ANCHOR FOR STEAM CULTIVATION.

One of the few new things exhibited at the recent Smithfield show in England, was a self-moving anchor for use in the "roundabout" system of steam cultivation. It is now some thirteen years or so since the late Mr. John Fowler brought out his well-known disk anchor, and so applied it to the "roundabout" system, that the strain on the rope passing along the headland from the anchor carriage tended to shift the latter forward. According to Mr. Fowler's plan, this tendency to forward motion was resisted by a chain secured by a fixed anchor, and the necessary shifting from time to time was obtained by removing pins passed through the links of this chain, and thus allowing the anchor carriage to move forward a certain distance. The anchor carriage, an engraving of which we reproduce from *Engineering*, is also moved forward by the strain on the rope extending along the headland, but instead of its movement being regulated by a chain, it is governed by means of a set of revolving anchors, the arrangement of which we can perhaps best explain by referring to the annexed sketch. In this, A is the frame of the anchor carriage, which is provided with the axles carrying the disk anchors, B C, one of these axles—that marked C—being capable of being "locked" round by means of a hand lever, not shown in the sketch, so as to enable the carriage to be readily turned when being brought into place or steered along a curved headland. The carriage is provided with a shallow body, D, which, as in Fowler's anchorage, is loaded with earth, etc., for the purpose of forcing the anchors into the ground. The strain on this latter ply of rope, extending along the headland, tends to draw the carriage forward in the direction in which the rope is led, but this motion is resisted by the revolving claw anchors or tines of which two sets are fixed to a strong axle at the rear of the machine. At one end of this axle is a kind of coarse ratchet wheel, H, the teeth of which are engaged by a projection from a hand lever, I. So long as this lever or detent is in gear with the teeth of the ratchet, the revolution of the shaft carrying the claw anchors is prevented, and these anchors are thus enabled to prevent the forward motion of the carriage. As soon as the lever is raised, however, the claw anchors being free to revolve, the strain on the headland rope



draws the carriage forward until its further motion is arrested by the lever coming into gear with the next tooth of the ratchet wheel. The lever just mentioned can be raised by a boy, and it is intended that one of the boys in charge of the rope porter shall lift this lever at each traverse of the implement, the men usually employed to shift the claw anchors being thus dispensed with—an important advantage. In the model exhibited, the ratchet wheel or stop, H, is provided with four teeth only. It, however, appears to us that the position of the anchor carriage could be more readily adjusted to suit the varying width of land cultivated at each traverse by different implements, if a greater number of teeth were provided, the number of tines of the revolving claw anchors being of course also increased. Indeed it might, in some cases be found more convenient to abandon the ratchet wheel and substitute a powerful brake in its place.

Correspondence.

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

The Wandering Jew, or Cow Killer.

MESSRS. EDITORS:—For the past forty years I have never spent a summer without my attention having been attracted to, and my curiosity excited by, an insect known in some localities of the Southern States as the "Wandering Jew;" in others as the "Cow Killer."

I herewith send you an outline of all I have ever learned of its appearance and habits, which is but little at best, still it partakes of so much that is singular as to create the wish to know more, and I doubt not but it may induce some of your correspondents versed in entomology to give its history in full.

The "Wandering Jew," or "Cow Killer" is in form a perfect ant, of large proportions, varying from five eighths of an inch to one and one fourth inches in length; the smallest I have ever seen being fully one half inch long. Its color is generally a solid, deep vermilion, of a shining velvety appearance, though sometimes there are found those which have one or two glossy black bands, about one sixteenth of an inch wide, across the back or upper part of the abdomen. These latter, however, are rare. They are by no means a numerous race, for though seen every summer, one will rarely meet over a dozen or fifteen in any single season. Of their food I know nothing, having in vain repeatedly attempted to ascertain upon what they subsist. They confine themselves to no particular localities, being found upon ridge and bottom lands, upon the sea-board and in the interior. They are not congregative; they never even "hunt in couples," but are invariably found roaming about singly—hence the name of "Wandering Jew." They are remarkably deliberate in all their movements; never exhibit any signs of fear, nor do they ever appear to hurry under any circumstances, nor have I been able to detect them with any apparent definite purpose in their travels. They show no reluctance when compelled to change their course, and when unmolested no disposition to return again to their former route; "whence they come or whither they go," is beyond my knowledge.

Of life they are exceedingly tenacious; roll them upon hard soil, under the foot till you think them dead, twenty times over, and twenty times over they will rise, "shake off the dust," and continue their route as unconcernedly as though no untoward event had occurred. More than this, cut off the abdomen of one in his journey, and the parts to which the legs are attached make no stop; how long they continue to travel, in the event of such an accident, I am not prepared to say, the statement nevertheless is strictly true.

Lastly, they are provided with the most formidable sting of any insect within my ken. I have frequently, in hunting expeditions, been compelled to "change my base" by bees, wasps, yellow-jackets, hornets, etc., but the exciting effect of the sting of all these combined is as naught, when compared to the exhilarating influence upon "mind and matter," produced by that of the veritable "Cow Killer." I speak from experience.

The name "Cow Killer," originates from a very general impression among the lower classes that cattle are frequently killed by the poison of the sting; this I think is questionable however. S. W. T.

Handsboro, Miss.

Circulation of Water in Steam Boilers.

MESSRS. EDITORS:—I have made a number of experiments to find out exactly what was going on in a rapidly fired steam boiler. First, as to the water level. Second, as to the circulation. Third, as to the state of steam over the water level, and to find out how high the water spray followed the new made steam in its upward escape, from the surface. I send you the results of my first experiments and will, if this proves acceptable, send you an account of the others.

I placed a row of water gage glasses along the side of my boiler, which was 16 feet in length, with inside pressure 45 pounds, and 14 pounds vacuum in condenser, it was indicating 180-horse power through a good low pressure engine.

I found the water, though quiet, was not level at all, but stood four inches higher over the grate bars than at the back end. I tested the heat of escaping gases at the back end and found 475° Fah. Here then I had water running down an inclined plane of 4 inches in 16 feet. This flow must be very rapid; and it must descend to the bottom and rush along the lower surface at the same rate to take its place in the upward current at the front end. I have always since then favored boilers that made free way for this downward current, and which had no obstruction that would hinder the water from reaching the hottest part in time to take its place in the upward current to the surface. T. L. L.

Olney Ill.

[We shall be glad to hear further from this correspondent.—EDS.

Ideas on Matters Nautical.

MESSRS. EDITORS:—As usual, I religiously read all but the advertisements and list of patents in your valuable journal, and I trust you will pardon me for suggesting that there is considerable poetry in the description of the Torpedo Boat, page 1, current volume, copied from the *Army and Navy Journal*, and an old salt like myself is disposed to doubt some of the statements contained in the article alluded to, when he reads that "the concussion felt on board the torpedo boat was not more than that caused by a wave striking a vessel at sea." Why, bless your hearts! a wave very often strikes a vessel so gently that it would not break a soap bubble or spill a glass of wine, and another will sweep the deck of spars, water casks, deck house, wheel, and binnacle, and, sometimes, ships are dismasted by the force of a wave.

If a jet of water, thrown from the deck pump, will knock over a cat, what will be the effect on a ship of a mass of water, containing a hundred tuns, rushing against her at high velocity?

This is a question in hydraulics which, if put right before your 100,000 readers, will create as much discussion as the great wheel question, to solve which I used up one pair of scissors, two reams of card paper, many pencils, and nearly one pair of old eyes.

While I have my pen in hand,I may as well allude to what is said, page 12, current volume, on the important subject of the preservation of iron, by Professor Colton, who, I am sure, has never paid a bill for docking and painting the bottom of an iron ship.

When the ship is building there is, generally, time enough and weather good enough to put on several coats of paint, and allow plenty of time between each for hardening; but when an iron ship or steamer comes from sea, and is advertised to sail on a certain day,there is very rarely time to clean and dry the ship inside and out,and not often suitable weather, so that the paint will dry and adhere. Under these circumstances, I know of no paint that will fulfill the necessary conditions, and I doubt if one has been found.

Let me go a little into details. The expense per day for hauling up or docking a ship of 2,000 tuns, will amount to nearly the cost of the professor's plan. We will give one day for cleaning and drying, inside as well as out, so as to to guard against the usual effect of condensation, or what we salts call sweating. One day for each of the three coats of red lead, and two days for drying between coats. One day for the coat of beeswax, tallow, and rosin mixture. This makes six days of fair weather. It will readily be seen, and I think, generally admitted that this will cost too much money.

The question is not, wholly, what will "ward off the attacks of atmospheric oxygen, and be unaffected by acids and salt water;" but, what will do this best, at a reasonable cost? The mere cost in money is usually small, compared to time, interest on capital, and the contingencies connected with delay.

I have had a good deal of costly experience on the subject of pigments for iron ships, and have found pure white zinc paint, put on over good red lead, the best of all—it dries quick and does not rub off easily—but nothing will stand when put on in frosty weather, or when the surface is damp from cold without and heat within, and the reverse—artificial or natural heat without, and cold within. Therefore, the composite ship. planked with teak, elm, or yellow pine, in two layers, and suitably fastened so as not to be injured by galvanic action,is the best and most durable ship,for she can be sheathed with metal, and will be likely to keep clean if you keep her going.

I should not have dared to write in a jocose vein, as in the opening of this double-shotted gun, had I not lost my gravity by reading Mark Twain on the stove question, page 13.

Boston, Mass. OLD SALT.

American Inventive Talent.

MESSRS. EDITORS:—In looking over your volumes for 1868 —which I do with great pleasure and instruction—nothing strikes me more than the immense amount of inventive power in our people. Do they acquire this power in consequence of the greater facilities for education enjoyed by our working people, or is it imported in an undeveloped form from other countries? It would be an interesting fact to know, whether we get this power out of pure Yankees, or whether it comes of foreign blood, stimulated by better institutions and fostered by a better market. In France, among mechanics in wood, especially, away from the great centers of trade, one finds men working with the rudest tools upon the roughest wood, and consequently turning out such crude work as would never be put into a house in this country, certainly not north of Mason and Dixon's line. In a town of France containing a population of 15,000, I often visited joiners' shops where all mortising was done with the hand chisel, and a mallet of ancient model; all sharpening of tools was done on a large flat stone by hand rubbing; all sawing by frame saws, similar to those we use for sawing firewood; wages were about three francs, or about sixty cents a day in gold; the amount of work done—the time for labor (ten hours)—being seriously cut up by several meals and much drinking and smoking, seemed to be very small and very poor in quality. When I told one of the most intelligent workmen that our house joiners earned about fifteen francs a day, he wanted to pack up at once, and asked if I could not pay his way to America, taking a lien on his chest of tools and on his labor for one year. He did not seem to be flattered when I told him that with his bad tools and worse habits, the security would be valueless, and that, if landed in America, without any lien on tools or labor, he would come to want in a few weeks. Yet it is literally true that this first class French joiner with his tools could not get a meager living here, until he should get into better training and could use our tools. But this is a digression; my intention when I took up my pen was to allude to what is said on page 216, in 1868, volume XIX., of your journal, about a uniform standard for bolts and nuts, as adopted by the navy department on the recommendation of a board of naval engineers. It was a subject well worth the thought of Mr. Wells and the naval engineers, and calls to mind a favorite idea many times discussed by naval constructors and naval commanders, but never carried out, that I am aware of, in any country; namely, to inaugurate a perfect system of interconvertibility, so that all the various fittings of ships, as spars, sails, anchors, cables, tanks, parts of machinery, boats, etc., etc., should be known by their numbers, and come into play in any vessel, large or small. It is for engineers to say whether this system could be carried out so as to include cylinders, boilers, shafting, and all the heavier parts of the motive power; but I see no reason why it could not be in many particulars, if we were to begin to re-organize our navy under a well digested system of economy.

Leaving this point of the subject to experts in that line, I now come to speak on the part most familiar to me, the sparring and rigging of *cruising ships*. These are a class of vessels that we cannot do without, if we desire to get the first well planted blow at the commerce of an enemy, and if we are to encourage the education of sailors. Monitors and heavy iron clad ships for coast and harbor defense are all very well,and will be very necessary for home use; but they are unsuited to act as cruisers and as training schools for sailors. I shall therefore confine my remarks to wooden or iron full rigged ships with steam enough to go ten or twelve knots with a moderate consumption of fuel, and to sail with their screws disconnected or turned up, as fast as any good modeled ship of their size. A well organized navy belonging to a commercial nation, likely to come in contact with another commercial nation, apart from monitors and iron clads, should have a considerable fleet consisting of at least three grades or sizes of cruisers. Suppose No. 1 to be 2,000 tuns—say about 240 feet long by 42 feet beam; No. 2, 1,150 tuns, say about 200 feet long by 35 feet beam; No. 3, 720 tuns, say 170 feet long by 30 feet beam. Now the rig of these vessels should be so proportioned, that the spars and sails in each should be available in the same ship in several places; for instance, the fore yard should be of the same length as the main top-sail yard, the lower fore top-sail yard the same as the upper main top-sail yard and the same as the cross-jack yard, the upper fore-top sail the same as the main top gallant and the lower mizzen-top sail, the fore top-gallant yard the same as the main royal and upper mizzen-top sail, and the fore-royal the same as main sky-sail (if one be needed, which I doubt), and the same as the mizzen-top gallant yard; and the fore sky-sail (if one be required) the same as the mizzen royal.

The sky-sails are only named by way of illustrating the different grades of sails and yards. The fore sail, too, might be of the same size as the main top-sail, the fore top-sail the same as the cross-jack sail; this implies very short lower masts, and consequently shoal courses, which would not suit naval men, but these are found to be most efficient in the merchant service, and require no reefing.

Now all these sails and spars should be known in naval arsenals by their numbers, namely, main yard and sail, 1; main top-sail and fore sail, 2; top-gallant, or upper top-sail and fore top-sail, 3; main top-gallant sail and upper fore top-sail, 4; and so on; whereby it will be seen the main sail, No. 1, is the only square sail not available on some place in the same ship.

The 2d class ships would have main yard No. 2, and the 3d class would have No. 3 for main yards, and so on to the end.

The same principle should prevail as to the jibs, flying jibs, and stay sails. In the same ship the head sails should fit as stay sails setting between the masts, and they should also be known by their numbers.

The navy storehouses would always have sails and spars ready for emergencies, known by their numbers, so that a ship arriving at any yard would call for and find her sail or spar ready again. As to anchors and chains and boats, the stream anchor and chain of No. 1 grade ship would be the bower anchor and chain of No. 2. The 1st cutter of No. 1 would be the launch of No. 2, and so on. This system may be carried out almost indefinitely, except as to arms. As to the guns,all vessels should carry as nearly as practicable the same caliber, diminishing the number in the smaller classes. Supposing, for instance, the larger class should mount two pivot and twenty broadside 10 or 11-inch guns, No. 2 could mount two pivot guns and twelve broadside, and No. 3 could carry 24-lb. boat guns on poop and forecastle, and work 6 or 8 broadside guns and if the recoil of a 10-inch gun should interfere on a 30,feet beam with the opposite gun, then cut the ports so as not to come directly opposite. This arrangement would look odd at first, like fidding a top mast or top gallant masts abaft the lower masts, but this is the only proper way to place masts in steamers, and the eye soon becomes accustomed to it, and I think it is not a bad idea to put guns so as to "break joints," so to speak.

The system would be in one sense carried out in the officers, as the smaller classes of ships would be commanded by men of inferior rank to the larger ones; but when you come to the steamers, we want first class men in all if we can get them, and the only way to do this is to give every encouragement to good seamen to enlist and to remain in some degree men-of-war, even when on temporary service in merchant vessels. A man once well trained to gunnery and naval discipline should be subject to call, and for this obligation he should receive a certain sum, and be permitted to enjoy certain hospital rights, and when finally disabled by age and long service he should have a home, even if he should not have been constantly on board of vessels of war. As the law now stands, a seaman must have been constantly, for the very long period of twenty years, in actual service, before he can be taken care of by Government. Last, but not least, every encouragement should be given to the young to sail in vessels of war, or to be trained in naval floating schools, without being compelled to enlist for a long period, or even to enlist at all. In a country like ours, when in time of war we shall be compelled to call on the seamen of the mercantile marine to man our war ships, there will be great economy in trusting to those who have had some previous training.

If I had not already made my communication longer than I intended, perhaps too long to permit of publication in your journal, I should want to add much more on this subject of nautical schooling, both for the navy and for the merchant service. The full development of nautical schools for both is a desideratum which, when fully realized, will restore something of our waning prestige on the ocean, and do much to prevent and mitigate crime on the land, by absorbing a large mass of elements to make excellent seamen, which otherwise would be preparing to graduate in public institutions, namely, by reason of the neglect of parents, and the shortsightedness of legislation and city governments.

R. B. F.

Aerial Navigation.

MESSRS. EDITORS:—I have been a constant reader of the SCIENTIFIC AMERICAN for years, and I must say that there is no publication of the day that I read with equal pleasure and profit. I have been very much interested in the articles on aerial navigation. My sympathies and best wishes are with the men who are now exploring this field, and, notwithstanding the many failures in attempts to navigate the air, I believe it will yet be accomplished. I wish here to call attention to the false argument of the *Philadelphia Bulletin*, as quoted in the second article on aerial navigation. We quote: "A ship is steered in the water because the action of the wind on the sails, and of the hull in the water, can be brought to counteract with each other by means of the rudder. Now, a flying machine is in but one element, and, hence, can never be steered."

