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Improvement in Heavy Ordnance.

The principle of this gun was first suggested by the explosion of the great wrought-iron gun "Peacemaker," on board the *Princeton*, on the Potomac river, in 1843, by which Secretaries Upshur and Gilmer, of President Tyler's Cabinet, and others, lost their lives. A model of it was exhibited at the Ordnance Office, in 1852, but the theory of its construction was then regarded as paradoxical, and no attention was paid to it. Letters patent upon it were obtained in December, 1868, and, at the same time, steps were taken to secure patents in Europe.

The part which contains the bore is a steel cylinder, cast with walls of a uniform thickness of two inches, which secures homogeneousness in the casting, and provides against cooling strains and flaws. To receive this steel barrel, an iron reinforce of great thickness is cast, with a caliber a little less than the entire diameter of the barrel. In the walls of the reinforce are eight rows of perforations, having the outlines of truncated cones, disposed in equilateral triangles, the small end of the openings, two inches in diameter, being upon the internal surface of the reinforce. These perforations and the bore are formed by cores, fixed on the flask or pit when the metal is cast. By thus multiplying the cooling surface, the requisite tensile strength may be obtained with less danger of flaws and neutralizing strains, when the mass of metal "sets," as all foundrymen know.

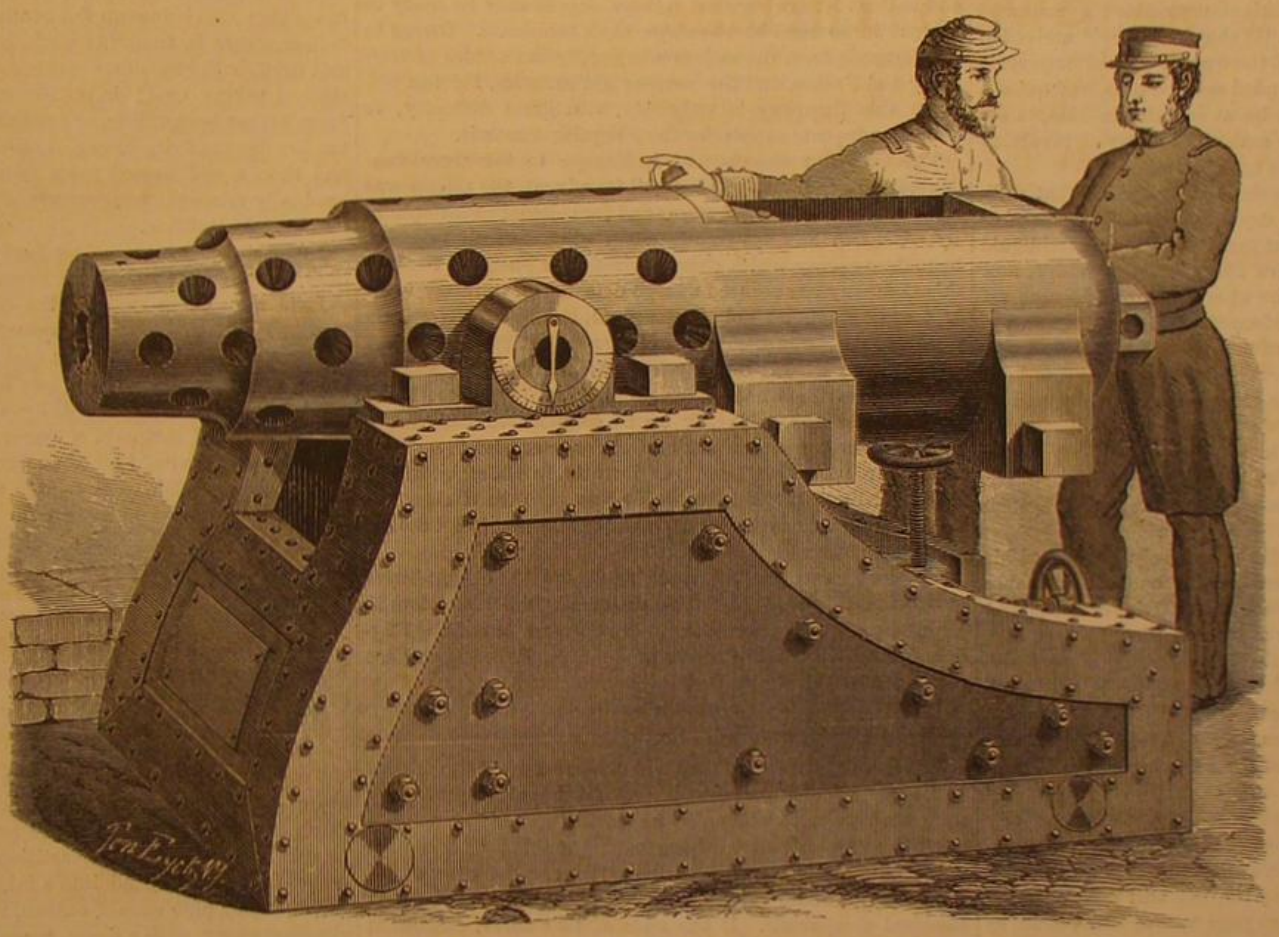
To receive the steel barrel, the reinforce is expanded by heat. It may be cast in sections, thus saving the great inconvenience attending the handling of the same if cast entire, and, in case of flaws in the casting, involving only the loss of the section in which they occur.

The barrel, when inserted, is firmly compressed as the iron cools; but since it is not otherwise secured, its longitudinal expansion, from the heat of discharges, is not so cramped as to cause a rupture. The radial expansion of heat is partly provided for by the elasticity resulting from the internal support received from the reinforce; but in this regard the main reliance is upon the immense radiating surface, penetrating to the very core of the gun, and preventing the accumulation of heat, at the dangerous points within the walls.

A gun thus constructed will, it is claimed, stand the rapid and continuous firing of solid shot indefinitely, without danger of bursting. The theory is, that the rapid firing of a thick-walled gun, made after any of the present approved models, must necessarily produce a degree of heat sufficient to cause unequal expansion in the mass of metal, and thus create cracks, or, at least, strains that will inevitably result in rupture when reinforced by the pressure of subsequent discharges. No gun now in use is so constructed as to be guarded against the silent power of this insidious and tremendous agent. The inventor believes that, with the requisite strength of wall, durability can only be obtained by providing for the harmless and safe escapé of this force, and that his perforated reinforce supplies this provision.

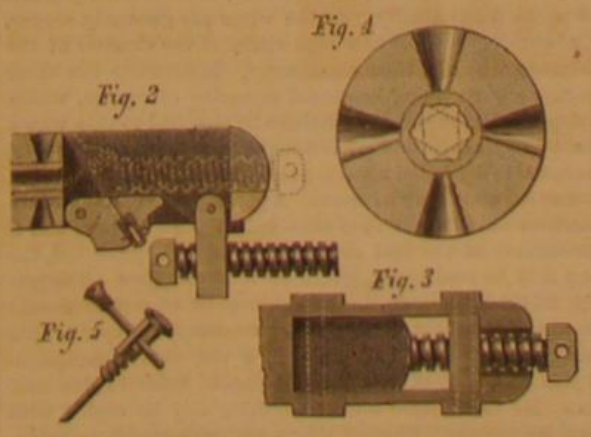
Another original feature of Colonel Terrell's invention is its ingenious breech-loading apparatus. Reference to the engravings will enable the reader to understand the details of this feature. Fig. 1 is a perspective view of the gun. Fig. 2 is a vertical longitudinal section, showing the hinged breech plate and devices for holding it in position. The dotted outlines show the parts in position for firing. Fig. 3 is a top view of the hinged breech plate, and the screw which holds it in its place when adjusted for firing, the screw being in the position shown in the dotted outline, Fig. 2, but the breech plate being dropped into position for loading. Fig. 4 is a cross section showing the form of the rifled grooves, and conical perforations in the reinforce. Fig. 5 is a detail view of the device for expending the charge.

A massive slotted breech is cast to the reinforce. In the walls of this slot is hinged the solid and close-fitting breech-plate. This is firmly compressed against the chamber by the powerful set screw, turning in a swinging nut, hinged in the rear end of the slot, and resting against its shoulders when in position. This screw is located out of all danger of fouling, which occurs when the screw is inserted in the rear end of the bore. By giving the screw a turn or two, it and the breech plate are loosened, and swing by their own gravity through the slot, thus leaving the way clear for swabbing and charging the piece.



TERRELL'S PERFORATED REINFORCE GUN.

To raise or lower the muzzle without loss of time, elevating screws of various lengths are screwed into a revolving bar, which has its bearings in the gun carriage, below the cascabel. To prevent the injuries which result from priming tubes located in the body of the gun, the device for exploding metallic cartridges, Fig. 5, is fixed in the breech plate; and when such cartridges are not used this contrivance can be withdrawn, and the slanting tube it occupied can be used as a receptacle for priming. The inventor of this gun is Colonel Henry John A. Terrell, of Bloomfield, Ky.; and a model of the gun is exhibited at No. 711 Fourteenth street, Washington, D. C., the patentee's present address.



A joint stock company is organizing under the General Incorporation act of the District of Columbia, in the name of the "Terrell Heavy Ordnance Manufacturing Company," for the purpose of manufacturing heavy ordnance for forts, harbor and coast defence, ships of war, etc., under patents granted to Colonel Terrell by the Government of the United States, with such improvements, in said inventions, as may from time to time be made. The duration of said corporation is limited to fifty years, and its capital stock is to be $100,000. This company proposes, first, to have trial guns made and fully tested.

The principal item of cost in the gun is the barrel or inner core. The gun has, we are informed, attracted much attention, and there are not wanting those who predict that it will effect a revolution in heavy ordnance. The tests proposed will be of much interest, and if the results are published, they will be placed before our readers in due time.

Conducting Wires for Military Telegraphs.

The conducting wires of the military telegraphs used in the French army are so made as to be capable of resisting the trampling of horses and the crushing of wheels of the heaviest vehicles on common roads, but not that of artillery. Of late the French military authorities have paid great attention to military telegraphy, and before the war broke out they instituted a series of experiments on it at the camp at Chalons. Lines of wire, says *Van Nostrand's Magazine*, were laid down in every direction on the public roads, and allowed to remain there day and night for whole weeks at a time, subject to all the passing traffic of horses, and vehicles of every description, and to every change of weather; and it was found that, notwithstanding all these trials, messages could be transmitted with perfect accuracy and facility. The wire with which the experiments were tried, and which is used at this moment by the French, is simply a line about one fifth of an inch in thickness. It is a sort of a miniature submarine cable, which, being protected by a strong covering, is capable of resisting the dangers of rupture and crushing, and, to the eye of the uninitiated, presents the appearance of a thin tarred rope. In the center of it 4 threads of copper twisted together, form the metallic portion which is to conduct the electric fluid, or rather the electric motion. A final spiral of cotton surrounds them; over this is a thin coating of india-rubber, and the whole, wrapped in a species of vegetable hair, is fastened together and held by two ribbons of impermeable stuff. The cable is wound round enormous bobbins, ranged in military line, 8 and 8, on special vehicles, and is wound off as the army advances. When it is to be used one of the telegraphers fixes it on the ground by double nails, resembling hair pins. But each carriage contains only 1,100 or 1,200 yds. of cable, and it frequently happens that the message has to be sent to a greater distance. In this case it becomes necessary to unite the cable already laid with that contained in another carriage. The telegrapher, therefore, cuts the ends of each wire, lays bare the copper thread, untwists them in a delicate manner, and then plaits the strands of each cable together, or, as sailors would say, splices them; and this operation can be repeated as often as need be. As, in the French service, the rule is to send a train of 8 carriages, laden with cable, with each brigade or division of the army, it is evident that telegraphic communication can be carried on to no greater distance than about 10,000 yds., or not quite six miles. In a great battle, extending over several miles, and in operations such as the recent campaigns, extending over a large area—say forty or fifty miles—these field telegraphs would have to be very numerous in order to keep up communication with all points of the line.

THE result of a curious and beautiful experiment is now on exhibition at the South Kensington Museum, England. It is a honeycomb, of almost white wax, filled with pure limpid honey, of a beautiful dark rose color. It was obtained by limiting the bees to a carefully selected diet. We hope the names of the flowers chosen for them will be made public, and then the investigation can be carried further.

CRANIA AND RELICS.—The crania obtained from the mounds, with other relics, referred to by "Rambler," in our last issues, were sent to the cabinet of Yale College, to be examined by O. C. Marsh, Professor of Palæontology, in the Scientific department of that institution.

THE CONDENSED MILK MANUFACTURE.

[Condensed from the Milk Journal.]

For many years there have been upon the market preparations called "Dessicated Milk," "Milk Powders," "Milk Essence," &c. But these were articles prepared from milk rather than actual milk. They found, however, prior to the introduction of Condensed Milk proper, considerable demand for use at sea, and in the colonies, where anything that has the appearance of milk will, in the nature, of the case, command more or less sale. Still they did not enter into family consumption to any extent. The desideratum was a preserved milk which should be so pure, wholesome, and palatable as to take the place of crude milk in large cities.

To Mr. Gail Borden, of New York, should be awarded the credit of producing preserved milk that filled all these conditions. Indeed, all the brands of good or even fair quality now sold are prepared substantially under the system originated by him. A man of intense energy and unyielding tenacity of purpose, and an inventor, of great ingenuity if not of marked scientific attainments, he added to all this the enthusiasm of a philanthropist who believed that preserved milk would be a boon to humanity. As long ago as 1846 he began his experiments, conducted simultaneously with others, the aim of which was the preservation of meat. It may be mentioned here that in the London Exhibition of 1851, a gold medal was awarded to Mr. Borden for his "Meat Biscuits." We believe that he did not at this time exhibit his condensed milk. It was not till about 1856 that he himself arrived at the conviction that he obtained the quality he had been seeking. Meanwhile he had expended energy, time, and quite a fortune in his experiments, for he at length saw that, to experiment to advantage, a large amount of material, involving much expense, must be used in each instance.

At an early stage of his experiments he decided that milk could not be preserved in a dry form, as "dessicated," or "powdered," or "solidified," but must be left in a semi-liquid state. That some preservative agent must be added, and that nothing but water must be eliminated, also became apparent. The result is that condensed milk, as now known to trade and consumers, consists of milk from which only water has been taken, and to which nothing but sugar has been added, the product being of the consistency of honey, and by dilution in water reconvertible to milk itself, somewhat sweetened. It may be stated in this connection that all the dry preserved milks require to be dissolved in hot water, while the condensed milk prepared under the Borden system readily dissolves in cold water.

By 1861, Mr. Borden had quite extensively introduced his article, and four or five factories were in operation, capable of producing in the aggregate, perhaps 5,000 tins of one pound each per day. During the war of the rebellion, large quantities were required for the Northern Armies, the officers and many privates purchasing it of the sutlers, while the hospitals were supplied by the Government and the various Sanitary and Christian Aid Societies. This gave an impetus to the trade, at the same time that the shipping demand steadily increased.

About this time Mr. Borden put upon the market for city use what he calls "Plain Condensed Milk." This is prepared in the same way as the other, except that no sugar is added, and it is not hermetically sealed. It will remain sound from one to two weeks, and is so pure and so convenient, as well as economical, that it is stated that now more than one third of the milk used in New York City is of this kind. With the end of the war and the dissolution of the armies, the demand for sugared condensed milk fell off, and the manufacturers, who had been stimulated to too great a production, turned their attention to this 'Plain Condensed Milk." It would be well if enterprise and capital and philanthropy could be enlisted in supplying London with this form of milk to the extent that New York and other American cities are now supplied with it. We have no means of estimating the present extent of the manufacture of condensed milk in the United States. For this we must wait for the returns of the census of 1870. However, we know that the capacity of the eight or ten factories, on the Hudson, in Connecticut, Pennsylvania, and Illinois, is not less than 500 cases of four dozen pound tins per day, equal to 8,500,000 pounds per annum. It may be stated that one pound of the condensed is equivalent to four or five pounds of crude milk.

The exports from the United States of condensed milk (combined with sugar) during the twelve months ending September 30th, 1870, amounted to a declared Custom House valuation of $200,000. In the year 1869 it was exported to England from New York to the value of upwards of $80,000, The bulk of the remainder exported from New York was sent to South America, Australia, India, and China, while that sent to London and Liverpool was mainly held in bond, and sent eventually to the British Colonies or disposed of as ship's stores.

We now pass to the introduction of the manufacture of the Borden kind of condensed milk in Europe, and to the development of its manufacture and sale.

In 1865 an American gentleman, who had noted the advantages of the article, in the American Army during the four years of the war, became resident in Switzerland in the capacity of United States Consul. Remarking the cheapness and richness of Swiss milk, the cheapness of labor, and other facilities afforded in that country, he conceived the idea of preparing condensed milk in Switzerland. The ultimate success of his project has abundantly proved the soundness of the conception. He promoted the "Anglo-Swiss Condensed Milk Company," the extent of whose present business is set forth in the following extract from "The Grocer" of December 31st:

"In the canton of Zug there has of late grown up a new mode of preserving milk, which, owing to the good pasturages of that locality, is very excellent in quality. In the commune of Cham, the Anglo-Swiss Condensed Milk Company, with a capital of £12,000, employ about sixty operatives in their factory, the tall chimney of which may be seen by the railway traveller passing over the line from Lucerne to Zurich. The number of cows hired for the year is 1440, and the average amount of condensed milk prepared daily during the 365 days of the year, (as it is necessary to include the Sundays), is 110 cases of four dozen each of 1lb. tins; these equal 1,927,200 tins as produce of the year. The price of the crude milk is 17c. per mass, or about 1d. per quart, and the daily cost of the tins, made in the establishment, amounts to £16 10s. About one half of the produce is sent direct to London, where one half of this is consumed, whilst the remainder goes for ship stores, is exported to the colonies, and sent to the provincial towns of England. Entering, as it does, into the daily food of the masses, no duty should be imposed upon it; at present it is classed with confectionery, and pays accordingly, whereas it is milk; at all events only the quantum of sugar which it contains should pay duty and this quantum is uniform, and can easily be ascertained. The half of the produce not sent to England is distributed over Germany, and there is some demand from France and Russia. We have been informed that a large shipment was placed in Paris two days before the investment of the city, and balloon letters beg that a large supply may be ready to be sent in so soon as the siege shall terminate. Owing to the demands from the sutlers who supply the armies of Germany and France, and the various aid societies, for the moment this Company is only able, with great difficulty, to keep an adequate supply for their regular demands.

This Company was the first in Europe to introduce condensed milk to family use. Until its advent, the article was known only as for ships' stores and for colonial consumption. By extensive and systematic advertising, and through the boundless energy which characterizes your business Yankee, this Company has secured a large demand for ordinary family consumption, not only in England, but also in Germany and Russia. Baron Liebig and other authorities on questions of food, supported it heartily from the first, and allowed the patronage of their names for publication. Its success led naturally to the springing up of competitive companies. These have been organized at Grüyerès and half a dozen other places in Switzerland, in Bavaria, in Holstein, in Ireland, and in England. But failing to produce a standard quality, and wanting in *prestige*, they have nearly all ceased to manufacture.

All now known to the London trade are the Anglo-Swiss ("Milkmaid Brand"); Mr. Newnham's "Irish Condensed Milk," from Mallow, near Cork ("Harp Brand"); and the English Condensed Milk Company" ("Lion Brand"), whose works are at Aylesbury, Buckinghamshire.

Electrotypy.

This has taken a very important place among the useful arts, enabling manufacturers to produce cheaply a great many things which were otherwise expensive, and artisans to do many things which were otherwise impossible. The process is not a difficult one to comprehend. A galvanic current has the property, under certain conditions, of decomposing many chemical compounds. If the ends of two wires, connected with a battery, be inserted in a vessel of water, and a current of sufficient power made to pass from one to the other through the water, the latter is decomposed into its elements, which are the gases hydrogen and oxygen. One gas will rise in bubbles from one wire end, and the other from the other. These wire ends are called electrodes. Many other substances, if dissolved in water, will decompose much more readily; as, for example, sulphate of copper, commonly known as blue vitriol. This is a compound of sulphuric acid and copper, and it takes much less power to separate the two than to resolve water into its component parts. As the current passes through the solution of blue vitriol the sulphuric acid appears atone electrode, and the pure copper at the other. The sulphuric acid thus set free from its previous combination, will at once attack its electrode, if it be of any metal for which it has affinity. As the wires are generally copper, it, of course, produces new blue vitriol at the expense of the electrode which is thus eaten away. Meanwhile the other electrode is receiving continual accession of copper, which is deposited upon it. If now there be attached to this wire a cast of any kind, which it is desired to reproduce in copper, the metal is deposited upon it as long as the galvanic current is flowing and doing its work. A perfect copy, taking every minutest hair line, is thus obtained in pure copper; and if the surface of the cast or mould be properly protected, the copy may be readily removed after it is complete. The process might be continued until the deposit of copper should become indefinitely thick, but for economy in expense it is usually arrested when there is only a very thin layer, and into this a backing of soft metal is run, in order to give stiffness. By this simple means, anything may be copied with absolute accuracy, whether it be a seal, or a medal, or an engraved plate, or a leaf, or even a photographic negative; the one condition being that the picture or device depend on an unevenness of surface. Engraved plates, especially those of the great masters, are very costly, and yet, after a certain number of proofs have been printed, they lose, by wearing, much of their delicacy in the finest lines and touches. The first thousand impressions are far more valuable than any taken subsequently. The difficulty is now obviated by electrotypy, as the original plate coming from the hand of the artist need never be put under the printing press to lose its sharpness of outline. Copies can be taken indefinitely, and the originals of great works preserved for all time. So, also, by some newly discovered device, a printed engraving of which the plate is lost or ruined, may be used to reproduce a new plate, as perfect as the original. Thus we have the means of restoring the best productions of the most celebrated masters at a very small cost. A much more extensive application of this art is in the reproduction of printed matter in the permanent form of copper plates. Various metals may be deposited by the same method from suitable solutions—gold, silver, nickel, and platinum, as well as copper. This gives a ready means for covering or plating inferior metals with the noble metals, which may be done to any desired thickness, as in a multitude of articles for domestic use.

Electrotypy affords an excellent employment for boys, combining entertainment with instruction and the development of skill. They can easily learn how to do it, if they are blessed with any aptitude, and it may lead them to deeper studies in chemistry, greatly to their advantage, and to the exclusion of mischief-making.—*Mechanics' Magazine.*

Warming Country Houses.

One of the most important items in the preservation of the general health is being comfortably warm all the time, for then we would never take cold. There should be a room in every farmer's family which should be kept at a temperature of not under 65° Fah., from daylight until bed-time, all winter, by stove or furnace heat; stoves are better, because they will bring up the heat more quickly. When the farmer comes in from his work, he is generally over-heated and tired, both conditions making him greatly more susceptible of taking cold; or, on the other hand, he is very cold from having been riding, or engaged in something which has not involved activity enough to keep him adequately warm, and then a well-heated room is exceedingly grateful, and gradually raises the temperature of the surface of the body to its natural condition.

Large stoves consume less fuel in proportion than small ones, and give out more heat hence are more economical.

It is a common error in the country to have too small stoves, so as to economize space, and under the mistaken notion that they consume less fuel in proportion. A circular stove, six feet high and about two feet in diameter, lined with fire brick two feet high, will keep a large room more equably warm, and maintain a purer atmosphere, with a very much less amount of fuel, than our common stoves. Stoves of this shape, made of porcelain, are used in Germany and Russia, where wood is grown for fuel; and, from persona observation, we think that about half the amount of wood is consumed, giving a greater, better, and more comfortable heat than we have here. In farmers' houses, an immense amount of heat is used in warming "all out doors.' The longer a flue is, the stronger the draft; all flues should be built from the ground, thus securing a good draft, and also saving millions of property every year from being burned, which is the case when flues are built on floors up through the rafters and roof.

Two sitting rooms on the same floor, and one or two chambers above, may be adequately warmed by one stove thus: Let the stove stand in one room, and let a pipe of good size be sent through the partition into the adjoining room, where it should expand into a large drum; from this drum the ordinary pipe should extend, through the floor, into the chamber above, with a drum there, if needed. Only a moderate amount of heat is needed in a chamber; but that moderate amount is needed in winter time. There is no advantage in going to bed in a cold room, nor in sleeping in a cold room, nor in getting up and dressing in a cold room; persons may survive it; many have lost health by it. To have the chill taken off the air on going to bed, and when dressing, is comfortable and healthful A room under 45° is a cold room for a sleeping apartment, and sleeping in an atmosphere, indoors, lower than that is always hurtful, is always positively pernicious, for the simple reason that such a temperature causes the carbonic acid gas of a sleeping apartment to condense and settle in the lower part of the room, where it is breathed into the lungs, with the most pernicious results. Sleeping in a room cooler than above named is especially dangerous to aged, feeble, and invalid persons, as it tends to cause inflammation of the lungs. Persons may sleep out of doors with impunity when the temperature is many degrees lower; that is because the out-door air is pure, is full of life, full of oxygen, without any admixture of indoor poisons, and hence gives a vigor of circulation, which keeps the whole body warmed to its natural point, resisting cold and all diseased conditions.—*Hall's Journal of Health.*

A New Brass.

The difficulty of uniting iron to brass is created by the unequal rate of expansion in the two metals, which destroys the unity when the temperature is changed. A new alloy of copper is announced, and the inventor claims that its expansion by heat is so similar to that of iron and steel, that the surfaces may be regarded, when joined, as permanently united, for all practical purposes. The formula (recently published in the *Journal of Applied Chemistry*) is as follows: Tin, 3 parts; copper, 39½ parts; zinc, 7½ parts. Any of our readers who have occasion to join iron and brass, can easily try this new "metal," and we shall be glad to hear of the practical value of an idea of such high technical importance.