Now, the fallacy of this argument must be apparent to every one who gives it the least attention. We have yet to learn that the two elements are necessary in order to the steering of a ship. It will not be denied that this is true of sail vessels, which depend upon the wind for motive power; but but when this motive power is stored in the vessel in the form of powerful engines, the one medium alone is used, both for propulsion and steering, and the vast difference claimed in the above quoted remarks, between the propulsion and steering of a vessel in water,and that of an aerial ship, is not nearly so apparent as when illustrated by a sailing vessel. On On the contrary, by taking a steam ship as the embodiment of the principles sought to be applied to aerial ships, it will be seen that the cases are completely analogous. If, then,the navigation of the air, by a steam vessel, is governed by the same principles as the navigation of water by steam vessels, what are the means necessary to apply those principles to the proposed object?

It is well known that the speed of a vessel steering against a curret, depends upon the excess of space passed over by the paddles or propeller, in their revolutions, to that of the current in the same time. In other words, the velocity of the circumference of the paddle wheels must be greater than the velocity of current. If the two be equal, it is apparent that no progress can be made—the vessel will drift upon the current. Neither can the vessel be guided. But, by increasing the velocity of the paddles sufficiently above that of the current, progress and direction are at once attained.

Now, the mechanical principles here employed to propel a vessel against a current of water would, if applied to the analogous case of the aerial ship, be productive of like results. But these principles must be largely extended in their application to the latter case if satisfactory results be reached. We regard the general conditions, necessary to success, to be:

1st. Engines constructed with a view to economy of space and fuel, the minimum of weight and the maximum of power.

2d. Propellers of large area compared to size of ship, and working at high velocities—rudder of like proportions.

3d. Gas holder of sufficient capacity to give ample buoyancy, and of a form presenting the least possible resistance to the air.

We think there is little danger of going too far in either of the directions indicated. These conditions complied with, success will result. T. A. HUFFER.

La Fayette, Ind.

The Recent Aurora.

MESSRS. EDITORS:—At 5 A. M. this morning I was awakened by a brilliant rosy light flooding the entire room. I arose and thought there must be a large fire at no great distance. Further observation proved the existence of a magnificent aurora, of a rosy hue, extending from northwest to southeast to 2° west of the zenith. One mass was very striking, a column 2° south of Ursa Major extending to 3° east of zenith, of a deep lake, so intense as to cast a shadow. At times an undulating curtain of light would form over the sky, then fade into increasing spears of dark and light. The aurora lasted till 16:45 A. M. Barometer, 29·009; thermometer, 28°; needle, 8° to 11° 30'; wind w.; force, 7. Latitude 40° 1' 00"; longitude 75° 10' 00".

ERNEST TURNER, C.E.

Germantown, Philadelphia, Pa., Jan. 3, 1870.

THE PRIZE ENGRAVING.—Letters acknowledging the receipt of the engraving are pouring in from all quarters, and every writer, without an exception, expresses great delight with his picture. It is gratifying to receive such unqualified testimonials of satisfaction from our friends.

[For the Scientific American.]

ON CHROMIUM.

BY PROFESSOR CHARLES A. JOY.

One hundred years ago a Saxon mineralogist named Lehman, was a good deal puzzled by a red mineral that was thought to contain gypsum, iron, and lead, and which was called red-lead spar. He wrote about it to Buffon in the orthodox Latin of the day—*de nova minera plumbi specie crystallina rubra*—but no one could tell him what it was.

Each successive chemist who examined it detected something new, and the ore was in a fair way of contributing a complete mineralogical cabinet in itself, until the famous German Klaproth, the father of analytical chemistry, announced that it contained a new metal; and the equally famous Frenchman, Vauquelin, discovered in it a new acid, which, on account of the beautiful colors it forms, was called in the Greek tongue *chroma*; and from the Greek we have the English word chromium. As soon as these two discoveries were announced, many of the chemists of the day attacked the mineral; and it was not long before they found that it was a very innocent thing and was composed of chromate of lead.

And here the history of this element would have come to an end, if, some years later, an iron ore had not been discovered in France, which also contained it, and thus afforded it in sufficient quantity for the various uses to which it was destined to be applied. Chromium ore has since been found in a good many localities, among others in the United States, near Baltimore, where it is a source of profit to the owners of the mines.

All attempts to prepare metallic chromium in any quantity have failed, and it is probable that no one has ever seen the pure metal. We can give an account of what has been done in the matter, and leave our readers to infer how near the various chemists have approached to obtaining it.

Fremy passed the vapor of sodium over chloride of chromium, and obtained in this way chloride of sodium or common salt, and a powder which he took to be the metal in a fine state of division. Under the microscope, perfectly regular octahedra were revealed, and what is singular about it is, that no acids, not even aqua regia, had any effect upon the powder. Fremy's metal was exceedingly hard, and so were its alloys. With iron it yielded needles which looked like cast iron, and were harder than steel.

Deville also tried to prepare chromium by reducing the oxide with charcoal at a very high temperature, but he was unable to obtain a perfectly homogeneous mass, although the heat was sufficient to convert platinum into a vapor.

The button obtained by Deville was as hard as corundum, was easily attacked by hydrochloric acid, slightly by sulphuric acid, not at all by nitric acid. Its specific gravity was 5·9. This was not the pure metal but a mixture of carbon and chromium.

Woehler also made an effort to obtain the metal by reducing the chloride of chromium with zinc. The regulus thus procured was an alloy of zinc and chromium from which the zinc was removed by nitric acid, leaving the chromium as a crystalline powder. This form of chromium is a clear gray, crystalline, shining powder, dendritic under the microscope, not the least magnetic, with a specific gravity 6·81. It is remarkable that an attempt to reduce the chloride of chromium by means of cadmium resulted in an explosion; but magnesium was found to serve as well as zinc. It is said that chromium can be prepared by passing hydrogen gas over its amalgam, and also that the chloride of chromium can be decomposed by electrolysis, as was done by Bunsen, in the form of laminæ resembling iron.

According to Loughlin, the sesquioxide of chromium can be reduced by a mixture of cyanide of potassium and animal charcoal. Prepared in this way it has the specific gravity of 6·2.

Bunsen's method of throwing down chromium by means of the battery has been proposed to be employed for electroplating, and a patent was taken out in England for this purpose. None of the alloys of chromium have any technical value, although several of them, as, for example, chromium with iron, zinc, copper, and tin, have been patented. It is not impossible that, in consequence of their hardness, some of them may ultimately prove of value.

Debray decomposed the chromate of lead and obtained an alloy with lead similar to Woehler's alloy with zinc, which he afterwards decomposed by nitric acid, and thus obtained the metal as a powder.

Peligot got a dark gray powder by reducing the violet chloride by means of potassium.

The specific gravity of the metal is given by different authorities at 5·9, 6·2, 6·8, 7·3—and researches differ quite as widely in reference to its behavior to acids, and in many other respects. From all of these observations it will be apparent that we know very little, as yet, of the properties or possible uses of metallic chromium—but the same remark cannot be applied to its compounds, as they are among the most useful and best understood salts we have in the whole round of chemistry.

MILK---FROM THE DEPOT TO THE CONSUMER.

WRITTEN FOR THE SCIENTIFIC AMERICAN BY A MILKMAN.

In your issue of Jan. 1st, I was much interested in reading an article on "Milk and what comes of it."

It gives the many consumers of milk in this vast metropolis, a very clear and comprehensive idea of the treatment of milk, from the time of milking, until it reaches the city; and closes with a few indefinite remarks, in regard to price, water, freight, and profits, which are liable to misconstruction, and are apt to mislead the consumer; in view of these facts, with your kind permission, I feel impelled to give you a supplement to the article referred to.

I think that almost every one is aware that from time immemorial, milkmen have been the jibe and jest of young and old, while the jokes and squibs relating to their treatment of milk, or "fixing it for sale," rival the adventures of Munchausen, or the travels of Gulliver. Indeed, to such a degree has this been carried, that it is really wonderful to see the enormous exaggerations that sensible, intelligent persons will swallow at a single gulp, and, should any one speak a favorable word for that proscribed class, the same expression that one of old was met with by the Jews, would be thought if not spoken, "How can any good thing come out of Nazareth?"

Strange though it may seem, there are honorable, honest, and respectable retail dealers of milk, in this city, to whom it is a source of regret to be obliged to furnish you on Sunday morning, with what you consider an indispensable auxiliary to your cup of coffee.

Neither the business, nor the inclination of but few of your readers, will induce them to rise early enough to inhale the fresh, invigorating morning air, and accompany me over a milk round and see for themselves; so if you will become the vehicle of communication, and your readers will accompany me in imagination, I will try and give them an idea of the way milk is served to them.

The time is 3 o'clock A. M. The horse tackled to the wagon, and cans in readiness, we proceed to the milk depot of—say the Harlem Railroad, which occupies half of the square bounded by 4th and Lexington avenues, and 47th and 48th streets. On arriving here, you will see a train of ten or a dozen cars, arrived some two hours since, and a hundred and fifty teams already here before you, and there will be no diminution in the number, some going, some coming, till the morning has well advanced; and the din of voices, gesticulations of drivers, clattering of hoofs and wagons, and rattling of cans, the apparent confusion prevailing, to obtain the most favorable position at the platform (which extends through the block on two sides of the depot), will present a scene of novelty that will not soon be forgotten. Our first business is to pay the freight, and ascertain how many cans our farmers have sent us this morning; we take all their dairies produce (this is invariably the case), and as each one milks from fifty to eighty cows, the slight variation of a pint to a cow will make a difference of a can or more in his amount.

The railroad company never trusts, so we have our money ready to pay the freight and receive our slip, or account of cans. The freight is one and a half cents per quart, and if a kettle leaks out, or is spilled by the carelessness of the employés of the railroad, as is not unfrequently the case, still we must pay the same as though the cans were all full, or they will not deliver us our milk. With our slip in hand, which is our voucher, we proceed to the car containing our supply, show our slip to the car tender, and he allows us to get our cans, which are marked with the farmer's initials, the number of the station, and labeled to the dealer. Having easily procured them, we roll them on edge to our wagon, and there taste the milk, the quality of which is told by an experienced person, as readily and more so, than an easy living, robust bacchanalian can detect the different qualities and flavors of wine. Should we be suspicious that a can will not keep, we must sell it or take it home and churn it.

If the supply is too great, we sell a can or more to a brother milkman who is short. If we have not enough, we buy. If the supply is scarce, we often pay more than our customers pay us, so that we may lose none, and if the supply is very great, we sell at even less than cost price; this part of the business is generally carried on, these later years, by speculators, or middlemen; the agent at this depot being one of the chief. In the summer time a great deal of sour milk comes over the road, especially during hot, murky weather, or after a severe thunder storm. Our German friends absorb a great portion of this milk in making pot cheese, smear kase, and sundry other articles of diet, peculiar to themselves, and a portion is churned for fresh (unsalted) butter, which our French and Jewish population are very fond of. Our quantity being correct, we turn the milk from the farmers' cans into our own, leaving theirs to go back, and off we start for our first customer.

But how is this, I fancy I hear one of you say, how about the Croton? Well, Sir, that is one of the things that you are so willing to be deluded about, as you have seen me this morning, so you see me every morning; and where water is used it is the exception. In that respect we milkmen have few secrets from one another, and though one should know another to use water, a principle of honor would prevent him from promulgating the fact. Yet, I am sorry to say that truth compels me to say, I have seen it done. I had the supervision, and was formerly agent for one of the largest milk companies in this city, and have now a business of my own, and I have *never* seen water used to "stretch" the milk, or any other adulteration whatever, where I have been concerned, nor have I seen anything of the sort, except in a very few cases. I have been at pains to inform myself in the matter; the farmers sometimes add a little water, as they say "to keep the milk," but they are soon found out, and their dairies go a begging. But we must hurry up to get our customers served; we go across this street, down that avenue round the corner, down to the next block, and so backward and forward, up and down, serving one customer here, another there, till you are completely puzzled, and wonder how a milkman ever learns to serve a round. Well, that is not one half; in one place we have a key to the area gate, in another the key to the front door, in another we open a window, and pour the milk through a long spout in a small kettle into the receptacle—the grating in front of the window preventing us from reaching the dish; and so on, more than forty or fifty different ways of serving.

Then, too, some have a regular quantity every day; some vary, and some have tickets; some pay by the week, some by the month; all this has to be remembered (for few have books with them) so that the accounts can be correctly set down when we get home. Then we must remember who paid money, so as to give them due credit, and who wants tickets, so that we can take them a supply to-morrow; but we must hurry on, or we shall be late and customers will find fault. You see a half minute late at each customer, supposing our round to number 120 customers, makes us one hour late at the last customer; and of course, they would all like to be served before breakfast; one half the customers in milk in this city are served before they are awake, and in many instances a milkman never sees his customer, or they their milkman, especially if they are "good pay."

With regard to profits, I suppose the average of retail rounds is not far from 160 quarts, more less than that there are over; by the article previously referred to, 160 quarts cost $11·20—but wait a moment, customers generally insist on a little more than is their due, "good measure," they say. It is close dipping to come within five quarts to the hundred, making eight quarts more to pay for. First cost of one day's supply, $11·76; freight, 1½ cents per quart, is $2·52; rent of stable and horse feed is cheap at $1·50 per day; and $1·75 to driver, makes a total of $17·53; now 160 quarts at 12 cents per quart, is $19·20; at 10 cents, is $16·00; so you see, when a milkman serves a customer at 10 cents in winter, he is losing money. I say to customers when a milkman offers to serve you at 10 cents at this season of the year, look out, something is wrong; it is better for you to buy a pint of a respectable dealer for 6 cents and put in the Croton yourselves. At 12 cents, the profit on a round is $1·67 per day. It must be taken into account, however, that wagon, harness, and kettles, are wearing out, and must at some time be renewed, then too, horses are liable to mishaps, and sooner or later must be replaced. You may take off the 67 cents, then—and it is a small allowance—for these expenses, that will leave $1·00 per day profit; one fourth of this remainder, will not more than balance your losses from "bad pay;" 75 cents a day then is the net profit on an investment of from one thousand to fifteen hundred dollars—that is about the average price of milk rounds, though you may buy a round cheaper, with an old, or lame horse, and a wagon that needs constant repairs.

Is the profit too great? Then tell your milkman you must have your milk cheaper; if he is an honest man you will drive him out of the business, if he is dishonest, then "look out for showers about this time," and your milk will serve as a barometer; these are the views of a milkman who is a constant reader of your valuable journal.

IT has been found that in all parts of the world arable land contains traces of phosphorus and magnesia, and various speculations have been hazarded as to the probable origin of these substances. M. Reichenbach, who has given much attention to the subject of shooting stars, has concluded that they constitute the source; and, seeing that the metallic dust accruing from the combustion of meteorites and shooting stars must have been rained upon the earth for myriads of years, it can hardly be doubted that the components of these bodies must be found widely diffused in the soil. To test the validity of this hypothesis, M. Reichenbach analyzed earth obtained from the tops of different mountains never before trodden by the foot of man, to ascertain if it contained nickel or cobalt, which are common constituents of meteors, and he found these metals to be generally present.

COTTON SEED AND COTTON SEED OIL.—We have in course of preparation some valuable illustrated articles upon the manufacture and purification of cotton-seed oil, which promises soon to become an important branch of industry, and one of especial value to the cotton producing States. The series of articles will be prepared by a French chemist thoroughly versed in all the details of the manufacture and trade, both theoretically and practically. We should be glad to have our Southern exchanges take notice of this announcement.

COMMISSIONER WELLS' ACCURACY DISPUTED.—A memorial to Congress prepared by proprietors of thirty-seven iron furnaces in the Lehigh, Schuylkill, and Susquehannah regions, recently published, maintains that instead of from $24 to $26 per tun, which the Commissioner instructed Congress was the cost of manufacture of pig iron, it ranges from $29 to nearly $30 per tun, these latter figures it is claimed being rather below than above the average.

SPOTS ON THE SUN.—We are in receipt of several able communications on the "Origin of the Solar Spots." With the present pressure on our columns we find ourselves unable to devote more space to this discussion than has been already allotted to it. Correspondents who have favored us with essays upon this subject can have their manuscripts returned to them by writing us to that effect, and inclosing postage stamps.

ACCORDING to the Frankfort *Zeitung*, an important (*sic*) discovery has been made by Herr Kircher, of Wurtemburg, of a new printing ink. The essential part of the discovery is that, by a peculiar process, the ink can be completely removed from the surface of the paper, at a cost of half a dollar (one gulden) for every hundred pounds of printed paper, and the material is then ready for use again.

Improved Motive Power for Domestic Purposes.

Our engraving is a representation of a new domestic motive power, or mechanical movement designed to transmit the force of a weight or spring to the propulsion of a churn, pump, or other light machine employed for domestic purposes. The minute details of its construction will be at once understood by any mechanic on inspection and need not, therefore, be dwelt upon.

Our artist has placed it in strong contrast with that other domestic motive power, which good housewives have found so difficult to manage and from which so many pray to be emancipated.

Mechanical powers of this character have not hitherto been very acceptable as aids to domestic work. Some have required too heavy weights, others using too much rope, and all requiring too much labor in winding to be labor-saving machines.

The inventor of this machine claims to have produced a power free from the objections named, as well as others not specified but which have proved insurmountable obstacles to the general introduction of other devices of the kind. It has a light weight and a short rope, and is easily wound by a woman or a child. It is also simple, compact, and cheap.

It is further claimed to make a splendid and powerful down dash, and it has a reversible or gathering dash to gather the butter. It occupies a space on the floor of only 18 by 20 inches, and is about 40 inches in hight. It is provided with a regulating lever to make the dashes slower or faster without changing the weight.

GALE'S CHURN POWER.

We are assured that all the advantages claimed have been established by actual test in practical churning. The movement consists of a double or twin gear escapement, spanned by a crossbar, having adjustable pawls to carry force to the balance wheel, thereby securing the benefit of a long lever to receive great force in close proximity to the driving wheel. It is applicable to any size of churn, and makes from forty to sixty dashes per minute; the speed being governed by the governing lever. It is also asserted to make better butter than hand churning, because the stroke is more uniform. It can be wound up in one minute to run half an hour, or in two minutes to run one hour.

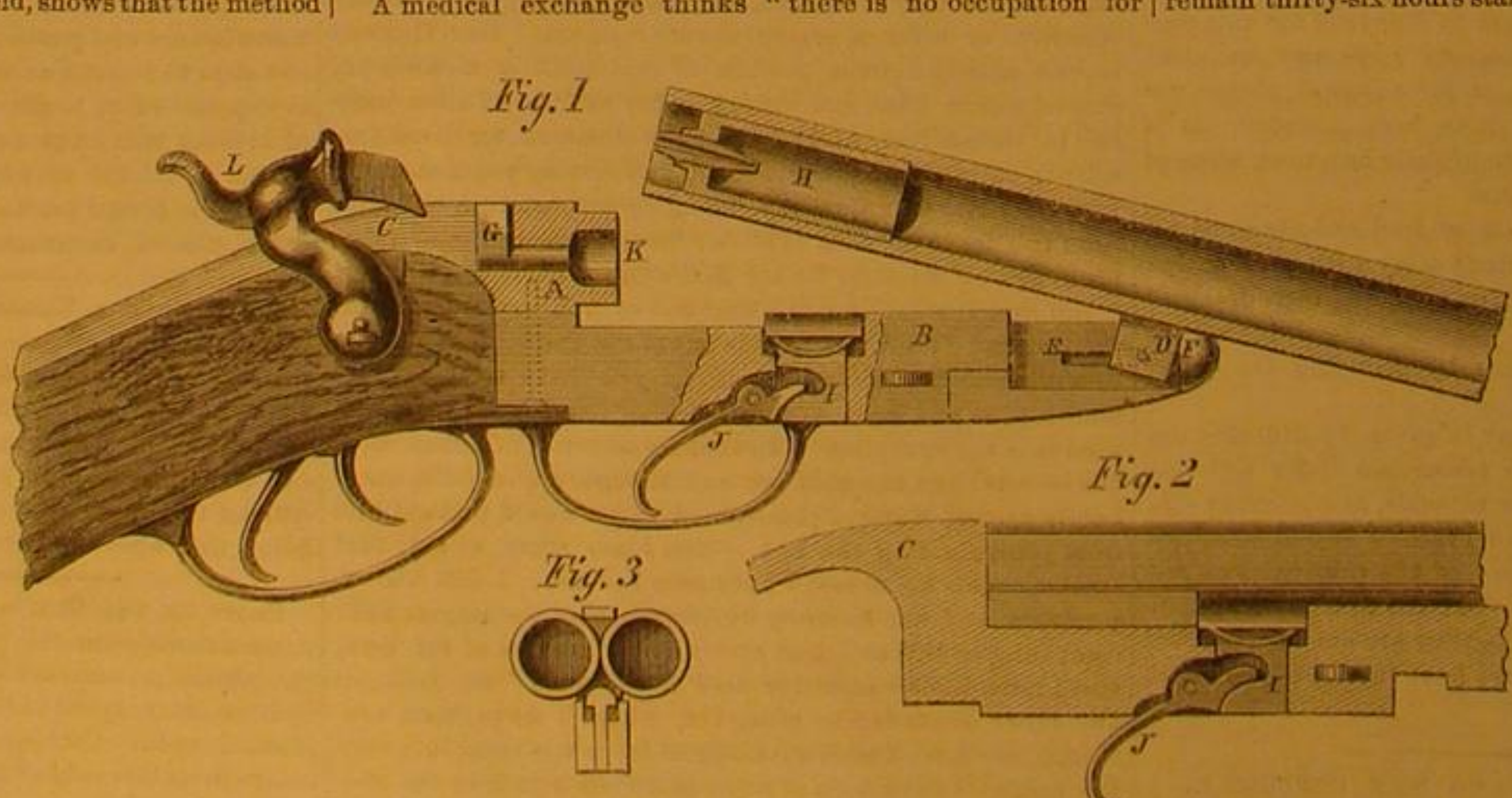
Our engraving represents the old tedious and laborious mode of working the dash by hand, in contrast with the movement we have described, where the power is self-working, giving the attendant time to sew or read while the machine is churning. It is also, as we have said, applicable for turning cylinders for coffee roasting, also for pumping water, for running sewing machines, or any kind of work where light mechanical power is required.

This device was patented through the Scientific American Patent Agency, Nov. 2, 1869. Parties who wish to confer relative to buying territory will address the patentee, D. A. T. Gale, Poughkeepsie, N. Y.

Improvement in Breech-Loading Fire-Arms.

A great number of improvements in breech-loading fire-arms have been made, and the great amount of inventive genius which has found scope in this field, shows that the method of breech-loading is ultimately destined to almost entirely supersede the method of muzzle-loading, in arms used for sporting as well as military purposes. A serious drawback to many of the arms of this class is the danger of their being accidentally discharged while the loading is going on; and it is regarded as the chief advantage of the gun, engravings of which we give herewith, that this accident can never occur in its use.

Fig. 1 represents a longitudinal section of this arm. Fig. 2 is a central longitudinal section, and Fig. 3 a cross section through the catch, I, Figs. 1 and 2.



HECKENBACH'S BREECH-LOADING FIRE-ARM.

A is the breech-block, having a forward extension, B, and a tail-piece, C. The double barrel is attached to the forward extension of the breech-block by lugs, D. These lugs are pivoted to B by a pin which plays in a slot, E, made in the front part of C. This arrangement allows not only a swinging motion of the barrel, but a sliding motion forward and backward. A cross-head, F, limits the motion of the barrel, and sustains it in the position shown in Fig. 1, while the loading is going on. Breech pieces, K, project from the breech-block, A, which, when the barrels are thrown down and slid back, as shown in Fig. 2, fit into and close the rear ends of the barrels, and also serve to help to hold them in position.

The position shown in Fig. 1 is that occupied by the barrels while the shells, H, are being inserted. These shells are made of steel large enough to receive the entire charge of powder and ball, or shot, as the case may be. Its front end fits closely against a shoulder on the interior of the barrel, and from this rear end projects a nipple upon which the percussion caps used are placed. When the piece is closed, as shown in Fig. 2, a spring catch, I, Figs. 1 and 2, holds the barrels from moving again until released by the action of the trigger, J.

The cap is exploded when the piece is closed by the action of the hammer, L, on the sliding bar, G; the front end of the latter fitting closely against the cap, when the piece is loaded.

The aperture in the nipple is widest at its rear end, and tapers to the front, where it is perforated by a cross bore, which, with the terminus of the longitudinal bore, makes three passages by which fire is communicated from the fulminate in the cap to the powder in the shell. The nipple is pointed on the inner end, so that it will pierce a cartridge and penetrate the powder. One or two of the passages described may be closed without interrupting the firing, and thus the piece is less liable to miss fire than if a single aperture were used.

The case or shell, H, forms a reliable measure for the charge, and also serves to keep the barrel clean, and in constant working order. The cases may be recharged as wanted, or extra ones previously charged may be employed.

As a sporting piece we regard this arm as very convenient, and likely to become popular. Patented through the Scientific American Patent Agency, June 22, 1869, by J. A. Heckenbach, whom address at Mayville, Wis.

Occupation for Women.

A medical exchange thinks "there is no occupation for which women are better fitted by nature than that of the chemist or druggist. The science of chemistry can be as readily learned in the school and laboratory by woman as by man, and, as an art, it requires the delicate manipulation, fine perceptions, and mathematical accuracy, in which woman excels. In the drug stores for dispensing medicines, but little physical strength is needed, and the business is very remunerative. The late frequency of fatal accidents, resulting from the carelessness of drug clerks, in putting up prescriptions, points with emphasis to the expediency of substituting female prescription clerks, as, other things being equal, the superior conscientiousness of women, especially where human life is involved, would go far to insure safety."

The Oyster Trade of Baltimore.

There are now licensed by the State 560 vessels, all engaged in bringing oysters to Baltimore from the Chesapeake and its tributaries within the limits of Maryland, and all those vessels are employed eight months of the year, and their average capacity is about 600 to 700 bushels, which makes an aggregate of about 4,000,000 bushels of oysters per year. Each vessel employed in the trade has an average of five men, which, in that branch of the business, makes an aggregate of 3,475 men. The greater part of the oysters brought to this market are packed and shipped, though many find their way to the west in the shell. There are in the city nearly one hundred packing houses, which give employment to five thousand persons the greater part of whom are females. In those houses where the oysters are packed raw, men are employed as shuckers, but in those where they are steamed females almost entirely are employed. Connected with this trade is the manufacture of tin cans, and while many of the larger packing establishments have a part of their cans manufactured on the premises, there are very few who make as many as they use. There are besides, some ten or twelve factories which do no other work, while immense numbers are made by the convicts in the Maryland Penitentiary, and by the inmates of the House of Refuge. The machinery for the manufacture of cans has been made so perfect that two or three men at the machines in cutting out and forming the cans will keep from twenty to thirty solderers to work. It is estimated that about five hundred persons are employed in the manufacture of cans.—*Baltimore Gazette.*

Paper Blue.

An invention which promises well for laundry establishments has been patented in England. According to the *Mechanics' Magazine*, it consists in substituting blue coated paper for the ordinary blue bag, and is more economical as well as more convenient. In manufacturing this article the inventor takes indigo of the best quality, and after it is finely ground and sifted he dissolves it in acid in the proportion of 3 lb. of acid to 1 lb. of indigo, and allows the mixture to stand for three days. After this there is added to every pound of indigo 20 lb. of water and 5 lb. of cow hair, the whole being boiled for three hours or until it becomes of a greenish hue. This is then allowed to remain twenty-four hours standing. The hair is then taken out and washed in clear cold water until a beautiful blue color appears. The hair is then put in ten gallons of water and boiled, and, whilst boiling, potash is added in the proportion of 10 lb. of potash to 1 lb. of indigo, thus rendering the indigo solution free from acid. The whole is then strained and evaporated to half its bulk, and allowed to remain thirty-six hours standing. Two fluids are now formed; the upper thin portion, when mixed with size, can be used as a blue writing ink; the lower portion, containing the real indigo-carmine, is then put in a wide but shallow vessel, and some glycerin added in the proportion of ½ oz. of glycerin to 1 lb. of indigo. Unsized paper is then dipped in the solution, and in a few minutes the paper takes up the coloring matter. The paper is now dried and pressed, and is then ready for use as a coloring and bleaching agent for use in the laundry, and for manufacturing purposes. Professor Attfield, F. C. S., has had this paper blue submitted to him, and he writes that he has fully examined and tested it, and is of opinion that it contains nothing likely to injure the fiber of linen goods in any way whatever, and that it possesses many advantages over the older forms of blueing.

M. ABEL accounts for the difference remarked in the nature of the explosion produced by various substances when they act upon matter of a different kind by supposing that the explosion produces a certain kind of vibration that may or may not be synchronic with that produced in the body operated upon by the explosion.

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN, S. H. WALES, A. E. BEACH.

"The American News Company," Agents, 121 Nassau street, New York.
"The New York News Company," 8 Spruce street.
Messrs. Sampson, Low, Son & Marston, Crown Building, 188 Fleet st. Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.
A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.

VOL. XXII., No. 3 . . . [NEW SERIES.] . . *Twenty-fifth Year.*

NEW YORK, SATURDAY, JANUARY, 15, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

THE PROGRESS OF THE PHYSICAL SCIENCES IN THE YEAR 1869.

There have been no conspicuous and startling discoveries in the year 1869, but the progress of our knowledge in every department of the physical sciences has been as great as at any former period. Purely theoretical investigations have given place to the practical applications of previous discoveries, and we have, as a result, a great improvement in every thing that relates to the amelioration of the condition of mankind.

We propose to pass in review some of the most important investigations that have been carried on during the past year.

NEW METALS.

The discovery of a new metal associated with zirconium, was announced some months since, but scarcity of material has prevented a more careful study and description of it. It is proposed to call it "Jargonium," after the name of the mineral in which it was found. At present our knowledge of this element is limited to a description of a few of its salts. Its oxide is used as a pencil in the oxy-hydrogen light and appears to withstand the heat as well as magnesia or lime.

The important researches of Graham on hydrogenium belong chiefly to this year, and are among the most important of any that have been announced. We are not prepared to exhibit a specimen of metallic hydrogen, but are nevertheless entirely convinced of its metallic character, and are fully acquainted with its properties.

The metals dianium, wasium, ilmenium, terbium, and norium have sunk into suspicious obscurity, and we shall probably never hear of them again. There are now fifty-two metals known to chemists, all of which have been made the subject of study during the past year, and some of them are growing in favor. Better ways of making zinc have been devised, and that metal is coming more and more into use in buildings and for ornamental purposes.

IRON AND STEEL

are manufactured on a vast scale, and the chief progress has been in improvements on the Bessemer process and in the construction of blast furnaces. The very valuable invention of Ellershausen for the conversion of crude cast iron, as it runs from the blast furnace, into wrought iron of fine quality, by the admixture of iron ore, is of American orgin, and has been chiefly worked out during the past year.

RARE METALS.

Our scientific knowledge of the properties of cæsium, rubidium, cerium, indium, uranium, molybdenum, tungsten, vanadium, thallium, and osmium, has been materially increased, but nothing practical has grown out of the subject.

POTASH.

A total revolution has occurred in the production of this salt since the discovery of the Stassfurt mines. Instead of coming from America and Russia, it is now found in vast deposits under the earth, and the whole business of the manufacture of saltpeter and of carbonate of potash has changed its base of operations, and has been transferred to Germany. By the side of potash has grown up an industry in bromine that is destined to materially affect our use of that element.

ANILINE COLORS.

The great contribution of chemistry has been in the production of new and magnificent colors from coal tar. Nothing can exceed the beauty of some of the shades of red, blue, and green invented during the year. The whole aniline industry is founded upon profound scientific research, and on this account it is destined to still greater triumphs.

CHEMISTRY AND ASTRONOMY.

During the year 1869 the extraordinary spectacle has presented itself of astronomers turning chemists. The telescope has been exchanged for the spectroscope, and mathematics has been laid on the shelf. Our observatories have become chemical laboratories, and the physical conditions of the sun's atmosphere, its protuberances, and the source of light and heat, have been chiefly studied, and all of the heavenly bodies have been brought down to earth for accurate analysis. No sooner was the computation of the time of the last total eclipse completed than the slate was thrown aside and preparations were made to photograph every stage of the obscuration, and to study the light of the sun by means of the spectroscope. The chief preparations were chemical ones, and the most novel discoveries were in this department of science. We are now acquiring information of the moon's temperature and atmosphere. We find hydrogen in the sun, and curious bands in the fixed stars and planets, and a system of telegraphing to the nearest star is no more impossible now than the submarine cable would have appeared to the man of science fifty years ago.

DISSOCIATION.

The material for the study of the theory of Laplace and for the solution of the gaseous condition of the sun has been gradually accumulating under the unfamiliar name of dissociation. This important doctrine is destined to play a most conspicuous part in the investigations of 1870—the foundation for which has been laid during the last twelve months. It is not a new doctrine, but has been revived by Henry St. Claire Deville, of France, and given its present name. It is just the opposite of association, and means that the chemical elements can be so separated or dissociated that they are out of the reach of the action of affinity, and thus are suspended independently in space. The study of astronomy and of geology will be greatly affected by a nearer knowledge of the laws of the tension of dissociation, and we can only allude to it as one of the dawning glories of the coming year.

ELECTRICITY.

The year 1869 has witnessed the publication of valuable works on the application of electricity to therapeutics, and what was for a long period in the hands of charlatans and quacks is now recognized by men of pure science as worthy of the most careful study. The result has been the invention of better apparatus, more portable and constant batteries, and a more accurate knowledge of the physiological effects of electricity.

The electric light has been brought to great perfection during the year, and for purposes of signals and for researches in anatomy through the intermediation of philosophy and the magic lantern, its uses have been very great. This form of artificial light appears destined to play an important part in the lecture room as an aid in the illustration of the study of the lower forms of life, and of its minutest cells as revealed by the microscope. All of these objects can be thrown upon screens and magnified to an extent that admits of a study that was never before possible.

The thermo-electric battery and the magneto-electric machines have made little progress during the year.

NEW MEDICINES.

The most important contribution of chemistry to medicine has been the hydrate of chloral. This substance is not to be considered as a substitute for chloroform, or an anæsthetic agent, but as a sedative and hypnotic it appears to have no rival. It will put a patient to sleep in cases of the most acute suffering—in delirium tremens, in insanity, and under circumstances that were not possible to be reached by any other remedy. It is a solid substance, easily soluble in water, of an agreeable, aromatic odor, and of sweetish taste, and can be taken along with the food without suspicion. The recovery from its effects is not attended with nausea or any of the consequences that usually follow the opium alkaloids. There are other remedies for which the pharmacopœia is indebted to chemistry, but the details would involve us in too many technical phrases, so we omit them.

DISINFECTANTS.