OPIUM culture has been attempted in Illinois, and although the poppies did not grow to be healthy plants, some opium was obtained, by incision of the capsules, which, on treatment by Mohr's process, gave nearly nine per cent of crystals of morphia. The grower will experiment further this year.

DYERS' RECIPES.

From Haserick's Secrets of Dyeing.

SCARLET ON WOOL.—For every 100 pounds of fabric, boil, in a suitable kettle, 11 pounds of ground Honduras cochineal, 5 pounds of half-refined tartar or 3 pounds of tartaric acid, 2 pounds of oxalic acid, 1 pound of tin crystals, 1½ pounds of flavine, 10 pounds of scarlet spirit. [The latter is prepared as follows: Take 16 pounds muriatic acid, 22° B., 1 pound feathered tin, 2 pounds water. The acid should be put in a stoneware pot, and the tin added, and allowed to dissolve; the mixture should be kept a few days before using.] After it has boiled for about fifteen minutes, cool the dye to 180° Fah.; enter the goods, handle them quickly at first, and let them boil slowly for one hour, when they will be a good scarlet. Take them out, cool, and rinse in cold water. If it should happen that the wool or flannel shows some white hair, which is generally the case when new wool is used, then add 5 pounds of raw muriatic acid to the dye. This powerful agent will work wonders in scarlets, oranges, and pinks, as it tans the wool, which is perhaps a little greasy, and prevents the tin crystals from fastening too quickly to it, and thereby evener colors are obtained. This latter fact is very valuable, and not generally known.

SCARLET WITH LAC DYE.—For 100 pounds of flannel or yarn, take 25 pounds of ground lac dye, 15 pounds of scarlet spirit, (as above), 5 pounds of tartar, 1 pound of flavine, according to shade 1 pound of tin crystals, 5 pounds of muriatic acid. Boil all for fifteen minutes, then cool the dye to 170° Fah.; enter the goods, and handle them quickly at first; let them boil one hour; rinse them while yet hot, before the gum and impurities harden. This color stands scouring with soap better than cochineal scarlet, but this is in consequence of a larger amount of acid being used than is necessary with cochineal scarlet. To this color, a small quantity of sulphuric acid may be used, as it dissolves the gum. The quantity of lac dye should be regulated by its quality.

COCHINEAL SCARLET, OLD MODE.—In former times, when cochineal was very expensive, the goods were colored in two waters, with nitrate of tin. By this process, the cochineal colors only the outside of the fabric (the cut showing white in broadcloth), and about thirty per cent less of cochineal is used than in scarlet colored with muriate of tin in one operation; but it is useful for braided scarlet random. To 100 pounds of fabric dissolve 10 pounds of nitrate of tin, 5 pounds of cream of tartar, 1 pound of flavine. The nitrate of tin should be made thus: 10 pounds nitric acid, 36° B.; 5 pounds muriatic acid, 22° B.; 5 pounds water; mix these ingredients, and add 1 pound feathered tin, in small quantities to prevent overheating. Boil it for ten minutes; cool off to 170°; enter the goods, and boil them for one hour; then take out, cool, and rinse. To fresh water add 7 pounds of cochineal, well ground, and 2 pounds of starch in solution, and strain; let all boil for five minutes; cool the dye to 180°; add 1 pound of nitrate of tin; handle the fabric well, and boil for three quarters of an hour; then take it out, cool, and rinse. This is a very bright scarlet, and is used for scarlet random; only use no flavine in the preparation of the random, to secure a good white. This scarlet requires two waters; the cochineal would not adhere to the wool with nitrate of tin, as it does with the muriate of tin in one operation. In all scarlets, the yellow shade is governed by the quantity of citron bark or flavine used. I find a very foolish habit, in many dye houses, of letting the liquor run half away after every dip is colored; the old liquor, or second kettle, makes not only a better color, but will save at least twenty per cent of dye stuff and heat. Of course common sense must govern the judgment of the operator, or the acid will be too strong in the dye, after several dips.

Sundry Notes on Illuminating Gas.

Gas, says Harris' "Gas Superintendent's Pocket Companion," in itself is not explosive; it is only so when mixed with air; one volume of gas to eight volumes of air is the most explosive mixture; one of gas to four of air is not safe, and all mixtures of one of gas to between four and fourteen parts of air are more or less dangerous. It is, however, possible and even probable, that explosions have taken place where only one per cent of gas was present.

Gas, on escaping, being lighter than air, at once takes its place next the ceiling; the law of diffusion of the gases begins to operate, and, in a given time, in proportion to the extent of the escape, about one foot of space from the ceiling will be filled with the most explosive mixtures, while the under part of the room has scarcely any gas in it. When an escape of gas occurs, enter the room without a light, open the top of the window and the door, and, before introducing a light, take means, as by smelling along the ceiling, to ascertain that the gas is all gone. If a light be in the apartment, extinguish it, or lower it to the floor; to lift it to near the ceiling is highly dangerous.

Four tenths of an inch may be fairly put at the disposal of the fitter for the friction of meter, pipes, and fittings. This, added to the pressure required at the burners, will give eight tenths for common gas, and ten tenths for cannel gas, as the minimum pressure to be supplied by the gas company.

The reason that cannel gas requires more pressure, is that it requires more oxygen for combustion, and should be projected into the air in a thinner stream and with greater force.

Accidents have sometimes occurred from the use of water slide pendants, when the seal has not been sufficient, or from evaporation of the water. To prevent evaporation, a teaspoonful of good salad oil should be added after the hydraulic tube has been filled up with water.

When the gas goes out suddenly, where the meter used is what is called a wet one, it is generally on account of a deficiency of water in the meter.

The singing or hissing noise made by gas, in passing through burners, is objectionable, especially in private apartments, and may be prevented by fixing a stop-cock in some part of the fittings leading to the burners, but at some distance from them. By regulating the supply by this cock (those at the burners being turned full on), the noise will cease.

If the gas blacken the ceiling, the burner passes more gas than is properly consumed, and carbon, in the form of soot, will be deposited.

Lava or porcelain burners are more suitable than iron ones, when exposed to a moist atmosphere, as in dye houses, print works, etc., on account of their non-liability to rust.

Sparks in gas may be produced by the ignition of particles of matter floating in the air, or, according to some authorities, by the presence of naphthaline in gas.

For cleaning out argand and other perforated burners, a strong darning needle is the best instrument; and for slit burners, a piece of thin watch-spring, or a slip of writing paper.

The proportion of light given by sperm and wax candles is 14 sperm=16 wax; but, though stated as each burning 130 grains per hour, it is found in practice that sperm candles burn 132 grains, and wax candles 172 grains per hour. A sperm candle ·85 of an inch in diameter consumes one inch in length in an hour.

On lighting the gas in factories, the warmth diffused renders the oil more limpid, increases its lubricating value, and thereby enables the machinery to be driven with less power.

Family Reading.

That increasing intelligence and morality are lengthening the average duration of human life cannot be disputed; it was twenty years two centuries ago; it is now over forty, in civilized societies. It is just as true that increasing intelligence and a decrease in the moral or religious element, will rapidly abridge the lives of individuals, communities, and nations. Intelligence insures prosperity, pecuniary thrift; but unless there be a corresponding increase of the religious sentiment, and of high moral principle, imposing proper restraints on the facilities of obtaining indulgences which wealth offers, individuals will die, communities will decrease, and nations will become extinct, from their very highest points of grandeur, of cultivation, of art and grace, of power and domain, and hoards of wealth. Egypt, and Babylon, and Greece, and Rome, pagan in principle and practice, went rapidly down to the deepest depths of human depravity and human degradation.

Leaving it to the pulpit to take care of the moral culture, occasion is here taken to suggest that it is of growing importance that every family, claiming in the least to be cultivated, should take, not only one good religious weekly publication and a respectable newspaper, but also some scientific journal, which, in its teachings, will certainly elevate and refine, because it addresses the reflective faculties; and whatever makes a man think, raises him upwards to a higher nature. Whatever makes the youngest child think, whatever tends to cultivate "thinking for themselves" in any household, goes far, very far indeed, to make of that household, within a very few years, men and women of which any community may well be proud.

The SCIENTIFIC AMERICAN is the first, the best, and the ablest of its kind in the world. Always of a high moral tone, elegant in its mechanical execution and getting up, it abounds always in practical matter of great value in the workshop, on the farm, in the dairy, the kitchen, the garden, and the orchard; it gives the earliest and most reliable information about all inventions and improvements, saving labor, economizing means, and adding immeasurably to household convenience and comfort. The very sight of it on a gentleman's center table is a guarantee that there is intelligence in that household.—*Hall's Journal of Health.*

The Nature of Different Gums.

Dr. Sacc, of Neuenburg, Switzerland, has made an extensive inquiry into the nature of different resins. We condense from it the follhwing results. The resins spoken of are copal, amber, dammar, common resin, shellac, elemi, sandarach, mastic, and Caramba wax. All these resins can be reduced to powder.

The following will become pasty before melting: amber, shellac, elemi, sandarach, and mastic; the others will become liquid at once.

In boiling water, Caramba wax will melt; common rosin will form a semifluid mass; dammar, shellac, elemi, and mastic will become sticky; while copal, amber, and sandarach will remain unchanged.

Dammar and amber do not dissolve in alcohol; copal becomes pasty; elemi and Caramba wax dissolve with difficulty; while rosin, shellac, sandarach, and mastic dissolve easy.

Acetic acid makes common resin swell; on all the others it has no effect.

Caustic soda dissolves shellac readily, rosin partly; but has no influence on the others.

Amber and shellac do not dissolve in sulphate of carbon; copal becomes soft and expands; elemi, sandarach, mastic and Caramba wax dissolve slowly; while rosin and dammar dissolve easily.

Oil of turpentine dissolves neither amber nor shellac, but swells copal; dissolves dammar, rosin, elemi, sandarach, and Caramba wax easily, and mastic very easily.

Boiling linseed oil has no effect on copal, amber, and Caramba wax; shellac, elemi, and sandarach dissolve in it slowly, while dammar, resin, and mastic dissolve easily.

Benzine does not dissolve copal, amber, and shellac, but does elemi and sandarach to a limited extent, and Caramba wax more easily; while dammar, resin, and mastic offer no difficulty.

Petroleum ether has no effect on copal, amber, and shellac; it is a poor solvent for resin, elemi, sandarach, and Caramba wax, and a good one for dammar and mastic.

Concentrated sulphuric acid is indifferent to Caramba wax; it dissolves all resins, imparting to them a dark brown color, excepting dammar, which takes a brilliant red tint.

Nitric acid imparts to Caramba wax a straw color; to elemi, a dirty yellow; to mastic and sandarach, a light brown; it does not affect the others.

Ammonia is indifferent to amber, dammar, shellac, elemi, and Caramba wax; copal, sandarach, and mastic become soft, and finally dissolve; while rosin will dissolve at once.

It is not difficult by means of these reactions to test the different resins for their purity.—*Deuzlin, Polytech. Journal.*

The Compass Plant.

The first mention of the so-called "polarity" of the compass plant, *Silphium laciniatum*, was made in communications addressed to the National Institute, by General Benj. Alvord, then Brevet Major, U. S. A., in 1842; although the fact was well known to many hunters and others.

General Alvord's first conjecture, that the leaves might have taken up so much iron as to become magnetic, having been negatived by analysis, he suggested that the resinous matter, of which the plant was full, and from which it was sometimes called resin weed, might have some agency in producing electrical currents.

As to its geographical distribution, he stated that it extended from Texas on the south, to Iowa on the north, and from Southern Michigan on the east, to three or four hundred miles west of Missouri and Arkansas; its chief habitat being rich prairie land.

Dr. Gray thought "that the hypothesis of electrical currents was hardly probable, as resin was a non-conductor of electricity; but that the polarity was due to the fact that the leaves were inclined to be vertical, and the direction of their edges north and south was the one in which their faces would obtain an equal amount of sunlight."

Mr. Charles E. Bessey, of the Iowa State Agricultural School, says: "We have the curious 'compass plant,' *S. laciniatum*, growing in great abundance throughout all this region. The polarity of its leaves is very marked. Use is made of it by the settlers, when lost on the prairies in dark nights. By feeling the direction of the leaves, they easily get their bearings."

From the record of these observers, there can be little doubt that the leaves on the prairies do assume a meridional bearing; and the cause assigned for this by Dr. Gray is undoubtedly the correct one, viz.: that both sides of the leaf are equally sensitive. It is well known that the two sides of a leaf usually differ in structure, that the number of *stomata*, or breathing holes, is much greater on the under than the upper surface; and that the tissue of the upper is denser than that of the lower stratum. As the two surfaces of the leaf of *S. laciniatum* appeared something alike, Dr. Gray suggested that it would be well to examine the leaf microscopically, in order to see if it corresponded with ordinary leaves in the above respects, or with truly vertical leaves, the two surfaces of which are usually similar, or nearly so. Such an examination was accordingly made, when it appeared that both surfaces of the leaves presented the same number of *stomata;* while the leaves of other species of *Silphium*, in which no tendency to assume a north and south position is shown, exhibited great difference in the *stomata* of their surfaces. The magnifying power used was about four hundred diameters.

The observations here recorded appear to show that the meridional position of the edges of the leaf is to be explained by the structure of the two surfaces, which, being identical, at least in the important respect of the number of the stomata, seek an equal exposure to the light; the mean position of equal exposure, in northern latitudes, being that in which the edges are presented north and south, the latter to the maximum, the former to the minimum of illumination.—*W. F. Whitney, in American Naturalist.*

Enameled Writing Surfaces.

An useful substance for making glass labels, sign boards, etc., is made as follows: 30 parts, by weight, of pure saltpeter, 90 parts of fine sand (silicic acid), and 250 parts of litharge, to be thoroughly blended, and then melted. The enamel made by these means can be written or drawn on with the same facility as the best paper; and has the novel, and, we may say, the unprecedented, capability, of perfect permanency, if the ink be properly prepared, as the writing can be burnt in, by means of a muffle, in less than a minute. Another advantage will help to recommend it to ingenious inventors: it can be treated, for photographic purposes, with a substitute for collodion. This substitute can be prepared as follows: 10 parts of gum, 1 part of honey, and 3 parts of bichromate of potash; filtered and dried on the surface of the above-described preparation. The plate is exposed in the usual way. The development is made by dusting, the powder being composed of 10 parts, by weight, of cobalt oxide, 90 parts of iron scales, 100 parts of red lead, and 30 parts of sand. When these components are mixed, the chromate should be decomposed by immersion in a bath of water, acidulated with 5 per cent of muriatic acid. After washing and drying, the enamel should be melted on a piece of iron plate, coated with chalk; a minute's subjection to heat is enough, and the photograph on the enamel, perfectly glazed on, will be apparent.

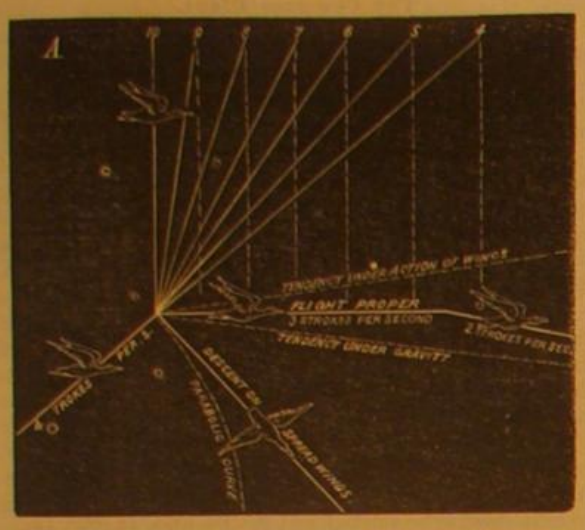
[For the Scientific American.]

THE FLIGHT OF BIRDS.

BY E. O. DAVIDSON.

In the flight of birds, there is involved a very intricate and equally interesting problem of nature, which seems to have hitherto escaped the observation of men of science. This flying puzzle consists of, first: the constant force of gravity; second, the relative weight of the body and the area of wing, which govern the number of the impulses of the latter in a given time; third, the direction and effect of the stroke of wing; and fourth, the incidental effect of the velocity upon the weight of the bird, which governs the amount of the power exerted in each case. The necessity for, and the combined character of, these several influences in this peculiar mode of locomotion, will be briefly explained in the following treatise, with the aid of two simple diagrams.

Referring to the diagram A, and taking, as an example of swift flight, one of the largest species of the wild duck, whose weight is usually about five pounds, accompanied by



one foot superficial of wing: let it be supposed that one of these birds starts from the ground, and raises himself, upon the angle indicated in the diagram, by the exertion of his wings, at the rate of four strokes per second of time. When he attains the point of intersection of the ascending and horizontal lines, the process of what may be appropriately called flight proper commences, thus: The bird now adjusts his body in a level position upon the horizontal plane of motion, and, at the same time, reduces the number of the strokes of wing to three beats per second, and then proceeds with the current velocity attained in making the ascent—to which is now added accelerated motion—until the resistance of the air in front establishes a uniform rate of progression. And, in this situation, it is evident that the animal must constantly gravitate diagonally, towards a point on the earth at a considerable distance ahead, as indicated by the dotted line in the diagram; which point advances *pari passu*, with the moving position of the animal in the air; and the equally constant vertical action of his wings tends to raise him upwards upon the dotted line, situated above that of his progression; so, being thus held under the control of these two conflicting influences, in accordance with the laws of the resolution of forces, the body necessarily assumes the diagonal upon the horizontal plane, and proceeds with a uniform velocity, of about one hundred miles an hour in a still atmosphere. This swift motion on the wing, so far reduces the weight of the animal for the time being, that one-pound power, imparted through the superficial foot of his organs of motion, exerted at the rate of three strokes per second, sustains the five pounds weight of body upon the line of flight. Thus the locomotion of birds is placed upon precisely the same footing with that of all terrestrial and aquatic animals, as regards the amount of power, exerted by each, compared with the weight carried.

The above-estimated velocity of the wild duck on the wing is based upon the writer's thirty years' constant observation, and is fully sustained by some interesting experiments with carrier pigeons, made several years ago by men of science in Europe. If the semi-annual migrations of the wild geese of North America, and other birds of passage, be carefully observed, it will be found that the birds alike traverse the atmosphere at the rate stated. The well-known fact that large flocks of wild geese rise from the valley of the Rio Grande in the morning, and descend into the Northern lakes in the evening of the same day—thus traversing a distance of from twelve to fifteen hundred miles without taking food or water—strikingly illustrates the position here contended for. Moreover, if the flight of birds generally be carefully observed, it will be found that the different species exert their wings with a uniform celerity of stroke, and that they, respectively, traverse the air at a uniform state of velocity; which circumstance can be accounted for alone by the fact that their progression on the wing is incidental; therefore, their velocity cannot be either increased or diminished, while they continue upon the same plane of elevation. The locomotion of all the terrestrial and aquatic animals is effected by propulsion; but that of the birds and bats, is chiefly due to the constant force of gravity, the exertion of the wings being mainly designed to raise and sustain the animal in the air: and hence the weight of the body is the chief means of their flight, and without it they would be entirely at the mercy of the winds, like the balloon.

In regard to the direction of the stroke of wing in flight proper, careful observation will show that it is vertical, and of course must be made at right angles with the line of progression, and hence it is clear that the bird cannot propel himself by such a movement of his organs of aerial motion. But the best argument, in support of the doctrine that the birds and bats do not and cannot propel themselves in flight, is, that it is not necessary in effecting that species of motion. The popular notion and error, derived from the cyclopædias, namely, that the stroke of wing in flight is made in a downward and diagonal direction, and thereby both sustains and propels the animal in the air, has no foundation in nature or truth.

And, concerning the effect of the velocity upon the weight of the bird on the wing, whereby the latter is reduced, as above stated, by four-fifths of its normal specific gravity, such a result is rendered more than probable from the well-known effect produced upon all bodies, animate or inanimate, by both rectilinear and rotary motion, the weight in all cases being, more or less, merged in the velocity. Many familiar instances of such results could be adduced, if deemed necessary, but they will occur to the mind of the intelligent reader; and men of science will see that the position here assumed is fully sustained and exemplified by the extreme cases of the heavenly bodies, the great velocity of which completely suspends the weight of each body in its orbit or revolution.

Birds, in flying, are compelled to make acclivities and declivities in the air, similar to those irregularities met with in travelling upon the surface of the earth; and, in ascending on the wing, more power is required than in traversing a horizontal plane, while nothing but the weight of the body is necessary in effecting the descent. For instance, if the wild duck or any similarly organized bird, after ascending up to the line of flight proper, upon the angle indicated in the diagram, should cease to exert his wings, but keep them spread, he must descend upon the dotted line marked, on expanded wings—upon the other side of the aerial hill, under the influence of gravity alone. And if, after again repeating the ascent, he should fold his wings, in that case, like a stone thrown upward from the hand, or a military projectile in returning to the earth, his body would describe one section of the parabolic curve in its descent, as indicated by the dotted line in the diagram.

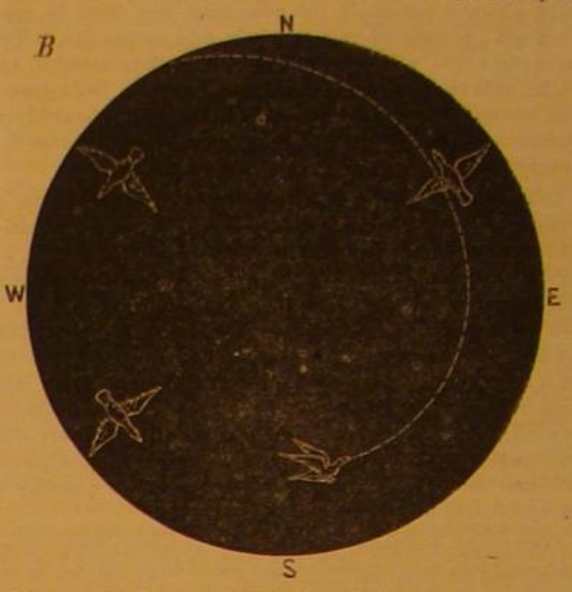
Referring again to the diagram, and supposing that a bird, in making his ascent upon the angle indicated, by four strokes per second, should continue to exert his wings at that rate, it will be seen that he must continue to rise upon the same angle of elevation, and thus soon attain a considerable hight above the earth, but with less progress in the same time.

Again: Suppose that, in repeating the ascent, in a similar manner, up to the point of intersection of the ascending and horizontal lines, the bird should then increase the action of his wings to five strokes per second; in that case, it should seem, that, instead of propelling himself faster, upon the line traversed, by four strokes, he must at once assume a wider ascending angle as the line of his motion. But it will be seen that there is a corresponding decrease in the distance made in the same time in both these cases, as indicated by the perpendicular dotted lines connected with the figures 4 and 5. According to the arrangement of this diagram, it must be understood that the wild duck, after making his ascent to the line of "flight proper," traverses the entire length of that line (150 feet) in one second of time, which is the basis of his estimated velocity of one hundred miles an hour, thus: after taking off one third (of the feet per second) the remaining two thirds gives the velocity in miles per hour. Hence it will be seen that, in ascending upon the angular line, marked 4 and 5, the bird falls short of the distance made in the same time, upon the line of flight proper, under the action of his wings exerted at the rate of only three strokes per second. And so in regard to the remaining ascending lines in the diagram, up to and including that marked ten strokes per second, which is designed to show the perpendicular ascension of the bird on the wing. Now, it appears, from this reasoning, that the redoubled exertion of the wings in the flight of birds, instead of propelling them with greater velocity upon the line of motion, results in merely multiplying and widening the angles of ascension above that line, until flight, in any rational sense, is lost in the perpendicular motion of the animal. And, on the other hand, it is equally clear that, after the ascent has been made, a less number of the impulses of wing than the conditions of the organism of each bird requires, especially among those species that make long passages, would inevitably soon result in letting the animal down to the earth, as indicated by that part of the diagram marked 2 strokes per second.

In conclusion, it only remains to give a brief explanation of the peculiar process of motion of certain large-winged species of the feathered tribe, as exhibited in the lofty and graceful soarings of the sociable vulture, and several other terrestrial and aquatic birds, on motionless wings. And it is pleasing to know that this hitherto seemingly mysterious "way of an eagle in the air" may be readily solved by the application of the leading principle of the foregoing new theory of the flight of birds, together with three other elemental conditions, which combine in producing those beautiful aerial evolutions, namely: first, the distinctive organism of these birds; second, the influence of the winds; and third, circular movements on the wing.

The weight of the male vulture, for example, is about six pounds, accompanied by three feet superficies of wing; and this relation, of the weight of body and area of wing, constitutes an indispensable condition of the organism required in this process of flight, if it may be so called. Referring to the diagram marked B, let it be supposed that one of these birds starts, upon expanded wings, from the top of a pole 100 feet high at the cardinal point east, and moves in a circle formed in passing around by north to west, and thence by south to the place of departure, in a still atmosphere. In such a case, it is evident that the animal would descend considerably below the top of the pole in closing the first circle; and thus, by many repetitions of similar gyratory movements, he would inevitably spiral himself down to the earth, deriving his motion alone from gravity, and descending under its influence, just as he would have done had the movement been made upon a rectilinear line. This case has been cited in order to show the necessity for a current of air, in this process of attaining aerial motion on spread wings.