One of the most important contributions to sanitary science has been the introduction of the earth closet, founded on the disinfecting property of dry earth. It is difficult to overestimate the importance of this application as a preventive of fevers and cholera, and as effecting a saving of a most valuable compost. Another matter of sanitary and economical importance is the introduction of the Norwegian felted boxes into domestic use. The theory of heat is here practically applied in an important way, effecting a saving of fuel and securing better cooked food.

PHOTOGRAPHY.

Carbon prints have been brought to great perfection, and processes have been invented for transferring photographs upon metallic plates so as to print under a press. The most successful invention of this latter kind is the direct printing process of Albert, of Munich. By this invention several thousand pictures can be produced in a day upon paper that will not require mounting, and with ink that will not fade. Attempts to dispense with silver have thus far failed, although Dr. Bolton, in this country, obtained very fair results with salts of uranium.

SOUND.

Investigations into the properties of sound have been continued with great zeal during the past year, and the leading practical result has been in a more intimate knowledge of the organs of hearing, and a consequent improvement in the treatment of deafness. Practical use is made of the researches of Helmholtz and Tyndall in improved ear trumpets, and in sensitive flames for the detection of burglary. Photographing sound by means of sensitive flames has not been brought to perfection.

PETROLEUM FOR FUEL.

Henry St. Claire Deville, was instructed by the French Academy to conduct a series of experiments upon this important subject, and he has succeeded in inventing a furnace that satisfactorily accomplishes the object. This may safely be regarded as one of the most important inventions of the year.

ILLUMINATING GAS.

The manufacture of illuminating gas been rendered less of a nuisance by the introduction of the iron purification process in the place of the lime purifiers that so long disgraced this branch of industry. The quality of the gas has not been improved in this country, and we are a people who sit in darkness as compared with other nations.

The application of the oxy-hydrogen gas for illuminating purposes does not find favor with scientific men; but its advantages for signal lamps, for the magic lantern, and especially for metallurgical works, are admitted by all.

ARTIFICIAL ICE.

Considerable progress has been made in the artificial production of cold, and ice machines have been set up in New Orleans, Philadelphia, and elsewhere. The method preferred is that of the liquefaction of ammonia, although compressed air and ether engines, and carbonic acid, have been successfully tried in this country and Europe.

METEOROLOGY.

The invention of self-recording meteorological instruments has greatly advanced our knowledge of the laws of storms, and the time appears to be at hand when we shall be able to predict the state of the weather with absolute certainty. What is wanted at the present time is a careful study of the rich material on hand, and its reduction to tables. We are on the eve of important discoveries in this department of science.

MICROSCOPY.

The application of the microscope to the study of the lowest forms of life, has been greater than ever before. The system of immersion has been thoroughly tested, and finds great favor with physicists. Microscopical anatomy has been the great feature of progress during the year, as it has received the important assistance of photography and the electric light. The microscope has revealed to us well organized beings in the lowest depths of the ocean, and has shown us traces of life in rocks that were formerly considered by our most learned geologists as of igneous origin.

CONCLUSION.

We have lightly touched upon some of the more popular investigations of the year and have omitted to speak of many of the abstruse points in the progress of our knowledge of heat and light, of geology and mineralogy, and of natural history. Enough has been said, however, to show that the past year has contributed its full share to the general increase of our knowledge, and that it has paved the way to grand discoveries in the future.

We shall endeavor to give soon a brief review of the progress of mechanical and engineering science during the past year.

SPECIALISTIC JOURNALISM.

No one who watches the growth and progress of journalism can fail to mark the tendency of the age toward the establishment and support of publications devoted to specialties. Newspaper and periodical literature is the most powerful educating agent of the nineteenth century. Compared with it, institutions of learning, from the university down to the free school, inclusive of all intermediate grades, dwindle into insignificance. The pulpit has, to-day, far less influence over the public mind than the religious press. For instruction, the masses turn to the daily, weekly, and monthly publications.

Now, it is manifest that, in any journal or magazine, endeavoring to cover all fields of information, and to teach on all topics, there must, of necessity, be much in which nearly every one of its readers will feel little or no interest. Some will read the sporting news and discussions on breeding trotting horses. Others will turn in disgust from such things to topics of moral and political reform. Some will feel a deep interest in an account of a new variety of potato, while many, not relishing potatoes, will prefer politics. It is seldom or never that a man can be found so omnivorous for information as to follow, with interest, all topics.

Such a publication will necessarily find it impossible to give as full information on any topic as those who make that topic a special study, require; and so a journal, devoting its columns to the full and complete record and discussion of events and discoveries in one particular field finds favor among those who delight in that field more than any other.

The demand for publications of a special character arose in this country many years ago. At first it was confined, more particularly, to scientific, religious, and sectarian publications, but we are now in the full stage of specialistic journalism.

One of the earliest established as well as one of the most successful of American papers of this class is the SCIENTIFIC AMERICAN. Its success is mainly attributable to the fact, that at the outset, it recognized the demand for a paper devoted to the topics which constitute its specialty, and, that while it has ever been a medium of instruction to the masses, it has never allowed itself to lose sight of the fact that, to instruct the masses, it is necessary not to assume a greater standard of general information among them than they really possess. It has, therefore, been an eminently popular journal, and its gradual improvement, since its foundation, is only the reflex of the general intellectual improvement among the masses, to which its efforts have doubtless contributed as much as any other paper ever published on this continent.

The tendency to specialistic journalism will, undoubtedly, increase, and, with the increase, diversity of industry and knowledge. To what length it will ultimately by carried, no one can, at present, predict. That its effect upon the profession of journalism is altogether salutary appears almost self-evident to us. It gives us men who concentrate their abilities upon the study and discussion of few subjects, instead of dispersing them over wide and unlimited regions of thought, and consequently gives strength and comprehensiveness to their productions.

AMERICAN AERONAUTICS---A FLYING SHIP TO BE BUILT.

Our transatlantic friends have done a good deal of talking and writing, and not a little inventing, upon and in the art of navigating the air. From giant projects down to engines of the minutest size and minimum weight, with maximum power in proportion to weight, they have filled the air with the fame of their devices, if not with the devices themselves.

Our trans-continental inventors on the contrary, have made little noise in the world; but if we are to credit statements coming from sources apparently entitled to credence, they are outstripping the rest of the world in this field.

Our readers will recollect the engraving of the aero-steamship *Avitor*, published in a recent number, with an account of a trial, the results of which as stated were not very encouraging. It now appears that the want of complete success in the experiments was, if we may credit our informant, attributable more to causes entirely disconnected from the machine, than the apparatus itself.

A meeting of the shareholders of the Aerial Steam Navigation Company was held on the 17th ultimo at San Francisco, and the Secretary's report read on that occasion details the following particulars.

An experiment made with the *Avitor* had resulted in a triumphant demonstration of the capability of the machine to move against the wind, to ascend or descend, and to be guided to any desired course. To use his own words, "enough has been demonstrated to convince the most skeptical, as well as to confirm the theory of the most scientific, that a machine has been constructed capable of moving through the air by its own power; capable of moving in any direction according to the will of the engineer; capable also of moving against the wind; nay, more, by its system of planes utilizing the adverse winds for the purpose of elevation and progress. This was not all. The committee judged it for the best to remove the model *Avitor* to the then unoccupied Mechanics' Pavilion, which was accordingly done, at considerable expense and risk. Thousands visited it there, and all expressed themselves satisfied that aerial navigation was an established fact. Nevertheless, there were great difficulties to contend with. The numberless gas fixtures in the hall were obstructions to continuous flight, and absolute impediments to the machine soaring to the roof. Still, the easy, graceful, calm power of motion through space was eminently exemplified in this, the first *Avitor*, that fulfilled all the requisitions for aerial flight, viz., sustaining power—propelling power—guiding power. The first was obtained by a spindle cylindroid filled with hydrogen gas, and by a system of planes, which, by their impingement on the air, materially aided the elevation of the machine when in motion; for whereas, when the model was at rest it barely maintained its equilibrium in the atmosphere, the moment it was in motion, and consequently atmospheric resistance obtained, the machine rose, more especially if the breeze were adverse, as was shown on that morning when it traversed the Shell-mound race track."

Naturally the public is skeptical of the truth of such statements as are here put forth, a skepticism which we not only think excusable, but in which we cannot help sharing. Not that we are wholly skeptical as to ultimate success in this field, but the thing has been so often to be done, and yet not done, that we are naturally shy of any sweeping announcements of success, fearing that they may prove premature. While, however, we may well be pardoned for entertaining some doubts, we must say that the action of the shareholders shows that their faith in the success of the invention is rather confirmed than weakened.

The construction committee having advertised for drawings and specifications, for a machine one hundred and fifty feet long with a carrying power of two thousand five hundred pounds—the steam engine and boiler being already constructed and in possession of the company—have accepted those prepared by Messrs. Miller & Haley, who offer to construct the machine for three thousand dollars in gold. This bid has been accepted, and a committee appointed to raise the necessary funds.

The general opinion prevailed at this meeting that the new *Avitor* would prove a triumphant success, and our readers will doubtless join us in cordial good wishes to the enterprise.

There is perhaps no mechanical problem of modern times more absorbingly interesting than that of self propelling air vessels, the solution of which has hitherto bid defiance to mechanical skill; and that the nineteenth century should add still another to its many glorious triumphs, is a consummation all must greatly desire. Success, say we, to "*The Avitor*."

PUMPING DOWN BUILDINGS.

A little recognized, but without doubt a serious cause of danger to heavy and massive structures, is the disturbance of deep water-bearing strata of earth underlying them. The moment a free outlet for the water in such strata is opened, the movement of the water commences to make inroads upon the material of the stratum through which it flows, the results of which will be speedy or slow in their manifestation, according to the peculiar character of the stratum itself.

If the water-bearing stratum be quicksand or of a character approximating thereto, the shifting of the material may be so rapid as to undermine and render unsafe any superimposed heavy structure in a short space of time.

This fact has been illustrated quite recently in a striking manner. The Metropolitan Railway Company in London, having tapped a layer of water-bearing earth extending under the dining hall of King's College have pumped down that building, and have, it is said, brought out of perpendicular to the extent of three inches, the river front of the large structure known as Somerset House. It is feared that unless proper precautions are taken, the safety of several other important structures, including St. Paul's church may be endangered by the operations of this company.

So far as we are aware nothing is determined in regard to the effect of tappings remote from large buildings upon the stability of such buildings; but it seems probable that in course of time a stratum of loose material might shift sufficiently to cause settling in an edifice situated so far from the outlet as to be supposed beyond the influence of any such movements. The subject is one of such interest and importance that more light upon it is desirable.

SILVERING MIRRORS.

The process of coating glass with an amalgam of quicksilver and tin is interesting. Notwithstanding many attempts have been made to secure an easier and less expensive process for converting plates of glass into mirrors, it still remains the principal method by which this important object is attained.

To understand this process it is necessary to understand somewhat of the nature of an amalgam.

When metals are reduced to a liquid state, they will, by their solvent power, often reduce other metals to that condition, although the fusing temperatures of the latter may be many degrees higher than that of the metal which dissolves them. In such cases the dissolved metals mingle intimately with the solvent metals, and in many instances form definite chemical combinations. Such mixtures or combinations are called alloys, but the special term amalgam has been applied to the alloy of mercury with another metal.

Mercury being liquid at common temperatures forms amalgams with a number of metals without the aid of heat, but its most important amalgams are those of tin, gold, and silver. The amalgams of gold and silver are important, as by their formation these metals are readily separated from certain kinds of ores.

The amalgam of mercury and tin is readily formed by dissolving tin in mercury, and this amalgam adheres with considerable force to glass when properly applied.

The process is as follows: The size of the glass being known, a sheet of tinfoil somewhat larger than the glass is spread upon the silvering table. This table is a slab of stone with as perfect a plane surface as can be made by mechanical means. When the tin foil has been sufficiently smoothed, it is brushed over with quicksilver until its surface is uniformly covered. Quicksilver is then added in larger quantity until the fluid metal lies upon the foil to a depth of from two to three twelfths of an inch.

The plate of glass is now gently and slowly slid, its longest side foremost, on to the foil, care being taken that its edge dips beneath the surface of the quicksilver so that no air may be retained between the latter and the plate.

The glass being thus slid upon the quicksilver floats upon it, and the excess of the latter is now squeezed out by the application of pressure to the glass. This is done by placing heavy weights upon the plate; and the table being now inclined, so that the quicksilver flows to one side, the latter is received in a trough provided for that purpose.

Notwithstanding the process is simple enough in its general principles, it requires much skill to successfully silver very large plates, and there are many things connected with it which it would be very desirable to avoid.

Hence many processes for silvering have been devised. Of these, we believe Drayton's has been the most successful, but it has not superseded the use of quicksilver. Mr. Drayton's method consists in depositing a film of pure silver upon the glass, the silver being reduced from a mixture of nitrate of silver, ammonia, and oil of cassia.

CORRELATION OF VITAL AND PHYSICAL FORCES.

ABSTRACT OF A LECTURE DELIVERED BY PROF. G. F. BARKER, BEFORE THE AMERICAN INSTITUTE, DEC. 31, 1869.

The third of the series of lectures now in progress at the above institution, was delivered by Professor Barker, of Yale College, and was one of deep interest. The lecture was illustrated by experiments, and was listened to with marked attention throughout. It is impossible to do justice to this able lecture in an abstract, but we find ourselves unable to spare space for anything more than this.

After an eloquent introduction reviewing ancient and modern opinions on the subject of life, Prof. Barker proceeded to discuss the evidences of vital and physical correlation. The word force had been employed to signify three things: In the first place, it is used to express the cause of motion, as when we speak of the force of gunpowder; it is also used to indicate motion itself, as when we refer to the force of a moving cannon ball; and lastly, it is employed to express the effect of motion, as when we speak of the blow which the moving body gives. Because of this confusion, it has been found convenient to adopt Rankine's suggestion, and to substitute the word energy therefor. And precisely as all force upon the earth's surface—using the term force in its widest sense—may be divided into attraction and motion, so all energy is divided into potential and actual energy, synonymous with those terms. It is the chemical attraction of the atoms, or their potential energy, which makes gunpowder so powerful; it is the attraction or potential energy of gravitation which gives the power to a raised weight. If now, the impediments be removed, the power just now latent becomes active, attraction is converted into motion, potential into actual energy, and the desired effect is accomplished. The energy of gunpowder or of a raised weight is potential, is capable of acting; that of exploding gunpowder or of a falling weight is actual energy or motion. By applying a match to the gun powder, by cutting the string which sustains the weight, we convert potential into actual energy. By potential energy, therefore, is meant attraction; and by actual energy, motion. It is in the latter sense that we shall use the word force in this lecture; and we shall speak of the forces of heat, light, electricity, and mechanical motion, and of the attractions of gravitation, cohesion, chemism.

From what has now been said, it is obvious that when we speak of the forces of heat, light, electricity, or motion, we mean simply the different modes of motion called by these names. And when we say that they are correlated to each other, we mean simply that the mode of motion called heat, light, or electricity, is convertible into any of the others, at pleasure. Correlation therefore implies convertibility, and mutual interdependence and relationship.

Having now defined the use of the term force, and shown that forces are correlated, which are convertible and mutually dependent, we go on to study the evidences of such correlation among the motions of inorganic nature usually called physical forces; and to ask what proof science can furnish us that mechanical motion, heat, light, and electricity, are thus mutually convertible. As we have already hinted, the time was when these forces were believed to be various kinds of imponderable matter, and chemists and physicists talked of the union of iron with caloric as they talked of its union with sulphur, regarding the caloric as much a distinct and inconvertible entity as the iron and sulphur themselves. Gradually, however, the idea of the indestructibility of matter extended itself to force. As it was believed that no material particle could ever be lost, so, it was argued, no portion of the force existing in nature can disappear. Hence arose the idea of the indestructibility of force. But, of course, it was quite impossible to stop here. If force cannot be lost, the question at once arises, what becomes of it when it passes beyond our recognition? This question led to experiment, and out of experiment came the great fact of force-correlation; a fact which distinguished authority has pronounced the most important discovery of the present century. These experiments distinctly proved that when any one of these forces disappeared another took its place; that when motion was arrested, for example, heat, light, or electricity was developed In short, that these forces were so intimately related or correlated—to use the word then proposed by Mr. Grove—that when one of them vanished, it did so only to reappear in terms of another. But one step more was necessary to complete this magnificent theory. What can produce motion but motion itself? Into what can motion be converted but motion? May not these forces, thus mutually convertible, be simply different modes of motion of the molecules of matter, precisely as mechanical motion is a motion of its mass? Thus was born the dynamic theory of force, first brought out in any completeness by Mr. Grove, in 1842, in a lecture on the Correlation of Force, delivered at the London Institution. In that lecture he said: "Light, heat, electricity, magnetism, motion, are all convertible material affections. Assuming either as the cause, one of the others will be the effect. Thus heat may be said to produce electricity, electricity to produce heat; magnetism to produce electricity, electricity magnetism; and so of the rest."