Now, let it be supposed that the wind blows at the rate of about five miles an hour (a gentle breeze, and all that is required in such cases), from east to west; and that one of these birds starts from the ground, by making a few strokes of wing to clear himself of local obstructions, and then begins to soar in circles, as he always does. It will be seen that, in passing round the northern half of the circle, the winds strike him behind, and thereby accelerate his motion (primarily produced by gravity) towards the westward point, upon



reaching which, he turns his head, and thus comes in contact with the wind, the force of which, pressing against the under surface of the concave wings, gradually raises the animal as he moves, with diminishing velocity, around the southern side of the circle, towards the eastern point. And thus, by many repetitions of these circular movements, gaining a little elevation each time while passing around the southern half of the circle, and losing nothing in rapidly traversing the opposite side, he, and all other similarly organized birds, readily ascends in the air upon motionless wings, where he is enabled by this process to sustain himself at any desirable elevation (below the clouds) for many hours, or even a whole day, without exerting any power, except the little muscular force required to keep the wings expanded, and to guide himself in circles. And the descent from the elevated positions of these birds, is effected by merely ceasing to gyrate: the force of gravity then having the entire control of their bodies, they must gradually return to the earth, upon angles formed by the relative weight of the body, and the area of wing of each.

Unwholesome Candies.

Hermann Endemann, Ph. D., Assistant Chemist to the Health Department of New York, has recently examined a great variety of candies, collected from various dealers by Drs. Loe and Frankell, Assistant Sanitary Inspectors.

Inorganic adulterations were detected in only two cases, in both cases in lozenges, to the extent of 3 and 6 per cent. In one establishment visited a white powder was obtained, which proved to be gypsum, (sulphate of lime).

COLORING MATTERS.—Reds were either carmine or aniline red, both harmless.

Yellows were either saffron, chromate of lime, chromate of baryta, chromate of lead, gamboge, or yellow vegetable colors precipitated by alum and chalk.

Of ten samples examined, five were colored with chromate of lead and one with gamboge, both of which were poisonous.

Greens were found to be harmless.

FLAVORS.—Oil of peppermint is often adulterated with oil of turpentine. The other flavors are generally artificial ethers, as, for example, butyric ether. Many of these are considered injurious.

SUBSTITUTE FOR SUGAR AND GUM ARABIC.—Glucose, starch sugar, is common in some kinds of candy. Starch is extensively used as a substitute for the more expensive gum arabic. Both of these substances are harmless.

In conclusion, the public is cautioned against highly colored yellow, orange, and green candies, and against highly flavored candies.—*American Chemist.*

Coal Slack.

The almost incredible amount of coal dust, made in the mines in England, has induced the invention of a means of burning it profitably; it is now used, in salt works, for the evaporation of brine. Tubes are arranged, projecting from the boiler below the water level, and a large receptacle is placed, over them, of which the bottom is perforated with slits, to allow the coal slack to fall, between the tubes, to the fire below. A rake is moved mechanically, to and fro, to graduate the fall of the coal dust. Thus the supply of air in front of the smoke can be graduated, and the consumption of smoke thereby secured. The saving of fuel by this means is great, and labor is reduced. The inventor claims that the boiler is not so liable to be burned; but as the destruction of iron is owing to the quality of it, we do not see how a more perfect combustion can reduce its perishability.

SPRING STEPS FOR STAIRWAYS.

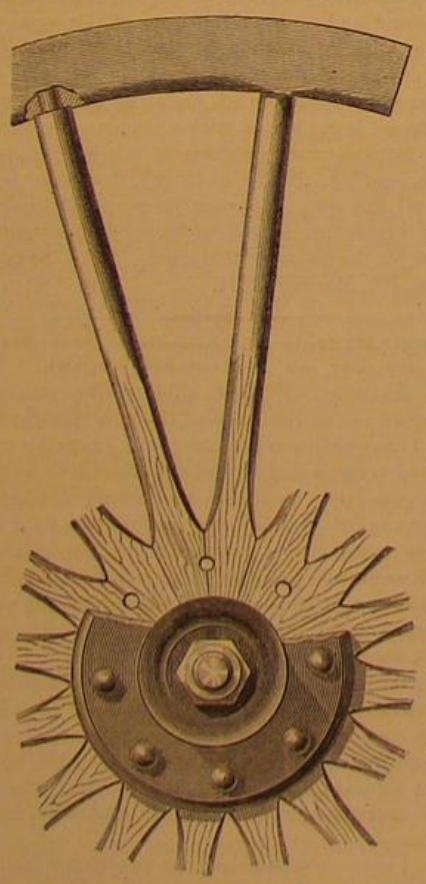
This device is the invention of N. Adkins, of Danbury Conn. It is designed to lessen the fatigue of ascending and descending stairways. It consists of hinged steps, having coiled or rubber springs placed on the under side of the front edge, or tension springs attached to the front corners of the



steps, and extending back to the next step, both methods of attachment being shown in the annexed engraving.

ARCHIBALD'S IMPROVED SPOKED WHEEL.

Our readers will remember an illustration and description of a novel and, in some respects, unique machine for putting together spoked wheels, published on page 151, Vol. XXII. of this journal. The accompanying engraving illustrates the wheels made by the same inventor and manufacturer, for which, we think, he justly claims superiority in design, strength, and facility in manufacture. The spokes and rim are made of the best quality of hickory, and are forced together by the powerful compressing apparatus above alluded to, so firmly that subsequent shrinkage cannot loosen any of the parts. The spokes have their ends, which enter between the flanges of the hub, made in the form of truncated wedges, and each of them has formed in it a semicircular cutting, which, when the spokes are placed together in the wheel, as shown, form a bolt hole to receive one of the bolts which pass through the flanged plates of the hub. They thus act as an arch of solid wood, so firmly clamped together as to give great strength at the part of the wheel receiving the



greatest lateral strain; and the wood being left uncut at the perimeter of the flanges, has a larger sectional area than is found in many other forms of spoked wheels.

In all good wheels the axle boxes should be true with, and so firmly secured to, the hub, as to obviate all danger of displacement. The spokes should be so firm in the hub that neither wear, weight, nor draft will cause them to work toward the center and loosen the tire, and so that the absorption of moisture shall not dish or cramp them. The spokes should be of the greatest size possible, consistent with comely appearance at their juncture with the hub. The spokes should be as many as can be inserted, consistently with the fulfilment of other essentials, to give proper support to the rim, and to permit the fellies to be made as short as possible in order to avoid cross-grained work at their ends or "chins." The spokes should be made to fit the felloes in the most perfect manner, without checking or splitting, which cannot be done as perfectly by driving on the felloes, as by compression. Each joint of the wheel should be brought together with such force that no subsequent pressure can force it further, and so that the wheel acts as one homogeneous whole, all strains being distributed to all parts of the wheel, rather than concentrated upon single parts, as is the case when everything is not held firmly in its place.

These requisites are undoubtedly secured in the wheel under consideration, which has been used in the most trying climates, and under the most trying circumstances, and has shown itself capable of great endurance.

Address, for further information, E. A. Archibald, Methuen, Mass. [See advertisement on another page.]

A Novel Water-Pipe Protector.

The unwelcome visit of the plumber to stop the too liberal water supply in our houses has been an incident of unpleasantly frequent occurrence during the late severe frosts. The *Building News* describes an arrangement in England for the prevention of this domestic nuisance. Certain valves and cocks are connected with the pipes, which, that they may be *self-acting*, are weighted in such a manner that when left to themselves and unsupported, they immediately shut off the supply of water and empty the pipes. They are prevented from doing this in ordinary weather by being suspended from a small tube of glass containing water, and specially manufactured for the purpose. As soon as a sharp frost occurs it attacks the glass tube, the water within which, quickly becoming frozen, expands and bursts the tube. The weighted valves and cocks, thus losing their support, immediately fall, shut off the water supply, and empty the pipes. The frost thus becomes the active protecting power of the pipes, instead of, as heretofore, being the cause of injury to them. The apparatus cannot fail, it allows water to be easily obtained from the pipes during the continuance of the frost; and when the thaw comes, the trifling cost of the renewal of the glass tube again effectually guards against the enemy.

IMPROVEMENT IN ENVELOPES.

The annexed engravings represent an improved envelope for which the designer has just obtained a patent. It is well known that, as the ordinary letter envelope is made, it is impossible to open it instantly and neatly, without the aid of a knife or other implement; and frequently the envelope is torn to pieces and its inclosure mutilated before the missive can be extracted. The "Improved Envelope" is intended to overcome this difficulty.

Fig. 1

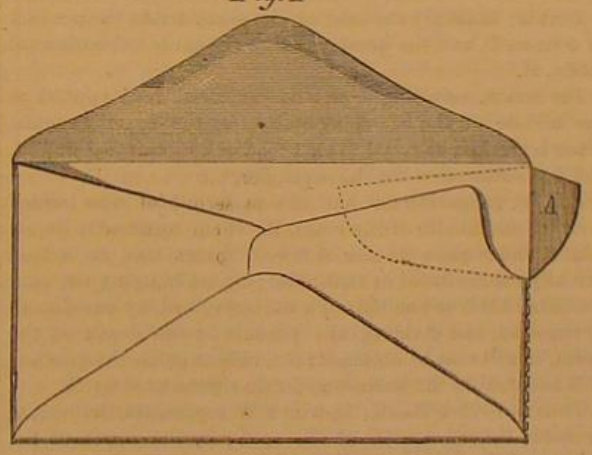
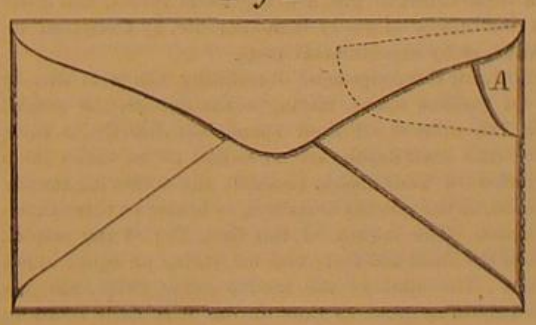


Fig. 2



When the envelope is sealed the lapel, A (shown in perspective, Fig. 1, its true form and position when closed being shown in dotted outline, Fig. 2), is inside; and when thus closed, the missive is as effectually shut out from view and reach as in the ordinary envelope, the double thickness of A rendering it impossible to withdraw it. The thumb or finger is inserted at A, thrust quickly down the perforated side (shown in the engraving), and the missive is withdrawn without disfiguring the envelope, which can be used as a wrapper in which to preserve the letter.

The envelope was patented, through the Scientific American Patent Agency, March 14, 1871, by Edward S. Ellis, Trenton, N. J., to whom all communications regarding it may be addressed.

BORAX.—Every day brings us accounts of new discoveries of minerals in the West, the last of which is an enormous deposit of borax in Nevada Territory. The great increase in the use of this invaluable product gives value to the discovery, for the amount of the mineral is such that a very small portion of it would be sufficient for the assayers and druggists, to whom chiefly its consumption was lately limited. Our report says that it is found, over a district of 150 square miles, in large quantities to the acre. A New York firm has made arrangements for working it, having sent some agents out to provide the necessary appliances; and we hear that an English expedition is coming out in the spring of this year for similar purposes.

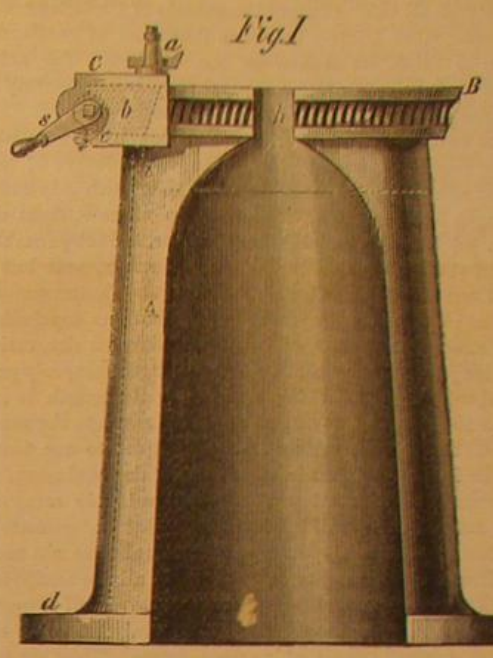
Correspondence.

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

Turning Plunger for Cylindrical Ring.

MESSRS. EDITORS:—I herewith enclose drawings of a tool, to turn a plunger to fit a segment of a cylindrical ring. In Fig. 1, A is a cylindrical or hollow tool post, made of wrought

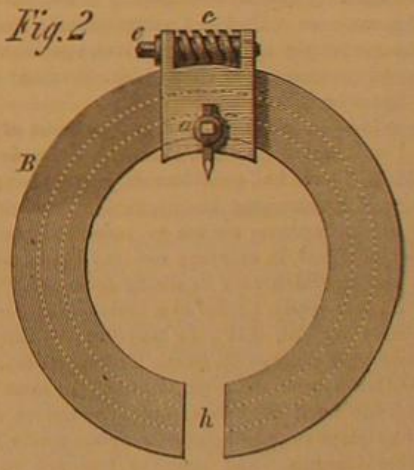
Fig. 1



pipe, or cast iron. It has a flange, *d*, at its base, to secure it in place upon the saddle block of an engine lathe. Upon this hollow post, at its upper end, is secured an annular ring B, by a flange, *i*, that passes down into the pipe, A. Both the inner and outer sides of this ring are beveled or cut tapering toward the pipe or post, A, as seen at *b*, Fig. 1, a section of the ring being shown.

This ring, B, has a tool block mounted upon it, as seen in Figs. 1 and 2. The side of the tool block, C, that bears against the inner surface of the ring, B, is curved to fit it exactly. Two flanges or ears project from the outside of said block, which support a worm shaft. This worm or screw meshes into a female worm cut upon the outside of the ring, B. A set screw, *c*, takes up the lost motion. The ring, B, is cut apart at *h*; this opening should be large enough to permit the tool block, C, to be placed in position; it is too small as shown in sketch. An opening considerably larger than

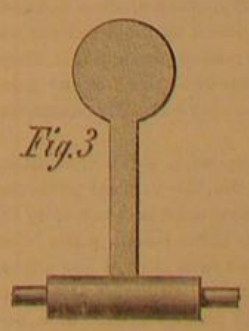
Fig. 2



the one in the ring is cut in the side of the tool post, A, as seen in Fig. 1.

Fig. 3 shows a section of the plunger to be turned; it is fastened to a flange plate, or arm that connects it to a central shaft. It is evident that the distance, from the center of the plunger to the center of its carrying shaft, must be the same as the radius of the segment of the cylindrical ring the plunger is desired to fit. Operation as follows: Place the centered shaft of the plunger in the centers of an engine lathe; fasten the tool post, A, upon the saddle block of the lathe, a proper distance from its centers, with the open side opposite the plunger. Adjust the saddle block by its screw, so that the tool, *a*, in tool block, C, will conform to the surface of the plunger, when revolved around it, by operating the worm shaft with the socket crank, *s*, (this handle is made removable to clear the ring, B). The lathe is set in motion, and at every revolution the tool, *a*, is fed until the plunger is turned up to the size of the bore of the cylindrical ring. The flange can be cut off, if desired, after the plunger is fitted.

Fig. 3



It may be mentioned that the opening in the hollow tool post, and slot in ring, B, are also intended to permit the plunger and its supporting arm to pass through, in making a revolution. The plate or arm that connects the plunger to the driving shaft, should be of sufficient thickness and width to prevent springing in the lathe; the shaft being secured by a dog, and back carrier, so that it will revolve properly. This tool would prove a valuable adjunct in many shops that do certain kinds of work, requiring small round-rimmed fly wheels, hand wheels, etc., finished.

Harrisburg, Pa. WM. P. PATTEN.

Beams and Girders---How they are Affected by Loads variously Applied.

MESSRS. EDITORS:—A careful reading of Mr. H. C. Pearson's communication of the 4th inst., on Beams, has failed to impress me in favor of his claim so confidently, if not flippantly, put forth in his criticism of an article on the same subject, November 12, 1870; namely, that he speaks the sentiments of all the "educated engineers of Christiandom." What intercourse I have had with that class of gentlemen leads me to think he cannot be one of them. For, aside from his numerous errors, he appears to be sadly wanting in at least one of their most pleasing characteristics.

But the real question under consideration is: Beams, and how they may be affected by loads. In the solution of this question, something more is required than such education as is taught in the schools. The sense to make a right application of knowledge of known truths, is indispensable. Viewed in this light, Mr. Pearson's criticisms appear but a confused mass of misstatements, errors, and heterogenous absurdities; ending in the perfectly preposterous conclusion that the strength of beams, of uniform transverse size, varies as their lengths; that a beam 10 feet in length, properly proportioned to sustain 10,000 lbs. will, when its length is extended to 100 feet, and having in all other respects the same dimensions as the first, sustain 1,000 lbs., equal to one tenth part of the first load. And in support of this conclusion, as Mr. Pearson claims, he has presented a formidable array of formulæ and deductions of learned men. But unfortunately for his theory, and for his acumen, the formulæ are not complete. They do not embrace or provide for all the conditions involved. And the deductions quoted are not in all respects applicable to the question. They are mainly based on experimental tests of beams of various forms. They do not prove which form is best. This can only be determined from an exact mathematical consideration of the action of all the forces affecting beams.

But owing to the obscurity in which writers have involved the question of beams, or to want of clear perception on the part of Mr. Pearson, he has mistaken their meaning. When they say the strength of beams varies as their length, or span, they mean, or ought to mean, beams of like proportions; that is, with their depths so varied as to correspond with their various lengths. When their dimensions are alike in all respects but in length, their strength varies as the squares of their spans. See "Haswell," 25th edition, page 463, where it is said: "The breaking weights in similar beams are to each other as the squares of their like lineal dimensions;" in which, "similar beams" means the transverse size, or section, and lineal dimensions, the length.

For fuller details on this point, see what is said by the learned and eminent practical engineer, Professor Herman Haupt, in his work on "Bridge Construction." And, I believe, all educated engineers who have given special attention to the question (excepting, of course, Mr. Pearson) coincide with Herr Haupt on this point.

Deeming it to be in bad taste for a man to boast of his own education, I will not follow Mr. Pearson's example in this respect. But as I have had considerable practical experience in designing and constructing beams, girders, bridges, roofs, etc., it may not be improper for me to refer to some of the results thus obtained, in carrying out my views as to the strains on beams, which vary so widely from Mr. Pearson's theory. For this purpose I refer to a series of articles of my own, published in Vol. XIV., SCIENTIFIC AMERICAN, old series, commencing October 30, 1858. These articles, and my replies to criticisms upon them, published in the same volume, have at least the merit of being so plainly written as to be understood by plain practical men—the class really most interested in this question—and they are believed to possess the further merit of being reliable. For, notwithstanding that some of the views advanced have been sharply criticised—and I desired to have their soundness tested—I have found no reason to doubt their entire correctness.

It will there also be found that my method of investigation is far more simple than that produced by most writers on beams. Theirs is mainly inductive; mine, deductive. They have experimented on various forms of beams for the purpose of finding the best—rather an awkward expedient for mathematicians.

My method consists in first ascertaining, mathematically, what forces will naturally result from the vertical pressure of loads, their normal directions, magnitude, and intensity of their action at all points. And from these I deduce the form required, and the exact dimensions of each part of the beam. It is similar to the course pursued by a distinguished astronomer for finding the exact position in remote space, of a before unknown planet.

For the purpose of exhibiting the respective merits of the two systems, I will present two examples.

Prior to the erection of the Britannia bridge, English engineers expended vast sums on experimental models, for the purpose of obtaining such information as might enable them to determine on the best form for the full size bridge. But by applying the results to that structure, they found the latter so defective as to make it necessary to add largely to its weakest parts.

Some seventeen years ago, I commenced constructing iron beams on my improved system; in all of which I acted upon the known fact that the strains on beams of uniform size vary as the squares of the spans, as before mentioned. I adopted a form and details without the least regard to any known form of beam, and wholly ignored the popular, but in fact mythical idea, of a neutral axis. I gave it such proportions as I had found, by purely mathematical calculations, would best answer all the requirements of a beam. The result was, that when the beam was tested, which was done in presence of several scientific as well as practical engineers, no one could discover any defect, or suggest any improvement. Nor have I, up to this time, been able to improve upon it, though I have since that time made many of the same kind, of greatly varying spans; but in none of them have I observed the least indication corresponding with the theory of Mr. Pearson.

The results of the foregoing test were published in the April number, of the Journal of the Franklin Institute, for 1854. The length of the beam was 34½ feet; clear span, 33 feet; depth, 2½ feet; weight, 3,450 lbs.; load, uniform, 104,000 lbs.; deflection, 1⅝ inches. When the load was removed, the beam resumed its original form, thus showing that it had sustained no injury.

In the winter of 1860, I tested a girder of the same kind as the before described beam. Its length was 69 feet; clear span, 66 feet; load, 150,000 lbs.; deflection, 2½ inches; and the results generally about the same, proportionately, as in the first.

The value of these results is believed to be one third greater than was obtained from any of the English models. And I am not aware that up to this time a like favorable result has been obtained from any other form of beam. But even these, of unprecedented strength, must have failed under their own weight, if, retaining the depth of the first, their length had been increased tenfold. But, according to Mr. Pearson's theory, the first, having a depth of 2½ feet, might have had its span extended to 330 feet, and at that length sustain a load of 10,400 lbs.; and the second to a span of 660 feet, and sustain an applied load of 15,000 lbs. Such assertions, however, prove only—that he knows nothing about such things, practically.

As the strength of a beam is, usually, equal to its capacity to sustain the strains resulting from the applied load, I propose to show how the strains vary in different spans, by the following simple formula, in which the horizontal strains, at the middle of the length of the beam, in both the upper and lower chords, are represented by H. The strain at other points than the middle can be determined by a similar process, rightly applied; but showing exactly, how the strains vary at the middle, will be sufficient to determine the question how the strength varies.

$\frac{S\,L}{8\,D}=H$: in which the span is represented by S; the uniform load by L; the depth by D; the multiplier of the depth by 8; and the horizontal strain in each of the chords by H.

That is: Multiply the load by the span, divide the product by 8 times D, and the quotient will be equal to the horizontal strain, H.

The strain, resulting from a concentrated load applied to the middle of the beam, is obtained by the same formula, when L is taken as equal to that load or concentrated weight, and 4 is substituted for the multiplier 8.

And, by supposing one half of a uniform load to be located at or on the middle of the beam, the same result will be obtained, and require the use of fewer figures; and for a load actually concentrated at that point: by multiplying the concentrated load, or one half of a uniform load, by one fourth of the span, and dividing the product by the depth of the beam, it will also be obtained: for, in both cases, the quotient will be equal to the horizontal strain represented by H.

Thus: $W\times S\div D=H$; in which W represents the weight or load; S, one fourth of the span; D, the depth of the beam; and H, the horizontal strain.

All of these formulæ produce the same result, and their perfect correctness is easily demonstrable, by analytical investigation, or by experimental tests.

And now, for the purpose of illustrating the fact: that in beams of various spans, having equal depths, the strains vary as the squares of their spans, but directly as their lengths, when their depths are so varied as to make them proportional to their spans: I submit the following simple application, of the process described, to beams of three different lengths. The length of the first, 20; of the second, 40, and of the third 200 feet; and all having an equal depth of 2 feet. The span of the second being twice, and the third ten times as great as that of the first, their relations are as 1 : 2, and as 1 : 10. And as the square of one is equal to 1, of two, equal to 4, of ten, equal to 100, it is only necessary to multiply the strain of the first beam by 4 (the square of the difference between the spans of the first and the second beams) to ascertain whether the strains vary as the squares of their spans. If they do so vary, then the product will be equal to the strain on the second beam. And, by multiplying the strain on the first by 100 (the square of the difference between the spans of the first and third beams), then we shall have a product equal to the strain on the third beam.

S L lbs.

Span, 20 feet; first beam, $\frac{20\times 20{,}000}{8\times 2}=25{,}000=H.$

Span, 40 feet; second beam, $\frac{40\times 40{,}000}{8\times 2}=100{,}000=H.$

Span, 200 feet; third beam, $\frac{200\times 200{,}000}{8\times 2}=2{,}500{,}000=H.$

By which it will be seen that the strain on the second beam is four times as great as that on the first; and on the third, 100 times as great as that of the first, the increase of the strains agreeing exactly with the squares of their differences (as 1 : 4 : and as 1 : 100), or as the squares of their spans.

But that the strains will vary directly, as the length of the spans of the beams, when their depths are made proportional to their spans, can be demonstrated by making D, representing the depth of the beam, proportional to the length of span. Thus: In the three foregoing examples, 2 occupies the place of D, because the depth of each beam is supposed to be 2 feet, which is equal to one tenth of the span of the first beam. Now, one tenth of the span of the second beam is equal to 4 feet. Hence, substituting 4 for the 2 (W), then H will become equal to 50,000; just one half its present value, and precisely twice as great as H of the first beam; which shows a direct correspondence between the strains and lengths of the two beams; and that the strain has not in this case increased in the ratio of the square of the length of the second beam to that of the first. Like results will follow by substituting 20 for the 2 in the third example, which is one tenth of that span. And the same may be said of all possible spans, invariably showing that when their depths are uniform, the strains will vary as the squares of their spans, when their depths are made proportional to their spans, then their strains will vary directly as the lengths of their spans. In practice, the weight of the beam must be considered as forming part of the load.

B. SEVERSON, C.E.

Washington, D. C.

The Stink Bug.

MESSRS. EDITORS:—I beg leave to make a few remarks, on a notice published on page 162, in the current volume of the SCIENTIFIC AMERICAN, as one "more clearly devoted to entomological studies" than my very worthy friend, Mr. Thomas Meehan. I did not see the article contributed to the Academy of Natural Sciences in Philadelphia, but, from the description of "a singular habit in the common stink bug of gardens" here, I understand that he speaks of the common squash bug, *Coreus tristis*, but he calls it *Reduvius novenarius* of Say, which is the insect now known as the *Tryonotus novenarius*, Latr. The *Reduvius serratus*, properly *Tryonotus serratus*, is described by Kirby and Spence as the "wheel-bug" of the West Indies, so named from the singular pro-thorax, circularly elevated and toothed like a cog-wheel. So far it agrees with our common species, and, for all I know may be the same; but it is not properly called the "stink bug," although an allied species. The collected turpentine, and other gummy exudations, not only from the "*Pinus cembra*," but from whatever source may yield the requisite material, is for use as a glue, by which the female attaches her eggs. She collects the viscid material, connects it to the end of an egg, and then glues this egg down; so, one egg alongside of another, until a patch of about fifty or one hundred of the eggs are in close proximity. These eggs are oblong, cylindrical, rounded beneath, and contracted and flaring out above the contraction, and appear like miniature sacks, filled and tied up. I observed the female, in the summer of 1862, to use the gum of a cherry tree, and plant a colony on a lath, under an arbor in my garden; and I watched their development (as written out for the *Fireside*, April, 1867).

My friend Anthony Iskey, while engaged at varnishing furniture in his yard, observed one of those insects, at stated intervals, come and appropriate drops of the copal varnish, and fly away with it; he thought that there must be more than one. He captured a specimen in the act, and brought the prisoner to me for a verdict, declaring that he was afraid of the thing—it being armed with a circular saw on its back.

Much of interest could be given on this subject, but I am already too lengthy. Suffice it to say, that the "important physiological discovery," to what purpose the insect appropriates the turpentine, is well understood by entomologists.

Yours, for the advance of science, J. STAUFFER.

Lancaster, Pa., March 9, 1871.

More about Hydrate of Chloral---A New Form for Its Use as a Remedial Agent.

MESSRS. EDITORS:—Without quoting the various paragraphs devoted to the discussion of the new remedy, Hydrate of chloral, I can conclusively state that a summing up of the experience of a large majority of experimenters, as given to the public, goes far to produce a very strong feeling against its use as an anodyne, a sedative, or a hypnotic, from the evil effects it has occasioned, in many cases, where administered.

Although at present recognized as a valuable remedy by many, it is not probable that it will occupy the high position in our pharmacopœia that the enthusiastic praise, of a few individuals, seems to predict for its future.

Since the date of its addition to our list of medicines, an extensive trial of its properties and effects has been given to it; and as a result, I find, in a recent and reliable paragraph in a medical journal, a recommendation to give up its use altogether; also, any number of cases given in the current news items of the day, record a variety of ill effects resulting from its use.

As far as I have ascertained, or my experience goes, I find it has produced secondary effects of a somewhat serious nature. A gentleman, taking it as an opiate, says: "It is sure to give me a good night's sleep, but I am afraid it has caused the constant dull headache I am troubled with." A lady has found that it brought on an attack of bronchitis, which disappeared on her leaving off her nightly dose of solution of chloral; another lady became dyspeptic, etc., etc.

Some months ago, when preparing a solution of the chloral, I held the stopper of the bottle containing it between my lips for a few moments. A small quantity of the crystals was sticking to it, and, on replacing the stopper, I found a red spot on my lower lip; this spot became quite sore, and continued so for several days. This fact led me to experiment with the chloral. The result is, I have found it to be one of the best, possibly, *the best*, suppurative agent known. According to the time it is left on the skin, it becomes a perfect rubefacient, irritant, suppurative, or even escharotic.

I have given it fair tests personally, and strongly recommend its use; but *externally* only. When applied, the burning is precisely like that produced by a cataplasm of strong mustard; but, at the same time, a sedative action is perceived,

which somewhat neutralizes the smarting, while it does not prevent an excessive irritation of the skin. It does not blister, but the part the chloral has been applied to becomes exceedingly inflamed, and more or less swollen; and, according to the length of time of application, shows a merely reddened skin, or a suppuration of several weeks' duration.

I give you my mode of application: Take a piece of fresh adhesive plaster, of the size wanted, and crush fine, on its surface, with an ivory spatula, enough of the crystals of the chloral to powder the piece of adhesive plaster quite evenly; use the edge of the spatula to take off the chloral where it is more than a mere dust in thickness, but distribute evenly, leaving one third of an inch margin for adhesion; heat the back of the plaster for an instant only, and apply. Leave it on about half an hour as a rubefacient, six hours as an irritant. To produce suppuration, put the chloral on the plaster in larger quantities, and leave on from twenty-four to thirty-six hours; on its withdrawal, apply a stimulating salve, and afterwards heal with cerate. For an escharotic effect, apply the chloral, thickly spread, and, after twelve hours, repeat the application, if necessary.

It is surprisingly active as a suppurative, and, for this reason it will not be prudent to apply it to any part of the surface of the abdominal cuticle, as, in one case under my inspection, having been left on too long, it occasioned a deep ulceration that was difficult to heal.

In this new mode of use, the chloral is truly invaluable; it is easily applied, cleanly, and perfectly reliable. It is a first-class derivative in facial neuralgia, earache, headache, and any affection of the eyes, a small plaster, of a half inch diameter, that can be hidden by the hair, being sufficiently active, if prepared with enough chloral, to irritate in a very short time. I earnestly recommend the above facts to the notice of the medical faculty.

When it is generally known that the hydrate of chloral, when used externally, can produce destructive effects as an irritant, no doubt greater hesitation will be felt to take it as a remedy *within* the human system. No person is desirous of making any use, *internally*, of croton oil, cantharides, or lunar caustic, excepting when prescribed in very minute doses; and the hydrate of chloral is only harmless when diluted to an almost inert extent, and given in small quantities.

A. M. LEWIS.

Harmony, Pa.

Artificial Roman and Egyptian Stones.

MESSRS. EDITORS:—I have had many inquiries from your scientific readers, in different States, relative to the manufacture of Roman and Egyptian stone, Roman stone sanitary tubes (coated inside and outside with glass), and culvert bricks, as found in the sewers of Pompeii.

As the majority of inquiries relate more especially to the latter article: as to what it is composed of, how it is made, and most especially, how it is burned; also, as to what is the best scientific mode of burning bricks generally; I will, with your permission, commence by informing the inquirers, that it is not so much the material of which the bricks are made, as the right composition of the ingredients, and the manner in which the burning is done, which make the bricks hard and imperishable in water. It can only be arrived at by an intense, regular, equalized high pitch of heat. This is one of the secrets or principles, which has so much puzzled the best practical clay workers of the present day. To it, both the Romans and Egyptians seem to have paid particular attention, and to it they appear to have attached the highest importance. For example, take the following composition, for either stone of a rough character or waterproof bricks: say two parts of a pretty good aluminous clay (common red brick clay will do, provided it be plastic, not loam), four parts of decomposed feldspar, and one of silica, decomposed quartz, or good sand, ground very fine, say in one of James Bogardus' (of New York) machines. This composition, tempered in a common or ordinary "pug mill," allowed to age for about two days (the older the better), will mold very readily into any shape of brick or block required. This, burned at a high, regular, equalized pitch of heat, will form a close, hard, vitrified body of feldspathic character; and it will greedily take hold of the volatilization of salt, thrown into the retorts or eyes of the furnace or kiln, and becoms coated with glass, or salt glaze, through which coating, and hard, vitrified body, water cannot possibly penetrate. The quality of brick is the old Roman culvert brick, with which the ancient city of Pompeii was sewered, as found by late excavators; which said brick, on examination, was found to be nothing worse for being buried in the sewer over two thousand years.

For building purposes, this brick does not require to be glazed; and still it is imperishable in the atmosphere, being proof against change of temperature, and, consequently, may be said to be almost proof against the ravages of time.

Aye, you say, that is all very well, but how did the ancients burn this material at such a high, regular, equalized pitch of heat you mention? Well, I will tell you: They build their furnace or kiln on principles (which the editors of this valuable journal are so worthily and energetically advocating), pure, simple, natural, and scientific. Although unacquainted with the manufacture of gas light (I am not aware of any account of their knowing of it), they most certainly had an eye to this very important fact, that the smoke, or crude carbureted hydrogen, arising from the fuel they used, was the very material which they required; and was therefore not allowed to escape, but was changed into flame; and the said flame was drawn, by very simple and scientific arrangement, through every portion of the furnace or kiln, on the natural principle, that where a vacuum is formed by the atmospheric or damp air becoming rarefied and expelled by heat, so surely will the preparing heat rush to the vacuum formed. By which means double use was made of the heat, the smoke was consumed, and therefore not one half the fuel was required.

This kind of furnace or kiln is now fast becoming the great European kiln for burning nearly all kinds of clay articles of a heavy commercial character, especially bricks, blocks, Roman stone sanitary tubes, coated inside and outside with salt glaze, and culvert bricks, for building large culverts, imperishable in water; also other rough heavy clay articles for city purposes, as well as fire-proof goods.

In this kind of furnace a pitch of heat can be raised, if required, sufficient to melt iron or steel, each and every piece of ware, brick, or stone block being equally burned. It is the system of burning bricks or clay in this country which is so lamentably deficient, causing such fearful waste of fuel, and producing only masses of rubbish. For instance, take brick burning, with which you are, perhaps, most familiar. The American brick-burner, in the first place, builds his kiln, or rather clamp, irrespective of all scientific principles, of such out-of-the-way dimensions, especially hight, that he puts it out of the power of heat, even of flame, to reach the whole mass; and then, forsooth, as a general thing, applies heat without flame, in the shape of carbon or stone coal, melting the eyes of the clamp, in order to get the few courses above the eyes, which are his facing bricks, hard burned. The bricks above them he terms his "salmon" bricks, but they are, in reality, generally nothing more or less than one complete mass of soft rubbish.

If, out of a clamp containing 100,000 bricks, he gets twenty or thirty per cent of facing bricks, he is doing remarkably well. Hence the high price of facing bricks in this country. Would he not do better, if each and every one of the 100,000 was a beautiful, hard-burned, facing brick, which would most certainly be the case, if he built his kiln on natural and scientific principles, adopting the Roman, Egyptian, or European mode of burning? Of course, if he wanted soft bricks, let him stop short with the fire. But he cannot possibly have bricks melted together, in masses, hard burned, soft burned, or his favorite "salmon" colored brick, all in one kiln. He must content himself with each and every one alike. In fact, he cannot possibly produce the real Egyptian block-stone brick without a high, regular, equalized pitch of heat.

I have superintended the building of many of this kind of furnaces or kilns in different countries in Europe, and never failed. In fact, failing is out of the question. To fail would be to prove natural laws and scientific principles wrong. On my travels and explorations through "the Pines," in New Jersey, in this country, I built one for a gentleman, Captain Daniel, at Townsend, near Woodmansie, on the Raritan and Delaware Railroad, for the purpose of burning brick and Roman stone sanitary tubes; and another at May's Landing, New Jersey; and on my return from the Blue Ridge and Alleghany Mountains, during my stay in Lynchburg, I have just completed another for a gentleman, Mr. W. B. Snead, the principal builder and brickmaker in the city, for the especial purpose of burning stone, fire-proof, and red building bricks.

The kiln was built in a model form, in order to prove the principle. It was filled with fire-proof, red pressed building bricks, samples of Roman stone, and the like. It was worked by one man and a boy, burned off in about forty-eight hours, and consumed one fourth of a cord of wood per 1,000 bricks, with less than one half the usual manual labor. Out of the whole kiln, containing from 20,000 to 25,000, there is not one soft, cracked, or salmon brick to be seen. From top to bottom, end and side, and in the heart of the whole pile, the bricks present the same beautiful uniform appearance.

What is most surprising about this system of burning is, that the kiln, owing to its natural principles, is self-regulating, consumes its own smoke, requires very little fuel, does not require one half the labor, can either be worked with wood or coal, and, what is perhaps more accommodating, costs less, in the first outlay, to erect, than the clumsy, worthless, old-fashioned clamp still in use in most places. It can be so arranged as to burn from 20,000 to 100,000 hard well burned facing bricks per week, if required.

Lynchburg, Va. JOHN DIMELOW.

A Question in Physics.

MESSRS. EDITORS:—"W. P. T., of Ohio. Two teams of horses of equal strength, pulling against each other, by means of a rope, would create the same tension in the rope, as one of the teams, drawing against an immovable object." SCIENTIFIC AMERICAN, of March 18, 1871.

Three times have I read over the answer above quoted, and as many times have I sighed over my school-boy and college derelictions, that have left me now so devoid of mathematical science that I cannot see how that problem can be so solved. Given a team—and I don't object to such gifts, if good—that will draw a tun—two teams of like force will draw no more. That's about it, isn't it? Either Homer has been nodding, or this is King Charles' joke over again.

Suppose, for instance, that you call the rope itself an immovable object; some ropes are, you know (see Davenport's "Reports on Knots"); and you put on one end a force working due north, and then put, on the other end, a similar force working due south; am I to understand and believe that there is no more tension applied to that rope than if there were only one force at work? Are not both teams doing to the rope exactly what they would do if one end only was immovable, and they were pulling together?

I wish I could believe you were right. Wouldn't I put the case, on true mathematical principle, to the man who keeps my bank account! Now the simpleton thinks that I draw enough to keep us in constant danger of a solution of the continuity between us. What would he think, if I should have my wife draw as much and as often as I do? Defend your answer, friend SCIENTIFIC; there is a principle at the bottom; and that principle, when you shall have demonstrated and triumphantly vindicated its truth, I shall immediately apply to the science of banking. H. B.

[There is no need of mathematics to prove the truth of our answer to W. P. T. Let H. B. place two small pulleys, one at each end of a bench or table, and, connecting two cords of equal thickness and weight by a spring balance between the pulleys, hang the cords over the pulleys, and suspend a ten pound weight from each: he will find that the spring balance now indicates ten pounds. Now let him tie one of the cords fast, and leave the weight suspended from the other. The balance will indicate the same as before. Then let him suspend both weights, as in the first instance, and commence adding one pound weights to each of the first weights, and, for each pound added to each cord, he will find the scale indicates one pound more. We are sorry H. B. neglected his opportunities in youth, but that is not our fault, and we hope himself and spouse will continue to draw together, even though they should overdraw their bank account. It is getting too rare, of late, that married people "pull together," even at the purse. We venture to say that if H. B. draws no harder than his wife, at the cashier's desk, he will come out all right at the end of the year, and nothing will break. Let H. B. consult the old text-book he neglected at college, and he will find that action and reaction are equal, and always in opposite directions, and that one force can never act without an equal force acting against it. If he cannot comprehend this elementary truth, he may return to his bank book no worse for the attempt at improving his mind.—EDS.

Reciprocating Parts of Steam Engines.

MESSRS. EDITORS:—I wish to add, as a note to my criticism of Mr. Porter's paper, published in your issue of March 4th, that my statement, that the line, H, C, I, was not a straight line, but a curve, was made upon a misconception of what Mr. Porter has said, and is, therefore, not true. On the contrary, assuming that the velocity of the crank is uniform, and that the points on the line of centers, from which the ordinates are drawn, correspond with the co-sines of the angles for which the ordinates are calculated, the ordinates *do* represent the velocities imparted to the piston, at those points; and the line, H C I, is, at least, *practically*, a straight line.

The exception I take to Mr. Porter's conclusion is, however, not affected by this admission, and is briefly this: That the *momentum* of the reciprocating parts is totally expended when the crank pin crosses the dead centers; and hence, the reciprocating parts can in no way contribute toward carrying the crank through those points, except by imparting, in their approach to the dead centers, their momentum to a balance wheel. Whereas, Mr. Porter affirms that "the crank will pass the centers under the strain of the centrifugal force of the reciprocating parts."

J. E. HENDRICKS.

LEECHES.—The universal use of leeches in surgery gives a great importance to their propagation, in the few places where they are raised. They are natives of England, Spain, Germany, and France, and it is in the latter country that they are made an object of cultivation. On the Landes, near Bordeaux, they are bred by hundreds of thousands, the wasted forms of moribund cattle being put into the marshes to supply them with nourishment. A cow is used by preference for this purpose, as, when the poor wretch is drained of her blood, she can be driven to a meadow where there is good feed, and will rapidly recover to furnish a fresh supply; whereas horses and asses sink under the attacks. The inhabitants of the country round the beautiful bay of Arcachon follow this trade largely, and send as many as 1,500,000 leeches to Bordeaux in a year.

CHEAP LECTURES FOR THE PEOPLE.—A series of lectures to working men is announced in London, to which the charge for admission is two cents. The object in making a charge is, no doubt, to secure the progress of the business of the evening, without interruption by noisy idlers and street Arabs, who are always attracted by the words "admission free." But the feature of this series is the names of the lecturers. Professors Huxley, Huggins, and Roscoe, are among those advertised for the first series; and the desire to benefit their less fortunate fellow-citizens may be credited to these eminent gentlemen in the largest manner. The best wishes for the success of so generous and sensible a movement, will be accorded by our readers in both hemispheres.

SAFETY RAILWAY AXLE.—Wm. B. Coates, of Philadelphia, writes to us that he has perfected and secured an invention, simple and reliable, for indicating, by an alarm, when a car axle breaks, and supporting it with safety to the passengers, until repaired. His device operates, by pressure of friction, an alarm, the instant the axle is broken; and also brings into action an apparatus which supports the broken parts.

THE ARCTIC TELEGRAPH.—One of our arctic subscribers, Mr. J. H. Tjorswaag, of Flekkefjord, Norway, informs us that in the latter part of the past year, telegraph stations were opened for public use at the small towns of Vardoe and Vadsoe, on the coast of the Arctic ocean, thereby completing the system of telegraph wires over the entire kingdom. Vardoe is situated on the northeastern extremity of Norway, and is, most likely, the northernmost town on the globe.

Improved Spring Bed Bottom.

A great deal of inventive talent has been employed in the improvement of beds. When we reflect, that on the average nearly or quite one third of the life of mankind is spent in bed, it is not strange that there should be a desire to perfect this most important article of domestic furniture. Every year brings forth a variety of new improvements designed to make the bed more luxurious, convenient, or durable, and most of the improvements find market, as the tastes, opinions, and means of people vary, so that inventors are encouraged to introduce any new device having a fair share of practical merit.

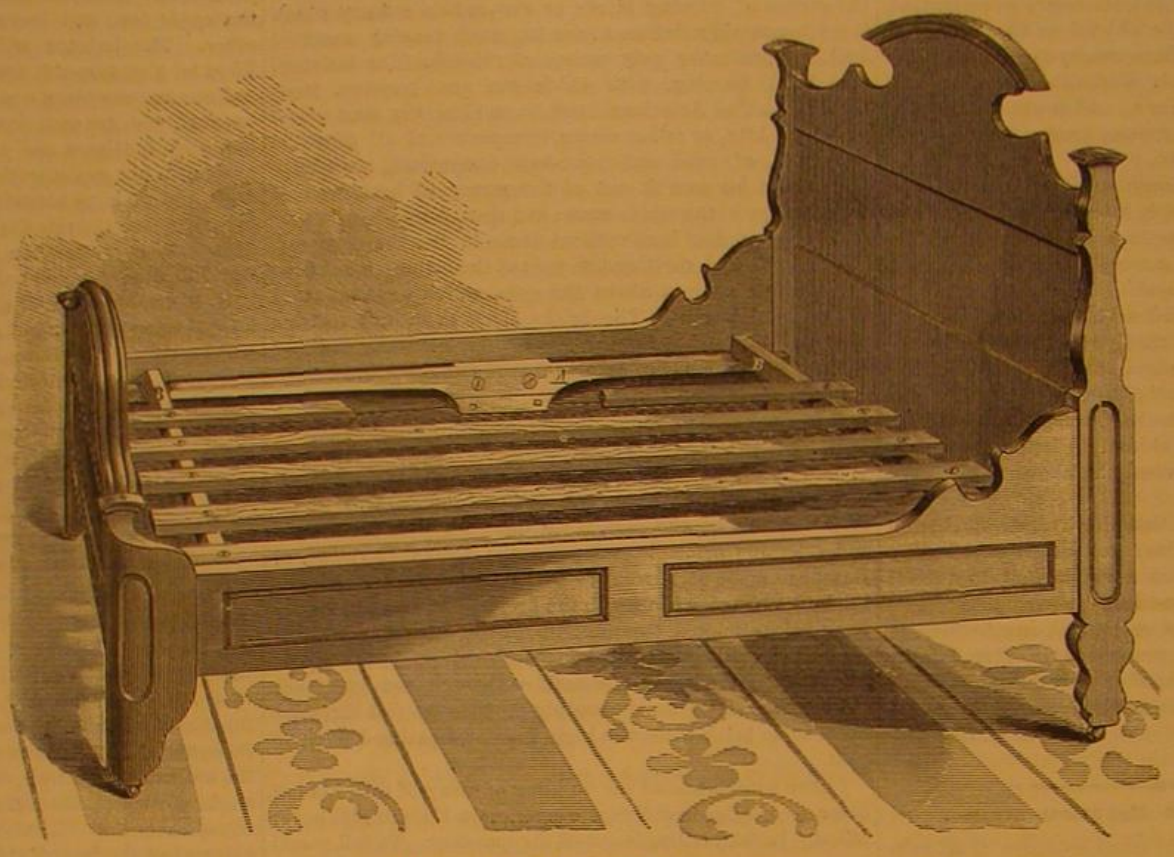
Our engraving illustrates a new method of supporting spring bed bottoms, which is cheap, durable, cleanly, and easily made by any ordinary workman in wood, and which, being itself a spring, adds to the elasticity and comfort of the bed.

In the engraving, some of the slats are shown removed, the better to exhibit the manner of attaching the springs to the side rails of the bedstead.

A, is one of the springs, preferably made of strong elastic wood, such as ash, hickory, etc. It is attached to the side rail by screws, as shown, and tapers each way from the point of attachment to the ends.

The springs support at their extremities crossbars, B, which in turn support the bed bottom as shown. The springs are fastened to the side rails nearer to the head than the foot of the bed, so that they may support the greater weight thrown on their upper sections.

Patented May 17, 1870. The right for the New England States has been sold, but territory may be had in other States by addressing W. B. Willard, 46 Broad street, or Post-office Box 5,710, New York city.



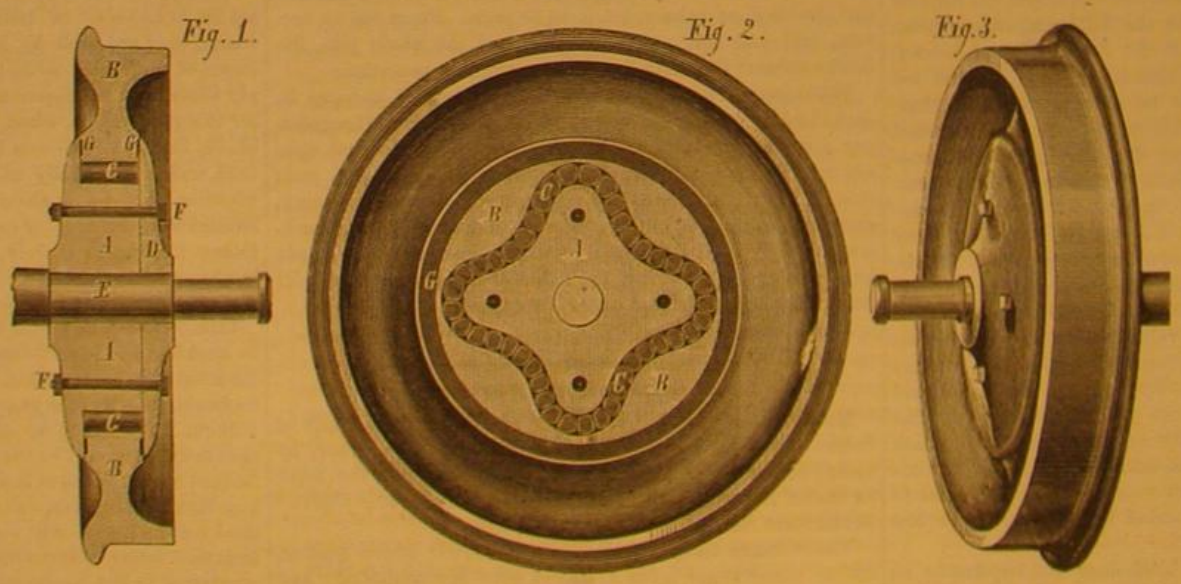
PATENT SPRING BED BOTTOM.

Improved Elastic Car Wheel.

For a long time the ingenuity of inventors has been taxed to devise a car wheel having a certain measure of elasticity with sufficient rigidity. The ultimate advantage sought through the employment of such wheels, was the reduction of the shock caused by the impact of solid wheels upon the rails, from which result, in a great measure, the wear and tear of both rolling stock and permanent way. For to the continued and violent vibration caused by this shock, is attributed the crystallization of both axles and rails, their consequent loss of strength, and increased liability to break under the strains to which they are subjected. The reduction of shock also results in the easier carriage, and lessening of the noise of the wheels, adding greatly to the comfort of passengers.

In the attempts hitherto made to secure elasticity by making some part of the wheel of elastic material, vertical elasticity has been secured. Wood used for this purpose, however, being itself a sonorous material, does not deaden the sound of the wheels so much as rubber, and also yields less than rubber under shocks.

The wheel illustrated herewith is constructed with rubber springs, as hereinafter described, and secures, in addition to vertical elasticity, a certain measure of lateral elasticity not attained in other wheels of its class. Its construction in no way interferes with the pressing on of the wheels to the axles, and does not increase their cost so that they cannot compete with wheels now in market. Railroad men are well aware of the advantages to be secured by a wheel of this class, from which the objections hitherto met with in practice are eliminated. It is claimed by the parties interested in the manufacture of this wheel, that it is free from every such objection, and that it is now in use on the Morris and Essex Railroad, in New Jersey, giving excellent satisfaction.