A few simple experiments will help us to fix in our minds the great fact of the convertibility of force. Starting with actual visible motion, correlation requires that when it disappears as motion, it should reappear as heat, light, or electricity. If the moving body be elastic like this rubber ball, then its motion is not destroyed when it strikes, but is only changed in direction. But if it be non-elastic, like this ball of lead, then it does not rebound; its motion is converted into heat. The motion of this sledge hammer, for example, which if received upon this anvil would be simply changed in direction, if allowed to fall upon this bar of lead, is converted into heat; the evidence of which is that a piece of phosphorus placed upon the lead is at once inflamed. So too, if motion be arrested by the cushion of air in this cylinder, the heat evolved fires the tinder carried in the plunger. But it is not necessary that the arrest of motion should be sudden; it may be gradual as in the case of friction. If this cylinder containing water or alcohol be caused to revolve rapidly between the two sides of this wooden rubber, the heat due to the arrested motion will raise the temperature of the liquid to the boiling point, and the cork will be expelled. But motion may also be converted into electricity. Indeed electricity is always the result of friction between heterogeneous particles. When this piece of hard rubber, for example, is rubbed with the fur of a cat, it is at once electrified; and now if it be caused to communicate a portion of its charge to this glass plate, to which at the same time we add the mechanical motion of rotation, the strong sparks produced give evidence of the conversion.

So, too, taking heat as the initial force, motion, light, electricity may be produced. In every steam engine the steam which leaves the cylinder is cooler than that which entered it, and cooler by exactly the amount of work done. The motion of the piston's mass is precisely that lost by the steam molecules which batter against it. The conversion of heat into electricity, too, is also easily effected. When the junction of two metals is heated, electricity is developed. If the two metals be bismuth and antimony, as represented in this diagram, the currents flow as indicated by the arrows ; and by multiplying the number of pairs, the effect may be proportionately increased. Such an arrangement, called a thermo electric battery, we have here ; and by it, the heat of a single gas burner may be made to move, when converted, this little electric bell engine. Moreover, heat and light have the very closest analogy ; exalt the rapidity with which the molecules move and light appears, the difference being only one of intensity.

Again, if electricity be our starting point, we may accomplish its conversion into the other forces. Heat results whenever its passage is interrupted or resisted ; a wire of the poorly conducting metal platinum becoming even red hot by the converted electricity. To produce light, of course, we need only to intensify this action ; the brightest artificial light known results from a direct conversion of electricity. Enough has now been said to establish our point. What is to be particularly observed of these pieces of apparatus is that they are machines especially designed for the conversion of some one force into another. And we expect of them only that conversion. We pass on to consider for a moment the quantitative relations of this mutual convertibility. We notice in the first place that in all cases save one, the conversion is not perfect, a part of the force used not being utilized, on the one hand, and on the other forces making their appearance simultaneously. While, for example, the conversion of motion into heat is quite complete, the inverse conversion is not at all so. And, on the other hand, when motion is converted into electricity, a part of it appears as heat. This simultaneous production of many forces is well illustrated by our little bell engine, which converts the electricity of the thermo-battery into magnetism, and this into motion, a part of which expends itself as sound. For these reasons the question "How much?" is one not easily answered in most cases. The best known of these relations is that between motion and heat, which was first established by Mr. Joule, in 1849, after seven years of patient investigation. The apparatus which he used is shown in the diagram. It consists of a cylindrical box of metal, through the cover of which passes a shaft, carrying upon its lower end a set of paddles, immersed in water within the box, and upon its upper portion a drum, on which are wound two cords, which, passing in opposite directions, run over pulleys, and are attached to known weights. The temperature of the water within the box being carefully noted, the weights are then allowed to fall a certain number of times, of course in their fall turning the paddles against the friction of the liquid. At the close of the experiment the water is found to be warmer than before. And by measuring the amount of this rise in temperature, knowing the distance through which the weights have fallen, it is easy to calculate the quantity of heat which corresponds to a given amount of motion. In this way, and as a mean of a large number of experiments, Mr. Joule found that the amount of mass motion in a body weighing one pound, which had fallen from a hight of 772 feet, was exactly equal to the molecular motion which must be added to a pound of water, in order to heat it one degree Fahrenheit. If we call the actual energy of a body weighing one pound, which has fallen one foot, a foot-pound, then we may speak of the mechanical equivalents of heat as being 772 foot-pounds.

The significance and value of this numerical constant will appear more clearly if we apply it to the solution of one or two simple problems. During the recent war two immense iron guns were cast in Pittsburgh, whose weight was nearly 112,000 pounds each, and which had a caliber of 20 inches. Upon this diagram is a calculation of the effective blow which such a ball, assuming its weight to be 1,000 pounds and its velocity 1,100 feet per second, would give ; it is 302,500 tuns! Now, if it were possible to convert the whole of this enormous mechanical power into heat, to how much would it correspond ? This question may be answered by the aid of the mechanical equivalent of heat ; here is the calculation, from which we see that when 17 gallons of ice-cold water are heated to the boiling point, as much energy is communicated as is contained in the death-dealing missile at its highest velocity. Again, if we take the impact of a larger cannon-ball, our earth, which is whirling through space with a velocity of 19 miles a second, we find it to be 32,994,400,000,000,000,000,000,000,000,000 tuns? Were this energy all converted into heat, it would equal that produced by the combustion of 14 earths of solid coal.

The speaker, after discussing the subject of the mechanical equivalent of light, and stating that the energy of the light of a spermaceti candle burning 126½ grains per hour, is equal in mechanical value to 13·1 foot-pounds per minute, as ascertained by Prof. Julius Thompson, of Copenhagen, and Mr. Farmer, of Boston, and after making a startling estimate of the power of the water raised each minute on our earth by the evaporative power of solar heat, proceeded to discuss the subjects of vitality or vital force.

Having now established the fact of correlation for the physical forces, we have next to inquire what are the evidences of the correlation of the vital forces with them. But in the first place it must be remarked that life is not a simple term like heat or electricity ; it is a complex term, and includes all those phenomena which a living body exhibits. In this discussion, therefore, we shall use the term vital force to express only the actual energy of the body, however manifested. As to the attractions or the potential energy of the organism, nothing is more fully settled in science than the fact that these are precisely the same within the body as without it. Every particle of matter within the body obeys implicitly the laws of the chemical and physical attractions. No overpowering or supernatural agency comes in to complicate their action, which is modified only by the action of the others. Vitality, therefore, is the sum of the energies of a living body, both actual and potential.

Moreover, the important fact must be fully recognized that in living beings we have to do with no new elementary forms of matter. Precisely the same atoms which build up the inorganic fabric, compose the organic. In the early days of chemistry, indeed, it was supposed that the complicated molecules which life produced were beyond the reach of simple chemical law. But as more and more complex molecules have been, one after another, produced, chemistry has become reassured, and now doubts not her ability to produce them all. A few years hence, and she will doubtless give us quinine and protagon, as she now gives us coumarin and neurine, substances the synthesis of which was but yesterday an impossibility.

The food of the plant is matter whose energy is all expended ; it is a fallen weight. But the plant organism receives it, exposes it to the sun's ray, and, in a way yet mysterious to us, converts the actual energy of the sunlight into potential energy within it. The fallen weight is thus raised, and energy is stored up in substances which now are alone competent to become the food of the animal. The food is not such because any new atoms have been added to it ; it is food because it contains within it potential energy, which at any time may become actual as force. This food the animal now appropriates; he brings it in contact with oxygen, and the potential energy becomes actual ; he cuts the string, the weight falls, and what was just now only attraction, has become actual force ; this force he uses for his own purposes, and hands back the oxidized matter, the fallen weight, to the plant to be again de-oxidized, to be again raised. The plant then is to be regarded as a machine for converting sunlight into potential energy ; the animal a machine for setting the potential energy free as actual, and economizing it. The force which the plant stores up is undeniably physical ; must not the force which the animal sets free by its conversion be intimately correlated to it ?

After discussing the subject of animal heat, and showing its identity with heat produced from any other source, Prof. Barker next proceeded to show that muscular action was identical in character to that of any other machine. The actual energy of the muscle is simply the converted potential energy of the carbon of the food. A muscle, therefore, like a steam engine, is a machine for converting the potential energy of carbon into motion. But unlike a steam engine, the muscle accomplishes this conversion directly, the energy not passing through the intermediate stage of heat. For this reason, the muscle is the most economical producer of mechanical force known.

The last of the so-called vital forces which we are to examine, is that produced by the nerves, and nervous centers. In the nerve which stimulates a muscle to contraction, this force is undeniably motion, since it is propagated along this nerve from one extremity to the other. In common language, too, this idea finds currency in the comparison of this force to electricity ; the gray or cellular matter being the battery, the white or fibrous matter the conductors. That this force is not electricity, however, Du Bois Reymond has demonstrated by showing that its velocity is only 97 feet in a second, a speed equaled by the grayhound and the race horse. In his opinion, the propagation of a nervous impulse is a sort of successive molecular polarization, like magnetism. But that this agent is a force, as analogous to electricity as is magnetism, is shown not only by the fact that the transmission of electricity along a nerve will cause the contraction of the muscle to which it leads, but also by the more important fact that the contraction of a muscle is excited by diminishing its normal electrical current ; a result which could take place only with a stimulus closely allied to electricity. Nerve force, therefore, must be a transmuted potential energy.

The speaker next discussed at length the highest manifestation of animal life—*thought-power*. Here the question arises, Can it be manifested inwardly without such a transformation of energy ? Or is the evolution of thought entirely independent of the matter of the brain ? Experiments, ingenious and reliable, have answered this question. The importance of the results, will, I trust, warrant me in examining the methods employed in these experiments somewhat in detail. Inasmuch as our methods for measuring minute amounts of electricity are very perfect, and the methods for the conversion of heat into electricity are equally delicate, it has been found that smaller differences of temperature may be recognized by converting heat into electricity than can be detected thermometrically. The apparatus, first used by Melloni 1832, is very simple, consisting first, of a pair of metallic bars like those described in the early part of the lecture for effecting the conversion of the heat ; and second, of a delicate galvanometer, for measuring the electricity produced. In the experiments in question one of the bars used was made of bismuth, the other of an alloy of antimony and zinc. Preliminary trials having shown that any change of temperature within the skull was soonest manifested externally in that depression which exists just above the occipital protuberance, a pair of these little bars was fastened to the head at this point ; and to neutralize the results of a general rise of temperature over the whole body, a second pair, reversed in direction, was attached to the leg or arm, so that if a like increase of heat came to both, the electricity developed by one would be neutralized by the other, and no effect be produced upon the needle, unless only one was affected. By long practice it was ascertained that a state of mental torpor could be produced, lasting for hours, in which the needle remained stationary. But let a person knock on the door outside the room, or speak a single word, even though the experimenter remained absolutely passive, and the reception of the intelligence caused the needle to swing through 20 degrees. In explanation of this production of heat, the analogy of the muscle at once suggests itself. No conversion of energy is complete ; and as the heat of muscular action represents force which has escaped conversion into motion, so the heat evolved during the reception of an idea, is energy which has escaped conversion into thought, from precisely the same cause. Moreover, these experiments have shown that ideas which affect the emotions, produce most heat in their reception ; a few minute's recitation to one's self of emotional poetry, producing more effect than several hours of deep thought." Hence it is evident that the mechanism for the production of deep thoughts, accomplishes this conversion of energy far more perfectly than that which produces simply emotion. But we may take a step further in this same direction. A muscle, precisely as the law of correlation requires, develops less heat when doing work than when it contracts without doing it.

The lecturer next reviewed the part which American Scientists had taken in the development of these great truths, and closed his address as follows :

In looking back over the whole of this discussion, I trust that it is possible to see that the objects which we had in view at its commencement have been more or less fully attained. I would fain believe that we now see more clearly the beautiful harmonies of bounteous nature ; that on her many-stringed instrument force answers to force, like the notes of a great symphony, disappearing now in potential energy, and anon reappearing as actual energy, in a multitude of forms. I would hope that this wonderful unity and mutual interaction of force in the dead forms of inorganic nature, appears to you identical in the living forms of animal and vegetable life, which make of our earth an Eden. That even that mysterious, and in many aspects, awful power of thought, by which man influences the present and future age, is a part of this great ocean of energy. But here the great question rolls upon us. Is it only this ? Is there not behind this material substance, a higher than molecular power in the thoughts which are immortalized in the poetry of a Shakespeare or a Milton, the art creations of a Michael Angelo or a Titian, the harmonies of a Mozart or a Beethoven ? Is there really no immortal portion separable from this brain-tissue, though yet mysteriously united to it ? In a word, does this curiously-fashioned body inclose a soul, God-given and to God returning ? Here Science vails her face and bows in reverence before the Almighty. We have passed the boundaries by which physical science is inclosed. No crucible, no subtile magnetic needle, can answer now our questions. No word but his who formed us can break the awful silence. In presence of such a revelation Science is dumb, and faith comes in joyfully to accept that higher truth, which can never be the object of physical demonstration.

The Phosphorescence of the Sea.

Every one recognizes the beauty of the singular phenomenon that we call the phosphorescence of the sea, and has watched the track of foam and diamond points of light left behind as the steamer cuts the wave. For a long time the cause of the shining appearance was a puzzle to philosophers. But the naturalists finally came to the conclusion that it is produced by animalculæ which are excited to luminosity when the water is agitated. It was also shown that the phosphorescence is brightest and the sparks most numerous immediately preceding an atmospheric disturbance. Thus, the little animalculæ must be included in the long list of delicate organisms that feel the approach of bad weather. Professor Decharme observed this coincidence and has been diligently studying the habits of the tiny creatures and their shining propensities. He tells us, as the result of his observations, that they are visible in the daylight with a glass magnifying about forty times. They are, under this magnifying power, of a lens-shaped form, and from seven to fifteen hundredths of an inch in diameter. They are of a transparent nature, more diaphanous in the center than around the periphery of their little bodies. The specimens experimented on by the Professsor lived in a bottle for several weeks, and became very brilliant when the water was shaken or stirred, or whenever a small quantity of exciting fluid, alcohol or acid was introduced into it. These infinitesimal barometers, when fully developed, attain the size of from two to four thousandths of an inch.

Faraday on Human Credulity.

I have not been at work except in turning the tables upon the table-turners. Nor should I have done that, but that so many inquiries poured in upon me that I thought it better to stop the inpouring flood by letting all know at once what my views and feelings were. What a weak, credulous, incredulous, unbelieving, superstitious, bold, frightened—what a ridiculous world ours is as far as regards the mind of man! How full of inconsistencies, contradictions, and absurdities it is ! I declare that, taking the average of many minds that have recently come before me (and apart from that spirit which God has placed in each) and accepting for a moment that average as a standard, I should far prefer the obedience, affections, and instinct of a dog before it. Do not whisper this, however, to others. There is One above who worketh in all things, and who governs even in the midst of that misrule to which the tendencies and powers of men are so easily perverted.

THE largest span of any truss bridge in the United States is that of the bridge across the Ohio river, at Louisville. It is 370 feet.

Visit to a Chinese Silk Factory

A correspondent of the Cincinnati *Commercial* thus describes a Chinese silk factory:

"I directed my guide to take me into the silk-weaving streets. We soon entered them. I at once dismounted to make a careful observation of their *modus operandi* for the production of this renowned fabric of Oriental looms. All around me was silk, silk, nothing but silk. In small dark houses, little better than hovels, were seen people, chiefly women, dyeing this delicate textile. Outside, in little filthy yards and pig-styes, over the ground where the family swine were wallowing, were placed bamboo poles, whereon were hanging skeins of colored silk just from the dye, and glowing with the most vivid hues as they hung for drying in the sunshine over the loathsome pools below. I visited several of their weaving shops. They were quite similar in their fixtures and arrangements. I spent some time in examining one of the largest. It was, perhaps, 100 feet long and about 16 feet wide. The walls were of coarse clay blocks, sun-dried, unpierced by a single aperture for air or light save at the front, which was entirely open the whole breadth of the building. The floor was simply of trodden clay, uneven and untidy. An aisle ran down the center, just wide enough for one person to pass; on either side of this were ranged the nearest looms and standing as close together as they could be placed.

Two or three persons were employed on the work of each loom. The looms are plain, common-looking affairs, almost precisely of the same kind, as to appearance and mode of manipulation, as were those upon which our grandmothers in Ohio used to weave the linsey-woolsey for the wear of Western boys, when even the preacher was almost a stranger to broadcloth. Squatting myself down by one of these friendly looking acquaintances of my boyhood, I leisurely watched the delicate and diligent manipulations of the weaver and his assistants as their shuttles flew to and fro in the mazy mystery of figures and flowers that came gradually out larger and plainer upon the growing surface of the gorgeous fabric which those skillful workmen were there creating under my eye. So complex were the movements of the men on these simple looking machines, and so marvelously beautiful were the products resulting therefrom, that I gazed with unbounded amazement upon this work of silk weaving as it progressed before me.

The weather being warm and the shop crowded the workmen were almost naked. My visit interested them manifestly, yet not a loom ceased its clicking, clacking noise, not a man left his employment to gaze; but I detected them giving furtive glances and exchanging mutual smiles among themselves at the curious stranger who had thus unceremoniously squatted himself down in their midst, by one of these humble looking looms, on a common dirt floor, within homely clad walls, where, nevertheless, are produced those beautiful fabrics which for ages and throughout the world have been the pride of wealth, the envy of beauty and the admiration and desire of royalty. Far down and nearly to the extreme limit of this long room was a plain board counter, extending quite across the room. Beyond it stood the proprietor of the factory, a smooth-faced, richly clad Chinaman. Directly over him the building was unroofed, thereby affording a spacious skylight; except this, window there was none. Through this skylight, and down upon the counter below, the sunshine fell upon the finished work of this dingy, dirty, squalid looking workshop. The proprietor was busy measuring off and packing up the products of his looms. And as the sunlight streamed full upon the gorgeous colors of those magnificent silks, satins, and brocades which the proprietor was tossing about in billowy radiance, it seemed to my eyes, as I stood far up in the feeble light of the center of the room, as though he were tossing and toying with rainbows. From places so humble and surroundings so squalid as this come those royal fabrics which are to decorate palaces and to adorn the persons of princes and monarchs of the earth.