HUNT'S ELASTIC CAR WHEEL.

The construction shown in Figs. 1 and 2 is extremely simple. Fig. 1 is a section through the center of the wheel, and Fig. 2 an elevation of the wheel with one of the side plates removed.

A, Figs. 1 and 2, is a flanged center piece, having something like the form of a four-rayed star, with the points rounded off. B, Figs. 1 and 2, is the exterior portion of the wheel, separated from the center piece, A, by the cylindrical rubber springs, C. A side plate, D, Fig. 1, is pressed on to the axle, E, simultaneously with A, after having been made to assume its proper position by bolts, F, passing through A and D. When thus bolted, it, together with the center piece, A, compresses rubber rings, G, Figs. 1 and 2, let into grooves formed in the exterior part of the wheel, B, and also compresses longitudinally the series of cylindrical rubber springs, C. The result is a wheel, elastic vertically and laterally.

The bolts, F, are only necessary to hold the parts in adjustment while the wheel is pressed on the axle in the usual way. They sustain no strain in use. Fig. 3 shows the wheel as completed and placed on the axle ready for use. Patented Nov. 15, 1869. For further information apply to Israel D. Condit, 30 Vesey street, New York.

Manufacture of Glue.

Common glue is a most useful and important substance. It has been known and used, from time immemorial, for cementing pieces of wood together, and for many other purposes, and is still extensively used in every country. It is generally made from ears of oxen and calves, the parings of the hides, skins, &c. The parings of ox and other thick hides are the strongest, and make about 45 per cent. of glue. The tendons and other like parts of animals make glue, but it is not so strong as that made from hides. Animal skin in every form can be made into glue. The cuttings and parings of hides are first macerated, in milk of lime, in pits and vats, and the liquor is renewed two or three times in the course of two weeks. They are then taken out, with the lime adhering to them, and washed in water in baskets, and are then placed on hurdles to dry. When exposed to the air, whatever lime remains on them is converted into chalk, by absorbing carbonic acid gas from the air. A small portion of chalk will not be injurious for the after processes, although the quick lime would. The next process is the extraction of the gelatine or glue from the pieces of skin, etc., so treated. For this purpose they are placed in a large bag, or rather net, made of thick cord, spread open within a large caldron. A light framing within the caldron prevents the bag from sticking to its sides. The water of the caldron is then gradually heated up to boiling point, and as the prepared skins in the net gradually melt and mingle with the water, more are placed in the net, and they are frequently stirred up and pressed with poles. The condition of the caldron is tested occasionally by taking out some of the liquor and setting it aside to cool in a glass. When a clear mass of jelly is produced by the boiling, it is judged to be sufficient; the mouth of the net is then closed with its cord, and it is raised or hoisted above the caldron over a roller, and left to drain. The liquor of the caldron, if not strong enough to make glue, may be further concentrated by boiling. The contents of the net are boiled a second time to make size, and when the solutions are too weak to make glue or size, they are economically used instead of fresh water. The gelatine liquid of the glue caldrons are drawn off into a vessel called a "settling back," which is surrounded with warm water, and the temperature is kept up for about five hours to maintain it in the liquid state until the solid impurities settle to the bottom. The clear liquor is then drawn off into wooden coolers, which are about six feet wide and two feet deep; here it becomes a firm jelly, which is cut out in square cakes with a spade; these are deposited in a wooden box with slits in it, through which a brass wire, attached to a bow, is drawn to cut the glue into thin slices. These are placed on nets stretched on wooden frames, and placed in long lattice sheds, where they are exposed to the air to dry. They are frequently turned and carefully watched until they are about two thirds dry, when they are removed to a room, and they are there left to dry still further, and then they are finally dried in a warm room. The drying of the glue is an operation which requires great care and attention.

Good glue contains no specks, but is transparent and clear when held up to the light. The amber colored glue is the best kind for cabinet makers, not the black kind as some suppose. The best glue swells without melting when immersed in cold water, and renews its former size on drying.

The best method of softening and dissolving glue for use is first to immerse it, in small pieces, for about twelve hours in cold water, then set it over a fire and gradually raise its temperature until it is all dissolved.

Fine white glue is made from careful selections of white, clean skin parings; these may be bleached in a degree by immersing them in a weak milk of chloride of lime instead of one of simple lime.

Size for stiffening straw and leghorn hats is made of clippings of parchment and fine white sheepskin, dissolved in boiling water. White glue is employed in the stiffening of silks and other fabrics which are re-dyed and re-dressed.

If glue which has been steeped in cold water until it has swelled, be then immersed in linseed oil and heated, it dissolves, and forms a glue of greater tenacity, which, when dry, resists damp. Glue is employed for making molds for for castings in wax and plaster of Paris, Mixed with molasses, it forms the ink rollers of the book printer.—*Cabinet Maker.*

Hydrate of Chloral.

The controversy as to the danger in use, and subsequent deleterious effects, of this popular hypnotic, still goes on. A new use of the drug, however, is reported by Dr. A. H. Kunst, of Weston Hospital for the Insane, West Va. A patient, 28 years old, had been insane for four years, and was approaching her death by consumption, when she was seized by convulsions. Dr. Kunst, after she had three seizures, injected three grains of hydrate of chloral, with a hypodermic syringe, into her arm. There was an almost instantaneous relaxation of the contracted muscles, which, however, was followed, in half an hour, by another paroxysm. The application of hypodermic injection was repeated, and the trouble then rapidly and entirely subsided.

The safe use of the new medicine will no doubt, be found ultimately in its combination with some diluent, so that its undoubted tendency to coagulate the blood may be neutralized, while its valuable sedative properties are preserved.

FROZEN potatoes can be cured by soaking in water for three days, before cooking.

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RAILWAY TRANSIT FOR NEW YORK.

Those who have studied the progress of the question of cheap and rapid railway transit through the length of the narrow island which supports the city of New York, have long since seen that the viaduct plan had a better chance than others, for the simple reason that improvement in immediate surface travel being impracticable, and underground transit not likely to disturb the value of property along the route to so great an extent, the first-named plan afforded the best opportunities to be turned into a "job" profiable to those who have got possession of the city government. This opinion has been verified by the action of the State Legislature this winter. A bill has just beeu introduced by Senator Genet for the construction of such a railway, and as there is considerable probability that it will pass, its main features are of general interest. They are as follows:

It first names, as the Viaduct Railway Company (said corporation to continue for one hundred years), the following gentlemen: Peter B. Sweeny, William M. Tweed, Jr., Hugh Smith, Richard B. Connolly, Forbes Holland, Sheppard F. Knapp, John S. Serrell, Leopold Eidlitz, James S. Burnett, William R. Travers, George A. Osgood, Peter Cooper, Alexander T. Stewart, James G. Bennett, Jr., Simon B. Chittenden, Wilson G. Hunt, John T. Agnew, Henry Hilton, John McB. Davidson, Aaron J. Vanderpool, Marc Eidlitz, William A. Booth, Manton Marble, John Taylor Johnston, Oswald Ottendorfer, Richard Schell, William Butler Duncan, William R. Martin, Horace Greeley, Charles A. Dana, James Turner, Walter Shanly, Edward B. Wesley, Terence Farley, Henry Smith, William Turnbull, George M. Van Nort, Edward K. Willard, James M. Sweeny, Edward H. Tracy, Gustave Herter, William T. Blodgett, Bernard Kelly, Henry N. Smith, and Walter Leonard.

The second section provides for the election of the directors, and the manner of their election, and the conduct of the future elections of the company.

The third section defines the powers and privileges of the company, which are those generally given to such corporations, by the act of 1850, except so far as the provisions of that law are modified by, or conflict with, subsequent provisions of the bill.

The fourth section defines the route, which is to "follow, as near as possible, a route commencing at or near to Chambers street, between Broadway and Chatham street, and running from thence northwardly, through the blocks and across the streets between Broadway and Chatham street and the Bowery, to or near to Houston street or Bleecker street, and from thence with one branch of said viaduct and railway diverging easterly through the blocks and across the streets to and across the Bowery, in the vicinity of Bond street or Great Jones street, and from thence passing northeasterly through the blocks and across the streets, roads, or avenues between the Third avenue and the East River; and also with another branch of said viaduct and railway diverging westerly from the first-mentioned line from Houston street or Bleecker street, and running through the blocks and across the streets to and across Broadway, near Houston and Bleecker streets, thence running westerly through the blocks and across the streets to and across Carmine street or the Sixth avenue, and from thence, through the blocks and across the streets, roads, or avenues west of the Sixth avenue and west of Central Park, to the Harlem River or Spuyten Duyvil Creek."

The fifth section confers the power to enter upon and cross such property as may lie in the route above defined.

The sixth section provides for the securing of title to such property as will be needed in the construction of the road, substantially in the usual manner of so doing under existing acts.

The seventh section prohibits the obstruction of existing horse railways during the construction of the proposed Viaduct Railway.

The eighth section is the usual clause prohibiting the use of the road for other than the purposes for which it is to be constructed.

The ninth section establishes the maximum fares as fifteen cents between Chambers street and Harlem River, and twenty cents between Chambers street and King's Bridge, for each passenger, and requires the company to run, with each train starting between six o'clock and eight o'clock in the morning, two special cars for the accommodation of artisans going to and from their work, limiting the fare in the cars to not more than five cents, and requiring the company to provide room in each special car for forty-eight passengers. Strange to say, the bill, as printed in the published reports, makes no provision for the running of special cars in the evening, when artisans are returning from work.

The tenth section requires $8,000,000 of the capital stock to be subscribed before the work is commenced, and also requires that this sum shall be obtained and the work commenced within one year from the passage of the act. It further requires the completion of the road to Forty-second street within three years, and its completion to Harlem within five years.

The eleventh section specifies the manner of obtaining subscriptions for stock.

The twelfth section constitutes the Governor of the State of New York, the Mayor of the city of New York, and the Commissioners of Public Works in New York city, a Commission, to whom plans, specifications, etc, must be submitted before the commencement of the work. This section also empowers the company to construct similar railways and branches in any part of the city, or into and in the county of Westchester, and to operate them under the general provisions of the act.

The thirteenth section authorizes the company to keep separate books of account for each of these additional branches or roads, in order that the interests of shareholders may be equalized and the profits eqiutably adjusted.

The New York public at large, so long sufferers for want of proper transit facilities, will hail with joy almost any means whereby they may be emancipated from their present discomforts, even if presented to them in questionable shape. The opposition of the bill will come from property holders along the proposed line, and from the promoters of other schemes. The men who back this scheme are men who cannot be played with, and any opposition which can defeat what they undertake, must be one of no ordinary strength.

No plan can be devised that will not meet with opposition. The matter has been too long neglected. It ought to have been attended to thirty years ago. Then property would have been adjusted to whatever plan had been put into operation, and far less sacrifice of personal interest would have been required.

We have always favored tunnel transit, as being less likely to disturb values of real estate, and for other reasons familiar to our readers, but we are prepared to accept and support any reasonable plan that seems adequate to the requirements of the case. Unless a beginning of some kind is speedily made, the interests of New York will be permanently injured, and perhaps the true solution of the transit problem can only be reached by experiment.

RATING OF BOILERS.

We are informed that a committee has been appointed by the Franklin Institute to take into consideration the subject of a standard rating for the horse power of boilers. We have advocated a standard rating for steam engines, and see no good reason why a standard cannot be adopted also for boilers; but, if we are correctly informed, the committee referred to is entertaining a proposition which cannot be adopted as a general standard, and which seems too absurd to be adopted by any scientific association. The proposition, as we learn, is to make a cubic foot of water evaporated per hour from 60°, at half the working pressure of the boiler, with an allowance of 8 lbs. of anthracite coal per cubic foot of water evaporated, the standard unit of boiler power. That is, the H. P. shall be computed by multiplying the total evaporation in cubic feet per hour by 8, and dividing the product by the amount of coal consumed in the evaporation of a cubic foot of water. Thus, a boiler evaporating 100 cubic feet per hour, with a consumption of 800 lbs. of anthracite coal, would be rated at 100-H. P. One evaporating 100 cubic feet, with a consumption of 1,000 lbs. of coal would rate as 80-H. P. *e.g.* $(\text{H. P.} = \frac{100 \times 8}{10} = 80)$. One evaporating 100 cubic feet per hour, with a consumption of 500 lbs. of coal, would rate at 160-H.P. $(\frac{100 \times 8}{5} = 160)$.

Such a proposition as this will never be accepted by engineers at large. If the steam in the above examples be generated under equal pressures in each case, the real power developed will be the same in each, though the nominal power, on the plan proposed, would be twice as great, on paper, in the fourth example as in the second.

Such a fiction is neither necessary nor tolerable for one moment to common-sense. The real power of the boiler is its evaporative power, and this has nothing to do with the waste of fuel in its furnace. The question of economy and effective power should be kept as distinct in rating boilers as in rating engines. The amount of power is one thing, the cost of generating it is another.

We therefore propose that, in rating boilers, the number of cubic feet of water, at 60°, they can convert per hour, into steam at 212°, be still, as heretofore, the accepted rating for the horse power of boilers, and that the standard for economy of fuel be fixed *by itself* at 8 lbs., if that figure be considered most convenient, and as the unit of economy. A boiler consuming 10 lbs. of coal per cubic foot evaporated, would then be rated and marked 1·25; one consuming 6 lbs. per cubic foot evaporated, would be marked 0·75, etc. The number 10 would, however, be far more convenient as a standard, as the conversion into percentages could be much more readily performed from that basis

We have implied that a cubic foot of water evaporated is considered the standard for the H. P. of boilers. This is, perhaps, too broad a statement. Many makers have been in the habit of computing the effective horse-power of their boilers from the basis of steam consumption in engines of the most modern and improved types, in which steam is used expansively, and in the most perfect manner known to engineers. A boiler supplying such an engine of course will appear to be doing better than when supplying an engine of inferior type. Another clause must therefore be added to the H. P. rating; namely, that the cubic foot evaporation per hour shall be considered a horse power when used non-expansively, and this would be very nearly accurate, as is quite unnecessary to state to engineers.

In short, the rating unit for both boilers and engines should be fixed to mean steam used non-expansively, and the gain, from using th steam expansively, denoted as percentage in decimal notation. If accurate rating be desirable —and we so believe it—it should be done in the most simple and clear manner. The mixing up of the effective power with the expense of fuel, will obscure the rating, without any practical benefit whatever.

THALLIUM, ITS PROPERTIES AND USES.

A few years ago, a metal was found in the slimy deposits of sulphuric acid chambers, to which, owing to the green color it imparted to flame, and a green line produced by it on the spectrum, the name of thallium was assigned, by its discoverer, Crookes. It has since been detected in a number of ores, and its compounds have been thoroughly studied.

It may be of interest to know how to prepare the metal from its ores. Dissolve the ore in *aqua regia*, dilute, filter, evaporate the filtrate with sulphuric acid to a sirupy consistence, dilute once more, and collect the sulphate of lead on a filter, and, to the filtrate, add carbonate of soda in slight excess, then add an excess of cyanide of potassium, warm, filter off the precipitate of lead and bismuth, and precipitate the thallium from the cyanide of potassium solution by sulphuretted hydrogen. If cadmium and mercury be present they will also be precipitated, but not copper, antimony, or arsenic. The cadmium can be extracted from the sulphuretted hydrogen precipitate by sulphuric acid, and the thallium can be separated from the mercury by hot dilute nitric acid. This solution must be evaporated, and the thallium precipitated as a dark brown powder, by metallic zinc. The spongy mass can be fused to an ingot in a current of hydrogen gas.

The metal is tin white, brilliant, malleable, and, after the metals of the alkalies, the softest metal: so soft that it can scratched by lead or the finger nail, and leaves a mark on paper. It is not very ductile, but easily pressed, and fuses at 554° Fah. It is volatile at a red heat, colors the gas or alcohol flame an intense green; and it is said that one-millionth of a grain will give a green line on the spectrum. Its specific gravity is 11·9.

Thallium is easily soluble in nitric and sulphuric acids, and in *aqua regia*, but not readily in hydrochloric acid, as the coating of chloride protects it from attack.

The metal becomes readily coated, in the air or water, with a white oxide or carbonate. It can be best preserved in glycerin or distilled water. It can be distilled at a red heat, and evolves, at a little above its melting point, brown vapors. Heated in the air, it closely resembles lead: and silver can be extracted from it by cupellation, in the same way as lead. When the metal is burned, it yields a brown suboxide, soluble in water; this oxide yields an alum, with sulphate of alumina. Thallium is thrown down by metallic zinc in the form of sponge, and it precipitates, from solutions, copper, gold, silver, mercury, and lead.

The soluble salts of thallium are more poisonous than arsenic, or corrosive sublimate. It stops digestion, produces nausea, violent vomiting, and colic. Rubbed into the skin, it produces similar symptoms; and hence the metal cannot be handled with impunity. Albumen does not affect the salts, and they do not possess antiseptic properties. The question whether thallium should be classed with lead or the alkalies, is still a matter of dispute with chemists. Some of the alloys have been studied. In the proportion of five to twenty-five per cent with magnesium, the alloy can be drawn into wires; and it is much more malleable than magnesium. In burning this alloy, the white magnesium flame entirely masks the green thallium color. Mercury amalgamates with it directly.

Alloys have been made with antimony, lead, cadmium, magnesium, aluminum, potassium, sodium, tin, zinc, and bismuth; but none of them possess any remarkable properties.

The chief practical application of the salts of thallium is as follows: The oxide, carbonate, and sulphate, substituted for potash, impart a higher dispersive power to glass than lead does, and suggest its use for optical purposes and artificial jewels. The green color, being more chromatic, adapts it to lighthouse signals. A magnificent green fire can be prepared by mixing eight parts chlorate of thallium, two parts calomel, and one part rosin. The chloride of thallium and the sulphate have been prescribed, in doses of one-fifth grain, for acute rheumatism. The oxide is turned brown by ozone;

and test papers, immersed in it, have been prepared for the detection of ozone in the atmosphere. The place in which to look for thallium is in most pyritous ores, in sulphuric acid chambers, and in the flue deposits of metallurgical works.

THE USE OF THE MICROSCOPE IN THE STUDY OF ROCKS.

Of late years, the microscope has been applied to the study of the minute structure of rocks, and many new and important deductions have been published as the results of these investigations. The greenstone and trap, of which we have such enormous quantities in New England, on the Palisades of the Hudson, in the Blue Ridge and Rocky Mountains, has especially been subjected to a close scrutiny; and as we use the trap block pavement to a large extent in New York city, it may be interesting to obtain a closer acquaintance with its composition. The particular vicinity of trap, occurring at Hoboken, and used on our streets, is called diorite, meaning "a clear distinction," because it contains feldspar and hornblade; and is thus easily distinguished from another variety called dolerite, meaning "deceptive," which is chiefly feidspar and augite.

It is known to all of us that, in proportion as the trap wears off it becomes slippery; the reason for this is, that the constituent minerals contain something like soapstone, and there is a species of lather formed on the surface as this magnesian mineral wears away.

The common notion regarding the structure of basalt rocks has hitherto been that, down to its minutest particles, basalt is a crystalline rock, that its individual microscopic ingredients mutually impinge on each other, and that the difference between the structure, for example, of granite and basalt consists in little more than in the varying relative size of their component minerals. The microscope has revealed that this notion is erroneous. Professor Zirkel has found that a cement exists between the crystals, sometimes glassy, sometimes granular, which appears to be the residuum of the original *magma*, out of which the recognizable minerals of the rock crystallized. His observations go to furnish new proof of the igneous origin of trap.

It appears that, by means of the microscope, different varieties of rock can be readily distinguished. Rocks which, to all outward appearance are simple, can be resolved by microscopic examination into as many as four distinct minerals; and this affords a ready method for the analysis of minerals. It is possible, by microscopical examination with polarized light, to distinguish augite and hornblende, even when minutely diffused through a rock. We can also determine whether rocks contain fossils, or are absolutely azoic, by the use of the same instrument. It is thus that the microscope has a new and important application.

THE HUMAN MIND AND THE HUMAN HAND.

The human foot is far superior as a mechanical instrument, for general purposes, to the paws or feet of any animal, except those of apes and monkeys. The human hand has, however, peculiarities of construction which render it one of the most wonderful pieces of mechanism in existence, and capable of being applied to a greater variety of uses than any other machine, whether natural or artificial. It is, however, not of the anatomy of the hand that we would speak. The celebrated surgeon, Bell, found it easy to write a large volume upon the human hand. Surely we would be rash to attempt an elaborate discussion of such a fertile subject in a single article. Our intention is merely to notice the mutual dependence of the human mind and the human hand upon each other, and to point out the fact, overlooked by most people, that without his perfect hand, man could never have taken the rank he now enjoys as the mental superior of all other animals.

It is an admitted fact that the human intellect has increased in power, as it has increased in knowledge, by civilization. Today there may be found savage races of men whose intelligence is not very far above that of our domestic dog, or of the wild apes. But now, were it possible to take any one of these races, and transform their hands and feet into such imperfect paws as those possessed by the dog, and then isolate this species from all other races, in some situation where coarse food could be obtained sufficient to sustain life, who can believe that such a race of beings would ever make a single advance towards civilization?

The chief of all the elements of human progress is written language. By its aid we are enabled to accumulate knowledge, and to concentrate, so to speak, in the present, wisdom acquired in the past. It is absolutely impossible to accomplish this through the medium of spoken language. Let any one who wishes to gain an adequate idea of the relative power of written and spoken language, visit some great library, and, wandering through its alcoves, judge what manner of man he would be who could carry in his mind the facts recorded in the books of a single department, not to speak of the entire collection. And could we suppose such a prodigy possible, how limited would his power be in oral instruction compared to that which books possess, reaching as they do, generation after generation of readers!

But written language and books and libraries would never have existed without the human hand. We are apt to consider spoken language as the principal and most important avenue through which ideas are communicated. It *is* the principal avenue, but, considered with reference to human progress, it is not the most important. The highest conceptions in art, science, and philosophy, find expression in written language through the hand. This language is not necessarily that by which ordinary ideas are conveyed. It may be a language of color or form, or both, on the painter's canvas, the sculptor's model, the architect's drawing paper, or the machinist's handiwork. It may be a language of sound in the score of the musician. Whatever the hand does, it speaks a language which is a clear index to the thought which guides it, whether its work be rude or refined.

But the hand is not only an avenue of expression; it is one of the doors through which we obtain a very large proportion of our objective knowledge. In fact, it is the vehicle, so to speak, which brings objects within the reach of the other organs of sense, while it is capable of determining much unaided by any other organ. More than this, the hand has been able to supplement the powers of other organs by the construction of instruments which greatly enlarge the scope of natural sensation.

The eye has discovered much, but these discoveries have been made possible, by the microscope, the telescope, and the spectroscope, which only the human hand could construct. The human ear has explored the mysteries of sound, but only through the help of the monochord, the siren, and other instruments which the hand provided.

We see, then, that the hand is the chief executive of the mind. When the mind wants to call anything to the aid of any of the senses, the order is issued through the hand, which forthwith summons and coerces the brute forces of nature into obedience. Through its energy crude materials are subjected to battering, to grinding, to fiery heat, and finally are compelled to assume the required forms, and take their place in the army of implements and instruments by which the mind forces its way deeper and deeper into nature's labyrinth of wonders. When the mind wants to express its conceptions, the hand is its ready servant, to write, to print, to paint, to carve.

There is another point connected with this view of the intimate mutual dependence of mind and hand, namely, that the mind of one may direct the hands of others, and *vice versa;* so that skilled minds may always find skilled hands, and skilled hands may not lack for skilled minds, though both may not be possessed by the same person. The greatest works are accomplished through such associations of mental with manual skill. Surely, then, the skilled hand is entitled to a place of honor with the skilled mind. Neither can do without the other, and human progress cannot dispense with either.

WOOD CARPETING.

The above is the name of a new article of manufacture sold by the National Wood Manufacturing Company, at their establishment, 480 Broadway, New York. It is an entirely unique production, and is rapidly gaining favor with the public, as its beauty and other intrinsic merits become known.

The article has steadily increased in sale since it was first introduced, and its manufacture bids fair to become a prominent industry.

The fabric is made of slats or more ornamental shapes, glued or cemented upon a cloth backing. The slats or strips of wood are of different colors, and are arranged to produce all the effects of tesselated floors, mosaic work, etc., and being about one fourth of an inch in thickness, they will wear many years. They are finished in oil, and fit together so tightly that the joints are as perfect as those in inlaid work. The surface thus produced can therefore be scrubbed, washed, and oiled, when needed, precisely like other floors made of ornamental woods, which floors they resemble in all respects, when laid.

A great many patterns were shown us, on a recent visit to the establishment where these carpets are sold; and there seems no limit to the variety which may be produced. The articles, after manufacture, can be rolled up, like ordinary carpeting, and are so packed for transportation. They can be fitted, in any style of pattern, to any sized room, and are admirable for dining rooms, bath rooms, halls, etc., having the same appearance as inlaid or tesselated floors, but costing far less.

The slats are cut by sawing, and are so free from saw marks as to obviate the necessity of either planing or sandpapering. As specimens of fine sawing, we have never seen anything to equal them. We supposed they had been dressed by planing them, until informed to the contrary. It is evident the company has some one in its employ who knows how to file, set, and run a saw.

COST OF WATER IN NEW YORK CITY.

One of the dearest beverages we have in New York is water; and since the proposed increase of the water supply, we may expect a proportionate addition to the cost of the pure article; but it is not to pure Croton water that we refer in our heading. We have in our minds the price we pay for water under the name of milk. The Board of Health has recently been investigating this matter; and the accomplished chemist of that body has been busy testing and analyzing specimens taken from milk trains, as they arrive, also from retail dealers; and the results will be embodied in a report, similar to the one with which we were favored last year.