UNITED STATES CIRCUIT COURT---SOUTHERN DISTRICT. BEFORE JUDGE BLATCHFORD.

RIVAL SEWING MACHINES—INFRINGEMENT—PRACTICE.

Sidney W. Dibble et al. vs. James M. Augur, as Agent of the Florence Sewing Machine Company.—This was a bill in equity for an injunction and account filed by the Wheeler & Wilson Manufacturing Company, the Grover & Baker Sewing Machine Company, the Singer Manufacturing Company.

Thomas J. W. Robertson and Sidney W. Dibble, as trustees of the above companies, and of Robertson, against the above defendant, on account of an alleged infringement of a patent granted to Robertson, November 22, 1859. It appeared from the evidence that Robertson on May 8, 1868, assigned all his rights under the patent, of which he was then sole owner, to Dibble. On the same day an agreement was made between the three companies and Robertson and Dibble, which provided, among other things, that Robertson was to have the right to sue for and retain all damages for past or future infringements of the patent by others than the three companies.

On June 16, 1868, Robertson assigned to Dibble as trustee for the three companies and for Robertson all claims for past infringements of the patent. The bill in this case was filed on June 13, 1868. The only evidence of infringement was an admission of the defendant that prior to February 20, 1868, he had sold Florence Sewing Machines as agent of that company, with a certain braiding attachment which the plaintiffs claim is covered by the Robertson patent. The defendants set up in answer a license granted by the three companies to the Florence Sewing Machine Company, February 20, 1868, providing among other things, that the licensers are not to claim any license fees other than those provided in the license, under any other patents which they may now or hereafter own or control, covering devices embodied in certain specimen machines.

On this state of facts it was contended on the part of the defendant, that the right to recover for infringements committed prior to Feb. 20, 1868, was in Robertson alone; that this bill would not lie in behalf of Robertson, because he had an adequate remedy at law, and was not when it was filed the owner of the patent; that it would not lie in behalf of the other plaintiffs, because when it was filed they had no interest in the claim for such forfeits, and that the enforcement by the three companies of the interest of Robertson, conveyed by him to Dibble, as trustees for the companies, is a violation of the license of Feb. 20, 1868.

Held by the Court—That the effect of the instruments of May 8, 1868, was to vest in Dibble as trustee for Robertson, all interest in claims for past infringements against others than the three companies and their licenses; but that the assignment of that date did not convey to Dibble, otherwise than as trustee, claims for past infringements. (Moore *vs*. Marsh, 7 Wallace, 515). That the bill in this case so far as past infringements are concerned, ought to have been filed in the name of Dibble as trustee for Robertson, joining Robertson as the owner of the equitable interest. It was so brought, adding as plaintiffs, Dibble as trustee for the three companies, and the three companies themselves. Such addition was surplusage, but as the objection thereto was not raised until the hearing, and as by the instrument of June 16, 1868, the claim for past infringements was transferred by Robertson to Dibble, as trustee for the three companies, and for Robertson, and as the bill is brought in the name of such trustee and of the *cestui que trust*, it will be allowed to stand. The defendant will then be responding to every person who can make a claim against him in respect to the alleged infringements. The suit being for an account, is properly bought in equity. In respect to the alleged infringement, the license of Feb. 20, 1868, has no application to infringements committed prior to that date. The first claim of the Robertson patent is not infringed, but the second claim is infringed by the defendant, and in respect to it there must be a decree for a perpetual injunction and an account with costs.

For the plaintiffs, F. H. Betts; for the defendant, A. L. Sarle.

THE ÆTNA SEWING MACHINE.

Orlando B. Potter et al. vs. Julius E. Braunsdorf and Henry Weil.—This was a suit for a perpetual injunction and an account of profits founded on the alleged infringement of letters patent reissued to John Batchelder Dec. 12, 1865, for an improvement in sewing machines. The original patent was granted to Batchelder, as inventor, in 1849, and was reissued to Isaac M. Singer and Edward Clark as assignees, in 1858. Afterward, on the application of Batchelder, the original patent was extended for seven years, from May 8, 1863, by the Commissioner of Patents, and in 1863 and 1865 the patent so extended was reissued to Batchelder.

The defense set up that as the original patent was assigned to Singer & Clark, and was by them surrendered, and was not in existence thereafter, but only a reissue of it, the extension granted to Batchelder was an extension of a patent not in existence and was in violation of the provisions of the act of July 4, 1836, section 18 (5 U. S. Stat. at Large, 125), and null and void.

Held by the Court—That the great feature of the invention of Batchelder's was the production of a sewing machine in which the cloth to be sewn is supported horizontally, and is fed through the machine perpetually. His machine was the first in which the cloth was so supported and advanced by an automatic feed of any kind. That the machine of the defendants called the Ætna Machine, though in some respects an improvement upon Batchelder's invention, nevertheless embodies and infringes upon it. That the views advanced by the defense as to the validity of the extension and reissue to Batchelder cannot be maintained the question having been already decided. (Potter *vs*. Holland, 4 Blatchf., C.C.R., 291; Woodworth *vs*. Stone, 3 Story, 749). As Batchelder did not ratify and adopt the surrender by, and the reissue to Singer and Clark, he had the same right after such transaction as before it in respect to obtaining an extension of time under the original patent. Such extended term did not come into being until the term granted by the reissue expired, so that the apparent objection does not obtain that there were two patents in existence at the same time for the same invention. The object of the act of July 4, 1836, section 18, is to prevent an extension for seven years after the expiration of fourteen years. In this case the fourteen years had not expired when the extension was granted.

Objections to the validity of the extension overruled. Decree for a perpetual injunction and an account with costs to the plaintiffs.

E. W. Stoughton and G. Gifford for the plaintiffs; A. C. Washburn and C. A. Durgin for, the defendants.

THE EMPIRE SEWING MACHINE.

The Same vs. The Empire Sewing Machine Company.—*Held by the Court.*—That the facts in this case are the same as in the case above, the machine being the same in construction and operation as the Ætna machine.

Decree for a perpetual injunction and an account with costs to the plaintiffs.

Answers to Correspondents.

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

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

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

J. H. H., of Mass.—The apearances in the Prince Rupert's drops, wh ich you mention, are not probably bubbles, but slight imperfections in the homogeneous character of the glass, caused by imperfect fusion. The theory of the breaking of these drops with apparently explosive force, is that the molecules of the mass are in a state of unequal tension, consequent upon the rapid cooling of the exterior while the interior is yet warm. Nipping off the points sets the unequal tension into active work, and throws the glass into fragments. We have already published a full description of the spectroscope, with illustrations and explanations, in a back volume, and we do not wish to return to the subject at present.

G. T. M., of Mass.—The products of the combustion of hydrocarbon oils in lamps are carbonic acid and water. The carbon of the oil unites with the oxygen of the air to form carbonic acid, and the hydrogen of the oil unites with the oxygen of the air to form water. The water thus generated is converted into steam by the heat of the flame, and condenses, of course, upon coming in contact with any cold surface like the bottoms of the glue pots of which you write. By constructing the pots with a bottom like a champagne bottle, the condensed water may be led to the outside so that it will not drip on to the lamp flame and extinguish it.

W. A., of N. Y.—We presume the apparatus for generating ozone to which you refer, is that known as Siemens' induction apparatus. It consists of a long glass tube, coated on the interior with tinfoil, over which a second and larger tube, coated on the outside with tinfoil, is placed. These tubes are charged with electricity, and pure dry oxygen is transmitted through between them. The oxygen becomes electrified by induction and assumes the peculiar state in which it is called ozone.

J. G., of N. J.—Particles of iron melted with brass make a very refractory compound. The iron ought to be separated before melting. The separation can be effected by stirring the brass filings, turnings, etc., with a powerful magnet. The iron filings will stick to the poles of the magnet, and may be brushed away as they accumulate. The hardness complained of is a property of some alloys of iron and zinc which any amount of annealing will not remedy.

T. P. W., of Montana.—The appearance of colored rings, or portions of rings, about the sun or moon, though not frequent in this latitude, is nevertheless sufficiently so to be well known and to have been observed by most persons at some time or other. They are called coronas when they surround the moon and parhelia when they surround the sun. They are formed by the reflection of light from the surface of watery vapor in the atmosphere.

A. P. B., of Ohio.—A great variety of nostrums and recipes has been recommended for removing scale from boilers, and all have found some to testify to their efficacy. We have found oak bark or twigs excellent for the purpose, put in in the morning and the boiler blown off at night, and repeated as often as necessary. But we know of nothing that we would consider as certain for all cases and also harmless.

W. D., of West Va.—The proposed increase of the cylinders will undoubtedly entail a proportionate increase in the capacity of your boiler; but as you give no data from which the heating surface can be computed, and nothing of the horse power you wish to obtain, no more definite answer can be given to your query.

H. M. H., of Montana.—A popular treatise on gems by Dr. L. Feuchtwanger, published by D. Appleton & Co., of this city, gives valuable information on the subject of gems. You will hardly, however, learn the lapidary's art from books.

R. B. S., of N. Y.—There is no doubt that the undulatory theory of light explains not only the passage of light through what is called a vacuum, but all other phenomena of light, more satisfactorily than the corpuscular theory.

G. B. M.—The process of testing the quality of soda ash and potash is called alkalimetry. You will find a full description of it on page 673 of the United States Dispensatory, which you will find in any good druggist's shop.

G. H., of Pa.—A boiler in addition to the expansive pressure of the steam which is transmitted equally in all directions, has upon the bottom the additional pressure of the contained water.

R. P. M., of Mich.—Asks whether a watch will work in a perfect vacuum. Answer—Yes.

G. H. H., of Mo.—We are unacquainted with the process to which you refer.

W. H., of Ohio.—Rubber erasers may be cleaned with soap and tepid water.

E. T., of Pa.—The plan you submit for street crossings does not seem practicable to us. We therefore respectfully decline it.

THE NEW YORK TIMES has some severe but true remarks, from which we quote: "Another illustration of the indifference to improvement is shown in the practice of Gas Companies in lighting street lamps. The lamps of European cities are lighted by a Torch, the operation being, literally, quick as a flash. Here labor is far dearer than in Europe, and yet the Manhattan Co. has but recently begun to use the Torch. Other Companies still send round a man with a ladder, with which he climbs the posts, turns on the gas, then takes a match from his pocket, scratches it upon the post, and lights the gas, the process taking about three times as long as the new one, carrying all who see it back almost to the middle ages." "This improved method of lighting street lamps, referred to by the *Times*, is the same to which we have called the attention of those interested in lighting street lamps, as being not only a great improvement, but the best, of which the full particulars may be obtained from Mr. J. W. Bartlett, of 569 Broadway, New York, who is proprietor of the Patents."—[EDS. GAS LIGHT JOURNAL.

Recent American and Foreign Patents.

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

MACHINE FOR CUTTING AND PRESSING THE HEADS OF METAL CANS.—Reuben Brady, New York city.—This invention relates to a new machine for cutting from large plates the circular heads or end pieces of sheet-metal cans and for, at the same time, forming the flanges on the same, both operations being performed by one single motion of the main working lever. The machine can be used for cutting plain circular plates or forming projecting flanges or for grooving and embossing the plates cut out in forming both the plain and ornamental impressions. The invention consists chiefly in the employment of a hollow cutter and of a punch or presser sliding therein, the presser being operated by a rocking lever, which, during part of its motion, also carries along and moves the cutter. The patent is for sale. Parties desiring information can address the inventor at 631 Hudson street, New York.

BEEHIVE.—Sylvester D. Barber and James Wolf, Mattoon, Ill.—This invention relates to certain improvements in that kind of beehives which are pointed at the bottom; and the invention consists in such an arrangement of parts that the bees will be protected from moths, frost, and all other inconveniences generally found on ordinary beehives.

ELECTRIC CLOCK.—Vitalis Himmer, New York city.—This invention relates to a new clock which is operated by electricity without the use of a pendulum, but with the aid of a spring balance, and which is so constructed, that it will operate with absolute exactness, and not be affected by atmospheric influences.

Sawing Machine.—Jacob D. Culver, Bellmore, Ind.—This invention relates to a new and useful improvement in machines for sawing logs across the grain.

Globe Valve.—George W. Reisinger, Harrisburgh, Pa.—This invention relates to a new and useful improvement in globe valves for steam, water, or other liquids, whereby the valve may be ground on its seat without removing the steam or water pressure.

Extension Curtain Roller.—Thomas Van Wagoner, Newark, N. J.—The object of this invention is to furnish a window curtain roller, all prepared to put up, without sawing off an end or putting on a cord pul.ey one which any person (male or female) can put up without difficulty.

Sadiron Heater.—John G. Redline, Lanark, Ill.—This invention relates to a new apparatus, which is to be applied to an ordinary stove, for the purpose of heating smoothing irons. The invention consists in the arrangement of a separate heater which has its own fire regulated by the draft of the stove, and which is provided with hinged slotted doors to receive and retain the irons to be heated.

Beehive.—John Montgomery, Union City, Pa.—This invention has for ts object to furnish a simple and convenient beehive, which shall be so constructed and arranged as to greatly facilitate the management of the bees, and which will, at the same time, protect the hive from the ingress of the moth.

Bread and Meat Slicer.—J. Ensigner, L. Fertig, Dauphin, Tenn.—This invention has for its object to furnish a simple and convenient machine, by means of which bread, and other soft spongy substances, may be sliced evenly and uniformly, and which may be used with equal advantage for slicing dried beef and other hard substances.

Attaching Hoes and other Tools to Handles.—Giles T. Jobson, Macon, Ga.—This invention relates to new and useful improvements in tools for dressing plants, and consists in a peculiar combination in one tool of a hoe and rake, or other similar implement, the said hoe and rake or other implement being made separately, and each provided with a longitudinal section of a tubular shank, by which they are connected to the handle by a clamping ring.

Brick Mold.—Matthew Newlove, Burlington, Iowa.—This invention relates to improvements in molds for shaping and pressing brick, and consists of a mold box with movable bottoms or followers, connected to a bar extending along all the molds in the box, and connected to bell crank levers privoted to fixed bearings on the box, and so arranged as to force the movable bottoms or followers through the mold boxes and discharge them when required for discharging the mold.

Wheel Hatrow.—A. L. P. Varian, Ripley, Miss.—This invention relates to improvements in harness, and consists of an arrangement of plane or dished disks on shafts inclined to the line of draft, and so arranged that the machine being drawn along the ground, so as to be supported on these disks, rolling on the ground will cause them to cut into the same and turn and pulverize it more or less, according to the dish or inclination of the said disks, any preferred number being arranged on the shaft, which is bent at the center so that one half the disks will throw one way and the other hall the other, to counteract the side draft of each set.

Safety Railroad Truck.—C. R. Morris and H. R. Franklin, Bridgeport, Conn.—This invention consists in the attachment to the trucks, preferably between the wheels, of runners, or guards in the form of runners, with curves at each end which will rest on the ties, reaching across two or more and slide thereon when the cars are thrown off the track, in a manner calculated to greatly protect them against the disastrous results which now occur by the wheels going down between the ties.

Washing Apparatus.—John T. Grose, Upper Sandusky, Ohio.—This invention has for its object to furnish a simple, convenient, and efficient machine by which the clothes will be quickly and thoroughly washed by the circulation of steam and hot water, and which shall be so constructed as to allow the dirty water to be drawn off and replaced by clean hot water when desired.

Cultivator.—B. F. Ward, Indian Springs, Ga—This invention has for its object to furnish a simple, convenient, effective, and cheap machine designed more particularly for cultivating plants planted in hills and drills, but which may be used with great advantage for preparing the ground to receive the seed, and for covering seeds planted in hills and drills.

Marker for Carpenters, Joiners, etc.—G. M. Nickason, Ellenville, N. Y.—This invention relates to a new device for marking the places on window blinds, sashes, etc., where mortises are to be cut, and has for its object to make the marking with such precision and accuracy that a large number of bars or planks can be prepared alike, when to be used for a number of equal sized shutters, sashes, or other articles.

Window Jack.—S. P. Loomis, Philadelphia, Pa.—This invention has for its object to simplify the construction of window jacks and to allow the same to be readily folded together.

Plowing and Harrowing Machine.—Arthur Cunningham, Cincinnati, Ohio.—This invention relates to improvements in machines for plowing and harrowing, and consists in certain peculiar arrangements of connecting and operating devices, whereby a common plow and harrow are connected to a truck adapted for the operator to ride on, in a way by which he may govern the plow and harrow as required. The said plow and harrow are adjustably connected to the frame of the truck so as to vary their action.

Scaffold Bracket.—James Chattin, Marion, Iowa.—This invention relates to new and useful improvements in brackets for attachment to inclined roofs to support the scaffold braces, without the driving of nails through the shingles. It consists of a pair of clamp jaws, an eccentric or cam-shaped clamping dog or lever, and a spring, so arranged that the jaws may be readily and securely attached to tne end of a shingle already nailed on, by raising the end of the said shingle, inserting it between the jaws, and turning the clamp dog to force the jaws together; the spring is used to force the jaws apart when the dog is turned down to release them, and to hold the cam dog in place.

Electric Pendulum Clock.—Vitalis Himmer, New York city.—This invention relates to a new pendulum clock, which is operated by electricity in such manner that a very accurate and reliable time-keeper is produced which can readily be regulated, and which will not be affected by differences of temperature.

Automatic Toy Savings Bank.—Wm. P. X. Smith, New York city.—This invention has for its object to furnish an improved toy savings bank for children, which shall be so constructed and arranged that when one part or figure of the device is pressed upon, a piece of money placed upon another part or figure may be thrown into the mouth of a third figure, which mouth opens at the proper time to receive it.

Machine for Cutting Irregular Forms.—F. Keagey, Chambersburg, Pa.—This invention relates to improvements in machines for holding, adjusting, and feeding the pillars, balusters, or other articles to be dressed in irregular forms or plain sides on a table past a rotary cutter, by which the dressing is to be effected. The said invention consisting of a bed with centers for holding the blank, one of which is adjustable as to length, and provided with a dividing plate for adjusting the blank to the center; also a pattern for governing the action of the tool on the blank.

Egg Box.—J. D. Michael, Baltimore, Md.—This invention relates to improvements in boxes for packing eggs for transportation and storage, and consists in providing packing boxes with tops, bottoms, and shelves or drawing boards capable of moving in or out of the same, and being attached at any point to confine the eggs spread evenly between them, so that they cannot move when the box is turned from side to side or otherwise handled. The said movable tops and bottoms are secured in their arrangement by bolts or rods passing through holes in the sides at or near the ends, and either through or above and below the said bottom.

Manufacturing Ginger Snaps, etc.—Daniel M. Holmes, Williamsburgh, N. Y.—This invention has for its object to furnish a simple, convenient, and effective machine by means of which ginger and other snaps mey be made from soft dough, rapidly, conviently, and accurately.

Self-Loading Toy Pistols.—Chester F. Smith, Torrington, Conn.—This invention relates to new and useful improvements in toy pistols, and consists in an arrangement in connection with the barrel and discharging spring of a magazine, which, being supplied with balls, will, on the spring being retracted and engaged with the trigger for firing, deliver a ball with the barrel in advance of the spring in readiness for discharging It also consists in a novel arrangement of the trigger for holding the ball from rolling out of the barrel at the same time that it holds the spring back. Also in an arrangement of the spring with the supply passage from the magazine to permit the discharge of more than one ball at a time.

Razor Honing Machine.—William Brown, Thomaston, Conn.—This invention relates to new and useful improvements in machines for honing razors and other blades. It consists of a bed for supporting the blades placed on trunnions, and a hone placed on the underside of a suitable stock having a slide working through a guide in rear of the bed for supporting the blade, the front end of the stock being taken in the hand and worked back and forth, and also laterally, by a kind of circular motion, whereby the hone is made to rub the side of the razor which is maintained parallel with the oscillating trunnions.

Apparatus for Drafting Clothes.—Ira J. Ordway, West Edmeston, N. Y.—This invention consists in combining with a main linear measuring stick for laying off dimensions of length of the subject ordering new clothes, other measuring sticks, perpendicular to the main stick, or inclined to it, and intended for the purpose of laying off dimensions of width, or of inclined or curved length.

Mole Trap.—W. C. Akers, Petersburg, Va.—This invention consists of a weight provided with prongs, and moving in a guideway in a vertical frame, at the top of which it is held by a lever, retained by a catch, from under which catch the lever is thrust by the action of a vertical rod, jointed at its bottom to the end of a second lever, called the earth trigger, which is raised by the mole burrowing under it, the disconnection of the upper lever from the catch being followed by a fall of the spiked weight upon the animal.

Portable Railway.—J. K. Glenn, New York city.—This invention relates to a new running gear for vehicles of all classes, such as are used for transporting goods or conveying passengers through cities or from one place to another, and is peculiarly adapted for soft or swampy ground.

Propelling Vessels.—Alfred Colburn Loud, San Francisco, Cal.—This invention relates to an improved device for propelling vessels, whereby increased speed as well as other advantages are obtained. The invention consists in mounting upon a horizontal shaft, two or more disk wheels at an angle varying from a right angle, fifteen degrees (more or less), so that the inner faces of such wheels or disks shall approach or meet each other upon one side and diverge from each other on the other side, the two or more disks forming (when thus secured to the shaft) a single wheel, which is general outline is in the form of a wedge. Propellers constructed in this manner are mounted on the paddle wheel shaft in place of the ordinary paddle-wheels.

Steam Pump.—Samuel Williston, James Sutherland, and Joseph Winslow Winslow, East Hampton, Mass.—The principal features of novelty are the use of secondary valves with their respective passages, arranged in combination with the main valve and the steam piston, to perform their three-fold functions of exhausting from one end of the main valve, admitting steam to the other end, and to hold it therein. The next improvement is packing the main and secondary valves by means of a small steam cylinder arranged in a recess, and provided with steam passages and steam space at the bottom of the recess. The steam piston is packed by means of a segmental ring and secondary spring ring. Steam is admitted to the interior of the piston through passages, and made to act on a valve arranged in rear of or behind the secondary spring. The pump cylinder is open at both ends and is inclosed in a case or envelope which is divided at the middle into two compartments. The water supply pipe and also the discharge valve are each provided with a set of clack valves communicating with the two compartments of the casing.

Mariners' Compass.—Demetrius Bittle Strouse, Salem, Va.—This invention consists of a combination of three or more systems of magnetized needles or bars attached to one or more axles and arranged in different horizontal planes.

Knitting Machine.—Mark Lamar Roberts, New Brunswick, N. J., and Fergus Peniston, New York city.—This invention relates to improvements in knitting machines, whereby it is designed to provide a machine capable of knitting plain tubular fabrics, such as bags for holding grain, hose for conveying water, or stockings, socks, and other similar articles of wearing apparel, to be operated either by hand or power, and which may be readily changed from the condition of a circular cam knitting machine for knitting plain tubular goods, in which condition it may be operated with great rapidity, to the condition of a family machine which may be used either for making tubular goods at a slower rate or articles of wearing apparel.

Manufacture of Felted Fabrics, and Wearing Apparel and other Articles from the same.—John Falconer, New York city.—The first part of this invention relates to an improved method of laying the fibers for bats, felts, waddings, and other similar goods so that they may be crossed and interlaced in all directions, for the purpose of causing them to adhere more firmly together, and thereby produce fabrics of durable quality. The second part of the invention consists in forming seamless articles of wearing apparel and other articles from the fabric above described. This fabric is especially adapted for this purpose by reason of the interweaving of the fibers.

Brick Machine.—Peter Haydon, Pittsburgh, Pa.—This invention relates to a new and improved machine for molding and pressing bricks, and it consists of an improved means for conveying the clay from the crushing mill to the press boxes, and also in a novel and improved construction and arrangement of parts for molding and compressing clay and discharging the same after being compressed.

Steam Boiler.—J. E. Culver, Hudson City, N. J.—This invention relates to a new method of utilizing the heat force created in a steam boiler, and consists in the employment of a steam engine and an atmospheric engine for that purpose.

NEW BOOKS AND PUBLICATIONS.

Hydraulic Motors. Translated from the French Cours De Mecanique Appliquee par M. Bresse Professeur de Mecanique a l' Ecole des Ponts et Chaussees. By F. A. Mahan, Lieutenant U. S. Corps of Engineers. Revised by D. H. Mahan, LL.D., Professor of Civil Engineering, etc., United States Military Academy. New York: John Wiley & Son, 2 Clinton Hall, Astor Place.

This is a treatise of the mathematical kind which may prove a valuable college text-book but is by far too abstruse for the general reader. The mathematical formulæ are ingeniously rendered more difficult and perplexing by the profuse use of Greek letters. Why this practice is of late so generally on the increase is a still greater puzzle to common sense. There are good reasons why a Greek letter may be adopted as a symbol which shall be accepted the world over as meaning always one thing, as, for instance, the ratio of the radius of a circle to its circumference; but why they shoula be used in algebraic instruction in preference to the much shorter and more convenient Roman letters, is to us an enigma; unless a vain display of apparent profundity is aimed at. The work in hand is undoubtedly valuable, notwithstanding the fault we have pointed out, but the readers who have the requisite mathematical knowledge to read it with advantage, are few in comparison to all who would like a book on the same subject treated in a less ambitious style.

Association Monthly

Is the title of the new journal started under the auspices of the Young Men's Christian Association of this city. It is edited by R. C. Morse, and gives promise of being an interesting and valuable means of instruction to thousands of young men who enter into sympathy with this Association and its objects. Terms, $1·00 per year.

The Court Circles of the Republic.

Such is the title of Mrs. Ellet's new book now going through the press of the Hartford (Conn.) Publishing Company. This fine work is to contain steel engravings of some of our notable ladies, accompanied by cleverly written sketches. It is a subscription work, and agents are wanted to dispose of it throughout the State.

We are in receipt of the first numbers of "Nature," a new weekly illustrated journal of science, published by Macmillan & Co., London and New York. It is devoted to rather abstract scientific discussions and the record of scientific events. This new journal will be apt to find favor among the professed scientists of the day, but will hardly become a popular journal in the broadest sense. It is printed in excellent style.

One of the best of our exchanges is the "Commercial Bulletin," published by Curtis, Gould & Co., 129 Washington street, Boston. As a business and commercial paper it occupies a prominent position among American journals, and the high literary character of its general reading and its reliability as a guide in commercial matters are widely acknowledged.

The Richmond and Louisville Medical Journal is still under the direction of E. S. Gaillard, M.D., Louisville, Ky. It is a very able work and has a fine list of contributors, including several well known New York physicians. Monthly. $5.00 per annum.

APPLICATIONS FOR EXTENSION OF PATENTS.

Spring Platform for Railroad Cars.—Charles H. Lewis, of Malden Mass., has petitioned for an extension of the above patent. Day of hearing March 9, 1870.

Water Meter.—Andrew J. Sweeney, Boston, Mass., has petitioned for an extension of the above patent. Day of hearing March 9, 1870.

Preparing Phosphoric Acid as a Substitute for other Solid Acids—E. N. Horsford, Cambridge, Mass., has petitioned for the extension of the above patent. Day of hearing, April 6, 1870.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING JAN. 4, 1870.

Reported Officially for the Scientific American

SCHEDULE OF PATENT OFFICE FEES:

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A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from ... $1 *upward, but usually at the price above-named.*

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98,460.—Asphalt Pavement.—Carl P. Alsing, New York city.

98,461.—Machine for Making Nets.—Benj. Arnold, East Greenwich, R. I.

98,462.—Gas Machine.—S. R. Ball, Hyde Park, Ill.

98,463.—Child's Chair and Table.—P. G. Beckley, Newark, N. J. Antedated December 22, 1869.

98,464.—Water Indicator for Steam Generators.—W. G. Bell, Pittsburgh, Pa. Antedated Dec. 30, 1869.

98,465.—Extension Table.—William John Boda, Dayton, Ohio.

98,466.—Composition for Dyeing and Coloring Leather, Hides, and Skins.—Charles Bond, New York city.

98,467.—Cattle Stanchion.—N. W. Boody, Westbrook, Me.

98,468.—Coach Lamp Bracket.—Thos. Boudren, Bridgeport, Conn.

98,469.—Chandelier.—Thomas Buckley, New York city.

98,470.—Dryer.—A. W. Cox and Wm. Gause, Indianapolis, Ind.

98,471.—Cultivator.—B. S. Cox, Paulsborough, N. J Antedated Dec. 22, 1869.

98,472.—Switch Stand for Railways.—N. N. Dale, Plymouth, Ind.

98,473.—Carriage Axle.—David Dalzell, South Egremont, Mass.

98,474.—Ice Sled.—Levi Darozir (assignor to himself and N. Nalette, Worcester, Mass.

98,475.—Spoke Shave.—Joshua Davies, Muskegon, Mich.

98,476.—Garment Hanger and Size Ticket Holder Combined.—Isaac Desky and T. A. Jennings, Seneca Falls, N.Y. Antedated Dec. 24, 1869.

98,477.—Ash Sifter, Leach, and Smoke House.—D. W. Doan, Rochester, N. Y.

98,478.—Automatic Vaccinating Instrument.—Chas. H. Eccleston, Oxford, N. Y. Antedated Dec. 24, 1869.

98,479.—Paper Clips.—G. W. Emerson, Chicago, Ill.

98,480.—Cast-Iron Pavement.—Alonzo Farar, Longwood, Mass.

98,481.—Sprinkling Pot.—Warren L. Fish, Springfield, Mass.

98,482.—Rotary Pump.—J. T. Foster, New York city.

98,483.—Sterring Propeller.—F. G. Fowler, Norwalk, Conn.

98,484.—Lamp Chimney.—S. W. Fowler, Brooklyn, N. Y.

98,485.—Cover for Sewing Machine.—E. F. French, New York city.

98,486.—Hay Spreader.—C. R. Frink, Norwich, N. Y.

98,487.—Manure Drag.—Wm. Geahr (assignor to himself and George Duchman), East Earl township, Pa.

98,488.—Guard for Carriage Steps.—R. H. Goodwin, Boston, and G. L. Gamage, Lynn, Mass., and R. J. P. Goodwin, Manchester, N. H.

98,489.—Burglar Alarm.—Hiram Green, Norwalk, Conn.

98,490.—Sectional Steam Generator.—John Griffith, G. W Wundram, and T. M. Muller, New York city.

98,491.—Machine for Making Rope.—B. S. Hale and J. B. Hale, Lowell, Mass.

98,492.—Rein Holder.—Jones Harding, Detroit, Mich.

98,493.—Mode of Securing Lash in Fly Net.—Moses Hellman, Lebanon, Pa.

98,494.—Bolt Work and Doors for Safes.—J. C. Hintz, Cincinnati, Ohio, assignor to Charles Diebold and Jacob Kienzle.

98,495.—Brick Machine.—J. S. Hobbs and L. R. Elder West Falmouth, Maine.

98,496.—Furnace for Deoxidizing Iron Ore.—Abram W Honsinger, Rome, N. Y.

98,497.—Drilling, Riveting, and Watch Jeweling Apparatus.—C. Hopkins, Philadelphia, Pa. Antedated December 30, 1869.

98,498.—Arrangement of the Pendulum in Calendar Clocks.—H. B. Horton (assignor to himself and Hervy Platts), Ithaca, N. Y.

98,499.—Thill Coupling.—Bennet Hotchkiss, Fair Haven, assigner to himself and W. J. Clark & Co., Southington, Conn.

98,500.—Knitting Machine.—Henry A. House, Bridgeport, Conn.

98,501.—Lead Pipe Coupling.—Jacob Hoyt, New York city, assignor to J. O. Morse, Englewood, N. J.

98,502.—Box for Coffee, Spices, etc.—H. W. Hutchins, Livermore Falls, Me.

98,503.—Sand Chamber for Well Pumps.—E. C. Johnson, Williamsport, Pa. Antedated Dec. 21, 1869.