Professor Chandler estimates that for every three quarts of milk, there is added one quart of water; and, as the annual consumption of milk in New York city and vicinity, is 120,000,000 quarts, 40,000,000 quarts of water are used to dilute it, which, at ten cents per quart, amounts to the snug sum of $4,000,000 annually, paid by our citizens for water. Few people can afford to drink water at that rate, and if they take to something stronger, they can plead extenuating circumstances.

It is gratifying to know that none of the following adulterations were found in the specimens thus far examined, viz.: chalk, cheese, flour, starch, gum, sugar, dextrine, borax, sheeps' brains, carbonate of soda, gypsum, or clay. Water appears to be the main stay of the dishonest dealer.

ON THE NATURE AND MANUFACTURE OF CHARCOAL

When wood is exposed to a high temperature, while protected from the action of the air, it gives off various fixed gases, a good deal of water, several acids, and some tar. This is the result of what is called "dry distillation," and, if carried on with rapidity, yields about fourteen per cent of the weight of the wood as charcoal, after all volatile compounds have escaped. But if the process of burning be done slowly, the same wood will yield from twenty four to twenty-eight per cent. This remarkable difference originates in the peculiar decomposition that takes places when steam is brought in contact with "highly-heated" coal, a large portion of the solid carbon passing off in the form of carbonic oxide and carbonic acid gas. This is a fact of the utmost importance to the charcoal burner, who has discovered, without being able to explain the reason, that in order to obtain the largest quantity of coal, he must perform his charring by allowing the heat to act gradually, and never to rise higher than can be avoided.

Good charcoal retains the form and structure of the wood from which it is made. It may be known by its clear fracture, glancing blue-black surface, and the property of giving a ringing tone when struck. Charcoal, incompletely burned, has a reddish appearance on the longitudinal fracture, and has a dull sound when struck. It possesses, in a fresh condition, the power of absorbing gases to which it may be exposed, to the amount of ten to twelve per cent, and on this fact rests the phenomenon it occasionally exhibits, of spontaneous combustion; the air being absorbed by the fine coal, and condensed in its pores, sets free enough latent heat to bring the mass to a glowing temperature. Although the weight of charcoal obtained by the usual methods is generally not over twenty-five per cent of the wood used, yet, in regard to volume, it suffers less loss, so that it ought, at least, to afford sixty to seventy per cent of the original mass of wood.

Charcoal is produced on an extensive scale by placing the wood in large piles, and covering it with earth, and thus by allowing, after kindling, a limited supply of air, securing a slow combustion of a portion of the wood, which furnishes heat for the dry distillation of the remainder.

The best season for burning is in summer or autumn, as the weather is more regular, the days longer, and materials more easy to obtain. The time occupied for charring is usually from eight to sixteen days, depending on the quantity to be done. The fire is then smothered by piling sand and clay tightly over it, to shut out the supply of air. After twenty-five to thirty hours the charcoal may be removed.

The Solar Eclipse.

The reports of the various expeditions to the south of Europe are now published, and the outlay for the journeys of the investigators has been well recompensed in the astronomical discoveries made and described. But the observations have been much hindered by the state of the weather, and the cloudiness of the sky has created some blanks in our scientific news. A perfectly clear atmosphere would have helped us wonderfully; and it is an interesting study whether some means of evading Nature, in her various obstacles, cannot be devised. An expenditure of a few thousand dollars would make the summit of Mont Blanc accessible to a large number of scientific men, who would gladly endure a few hours hard walking and inconvenience, to be able to see the phenomenon amid the absolutely perfect circumstances of an atmosphere that no change of weather could disturb. Above the clouds will be found the proper stand-point for an observation of an eclipse of the sun; and we recommend to our scientific observers, whose ingenuity is inexhaustible, the establishment of a temporary observatory beyond the range of terrestrial influences, where the telescope and spectroscope could have full play. When the next eclipse occurs, we hope that such position will be found, and we are sure that the results will fully repay any outlay for the purpose.

A NEW INVENTION.—We understand that a new substitute for jet and vulcanite is about to appear in the market. The material is called tanite, and is said to be readily worked, and to equal in appearance the finest Whitby jet. Time will show whether it is to be ranked among the thousand compositions which have had their trial and passed away, or whether it will take its place as what it claims to be—a new invention, the result of processes and principles not in common use.

SUGAR IN FRANCE.—Great as the consumption of sugar is, in France, no less than two thirds of the whole is made in that country, chiefly from beet root. The annual value of the manufacture is now $20,000,000, representing 600,000 tuns, produced by 1,800 factories. In addition to the sugar, the crop afforded, last year, spirits to the value of $3,700,000, and an unknown quantity of molasses. Potash for fertilizing, and pulp cake for feeding cattle, are products incidental to the boiling and refining, and are of great value.

MANY readers of the SCIENTIFIC AMERICAN will learn with regret the death of Aaron R. Haight, who for nearly twenty years was associated with us as an employé in our Patent Office department. About two years since, and much to our regret, Mr. Haight voluntarily resigned his position in our office to establish an agency of his own, and, we doubt not, would have succeeded well, but for the appearance of the insidious disease which finally terminated his career on the 15th inst., at his residence in Mount Vernon, Westchester Co., N. Y., where he was highly respected as a good citizen and an honest man.

RECENT PATENT DECISION.

In the matter of the application of Alfred Shoe for letters patent for a Corn Planter.—This application was filed April 16, 1869. On the 3d of May the case was taken up for examination, and, after due consideration, applicant was officially notified that the first claim was anticipated by the patent of F. J. Ashburn. This was a refusal to grant the patent asked for; and, although the objection lay against one claim only of the three contained in the application, the adverse action was a rejection, it being an action which, if adhered to by the examiner, would entitle the applicant, upon the payment of the prescribed fee, to have the judgment of the Board of Examiners-In-Chief. After this rejection, applicant took no further action in the premises until the 8th day of the past month, when his attorney filed a paper of which the following is a copy:

To the Commissioner of Patents:

SIR: I amend the case of A. Shoe in the matter of his application for letters patent for improvements in Corn Dropper, filed April 16, 1869, by erasing the first claim, in accordance with the suggestions contained in official letter.

Respectfully, T. H. ALEXANDER, Attorney.

Applicant now moves that this paper be received as a renewal of his application, and that the examiner, in charge of the class to which the invention belongs, be directed to proceed with its consideration.

If applicant were entitled to renew his case at the date named, this paper can undoubtedly be received as constituting a valid renewal. As the statute does not prescribe any particular formula for the purpose, any act, on the part of the applicant, which brings his rejected case before the attention of the Office for further consideration upon its merits, may unquestionably be regarded as a renewal within the meaning of the law. The question then comes, whether applicant could properly renew his case at the date named?

In the proviso attached to section 35 of the revised patent law, it is enacted as follows:

"That when an applicant for a patent has been rejected or withdrawn, prior to the passage of this act, the applicant shall have six months from the date of such passage to renew his application, or to file a new one; and, if he omit to do either, his application shall be held to have been abandoned."

The present application having been rejected prior to the passage of the act, and not renewed within six months thereafter, it follows: that if the literal construction of the proviso quoted is to prevail, the application must be held to have been abandoned on and after the 8th day of January, 1871; and consequently it could not be renewed at the time when the proposed amendment, withdrawing the first claim, was filed in the Office. It is pertinent to inquire, therefore, whether there are sections in the law which can be invoked to modify and limit the scope of this proviso. The only other clauses that can have any relation to the subject, are section 32, and the second proviso appended to section 111. Section 32 is in these words:

"*And be it further enacted*, That all applications for patents shall be completed and prepared for examination within two years after the filing of the petition, and in default thereof, or the failure of the applicant to prosecute the same within two years after any action therein, of which notice shall have been given to the applicant, they shall be regarded as abandoned by the parties thereto, unless it be shown to the satisfaction of the Commissioner that the delay was unavoidable."

While this section, in terms only, determines the status of an application which remains incomplete for two years after the filing of the petition, or which, if completed, the applicant fails to prosecute for two years after any action thereon of which notice shall have been given him, yet by implication it was manifestly intended to provide that an applicant may, if he choose, delay the prosecution of his case for any period of time less than two years after an action by the Office, of which he shall have received notice, without having his rights in any way impaired by the mere fact of such delay. Standing by itself, of course the section has relation only to applications made under the amended law, that is, subsequently to the passage of the act of which the section forms a part; but its provisions, as well as various others in the law, are made applicable, to a large number of cases filed prior to the passage of the act, by the proviso attached to section 111 in which it is enacted: "That all applications for patents pending at the time of the passage of this act, in cases where the duty has been paid, shall be proceeded with and acted on in the same manner as though filed after the passage thereof."

It was not the intention of Congress, in enacting the amended patent law, to make radical changes in the patent system. The main object was to consolidate the existing statutes into one. As the codified statute was to work a repeal of the laws which had preceded it, justice to those parties who had acquired rights under the former acts demanded that some provision should be made for the preservation of those rights, when the statutes themselves under which they had arisen should be annulled. For this reason there were appended, to the repealing section the various provisos which accompany it. The first of these relates to such rights as may form the basis of a suit at law or in equity (v. Egbert W. Sperry, *ex parte*, Commissioner's Decisions, 1 70, p. 129), and enacts that the repeal, enacted by the body of the section, "shall not affect, impair, or take away any right existing under any of said laws." The third proviso relates to offenses defined and made punishable under the former statutes, and to penalties and forfeitures created thereby, and incurred before the passage of the repealing law, and continues said laws in force for the purpose of punishing such offenses and enforcing such penalties and forfeitures. The second proviso, already quoted, and which more immediately concerns the question raised by the present motion, has relation solely to the rights of an applicant before the Patent Office; and manifestly it proceeds upon the theory, that if a party has paid the fee, prescribed by the act in force at the time of filing his petition, he is entitled to have his application considered, and fully considered, notwithstanding the repeal of the act under which it was filed; and upon this theory it would be a narrow and illogical construction of the term "pending," as contained in the proviso, to confine it to those cases which, being completed, had never been acted on by the Office; or which, having been acted on adversely, and subsequently called up by the applicants, either by amendment or a demand for a re-examination without amendment, stood upon the docket, awaiting further action on the part of the Office, at the time of the passage of the amended law. The same reason that would extend the benefits of the proviso to such cases, would make it applicable also to all cases in which, if they had been filed subsequently to the passage of the act and had then assumed the same status, the parties would have further rights before the Office. It must be held, therefore, to include all cases except withdrawn cases, and those in which the parties, by carrying them up to the highest tribunal of appeal, had exhausted their rights before the Patent Office, and before the appellate judges who were designated quasi-commissioners to hear appeals from the adverse decisions of the Office; and even such cases might be included within the meaning of the term as to all other than the special questions involved in the appeals and decided adversely by the judge. In other words, the term "pending," as used in the proviso, includes all cases in which the application fee has been paid prior to the passage of the law, and which at that time either stood upon the docket, awaiting action on the part of the Office, or were subject to be called up for further consideration, by action on the part of the applicant. It seems not to be opposed in sense to the term "rejected," but rather to the term "finally rejected," as used in section 14. If regard be had to the intent of the proviso, it is not easy to see how a less comprehensive construction can be put upon the term, although it is thus made to embrace: not merely cases never acted on by the Office, and cases which, having been acted on, had been called up by the parties, and were awaiting further action at the time the law went into effect; but also all cases which at that time stood rejected, except, as before stated, those that had been withdrawn, and that small class of cases in which the rejection, because based upon the adverse judgment of one of the justices of the Supreme Court of the District of Columbia, was final. Except as to these comparatively few cases, then the proviso operates to make the 32d section retroactive; and, if this section be retroactive, it follows that a party, whose application before the Office stood rejected at the time of the passage of the law is entitled to two years from the date of notice of such rejection before any mere delay on his part can operate as an abandonment of the application.

This interpretation of the law, derived from a comparison of sections 32 and 111, is in conflict with the literal terms employed in section 35; but this conflict is reconciled by limiting the term "rejected," as used in the latter section, to cases not provided for in the former. Under the former sections, those cases only could be removed which had been rejected not more than two years at the date of renewal. The object of the proviso in section 35 was to give opportunity to renew their cases to parties who had been rejected for a longer time; and to this end, it enacts that all rejected parties, however long the adverse action of the Office may have stood against them, and even though, being rejected prior to the law of 1861, they had withdrawn their applications, shall have six months in which to call their cases up for further action, failing in which they shall be estopped from renewal, thenceforth and forever.

In giving such parties this additional time there was a manifest equity; for under the former laws, there was no time fixed within which a case must be prosecuted after a rejection; and the statute nowhere proclaimed abandonment as the result of any specified delay in such prosecution. It was necessary, therefore, in establishing the present statutory abandonment, that a reasonable time should be given before applying it to parties already before the Office.

A serious doubt is suggested, in passing, as to whether Congress intended that this right of renewal, as conferred by section 35, should attach to cases which had been finally rejected upon the adverse judgment of a judge, upon appeal from the Commissioner of Patents. But, however this may be, the proviso, under the interpretation now suggested, becomes in reality, an addendum of section 32, simply defining an additional class of cases in which, subject to the limitation specified, the parties may file renewals; and, thus regarded, all conflict, between it and the other sections named, disappears.

Any other interpretation, instead of making it harmonious with section 32, would bring it into direct conflict therewith. Further, it would make the proviso itself bear very unequally upon those who come under its operation. A party, for instance, rejected the day before the passage of the act would be required to renew within six months, under penalty of absolute forfeiture, by constructive abandonment, while a party rejected one day after would have two years in which to proceed with his case. Certainly no such partial legislation could have been intended by Congress; and the law should be so interpreted, if possible, as to relieve it from any such inequality of operation.

The interpretation now proposed seems the most equitable, and on the whole, presents fewer difficulties than any other. It is therefore adopted.

It follows that the present applicant, who was rejected on the 3d day of May, 1869, is entitled to two years thereafter in which to revive his application. The amendment offered comes within this limit, and must be received. The motion accordingly is granted, and the case is referred to the primary examiner for action. SAMUEL A. DUNCAN, Acting Commissioner.

U. S. Patent Office, March 7, 1871.

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Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N. Y. (Send for Circular.)

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N. Y. Send for catalogue.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

2d hand Worthington, Woodward and Novelty Pumps, Engines 25 to 100 H. P., 60 Horse Loc. Boiler. W. D. Andrews & Bro., 414 Water st., N. Y.

Agents wanted, to sell the Star Bevel. It supersedes the old style. Send for Circular. Hallett & White, West Meriden, Conn.

English and American Cotton Machinery and Yarns, Beam Warps and Machine Tools. Thos. Pray, Jr., 57 Weybosset st., Providence, R. I.

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year.

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 advertisements at 1 00 a line, under the head of "Business and Personal."

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

IMITATION OF ROSEWOOD.—I give, in reply to query of H. G. W., the following recipe: Boil half a pound logwood in three pints water, till the mixture is of a very dark red; add half an ounce salt of tartar. While boiling hot, stain your wood with two or three coats, taking care that it nearly dries between each; then, with a stiff, flat brush, such as is used for graining, form streaks with the following black stain: Boil one pound logwood in four quarts water: add a double handful of walnut peel or shells; boil it up again, take out the chips, add a pint best vinegar, and it will be fit for use; apply while hot. All this, if carefully executed, will produce very nearly the appearance of dark rosewood.—J. B., Jr., of Ohio.

HARDENING TALLOW.—I have used the following mixture with success: To one pound tallow take one fourth of a pound common rosin; melt them together, and mold the candles the usual way. This will give a candle of superior lighting power, and as hard as a wax candle; a vast improvement upon the common tallow candle, in all respects except color.—F. S. E., Pa.

SILVER SOLDER.—Silver coin, 17 pwts.: copper, 2 pwts., 12 grains; zinc, 2 pwts; melt the silver and copper; after cooling a little drop in the zinc; then heat again.—J. G. M., of Mass.

A. J. S.—If you are using suitable timber for plow handles, and steam them till they are equally heated and softened throughout, you should have no trouble in bending them. Of course, we suppose you bend them before dressing them into shape. To bend well, the wood should be heated nearly to the boiling point, and thoroughly saturated with steam.

F. M. C., of Iowa.—When you ask why the boiler, the explosion of which you describe, followed the head which was blown out, you ask a question we cannot answer. The theory that the steam raises a boiler like a balloon, is absurd. There are many inexplicable things constantly occurring in connection with boiler explosions. There was probably some local cause for the boiler and head both flying in the same direction, that close examination by an expert might discover.

M. E., of Mass.—The distance between London Bridge and Dover, England, is 88 miles. The 7.25 A. M. train runs through, without stopping, in one hour fifty-five minutes. From Euston Station, London, to Rugby, 82 miles, the run is made in two hours. We have no record of any faster railway running than the above.

R. H., of N. Y.—The theory you advance, that boilers when at rest may be heated higher than the boiling point under a given pressure, and suddenly release their steam with explosive force when started, is not new, and has had, in times past, many able supporters. It is plausible, but is doubtless only one of a series of causes, which combine together in such cases to produce the effect.

E. P. T., of Ark.—A hollow shaft, of any size, is not so strong as a solid one of the same diameter, though stronger in proportion to its weight. The device you propose is not patentable.

L. S., of Ohio.—We know of no coating that can be applied to metal pipes which will increase their power to conduct heat.

G. C. B., of Tenn.—We do not desire at present to open a discussion in our columns, of the subject of "squaring the circle." No good can come of it, and we consider our space of more value for other subjects.

Z. A. S., of N. J.—The carbon plate, in a carbon battery, is nearly pure carbon, and is generally of the kind known as gas-carbon.

B. B. R., of Wis.—Arsenic is applied to organic substances, as the skins of animals, etc., as a preserving agent only.

H. A., of Va.—The water mark in paper, is produced by wires raised above the fine woven wire surface of the mold or web upon which the pulp is received to form the sheet.—L.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.]

1.—BLUING AND BROWNING IRON AND STEEL.—Will some one be kind enough to tell me how I can give the polished surface of iron a nice brown or blue appearance, such as is found on gun barrels?—D. M. S.

2.—ADAMANTINE CANDLES.—I have read your articles in the SCIENTIFIC AMERICAN, on the danger of using the light or explosive oils. Thousands would use candles, in preference to such oils, did they know how to make them. A recipe for the domestic manufacture of adamantine candles, in a cheap and simple manner, would be of inestimable value to the community. Can some one give it?

3.—RAILWAY CURVES.—What is the shortest and sharpest curve on a railway of 4 feet 8½ inch gage, over which an engine and tender can pass with safety at full speed? And also what is the sharpest curve over which they could pass at any low speed? Of course I wish these curves to be indicated by their radii.—F. W. G.

4.—CEMENTS.—What is the best cement for the brass tops of kerosene lamps? Also, what is the best cement for mending china ware?—R. X. T.

5.—SILVERED SURFACES.—How can I keep the surfaces of silvered arcs on mathematical instruments free from tarnishing by the generation of the black sulphide of silver, and yet not obscure the graduation marks?—B. G.

6.—TEMPERING COLD CHISELS.—Will some one give me directions for tempering cold chisels made from old files?

7.—CHASERS.—Can a very fine true thread, say twenty to the inch, be cut on brass screws one quarter inch in diameter? I want the threads to be perfectly true, and to avoid, if possible, the slower process of cutting with an engine lathe. I require to use a great many of them, and I do not succeed with the chaser, in getting perfect enough.—L. C. D.

8.—BLANKS FOR TOOTHED WHEELS.—Can blanks for small brass toothed wheels be punched from the sheet simultaneously with the hole in the center of the blank? I am now doing this with two different dies, and at two operations. Can it not be done by a single punch?—B. B. S.

9.—ARTIFICIAL INCUBATION.—I wish some reader of the SCIENTIFIC AMERICAN, familiar with this subject, would give me a brief description of an apparatus which will hatch, say, 2,000 eggs at once by artificial heat. I should prefer steam heat, but do not make it an essential.—T. K.

Recent American and Foreign Patents.

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

LETTER ENVELOPES.—Edward S. Ellis, Taunton, Mass.—This invention relates to improvements in envelopes for inclosing letters, and it consists in an arrangement calculated to facilitate the opening of the same; also, to retain the letter after being opened, and the inclosure replaced in it.

SECURING WHEEL TIRES.—Anthony Huegler, Sullivan, Mo.—This invention consists in arranging the ends of the tire to lap each other, for a considerable distance, serrating or grooving the lapping surfaces so as to hold firmly when clamped together, and clamping them together by a bolt, passing radially through them (one of which is slotted), and through a short metal felloe, introduced in a gap prepared between the ends of the wood felloes, the said felloes being secured to them by bolts, passing through flanges on the ends into the ends of the said wood felloes. This invention also comprises the application to the ends of the wood felloes, of corner plates, to protect the corners from crushing or brooming under the action of the concussions of the metal felloe and the tire against them, when in use.

UNIVERSAL MANDREL FOR LATHES.—James Gallatin, Jr., New York city.—The object of this invention is to provide a universal mandrel, which can be placed into lathes to retain different sized tubular articles in exact central positions.

CAR COUPLING.—Godfrey Brenner and George T. Polk, Poughkeepsie, N. Y.—This invention has for its object to furnish an improved car coupling, which shall be simple in construction and effective in operation, coupling the cars automatically, as they are run together, holding them securely when coupled, and uncoupling them automatically, should one or more cars be thrown from the track.

MACHINE FOR FEEDING FUEL TO FURNACES.—Alexander Rodgers and Esau Tarrant, Muskegon, Mich.—This invention relates to a new machine for feeding fuel, such as sawdust, shavings, coal, or other material, capable of pulverization, if not already in a powdered state, to furnaces, with an object of obtaining complete control of such feeding mechanism, to permit perfect regulation of feed.

MECHANICAL MOVEMENT.—Edward G. Russell, Ravenna, Ohio.—This invention relates to improvements in apparatus for imparting a reciprocating motion from an oscillating device, or *vice versa*, and it consists in a connection of the reciprocating and oscillating devices, by rods arranged in a manner by which the tendency of one rod to force the reciprocating bar out of its right line will be counteracted by the other.

HEATING STOVE.—William Cottingham and John W. Stafford, Troy, Ohio.—This invention relates to a combination of drums, placed within an inclosing acket, and provided with peculiar facilities for supplying the main drum with fuel, and for cleaning the smaller side drums, the whole forming a furnace that can be made to radiate as much or as little heat as required, and is very simple and cheap.

CAN AND VENTILATING STOPPER FOR PRESERVING PURPOSES.—Nicholas H. Shipley, Baltimore, Md.—This invention has for its object to provide a sufficient means for the escape of air, or vapor, from a vessel, from which it may be desirable to expel it for the preservation of its contents, and in new and simple means for enclosing and hermetically sealing the same, while in process of exhaustion, whether the same is effected by heat or the action of the air pump.

WASH BOILER.—Charles W. Powell, Bloomfield, Conn.—This invention relates to a new and useful improvement in apparatus for washing clothes, and consists in a framework made of perforated metal, or woven wire, constructed in size and shape to fit into an ordinary wash boiler.

STIRRUPS.—L. S. Taylor, Sigel, Mo.—This invention relates to improvements in stirrups for saddles, and it consists in the application of springs to the foot-piece, which is jointed to the yoke, so as to oscillate, for assisting in raising the heel as the foot vibrates on the cross-bar of the yoke.

ELEVATOR.—Zebulon C. Favor, Chicago, Ill.—The object of this invention is to provide means for elevating guests and baggage at hotels, goods and customers at stores, and for all purposes to which elevators or elevating machines may be applied.

COATING SHEETS OF IRON.—John D. Grey, Pittsburgh, Pa.—This invention relates to an improved process of coating sheet iron with zinc, whereby many objections to and difficulties in the methods hitherto in use are overcome.

TREADLE MOTION.—G. K. Proctor, Salem, Mass.—This invention relates to improvements in treadle motions for sewing machines, and other light machinery, and it consists in one treadle connected at one end to the crank by a pitman or connecting rod, rising nearly vertical, and another treadle having a rigid vertical bar, about as high as the shaft of the wheel, and connected to the crank by a pitman nearly perpendicular to the other pitman; the said arrangement being calculated to give a more even application of power than other arrangements.

POTATO MASHER.—C. A. Frederick, San Francisco, Cal.—This invention relates to a new instrument for thoroughly mashing potatoes, and other fruit or vegetable substance, and consists in the employment of a sieve and plunger, of which one receives reciprocating motion while the other is stationary.

MODE OF CLOSING WATER COURSES ENCOUNTERED IN DRILLING OIL WELLS.—John R. Hill, Rouseville, Pa.—This invention has for its object to furnish a simple, convenient, and effective mode of closing the water courses encountered in drilling oil and other artesian wells, to enable the well to be drilled dry.

COMBINED BRAKE AND STARTER FOR VEHICLES.—Eduardo Bonneval, Boston, Mass.—This invention has for its object to furnish an improved brake, for attachment to cars and other vehicles, which shall be so constructed and arranged that it will stop, and hold the vehicle, when stopped upon an up grade, in such a way as to assist the motive power in starting, and diminish the strain.

REPEATING FIRE-ARMS.—H. J. Drew, Dixon, Ill.—This invention relates to an improvement on the Winchester rifle, the same consisting of a metallic cover for the opening in the breech, through which empty cartridge shells or unexploded cartridges are ejected, said door being so connected with the vertically sliding cartridge bearer, by means of links or rods, as to be thrown open when the cartridge bearer is raised, and closed, when the same is drawn downwards into the position it occupies when the gun is discharged.

WASH BOILER.—H. R. Robbins, Baltimore, Md.—This invention relates to that class of wash boilers in which the water enters a trap at the bottom of the boiler, and is thereby conducted to pipes passing upwards through the bottom of the boiler, and discharging near the top of the same. The invention consists in a cylindrical trap, provided with holes in its outer shell for the admission of water, and with a series of circular concentric partial partitions, dividing its interior into annular chambers, opening one into another. These permit a free flow of water into and through the trap, but prevent its return into the boiler except through the pipes. The invention also comprises a metal heat-fending plate, attached to the bottom of the boiler in connection with the trap.

REPEATING FIRE-ARM.—H. J. Drew, Dixon, Ill.—This invention relates to a cover attached to the sliding breech pin of a Winchester rifle, and automatically operated thereby, said cover, when the piece is ready for a discharge, being over the chamber in which is placed the vertically sliding cartridge bearer, and serving, in this position, to protect the eyes of persons using the gun, from injury by back fire, bursting of the cartridge, or leakage, and also to protect the mechanism within the breech from the intrusion of dirt, and from exposure to the weather.

COW'S TAIL HOLDER.—William H. Gray, Ashfield, Mass.—This invention consists essentially in a pair of pincers, which is designed to be applied to the leg of a cow for the purpose of preventing switching of the tail. The pincers shut in front of the cord which is at the rear of the shank of the leg, and are provided with a comb for holding the tail by the tuft of hair at the end thereof.

SHIRT-POLISHING MACHINE.—E. B. Blackwell, Newton, Mass.—This invention relates to a new apparatus for polishing shirt-bosoms, cuffs, and similar articles, made of linen or other fabric, and consists chiefly in the use a new polishing tool, which has a convex, almost pointed working surface, so that the heat, weight, and friction applied by the same to the fabric are always concentrated at one point, in contradiction to the extended surface of the ordinary smoothing iron. Most thorough operation is thus effected. The invention also consists in applying said polishing tool adjustably to a pointed, weighted bar or frame, so that it may be used on an ordinary table or suitable plate.

STRETCHER FOR PAINTINGS.—James Fairman, New York city.—The object of this invention is to improve the construction and arrangement of the stretcher frames for oil paintings. The sections which compose the stretchers now in use are jointed at the corners by tenons and mortises, and can be spread by wedges which are forced between the adjoining edges. The construction of the sections, with such tenons and mortices, is expensive, and does not produce reliable articles, as the wood is considerably weakened thereby. To obviate the latter deficiency, and also to reduce the expense of making the stretchers, this invention provides a metallic connecting plate, which enters the slotted or grooved mitered ends of two adjoining sections of the frame, holding the same properly together. This plate has a projecting rib on one face, which, entering transverse grooves, prevents the sections from slipping apart. A forked wedge is interposed between the adjoining sections of the frame, to straddle the joining plate and force the sections apart.

ATTACHING THE HAIR-SPRING COLLET TO THE BALANCE WHEEL STAFF.—C. W. Wadsworth and Carl Gullberg, Peekskill, N. Y.—This invention has for its object to furnish an improved means for attaching the hair-spring collet to the balance wheel staff, by the use of which inexperienced workmen will be less liable to injure fine watches, chronometers, etc., which will enable the hair-spring collet to be removed easily, quickly, and without danger of throwing the balance wheel out of true, and which will enable the spring to be easily put "in beat" after having been removed from the staff.

METHOD OF CONSTRUCTING WELLS.—William Mason, Providence, R. I.—This invention has for its object improvements in dug wells, and aims at lessening the time, labor, and expense involved in constructing the same, as well as removing the liability of deterioration of the water collected in them, by causing "surface water" from any source to permeate the soil to the whole depth of the well, before being admitted thereto. The invention consists in a certain novel application of cement and a cement cylinder.

MACHINE FOR TAPPING BOILERS, ETC.—P. I. Perrin, Taunton, Mass., and J. L. Hewes, Newark, N. J.—This invention relates to a new machine for tapping steam boilers, applying the screw bolts thereto, and perforating or plugging other suitable articles. The invention consists chiefly in the arrangement of a rotary spindle, which is adjustable in every direction, so as to be adaptable for boring or tapping holes horizontally or suitably inclined, and which can, at its end, receive a suitable boring, tapping, or applying tool.

KEYING WHEELS TO SHAFTS.—C. B. Cole, Chester, Ill.—This invention relates to improvements in keying wheels to shafts, and it consists in having the keys divided longitudinally into upper and lower parts, on a line oblique to the bottom of the key seat, so that when the upper one is moved on the other, in the direction opposite to that in which the wheel turns, in which direction the resistance on the wheel tends to make it turn, they will wedge tightly between the bottoms of the key seats; also in having the lower part of the key provided with lugs, which fit in holes in the bottom of the key seat of the shaft, to prevent it from working out, in case it becomes loose.

POWDER FLASK.—J. T. Capewell and G. D. Capewell, Woodbury, Conn.—This invention relates to a new construction of caps or covers for powder flasks, with the object of reducing the expense of making the same; also to a new manner of attaching said caps, so that they can be removed for filling the flasks.

PLASTER SOWER.—C. E. Gladding, Towanda, Pa.—This invention has for its object to furnish an improved machine for sowing plaster, which shall be simple in construction, effective, reliable, and uniform in operation, and easily adjusted to sow more or less to the acre, as may be desired.

COMBINED CORN PLANTER AND CULTIVATOR.—Franklin Underwood, South Rutland, N. Y.—This invention has for its object to furnish an improved machine, simple in construction, inexpensive in manufacture, strong, and durable, and which shall be so constructed that it may be readily adjusted for use as a corn planter or cultivator, doing its work accurately and well in either capacity.

TRIMMING YARN AND THREAD.—Gilman Jaquith, West Concord, Mass.—This invention relates to an improved means of trimming yarn to remove the foul matter incorporated with it in working it up from the cotton, and consists in the application, preferably to the spooler, whereon the yarn is all handled by separate threads, of corn cobs, in a way to cause the threads to be drawn over the roughened surface, to separate the foulmatter. It is proposed to use the cobs also in all other applications in which it may be useful in dressing yarn.

DRY DOCK.—George A. Albertson, New York city.—This invention has for its object to improve the construction of dry docks so that vessels may be raised out of and lowered into the water by the fall and rise of the tide, which shall at the same time be simple in construction.

BROADCAST SEEDER AND CULTIVATOR.—Lyman Wight, Whitewater, Wis.—This invention has for its object to furnish an improved machine, simple in construction, effective in operation, and easily operated, and which shall be so constructed as to adapt it for use as a broadcast seeder or cultivator, as may be desired.

OPERATING HARVESTER RAKE.—David R. Kinyon, Raritan, N. J.—This invention has for its object to furnish an improved device for operating the rake of a harvester, which shall be simple in construction, effective in operation, not liable to get out of order, and which will allow the cutter bar to be brought closer to the side of the machine, and will diminish the side draft.

CASE FOR PRINTER'S USE.—W. H. A. Gersham, Atlanta, Ga.—This invention relates to an improved case for printer's use, designed more especially for use when doing tabular work, for economizing or lessening the movements of the hand, by combining in a small compact case, compartments for type for everything used in the most complicated work.

CONSTRUCTION OF HORSE RAKE.—James Howard and Edward Tenney, Bedford, England.—This invention relates to an improved arrangement of leverage to be applied to self-acting rakes or grass collectors. The object sought is to provide a leverage with a very limited range to be operated either by hand or foot, which leverage, when put in action, will cause friction bands to come in contact with rings or flanges cast upon the travelling wheels, and thereby, as the implement advances, cause the rocking frame, which carries the tines or other operating instruments, to rise and lift them from the ground.

HOSE BRIDGES.—Patrick Dailey, New York city.—This invention relates to improvements in apparatus for use on street and other railroads for passing the cars over the hose of fire engines laid across the track when fires occur near them, which is at the present time a cause of great detention of the cars, for want of convenient means for passing the cars over successfully.

TICKET HOLDER.—Henry Wexel, Providence, R. I.—The object of this invention is to facilitate the operation of conveying and selling tickets to passengers on street railroads, and to provide a check upon the ticket seller or conductor.

REIN HOLDER.—R. J. Achenback, Saddle River, N. J.—This invention has for its object to improve the construction of the improved rein holder, patented, by the same inventor, June 7, 1870, and numbered 103,820, so as to make it more convenient in construction and more effective in use.

CREEPING-BABY DOLL.—Robert J. Clay, New York city.—This invention relates to a new doll, which is provided with a concealed clockwork and mechanism, whereby its limbs are moved in imitation of those of a creeping baby, while the doll itself is being propelled on the floor by concealed rotating wheels, which support it. A very amusing toy is thus produced at small cost.

BABY CARRIAGE.—William B. Whitney, Leominster, Mass.—This invention relates to a new and useful improvement in hand carriages, for babies or infant children, and consists in the mode of attaching the springs to the body of the carriage, and in the general arrangement of parts.

CHILDREN'S CRIBS.—George W. Ennis, Orange, N. J.—This invention relates to a new and useful improvement in cribs for children, designed to take the place of the rocking cradles now in use.

GAS BURNER.—Mark Rosenwax, New York city.—This invention relates to a new and useful improvement in burners for illuminating gas, whereby he combustion of the gas is more complete and its illuminating power increased.

CHEESE HOOPS.—Artemus Holdridge,, West Burlington, and Benjamin Harrington and Henry H. Harrington, New Berlin, N. Y.—This invention relates to improvements in hoops or pressing cases, to be used the manufacture of cheese in rectangular form, and it consists in a four-sided case, in two or more horizontal sections, having the sides jointed together at one or two of the corners, and detachably connected at one or both the other corners for opening to release the cheese, after being pressed, each section being provided with locking cleats, adapted for controlling the position of the superposed sections.

New Patent Law of 1870.

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Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

428.—PENHOLDERS.—A. M. George, Sand Fly, Texas. February 17, 1871.

429.—LAMPS.—F. T. Grimes, Liberty, Mo. February 17, 1871.

437.—ILLUMINATING GRATINGS.—Theodore Hyatt, New York city. February 18, 1871.

419.—TYPE-DISTRIBUTING MACHINE.—J. T. Slingerland, New York city. February 16, 1871.

394.—BREECH-LOADING FIREARMS.—S. F. Van Choate, Boston, Mass. February 16, 1871.

452.—APPARATUS FOR CARBURETING ATMOSPHERIC AIR.—Antoine E. Dupas and Arthur Barbarin, New Orleans, La. February 21, 1871.

463.—TRACK CLEANERS FOR RAILWAYS.—Hiram Saunders, of Philadelphia, Pa., now living at 35 Southampton Buildings, Middlesex, Eng. February 22, 1871.

472.—APPARATUS FOR CARBURETING ATMOSPHERIC AIR.—Antoine E. Dupas and Arthur Barbarin, New Orleans, La. February 22, 1871.

475.—IMPROVEMENTS IN GAS BURNERS.—Antoine E. Dupas, New Orleans, La. February 23, 1871.

493.—PENCILS FOR WRITING AND DRAWING.—Joseph Reckendorfer, New York city. February 24, 1871.

517.—AMMONIACAL GAS ENGINE.—Emile Lamm, New Orleans, La. February 25, 1871.

523.—STEAM TRAP FOR WITHDRAWING CONDENSED WATER.—Edward L. Perkins, Joseph H. Moulton, and Charles E. Sawyer, all of Boston, Mass. Feb. 27, 1871.

APPLICATIONS FOR EXTENSION OF PATENTS.

PROCESS OF MANUFACTURING LEATHER SHOE BINDING.—Eugene L. Norton, Charlestown, Mass., has petitioned for an extension of the above patent. Day of hearing, May 17, 1871.

STEAM PUMPING APPARATUS.—George H. Corliss, Providence, R.I., has petitioned for an extension of the above patent. Day of hearing, May 17, 1871.

BEDSTEAD FASTENING.—Ann M. Rodefer, Springfield, Ohio, has petiltoned or an extension of the above patent. Day of hearing, May 10, 1871.

MANUFACTURING SCREWS OF THIN METAL.—John L. Mason, New York city, has petitioned for the extension of the above patent. Day of hearing May 17, 1871.

MACHINE FOR SEAMING SHEET METAL ROOFS.—Joshua B. Prouty, Cincinnati, O., has petitioned for an extension of the above patent. Day of hearing, July 12, 1871.

BINDING BOOKS.—Archibald H. Rowand, Allegheny City, Pa., has petitioned for an extension of the above patent. Day of hearing, April 26, 1871.

NAIL PLATE FEEDING MACHINE.—John C. Gould, Oxford, N.J., has petitioned for an extension of the above patent. Day of hearing, April 26, 1871.

ELECTRO-MAGNETIC FIRE ALARM TELEGRAPH FOR CITIES.—William F. Channing, Providence, R.I., and Moses J. Farmer, Boston, Mass., have petitioned for an extension of the above patent. Day of hearing, May 3, 1871.

Official List of Patents.

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FOR THE WEEK ENDING MARCH 14, 1871.

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112,524.—REIN HOLDER.—J. R. Ackenback, Saddle River, N. J.

112,525.—DRY DOCK.—G. A. Albertson, New York city.

112,526.—MACHINE FOR COILING WIRE.—E. B. Allen, C. O. Small, and A. P. Small, Augusta, Me.

112,527.—GARDEN HOE.—J. P. Avery, Norwich, Conn. Antedated Feb. 28, 1871.

112,528.—CARRIAGE PERCH.—I. P. Bacon, Bedford, Mass.

112,529.—CHIMNEY CAP.—T. D. Bailey, Lowell, Mass.

112,530.—HARVESTER.—L. M. Batty, Canton, Ohio.

112,531.—FEEDING MECHANISM FOR SEWING MACHINES.—R. M. Berry, Brooklyn, N. Y. Antedated Feb. 28, 1871.

112,532.—FRUIT DRYER.—J. S. Biddle and T. S. Lingenfelter, Pattonville, Pa.

112,533.—SHIRT-POLISHING MACHINE.—E. B. Blackwell, Newton, Mass.

112,534.—CAR BRAKE AND STARTER.—Eduardo Bonneval, Boston, Mass.

112,535.—TREATING MARINE PLANTS TO OBTAIN GELATINE, ETC.—Gustav Bourgade, New York city.

112,536.—CAR COUPLING.—Godfrey Brenner and G. T. Polk, Poughkeepsie, N. Y.

112,537.—OIL-CAN HOLDER.—W. S. Brick, Fitchburg, Mass.

112,538.—APPARATUS FOR CARRYING DRAIN-PIPES.—D. W. Brown, Woodbridge, N. J.

112,539.—APPARATUS FOR EVAPORATING SACCHARINE LIQUIDS.—F. G. Butler, Bellows Falls, Vt., assignor to himself and J. B. Williams, Glastonbury, Conn.

112,540.—COMBINED DRILL AND SEEDER.—J. E. Buxton, Owatonna, Minn.

112,541.—SEEDING MACHINE.—J. E. Buxton, Owatonna, Minn.

112,542.—POWDER FLASK.—J. T. Capewell and G. D. Capewell, Woodbury, Conn.

112,543.—TEA KETTLE.—Edward Card, Providence, R.I.

112,544.—MARBLEIZING PAPER.—Thomas Carson, Brooklyn, N. Y.

115,545.—WATER WHEEL.—J. T. Case (assignor to National Water Wheel Company), Bristol, Conn.

112,546.—ANIMAL POKE.—H. F. Chapin, Rochester, N. Y.

112,547.—REFRIGERATOR.—A. J. Chase, Boston, Mass.

112,548.—BURNISHER FOR BOOTS AND SHOES.—Robert Chauncey, Syracuse, N. Y.

112,549.—CLIP FOR BUGGY SPRINGS.—R. A. Clark, Unadilla, N. Y. Antedated March 9, 1871.

112,550.—CREEPING DOLL.—R. J. Clay, New York city, assignor to himself and T. H. Marvin, Brooklyn, N. Y.

112,551.—KEYING WHEELS TO SHAFTS.—C. B. Cole, Chester, Ill.

112,552.—LADDER.—J. H. Conley, Philadelphia, Pa.

112,553.—WOOD-BENDING MACHINE.—E. A. Comer, Metropolis, Ill.

112,554.—MACHINE FOR FEEDING RIVETS, AND INSERTING THEM IN SHOES, ETC.—L. A. Cook, Woonsocket, R. I.

112,555.—HEATING STOVE.—William Cottingham and J. W. Stafford, Troy, Ohio.

112,556.—MOP HEAD.—James Davis, Chicago, Ill.

112,557.—GAS RETORT.—Darius Davison, New York city.

112,558.—BITTERS.—Antoine Desaulniers, Oswego, N. Y.

112,559.—WAGON BOX AND HAY RACK.—Samuel Dickson, Sandwich, Ill.

112,560.—STONE CRUSHER.—Andrew Dietz, New York city.

112,561.—PUMP.—Isaac Dillingham, Rockbottom, Mass.

112,562.—PROCESS OF MANUFACTURING TYPE BLOCKS.—D. A. Draper, Cambridge, Mass.

112,563.—MAGAZINE GUN.—H. J. Drew, Dixon, Ill.

112,564.—REPEATING FIRE-ARM.—H. J. Drew, Dixon, Ill.

112,565.—BREECH-LOADING FIRE-ARM.—Joseph Duval, Laprairie, Canada.

112,566.—SLEIGH.—Robert Elliott, Chester, Pa.

112,567.—COTTON PLANTER.—De Witt C. Ellis and G. N. Deming, Rochester, N. Y.

112,568.—ENVELOPE.—E. S. Ellis, Trenton, N. J.

112,569.—SAW.—J. F. Emerson, Trenton, N. J.

112,570.—CHILDREN'S CRIB.—G. W. Ennis (assignor to himself and J. B. Ennis), Orange, N. J.

112,571.—PAPER COLLAR.—Nathaniel Evans, Jr., Boston, Mass.

112,572.—HEAD BLOCK FOR SAW MILLS.—J. S. Everitt and C. H. Avery, Oshkosh, Wis.

112,573.—ELEVATOR.—Z. C. Favor (assignor to himself and O. C. Chase), Chicago, Ill.

112,574.—NUT LOCK.—Lyman Fay, Worcester, Mass.

112,575.—TRACK CLEANER.—Henry Fellows, Bloomington, Ind.

112,576.—NEEDLE AND HOLDER FOR SEWING MACHINES.—G. M. Frary, St. Louis, Mich., assignor, by mesne assignments, to Carpenter Sewing Machine Needle Co., New York city.

112,577.—POTATO MASHER.—C. A. Frederick, San Francisco, Cal.

112,578.—TUCK CREASER FOR SEWING MACHINES.—H. W. Fuller, New York city.

112,579.—MOWING MACHINE.—Solomon Fuller, Somers, Conn.

112,580.—UNIVERSAL MANDREL.—James Gallatin, Jr., New York city.

112,581.—TEA KETTLE.—P. V. B. Gantz (assignor to C. E. Gantz), Albany, N. Y.

112,582.—HARVESTER CUTTER.—Thomas Garrick, Providence, R. I.

112,583.—PLASTER SOWER.—C. E. Gladding, Towanda, Pa.

112,584.—FANNING MILL.—Reuben Gipson, Shelby, Ohio.

112,585.—ELECTRICAL ALARM LOCK.—Frójus Girard, Havana, Cuba.

112,586.—LAMP.—H. J. Goff, Dubuque, Iowa.

112,587.—COW'S TAIL HOLDER.—W. H. Gray, Ashfield, Mass.

112,588.—COATING SHEET IRON WITH ZINC.—J. D. Grey, Pittsburgh, Pa.

112,589.—BREECH-LOADING FIRE-ARM.—Henry Hammond, Hartford, assignor to Lewis Hammond, Collinsville, Conn.

112,590.—WINDOW SCREEN.—John Hancock, Jr., Providence, R. I., assignor to C. L. Spencer, trustee; and C. L. Spencer, trustee, assignor to John Hancock, Jr., and Benjamin Morse.

112,591.—ROTARY STEAM ENGINE.—A. S. Harlan, Bloomington, Ill.

112,592.—POTATO DIGGER.—W. D. Harrell, Moore's Hill, Ind.

112,593.—GAS RETORT.—G. W. Harris, Elizabeth, N. J.

112,594.—SKY-LIGHT, CONSERVATORY, AND OTHER GLAZED STRUCTURES.—George Hayes, New York city.

112,595.—MEDICAL COMPOUND FOR TREATING BRONCHIAL AND LUNG DISEASES.—S. W. Helm, Bachalor Valley, assignor to Britton Capell and W. J. Rose, Little Lake Valley, Cal.

112,596.—OIL-WELL DRILLING.—John R. Hill, Rouseville, Pa.

112,597.—CHEESE HOOP.—Artemus Holdredge, West Burlington, and Benj. F. Harrington and Henry H. Harrington, New Berlin, N. Y.

112,598.—CONSTRUCTION OF LAMP.—J. J. Hoyt, Chelmsford, and J. E. Crane, Lowell, assignors to the Lowell Oil Cup Company, Lowell, Mass.

112,599.—SECURING WHEEL TIRES.—Anthony Huegler, Sullivan, Mo.

112,600.—MACHINE FOR DRESSING YARN OR THREAD.—Gilman Jaquith, West Concord, Mass.

112,601.—EMBROIDERING ATTACHMENT FOR SEWING MACHINES.—Albert W. Johnson (assignor to himself, Rufus Baker, and O. D. Lee), Middletown, Conn.

112,602.—HAY TEDDER.—William G. Kenyon, Wakefield, R.I.

112,603.—WASHING MACHINE.—Osman S. King, Painesville, Ohio.

112,604.—SKATE.—Moses Kinsey, Newark, N. J.

112,605.—HARVESTER RAKE.—David R. Kinyon (assignor to himself and Job C. Kinyon), Raritan, N. J.

112,606.—PROCESS OF REFINING AND WHITENING THE PRODUCT FROM SULPHURETS OF LEAD AND ZINC.—George T. Lewis, Philadelphia, Pa.

112,607.—REFINING AND WHITENING THE PRODUCT FROM ORES OF LEAD AND ZINC.—George T. Lewis, Philadelphia, Pa.

112,608.—MANUFACTURE OF CARBONATE OF LEAD, ETC.—G. T. Lewis, Philadelphia, Pa.

112,609.—BASE-BURNING STOVE.—De Marcus Madden (assignor of one-half his right to R. T. Wood and Farley Holmes,) Penn Yan, N. Y.

112,610.—MANUFACTURE OF BOTTLED MINERAL WATER.—Thon as Maloney, Des Moines, Iowa.

112,611.—SAFETY VALVE.—Stewart C. Marsh, Newark, N. J.

112,612.—MACHINE FOR CUTTING SCREW THREADS ON BOLTS.—Henry Martin, Louisville, Ky.

112,613.—MODE OF MAKING WELLS.—Wm. Mason, Providence, R. I.

112,614.—COMBINED CLOTHES RECEPTACLE, IRONING BOARD, AND DRYER.—Samuel T. McDougall, Brooklyn, N. Y.

112,615.—MOP HEAD.—Joseph Messinger, Springfield, Vt.

112,616.—TREADLE FOR SEWING AND OTHER MACHINES.—George W. Miles, Lynn, Mass.

112,617.—POTATO PLANTER.—John C. Mills (assignor to himself and Richard Leake), Rochester, N. Y.

112,618.—PIPE CONNECTION.—James M. Morehead, Brooklyn, N. Y.

112,619.—BURGLAR ALARM DRAWER.—Jeremiah Murphy, Boston, Mass.

112,620.—EARTH CLOSET.—Solomon D. Newbro, Lansing, Mich.

112,621.—MODE OF ATTACHING PIPES TO SINKS, DRAINS, ETC.—A. B. Nott (assignor to himself and P. E. Merrihew) Fairhaven, Mass.

112,622.—FRUIT GATHERER.—Cornelius Ostrander (assignor of one half his right to Alson Ostrander), Poughkeepsie, N. Y.

112,623.—PAPER-CUTTING MACHINE.—Charles Paine (assignor to himself and Cyril C. Child), Boston, Mass.

112,624.—GLOBE HOLDER AND COOLER COMBINED, FOR VAPOR BURNERS.—Jason J. Palmer and Franklin G. Palmer, Pittsburgh, Pa.

112,625.—SKIRT.—Charles W. Pierce, Jr., Bristol, Pa.

112,626.—MACHINE FOR TAPPING BOILERS.—Parley I. Perrin, Taunton, Mass., and Joseph L. Hewes, Newark, N. J., assignors to Parley I. Perrin.

112,627.—WASH BOILER.—Charles W. Powell, Bloomfield, Conn.

112,628.—TREATING COTTON SEED.—J. J. Powers, Memphis Tenn.

112,629.—FINGER-BEAM FOR HARVESTERS.—Amos Rank, Salem, Ohio.

112,630.—SLEIGH.—Amos Rank, Salem, Ohio.

112,631.—BELL.—Joshua Regester, Baltimore, Md.

112,632.—HAIR TONIC.—Sarah Amanda Reybert, Plainfield, N. J.

112,633.—CARPET FASTENING.—Joseph A. Robbins, Medford, assignor to himself and Martin W. Ford, North Chelsea, Mass.

112,634.—MOLD FOR SUPPOSITORIES.—Joseph A. Robbins, Medford, assignor to himself and Francis V. Holmes, Boston, Mass.

112,635.—SAFETY HASP OR LATCH.—Charles E. Robinson, Boston, Mass., assignor to himself and Charles W. Brunner, Savannah, Ga

112,636.—MACHINE FOR FEEDING FUEL TO FURNACES.—Alexander Rodgers and Esau Tarrant, Muskegon, Mich.