98,504.—Gage and Divider.—George Kenny, Nashua, N. H.
98,505.—Spiral Spring for Mattresses and Furniture.—S. P. Kittle, Brooklyn, N. Y.
98,506.—Casket Handle.—Dennis Leonard, Winsted, Conn.
98,507.—Card Clothing Clamp.—J. O. Lewis, Worcester, Mass.
98,508.—Curtain Fixture.—John S. Lovejoy, Washington, D. C.
98,509.—Tea-kettle Cover.—Wm. C. Lovering, Taunton, Mass.
98,510.—Stop Valve.—J. A. Marden (assignor to G. M. Gibson, and T. A. Johnston), Boston, Mass.
98,511.—Cruet.—T. H. Mead, Boston, Mass.
98,512.—Machine for Attaching Rivets to Buttons.—J. J. Mervesp, New York city.
98,513.—Indicator Lock.—E. M. Mix and J. E. Mix, Westfield, N. Y. Antedated July 27, 1869.
98,514.—Leather Fastening for Harness.—T. G. Moore, Albia, Iowa.
98,415.—Wrench.—Robert Morrison, New York city.
98,516.—Iron Core for Castings.—A. C. Mott, Philadelphia, Pa.
98,517.—Manufacture of Artificial Stone.—J. M. Ordway (assi-nor to Sewell Brackett), Jamaica Plains, Mass. Antedated Dec. 18, 1869.
98,518.—Collecting Gold from Ores.—A. F. W. Partz, Oakland, Cal.
98,519.—Tile Machine.—J. W. Penfield, Willoughby, Ohio.
98,520.—Bed Bottom.—James Potter, Portland, Me.
98,521.—Shirt Sleeve.—W. A. Ramsay, Philadelphia, Pa.
98,522.—Composition for Concrete Pavements.—E. W. Ranny, New York city.
98,523.—Permutation Lock.—J. P. Schmucker (assignor to himself and J. D. Willis), Ashland, Ohio.
98,524.—Steam Trap.—W. A. Schneider, Albany, N. Y.
98,525.—Washing Machine.—Jerome Scott, Charleston, Pa.
98,526.—Metallic Can Bottom.—H. W. Shepard, Mannsville, N. Y.
98,527.—Bag-String Fastener.—E. B. Southwick, Mendon, Mich.
98,528.—Head-Block for Saw Mills.—A. W. Thompson, Saginaw, Mich., for himself, and as administrator of the estate of Henry Thompson, deceased.
98,529.—Cartridge-Loading Apparatus.—F. A. Thuer (assignor to "The Colt's Patent Fire-Arms Manufacturing Company,") Hartford, Conn. Patented in England, April 9, 1869.
9?,530.—Sleigh Shoe.—T. B. Titus, Phelps, N. Y.
98,531.—Harrow.—Merrit Vanbibber, Tipton, Ind.
98,532.—Stop for Curtain Rollers.—Rudolph Wangeman, Chicago, Ill.
98,533.—Egg Beater.—Lewis Williams, Terrysville, Conn.
98,534.—Fix for Boiling and Puddling Furnaces.—J. D. Williams, Allegheny, Pa.
98,535.—Medical Compound.—A. D. Willis, Crawfordsville, Ind.
98,536.—Permutation Lock.—S. N. Brooks, Bernardston, Mass., administrator of Linus Yale, Jr., deceased.
98,537.—Method of Manufacturing a Fagot for Steel-Headed Rails.—John Absterdam, New York city.
98,538.—Carriage Curtain Fastening.—James Adams, Newark, Del.
98,539.—Mole Trap.—W. C. Akers, Petersburg, Va.
98,540.—Vulcanized India-Rubber Car Springs.—H. A. Alden, Matteawan, N. Y.
98,541.—Lumber Dryer.—Joseph Allonas (assignor to C. Aultman and H. H. Taylor), Mansfield, Ohio.
98,542.—Combined Seeder and Cultivator.—Clark Alvord, Westford, Wis.
98,543.—Axle-Box for Carriage.—A. G. Baker and G. M. Ennis New Bedford, Mass.
98,544.—Beehive.—S. D. Barber and James Wolf (assignors to said Barber and Hiram Cox), Mattoon, Ill.
98,545.—Lock.—Ludwig Beer, New York city.
98,546.—Railway Rail Chair.—T. G. Bering, Harrisburg, Pa.
98,547.—Brick Machine.—Thos. Bishop and Daniel Agnew, Vincennes, Ind.
98,548.—Weather Strip.—J. T. Bliss and J. D. Davenport, North Providence, R. I.
98,549.—Mechanism for Stopping the Delivery-Rollers of Spinning Machines.—Henry Bottomley and Peter Greenwood, Camden, N. J.
98,550.—Machine for Cutting and Pressing the Heads of Metal Cans.—Reuben Brady, New York city.
98,551.—Razor Honing Machine.—William Brown, Thomaston, Conn.
98,552.—Water-Wheel.—J. D. Bryson and W. R. Dunlap, Newcastle, Pa.
98,553.—Bag Holder.—J. M. Burke, Dansville, N. Y.
98,554.—Medical Compound.—W. R. Call and T. F. Griffin, Gloucester, Mass.
98,555.—Ventilating Millstone.—Constant Cerisier, Mung-sur-Loire, France.
98,556.—Washing Machine.—George E. Chamberlin, New York city.
98,557.—Rake Attachment for Reaper.—M. C. Chamberlin and A. Clawson, Plainview, Minn.
98,558.—Saw Mill.—Thomas E. Chandler and John C. Bartholomew (assignors to Thomas E. Chandler and Franklin Taylor), Indianapolis, Ind.
98,559.—Scaffold Bracket.—James Chattin, Marion, Iowa.
98,560.—Cultivator.—A. L. Chubb, Grand Rapids, Mich.
98,561.—Water Wheel.—F. O. Clarke, Unadilla Forks, N. Y.
98,562.—Bird Cage.—G. F. J. Colburn, Newark, N. J.
98,563.—Draft attachment for Horses.—Cyrus C. Cole, Phelps, N. Y.
98,564.—Shoulder Brace.—Henry N. Conklin, Indianapolis, Ind.
98,565.—Hominy Mill.—William C. Coombs and James M. Gray, Memphis, Ind.
98,566.—Clothes Wringer.—Wm. Cooper, Independence, Iowa.
98,567.—Joint Mold or Flask.—William Culliss, Philadelphia, Pa.
98,568.—Sawing Machine.—Jacob D. Culver, Bellmore, Ind.
98,569.—Plowing and Harrowing Machine.—Arthur Cunningham, Cincinnati, Ohio.
98,570.—Guard for Machine for Picking Waste.—Charles J. Dean (assignor to himself and Francis B. Ray), Franklin, Mass.
98,571.—Construction of Concrete Arches for Buildings, etc.—Charles Colton Dennett, Nottingham, England. Patented in England, August 13, 1863.
98,572.—Buckle.—Noah Dice, Xenia, Ind.
98,573.—Farm Gate.—John Dickason, Vevay, and George W. D. Culp, More's Hill, Ind., assignor to John Dickason.
98,574.—Clamp for Holding Staves.—Edmund Doremus, Rondout, N. Y.
98,575.—Pruning Hook.—William M. Doty, Woodbridge, N. J.
98,576.—Bread and Meat Slicer.—Jacob Ensinger and Lewis Fertig, Dauphin, Pa.
98,577.—Lock.—Edward Fay, Washington, D. C.
98,578.—Wooden Pail.—Leonard Asa Fleming, West Mount Vernon, N. Y.
98,579.—Breech-loading Fire-arm.—George H. Fox, Boston, Mass.
98,580.—Coal Stove.—H. J. Frizelle, East Saginaw, Mich.
98,581.—Hay Rake and Loader.—Nelson Gabel, Minneapolis, Kansas.
98,582.—Stove Pipe Shelf.—John H. Gerhart and Joseph S. McCord, Middletown, Pa.
98,583.—Automatic Coal Sifter.—William Gluck, Baltimore, Md.
98,584.—Cant Hook.—W. Q. Greely, St. Anthony, Minn.
98,585.—Washing Apparatus.—John T. Grose (assignor to himself and Wm. E. Kinnear), Upper Sandusky, Ohio.
98,586.—Fruit Jar.—Wm. L. Haller, Philadelphia, Pa.
98,587.—Gymnastic Apparatus.—William Hanlon, New York city, assignor to himself and George, Alfred, Frederick, and Edward Hanlon.
98,588.—Gymnastic Apparatus.—William Hanlon, New York city, assignor to himself and George, Alfred, Frederick, and Edward Hanlon.
98,589.—Lounge and Bed.—August Hansen, San Francisco, Cal.
98,590.—Lawn Mower.—Hiram W. Harkness (assignor to Landers, Fray & Clark), New Britain, Conn.
98,591.—Washing Machine.—Lionel B. Hartt, Detroit, Mich.
98,592.—Velocipede.—John H. Haynes, Boston, Mass.
98,593.—Electric Clock.—Vitalis Himmer, New York city, assignor to himself, W. Heissenbuttle, and James McMullen, Brooklyn, N. Y.
98,594.—Electric Clock.—Vitalis Himmer, New York city, assignor to himself, W. Heissenbuttle, and James McMullen, Brooklyn, N. Y.
98,595.—Gun Carriage.—Jules Cesar Houel and Ferdinand Louis Felix Caillet, Paris, France.
98,596.—Filtering Apparatus for Pipes.—Thomas Smith Hudson, East Cambridge, Mass.
98,697.—Pipe Coupling.—John Vivian Jepson, Brooklyn, N. Y. Antedated December 24, 1869.
98,598.—Hoe.—Giles T. Jobson, Macon, Ga.
98,599.—Cock for Water Closet.—Henry Jones, Philadelphia, Pa., assignor to himself James Jones, and Charles Harrison.
98,600.—Guide for Planing Machine.—Franklin Keagey, Chambersburg, Pa.
98,601.—Extension Window Screen.—John T. Kimball and Benjamin F. Hebard, Boston, Mass.
98,602.—Lantern.—Thomas Langston, Meriden, Conn.
98,603.—Hose.—Benjamin F. Lee, New York city.
98,604.—Cultivator.—John P. Letz, Lacon, Ill.
98,605.—Window Jack.—S. P. Loomis, Philadelphia, Pa.
98,606.—Process of Preparing Coal for Smelting Ore.—William John Lynd, Golden City, Colorado Territory.
98,607.—Using Colorado and Similar Coal for Metallurgical Operations.—William J. Lynd, Golden City, Colorado Territory.
98,608.—Safe.—W. K. Marvin, New York city.
98,609.—Egg Box.—J. D. Michael, Baltimore, Md.
98,610.—Die for Forming Carriage Shackles.—R. M. Miller, Plantsville, Conn.
98,611.—Paper-cutting Machine.—Chas. Montague (assignor to C. C. Child), Boston, Mass.
98,612.—Beehive.—John Montgomery, Union City, Tenn.
98,613.—Safety Railway Truck.—C. R. Morris and H. W. Franklin, Bridgeport, Conn.
98,614.—Desk and Book Rack.—Geo. Munger, Madison, Conn., assignor to himself and J. W. Schermerhorn & Co., New York city.
98,615.—Apparatus for the Manufacture of Chocolate Drops and Other Confections.—W. C. Murdoch and E. K. Haynes, Boston, Mass.
98,616.—Lock for Sewing-machine Case.—H. O. Nauen, New York city.
98,617.—Marker for Carpenters.—G. M. Nickason, Ellenville, N. Y.
98,618.—Device for Measuring and Laying Out Garments.—I. J. Ordway, West Edmeston, N. Y.
98,619.—Rotary Engine.—Frederick Ortlieb, Green Point, N. Y.
98,620.—Bridge.—C. H. Parker, Boston, Mass.
98,621.—Railway Car Brake.—O. S. Pilase, Xenia, and L. E. Skinner, Cincinnati, Ohio. Antedated Dec. 24, 1869.
98,622.—Permutation Lock.—James Sargent, Rochester, N. Y.
98,623.—Lock and Bolt Spindle.—James Sargent, Rochester, N. Y.
98,624.—Machine for Stretching Hats.—Augustus Pelisse (assignor for one fourth to W. A. Childs), Newark, N. J.
98,625.—Tongs for Lifting and Adjusting Well Tubing.—David Phillips (assignor to Daniel M. Zook and Herman Klingman, Oil City, Pa. Antedated Dec. 18, 1869.
98,626.—Rotary Steam Engine.—G. H. Pond, San Francisco, Cal.
98,627.—Combined Harrow, Roller, and Seeder.—Ambrose Powell, New Baltimore, Md.
98,628.—Sawing Machine.—David R. Pratt, New Petersburg, Ohio.
98,629.—Sadiron Heater.—J. G. Redline, Lanark, Ill.
98,630.—Water Gage for the Tunnage of Vessels.—Wm O. Reim, Springfield, Ohio.
98,631.—Globe Valve.—G. W. Reisinger, Harrisburg, Pa.
98,632.—Mechanical Movement.—Geo. M. Rhoades, Hamilton, N. Y.
98,633.—Boring Machine.—Juan Ribon, New York city.
98,634.—Liquid Meter.—Alexander K. Rider, Elizabeth City, N. J.
98,635.—Harvester.—Moses H. Ripley, Minneapolis, Minn. Antedated Dec. 24, 1869.
93,636.—Ship's Rudder.—Thomas Robin and C. E. Burk, Sheboygan, Wis.
98,637.—Horse Hay Rake.—Charles W. Sanborn, Morrill, Me.
98,638.—Refrigerator for Buildings.—J. J. Schillinger, New York city. Antedated Oct. 7, 1869.
98,639.—Fruit Picker.—D. F. Slane, Chillicothe, Ohio.
98,640.—Plow.—L. L. Sloss, Auburn, Ky.
98,641.—Toy Pistol.—C. F. Smith, Torrington, Conn.
98,642.—Stump Extractor and Rock Lifter.—Silas Smith, West Stockholm, N. Y.
98,643.—Toy Savings Bank.—William P. X. Smith, New York city.
98,644.—Wrench.—G. C. Taft, Worcester, Mass.
98,645.—Plant Protector.—Abel Tuttle, Mannsville, N. Y.
98,646.—Valve Cock.—C. R. Vaillant, Whistler, Ala.
98,647.—Wheeled Harrow.—A. L. P. Vairin, Ripley, Miss.
98,648.—Pitchfork.—G. Van Sickle, Shorterville, assignor to himself and W. H. Van Sickle, Springport, N. Y.
98,649.—Extension Curtain Roller.—T. Van Wagoner, Newark, N. J.
98,650.—Cultivator.—B. F. Ward, Indian Springs, Ga.
98,651.—Apparatus for Tanning Hides and Skins.—W. Y. Warner and Jas. Crooks, Wilmington, Del.
98,652.—Composition for Flooring, Wainscoting and other Purposes.—Samuel Whitmarsh, Northampton, Mass.
98,653.—Slate Frame.—W. A. Wilde, Malden, Mass.
98,654.—Curtain Fixture.—John Wyatt (assignor to himself and Geo. Lewis), Philadelphia, Pa. Antedated Dec. 24, 1869.
98,655.—Lubricator.—R. S. Hildreth, South Adams, assignor to himself and R. B. Richmond, Adams, Mass.

REISSUES.

89,004.—Lawn Mower.—Dated April 20, 1869; reissue 3,784.—Samuel Colt, Hartford, Conn., assignee of Joseph Arnelter.
31,578.—Paper-folding Machine.—Dated Feb. 26, 1861; reissue 3,785. Division A.—S. C. Forsaith, Manchester, N. H., assignee, by mesne assignments, of W. H. Milliken and John Milliken.
31,578.—Combining Paper-folding Machines with Printing Presses.—Dated February 26, 1861; reissue 3,786. Division B.—S. C. Forsaith, Manchester, N. H., assignee, by mesne assignments, of W. H. Milliken and John Milliken.
33,006.—Manufacture of Bar Iron.—Dated Aug. 6, 1861; reissue 3,787.—W. H. Perry, Sharon, Pa.

DESIGN.

3,810.—Rubber Eraser.—W. N. Bartholomew (assignor to J. Reckendorfer), Newton Centre, Mass.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,519.—Harness.—D. Waldhauer, New York city. December 4, 1869.
3,545.—Screw Propeller.—M. Kolb, New York city. December 8, 1869.
3,549.—Working of Glass.—T. Hyatt, Atchison, Kansas. December 8, 1869.
3,562.—Vise.—J. Simpson, Cleveland, Ohio. December 9, 1869.
3,564.—Fire-Resisting Safe, etc.—J. P. Graly, —, Mass. December 9, 1869.
3,597.—Preserving Dead Bodies.—G. W. Scollay, St. Louis, Mo. Dec. 11, 1869.

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

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AN IMPORTANT PATENT DECISION.

Spaulding's Mode of Inserting the Teeth.

From the San Francisco Times, Oct. 27.

The case of Nathan W. Spaulding *vs.* William Tucker has been on trial in the Circuit Court, before Judge Deady and a jury, during the past week. The suit was for the infringement, by the defendant, of a patent granted to plaintiff in 1863, for an improved method of inserting teeth in saws. The subject of the patent is the form of the socket in which the teeth are inserted, and the invention consists in rounding the bottom of the socket, so as to exclude angular corners so as to leave the plate stronger—that is, more secure against cracking from the socket. It seems that, prior to the plaintiff's invention, the universal method had been to make the sockets rectangular, which allowed the strain to be concentrated at a single point in the angle of the socket. The result was, that in case of any special resistance or obstruction, like iron, stone, or even hard knots, the plate was liable to crack, and did frequently crack at the corner of the socket.

The plaintiff's device seems to have obviated this objection to inserting teeth in the most effective manner, and this style of saw has since become the universal favorite.

The defendant, who is acting as agent of the American Saw Company of New York, has been selling saws in this city for something over a year past, having inserted teeth, and, as the plaintiff claims, of such likeness to his as to infringe his patent. This the defendant denies, and sets up the further defense that the plaintiff was not the first inventor of the device.

The whole subject was thoroughly discussed by counsel, the Court, and many experts. The case involved many intricate questions of law, and is evidently deemed by inventors and mechanics an important one, a large attendance of whom it attracted.

The jury returned a verdict for the plaintiff, and assessed the damages against defendants.

Mr. Nathan W. Spaulding, plaintiff in the above suit, is of the firm of N. W. Spaulding & Brothers, Nos. 23 and 25 North Clinton st., Chicago, Ill.

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32 Cortlandt st., New York.

N. B.—The Weekly Tribune of Dec. 15, 1869, in answer to a correspondent, says: "Of washers there is nothing to be compared with Doty's."

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Steam Super-Heater,
Saves fuel, and supplies Dry Steam for Heating, Boiling, etc. HENRY W. BULKLEY, Engineer, 70 Broadway, N. Y.

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Patentee, San Francisco, Cal.

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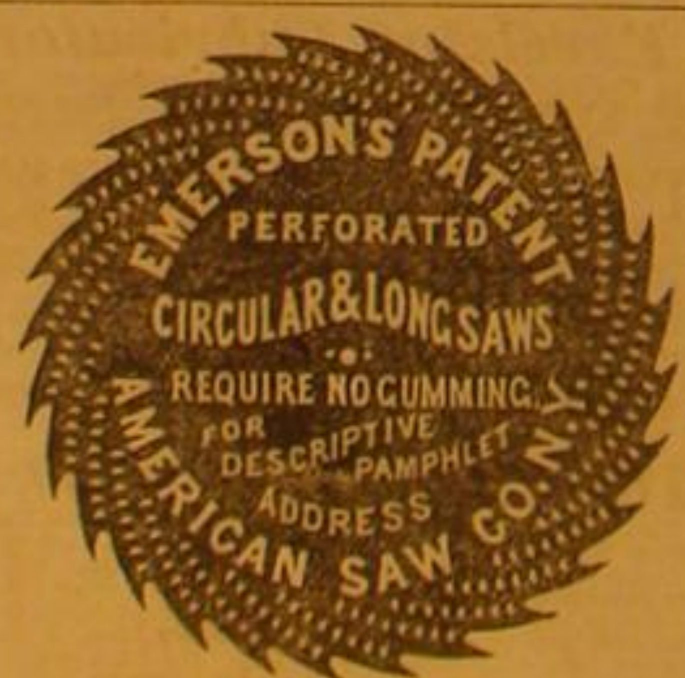

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