112,637.—GAS BURNER.—Mark Rosenwax, New York city.

112,638.—BOOT JACK.—Joseph Rouard, San Francisco, Cal.

112,639.—WINDOW FOR RAILWAY CARS.—Ernest A. Schoeller, Connellsville, Pa.

112,640.—HORSE-CAR STARTER.—Henry Schreiner, Philadelphia Pa.

112,641.—SHAFT COUPLING.—Freedom G. Shepard, Battle Creek, Mich.

112,642.—SEALING CANS AND OTHER VESSELS FOR PRESERVING FRUITS, MEATS, ETC.—Nicholas H. Shipley, Baltimore, Md.

112,643.—SHUTTLE FOR LOOMS.—Charles Elbridge Smith (assignor to himself, John S. Jaques and Frank T. Jaques) Lowell Mass.

112,644.—SKY-LIGHT.—Charles Scott Snead, Louisville, Ky.

112,645.—BOILER-FLUE BRUSH.—Benj. M. Spencer, Newark, N. J.

112,646.—VELOCIPEDE.—Manassa Staudt, Summit Hill, Pa.

112,647.—PACKING FROM ASBESTUS AND OTHER FIBROUS MINERALS.—Chase A. Stevens, New York city, assignor to Abijah Richardson, Boston, Mass.

112,648.—FIBROUS MINERAL PACKING FOR JOURNALS, BEARINGS, ETC.—Chase A. Stevens, New York city, assignor to Abijah Richardson, Boston, Mass.

112,649.—TREATING ASBESTUS AND OTHER MINERAL FIBERS FOR USEFUL PURPOSES.—Chase A. Stevens, New York city, assignor to Abijah Richardson, Boston, Mass.

112,650.—TREATING ASBESTUS AND OTHER FIBROUS MINERALS.—C. A. Stevens, New York city, assignor to Abijah Richardson Boston, Mass.

112,651.—MACHINERY FOR FORMING PACKING FROM ASBESTUS AND OTHER FIBROUS MATERIALS.—Chase A. Stevens, New York city, and Isaac Lindsley, Pawtucket, R. I., assignors to Chase A. Stevens; and said Stevens assignor to Abijah Richardson.

112,652.—STIRRUP FOR RIDING SADDLES.—Leonard S. Taylor, Sigel, Mo.

112,653.—FERTILIZER.—Thomas Taylor, Washington, D. C. Antedated March 1, 1871.

112,654.—APPARATUS FOR MAKING ICE AND REFRIGERATING.—A. B. Tripler, New Orleans, La. Antedated February 28, 1871.

112,655.—FASTENER FOR SPINNING RINGS.—C. E. Trowbridge, Whitinsville, Mass.

112,656.—MACHINE FOR BLOCKING RIBBONS, ETC.—George Vincent, Stockton, Cal.

112,657.—ATTACHING THE HAIRSPRINGS OF WATCHES.—C. W. Wadsworth and Carl Cullberg, Peekskill, N. Y.

112,658.—WIRE FENCE.—Charles A. Wakefield, Pittsfield, Mass.

112,659.—REFRIGERATOR.—John H. Welsh, Erie, Pa.

112,660.—ANTI-FRICTION JOURNAL BOX.—Henry P. Westcott, Seneca Falls, N. Y.

112,661.—HAT.—William H. White, Baltimore, Md.

112,662.—CHILD'S CARRIAGE.—William B. Whitney (assignor to himself and F. A. Whitney), Leominster, Mass.

112,663.—BROADCAST SEEDER AND CULTIVATOR COMBINED.—Lyman Wight, Whitewater, assignor to himself and Orison G. Ewing Lagrange, Wis.

112,664.—COPY HOLDER.—Henry R. Williams, Buffalo, N. Y.

112,665.—CARRIAGE BRAKE.—August Wnuck, Cincinnati, Ohio.

112,666.—BLIND SLAT MACHINE.—George F. Woolston, Washington, D.C.

112,667.—WATER WHEEL.—Pierce W. Yarrell, Littleton, N. C.

112,668.—ROLL FOR FORMING HORSESHOE BLANKS.—William Acheson (assignor to Charles L. Fitzhugh), Pittsburgh, Pa.

112,669.—CLOTHES WRINGER.—August Albrecht, Philadelphia, Pa.

112,670.—RAILROAD STATION INDICATOR.—Granville W. Alexander, Chicago, Ill.

112,671.—RAILROAD STATION INDICATOR.—Joseph Bell Alexander, Washington, D.C.

112,672.—FENCE.—William Altick and Franklin P. Grimes (assignors to Wilson & Grimes), Dayton, Ohio.

112,673.—DOOR CHECK.—Charles R. Anderson, St. Louis, Mo.

112,674.—VENTILATING MILK CAN.—Lauren B. Arnold, Lansing, N. Y.

112,675.—BENCH PLANE.—Joseph R. Bailey (assignor to himself and Selden A. Bailey), Woonsocket, R. I.

112,676.—ROTARY HARROW.—John W. Barton and Thomas Holmes, Emporia, Kansas.

112,677.—HAT PRESS.—Samuel Beatty, Norwalk, Conn.

112,678.—SEWING MACHINE.—Joseph Bennor, Philadelphia Pa.

112,679.—LOOM.—William H. Boozer, Potter's Mills, Pa.

112,680.—CARVING TOOL.—Myron T. Boult, Battle Creek, Mich.

112,681.—HOOP SKIRT.—Morris P. Bray (assignor to himself and Downs & Bassett), Birmingham, Conn.

112,682.—SAWING MACHINE.—George W. Braymer, Penn Township, Mich.

112,683.—CLASP FOR ARTIFICIAL LIMBS.—Samuel E. Burd, Mercer, and Joseph F. Denniston, Pittsburgh, assignors to Artificial Limb Manufacturing Company, Pittsburgh, Pa.

112,684.—STEAM VALVE.—Adam S. Cameron, New York city.

112,685.—PISTON PACKING.—Adam S. Cameron, New York city.

112,686.—FURNITURE PAD.—David H. Clark and Henry Winson, New Haven, Conn.

112,687.—FANNING MILL.—George E. Clarke, Racine, Wis.

112,688.—ROTATING CYLINDER ENGINE.—Robert Livingston Cohen, Philadelphia, Pa., assignor to himself and William L. Lance, Plymouth, Pa. Antedated March 8, 1871.

112,689.—CUTTING APPARATUS FOR HARVESTERS.—George W. Cook, Geneseo, and Francis M. Duncan, Aledo, Ill.

112,690.—GRAPPLE.—Edwin G. Crandal, Belfast, N. Y.

112,691.—MOLDING MACHINE.—James H. Culver, San Francisco, Cal.

112,692.—HARVESTER CUTTER.—Henry Cutler, Central Village, Conn.

112,693.—LOCKING STOP-COCK.—Ellwood Davis and Jacob M. Stiles, Camden, N. J.

112,694.—BREECH-LOADING FIREARMS.—William C. Dodge and Philip T. Dodge, Washington, D. C.; said Philip T. Dodge assigns his right to said William C. Dodge.

112,695.—SPRING SEAT FOR WAGONS.—Willoughby P. Elam, Petersburg, Ill.

112,696.—CHILD'S CARRIAGE.—Roscoe G. Elder, New York city.

112,697.—LADDER.—George Henry Ellis (assignor to Augustus Salem Dimsdate and Edward Bovine Lovell), London, England.

112,698.—FURNACE FOR TREATING ORES, ETC.—William Ennis, Philadelphia, Pa. Antedated March 7, 1871.

112,699.—MECHANICAL MOVEMENT.—William A. Fenn, Rochester, N. Y.

112,700.—GRAIN DRILL.—Silas N. Gallup, Macedon, N. Y.

112,701.—ALE OR BEER COCK.—Henry Getty, Hoboken, N. J.

112,702.—MACHINE FOR MAKING BOOT AND SHOE HEELS.—Charles W. Glidden, Lynn, assignor to McKay Heeling Machine Association, Boston, Mass.

112,703.—STAINING GLASS.—Ebenezer A. Goodes, Philadelphia, Pa.

112,704.—ELECTRO MAGNETIC BURGLAR ALARM.—William B. Guernsey, Jersey City, N. J.

112,705.—ELECTRO MAGNETIC BURGLAR ALARM.—William B Guernsey, Jersey City, N. J.

112,706.—ELECTRO MAGNETIC BURGLAR ALARM.—William B Guernsey, Jersey City, N. J.

112,707.—DOUGH KNEADER.—Herbert Henry Hawes, Mount Meridian, Va.

112,708.—SWING.—Francis Hovey (assignor to himself and John Albert Brown), Ipswich, Mass.

112,709.—TRUSS.—Henry Howe, Council Bluffs, Iowa.

112,710.—CONFECTIONER'S MOLD.—Henry S. Howe, Rutland, Vt.

112,711.—SAW GUMMER.—David Huffman, Luray, Va.

112,712.—SHOWCASE.—John A. Hughes, Somerville, assignor to John A. Hughes & Co., Boston, Mass

112,713.—PAD FOR HORSE COLLARS.—Lemuel L. Hull, Oskaloosa, Iowa.

112,714.—FIRE ESCAPE.—John Ivory, New York city.

112,715.—DRAFT EQUALIZER FOR THREE HORSES.—Henry F. Jerauld (assignor to Jerauld & Stolle) Vandalia, Ill.

112,716.—BEDSTEAD.—George A. Jeremiah, New York city.

112,717.—WINDOW BUTTON.—Albert D. Judd, New Haven, Conn.

112,718.—BRUSH.—David L. Keeler, Norwalk, Ohio.

112,719.—MACHINE FOR MAKING AND SETTING BLIND STAPLES.—Jeremiah Keith, Charlton, Mass.

112,720.—TREADLE MOTION.—Eben B. Keyes, Charlestown, Mass.

112,721.—MACHINE FOR CUTTING SPLITS.—Ebenezer Knight (assignor to himself, Rufus S. Mitchell, and Edward S. Compton), Elizabeth, Ind.
112,722.—METER.—Albert D. Laws, Bridgeport, Conn.
112,723.—MODE OF ATTACHING SEATS TO WAGONS.—Joseph L. Llaville and William Shimanour, Findlay, Ohio.
112,724.—PERMUTATION LOCK.—Samuel Lloyd, New York city.
112,725.—MANUFACTURE AND TREATMENT OF ALCOHOLIC SPIRITS.—Orazio Lugo, Baltimore, Md.
111,726.—COOLING AIR IN THE MANUFACTURE OF ICE.—Orazio Lugo and James B. McPherson, Baltimore, Md.
112,727.—COMBINED BAG HOLDER AND FILLER.—William F. Lum, Waterloo, Wis.
112,728.—COMPOUND FOR LUBRICATING WOOL.—John James Lundy, Leith, near Edinburgh, North Britain.
112,729.—DRESS SWORD.—James M. Mason (assignor to Alexander & Mason), Washington, D.C.
112,730.—PUMP.—Benjamin Franklin McKeehan, Clarksburg, W. Va.
112,731.—HOSE TUNNEL FOR CITY RAILROADS.—Laurence Myers, Philadelphia, Pa.
112,732.—COMPOUND FOR DESTROYING POTATO BUGS.—Lemuel Pagin, Niles, Mich.
112,733.—MACHINE FOR GRINDING WOOD PULP.—S. A. Perkins, Topsham, Me.
112,734.—WOOD PULP MACHINE.—S. A. Perkins, Topsham, Me.
112,735.—ROLL FOR HUSKING CORN.—Peter Philip, Stockport, N. Y.
112,736.—DEVICE FOR PREVENTING BACK-LASH IN MACHINERY.—John L. Post, Ashley, Pa.
112,737.—MACHINE FOR SLOTTING AND CUTTING METAL.—S. W. Putnam, Jr., Fitchburg, Mass.
112,738.—POLISHING COFFEE.—John T. Randall, Baltimore, Md.
112,739.—WASH BOILER.—Henry R. Robbins, Baltimore, Md.
112,740.—CASTER FOR SEWING MACHINES.—Benjamin F. Rider, New York city, assignor to Sargent & Company, New Haven, Conn.
112,741.—SEED TUBE FOR CORN PLANTERS.—Levi Schofield, Watertown, assignor to himself and J. B. Wait, Farmington, Wis.
112,742.—BEER COOLER FOR BEER ON DRAFT.—Hugo Sell, New York city.
112,743.—CARRIAGE CLIP.—Moses Seward, New Haven, Conn.
112,744.—SEWING MACHINE NEEDLE.—John J. Sibley, New York city.
112,745.—SEWING MACHINE.—William Sidenberg, New York city.
112,746.—SUSPENDER.—Sydney E. Smith, Washington, D. C., assignor to himself and F. G. Ford.
112,747.—SEWING MACHINE.—Greenleaf Stackpole, Elizabeth N. J.
112,748.—FLORAL BRACKET.—Elizabeth Mary Stigale, Philadelphia, Pa.
112,749.—HAIR RESTORATIVE.—W. P. Thomas and Joseph F. Boardman, Elko, Nevada.
112,750.—HARVESTER.—A. H. Wagner, Chicago, Ill.
112,751.—APPARATUS FOR DISTILLING PETROLEUM AND OTHER LIQUIDS.—W. G. Warden, Philadelphia, Pa.
112,752.—MACHINE FOR CUTTING TEXTILE AND OTHER MATERIALS.—Albin Warth Stapleton, N. Y.
112,753.—FASTENING FOR TEXTILE FABRICS.—Albin Warth, Stapleton, N. Y.
112,754.—WOODEN SHANK FOR SHOES AND BOOTS.—J. M. Watson, Sharon, Mass.
112,755.—APPARATUS FOR VULCANIZING RUBBER.—Henry W. Welcker, Woonsocket, assignor to himself and G. W. Miller, Smithfield, R. I.
112,756.—SHUTTER FASTENER.—Peter L. Weimer, Lebanon, Pa.
112,757.—CARRIAGE AXLE.—Edward Wells, New Haven, Conn.
112,758.—LANDAU CARRIAGE.—Edward Wells, New Haven, Conn.
112,759.—LATHE DOG.—H. K. White, Chelsea, Mass.
112,760.—WASH BOILER.—W. B. White, Rome, N. Y.
112,761.—PORTABLE STEAM GENERATOR.—J. E. Woodruff (assignor of one half his right to J. F. Rowley), Buffalo, N. Y. Antedated March 6, 1871.
112,762.—GATE.—Claiborne Wright, Mason, Mason, Ill.
112,763.—BREECH-LOADING FIRE-ARM.—William C. Dodge, Washington, D.C.

REISSUES.

4,295.—HARNESS RING.—H. N. Eames, Newport, assignor to H. R. Olmstead and R. W. Jones, Syracuse, N.Y.—Patent No. 100,284, dated March 1, 1871.
4,296.—CARPET LINING.—Joel F. Fales, Walpole, Mass.—Patent No. 52,855, dated Feb. 27, 1866.
4,297.—ELECTRO-MAGNETIC BURGLAR ALARM.—William B. Guernsey, Jersey City, N. J., assignor to Cyrus B. Martin, Newburgh, N. Y.—Patent No. 108,257, dated October 11, 1870.
4,299.—DEVICE FOR CUTTING BOLTS AND RIVETS.—Jesse Johnson, Cochransville, Pa.—Patent No. 65,391, dated June 4, 1867.
4,300.—MAKING THICK PAPER.—Samuel G. Levis, Kellysville, Pa., assignor to James C. Beach.—Patent No. 10,519, dated February 14, 1854; reissue No. 2,782, dated October 22, 1867; extended seven years.
4,301.—STEAM GENERATOR.—A. L. Pennock, Philadelphia, Pa.—Patent No. 108,363, dated May 24, 1870.
4,302.—STEAM BOILER.—Patrick Quinn, South Newmarket, N. H.—Patent No. 110,159, dated Dec. 13, 1870.
4,303.—BUTTON HOLE.—B. M. Smith, New York city.—Patent No. 75,212, dated March 3, 1868.
4,304.—LAMP.—Lewis White (assignor, through mesne assignments, to R. S. Merrill, Boston, Mass.; said R. S. Merrill assignor of two thirds of his right to W. B. Merrill), Waterbury, Conn.

DESIGNS.

4,700.—ORGAN CASE.—C. E. Bacon, Buffalo, N. Y., assignor to himself and G. A. Prince.
4,701.—HAME TOP.—M. F. Boland, Philadelphia, Pa.
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4,710.—SPOON OR FORK HANDLE.—William Parkin (assignor to Reed & Barton), Taunton, Mass.
4,711 to 4,713.—FLOOR OIL-CLOTH PATTERN.—Joseph Robler (assignor to W. M. Brasher), Brooklyn, N. Y. Three patents.
4,714.—GROUP OF STATUARY.—John Rogers, New York city.
4,715.—SPOON OR FORK HANDLE.—Geo. Sharp, Philadelphia, Pa.
4,716.—BACK OF MITTEN.—W. S. Tooker (assignor to himself and Elliot Thomas), Kingsborough, N. Y.
4,717.—CARPET PATTERN.—John T. Webster, New York city, assignor to Daniel M. Read and Charles A. Read, Bridgeport, Conn.
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190.—DRESSING COMPOUND.—E. R. Millard, Waltham, Mass.
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EXTENSIONS.

MACHINE FOR CUTTING PASTEBOARD FOR BOXES.—Frankli N. Clarke, of New Haven, Conn., administrator of Elizur E. Clarke, deceased.—Letters Patent No. 16,719, dated March 3, 1857.

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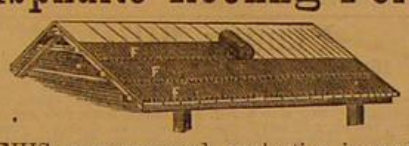
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Advertisements will be admitted on this page at the rate of **$1·00** *per line for each insertion. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

New Loan of the United States.

IMPORTANT CIRCULAR.

TREASURY DEPARTMENT, WASHINGTON, Feb. 20, 1871.

Public notice is hereby given, that books will be opened on the 6th day of March next, in this country and in Europe, for subscriptions to the National Loan, under the Act approved July 14, 1870, entitled "An Act to authorize the Refunding of the National Debt," and the Act in amendment thereof, approved Jan. 20, 1871.

The proposed loan comprises three classes of Bonds, namely:

1st. Bonds to the amount of five hundred millions of dollars, payable in coin, at the pleasure of the United States, after ten years from the date of their issue, and bearing interest, payable quarterly in coin, at the rate of five per cent per annum.

2d. Bonds to the amount of three hundred millions of dollars, payable in coin, at the pleasure of the United States, after fifteen years from the date of their issue, and bearing interest, payable quarterly in coin, at the rate of four and a half per cent per annum.

3d. Bonds to the amount of seven hundred millions of dollars, payable in coin, at the pleasure of the United States, after thirty years from the date of issue, and bearing interest, payable quarterly in coin, at the rate of four per cent per annum.

Subscriptions to the loan will have preference in the following order, namely:

1st. Subscriptions that may be first made for five per cent Bonds to the amount of two hundred millions of dollars, of which there will be reserved, for twenty days, one half for subscribers in this country, and one half for subscribers in foreign countries.

2d. Subscriptions for equal amounts of each class of Bonds.

3d. Subscriptions for equal amounts of Bonds bearing interest at the rate of four and a half per cent, and of Bonds bearing interest at the rate of five per cent.

4th. Subscriptions for any five per cent Bonds that may not be subscribed for in the preceding classes.

When a subscription is made, the subscriber will be required to deposit two per cent of the amount thereof in coin or currency of the United States, or in bonds of the class to be exchanged, to be accounted for by the Government when the new Bonds are delivered, and payment may be made either in coin or in bonds of the United States, known as Five-twenty Bonds, at their par value.

The coin received in payment will be applied to the redemption of Five-twenty Bonds, and the debt of the United States will not be increased by this loan.

The bonds will be registered, or issued with coupons, as may be desired by subscribers. Registered bonds will be issued of the denominations of $50, $100, $500, $1,000, $5,000, and $10,000; and coupon bonds of each denomination except the last two. The interest will be payable in the United States, at the office of the Treasurer, any Assistant Treasurer, or Designated Depositary of the Government, quarterly, on the first days of February, May, August and November, in each year.

The bonds of the several classes aforesaid, and the interest thereon, are exempt from the payment of all taxes or dues to the United States, as well as from taxation in any form, by or under State, municipal or local authority.

After maturity, the bonds last issued will be first redeemed, by classes and numbers, as may be designated by the Secretary of the Treasury.

The bonds will be issued at the United States Treasury, but the agents for the negotiation of the loan in Europe are authorized to make arrangements with subscribers for the transmission of the bonds to the agents, through whom subscriptions may be received.

Subscribers in the United States will receive the new bonds of the agents with whom the subscriptions are made.

In the United States, the National Banks are authorized to receive subscriptions, and subscriptions may also be made at the office of the Treasurer of the United States, or of any Assistant Treasurer, or at the Designated Depositaries at Buffalo, N. Y., Chicago, Ill., Cincinnati, Ohio, Louisville, Ky., Mobile, Ala., and Pittsburgh, Penn.

Subscribers to the Loan can deliver their Five-twenties at once at the Department, or to any of the Loan Agents, receiving the interest thereon to May 1, in gold, in advance, and receiving also a Scrip Certificate for the delivery of the new Bonds, on May 1, from which date they will bear interest.

GEO. S. BOUTWELL,
Secretary of the Treasury.

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HAVING made the manufacture of Solid Emery Wheels a specialty, now call the attention of all mechanics and manufacturers to these valuable tools, and to the machinery needed for mounting and using them. The Tanite Co. manufacture machines, from $15 to $100 each, adaped to all the sizes and uses of their wheels. They also make to order Mandrels of any size, and they furnish Solid Emery Wheels from ⅝x¼ up to 36x6. An increasing trade has spread their goods widely through the United States and Canada, and they now confidently appeal to the established reputation of these goods as the best guarantee of their value. Those who are using Emery in any form are urged to give THE TANITE CO.'S Wheels and Machines a thorough and fair trial. Those who are still bound down to the slavery of the File and the Grindstone will find short hours and large profits if they master the Emery Wheel instead of being mastered by old-fashioned implements. THE TANITE EMERY WHEEL *is a Rotary File, whose cutting points never grow dull!* Scarcely admitted yet into the brotherhood of Labor Saving Machines, it WILL occupy no mean place in the ranks!

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NEW INVENTION. ADDRESS, HOWARD IRON WORKS, BUFFALO, N.Y.

Working Models

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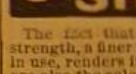
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SCIENTIFIC AMERICAN

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

Vol. XXIV.--No. 14. [NEW SERIES.] NEW YORK, APRIL 1, 1871. $3 per Annum. [IN ADVANCE.]

Improved Horizontal Steam Engine.

The design of the horizontal steam engine, illustrated in the accompanying engraving, shows that in engineering as well as in other matters, "Westward the star of empire takes its way." For a long time the principal cities in the Atlantic States have supplied the market with the best class of engines, and still the larger proportion of engines yearly turned out, are from Eastern manufactories. The design herewith presented will show, however, that the older shops in the East are no longer free from Western competition, and that they must now expect to yield at least a portion of the field to younger, though fully as enterprising, establishments.

This engine is built from designs prepared by Mr. Isaac V. Holmes, who, for a number of years was superintendent of construction at the Novelty Iron Works, New York city.

In the planning of a steam engine, the great desideratum to be obtained is, the combination of simplicity of parts and proper distribution of material for strength, with such a correct proportion of the working mechanism as shall give the highest possible stability, durability, and economy in the use of steam. These points have been kept prominently in view in this engine.

The bedplate contains, in one casting, the shaft, pillow block, crosshead, slides, cylinder head, and stuffing boxes for piston rod and valve stems, thereby avoiding all trouble from bolts and joints failing or working loose. Its form and section are those of a girder, wherein the metal is so distributed as to give great firmness and stability.

The end of this bedplate containing the pillow block is formed with heavy flanges, extending out into a broad and strong base to rest upon the foundation; while the opposite end, forming the cylinder head and slides, is so disposed as to furnish an equally strong supporting base for the cylinder, the two being united by an elliptical arch, which resists all lateral motion caused by the angular thrust of the connecting rod.

To this head, provided with broad and heavy flanges, is bolted the cylinder and steam chest in one casting.

The chest, being placed at the side, gives ample width, to the structure, for stiffness, and also allows the cylinder posts to extend below the bottom line of the cylinder bore, to insure complete drainage through the exhaust passage.

The outer end of the cylinder is provided with a faced lug, resting upon, but not attached to, a pedestal firmly bolted to the foundation. This supports the weight of the cylinder, and, at the same time, allows perfect freedom for expansion caused by the heat of the steam; and, as the cylinder, steam chest, slide valve, and piston rod, lengthen in the same direction, the engine will have the same clearance and lead when at work as when cold.

In the manufacture of these engines they are divided into three classes; first, those with the single slide valve, cutting off by lap, at two thirds of stroke, and not adjustable, with a good reliable governor attached to steam chest; strong, plain, solid engines, adapted to saw mills and any kind of work where simplicity and durability are wanted, and where saving of fuel is not an object. The second class includes those with cut-off valves, arranged to close at any part of the stroke, and adjustable by a hand lever while the engine is in motion; the cut-off point being indexed, so that the engineer can see it, and the speed of the engine being regulated by a Judson governor. Engines of this class are suitable for driving grist mills and other machinery carrying a steady load, and only varied at stated times, when the point of cut-off can be readily adjusted to the load; and they are claimed to give, under such circumstances, a maximum result in the economical consumption of fuel, combined with a simplicity of valve gear that can be placed in the care of ordinary engineers.

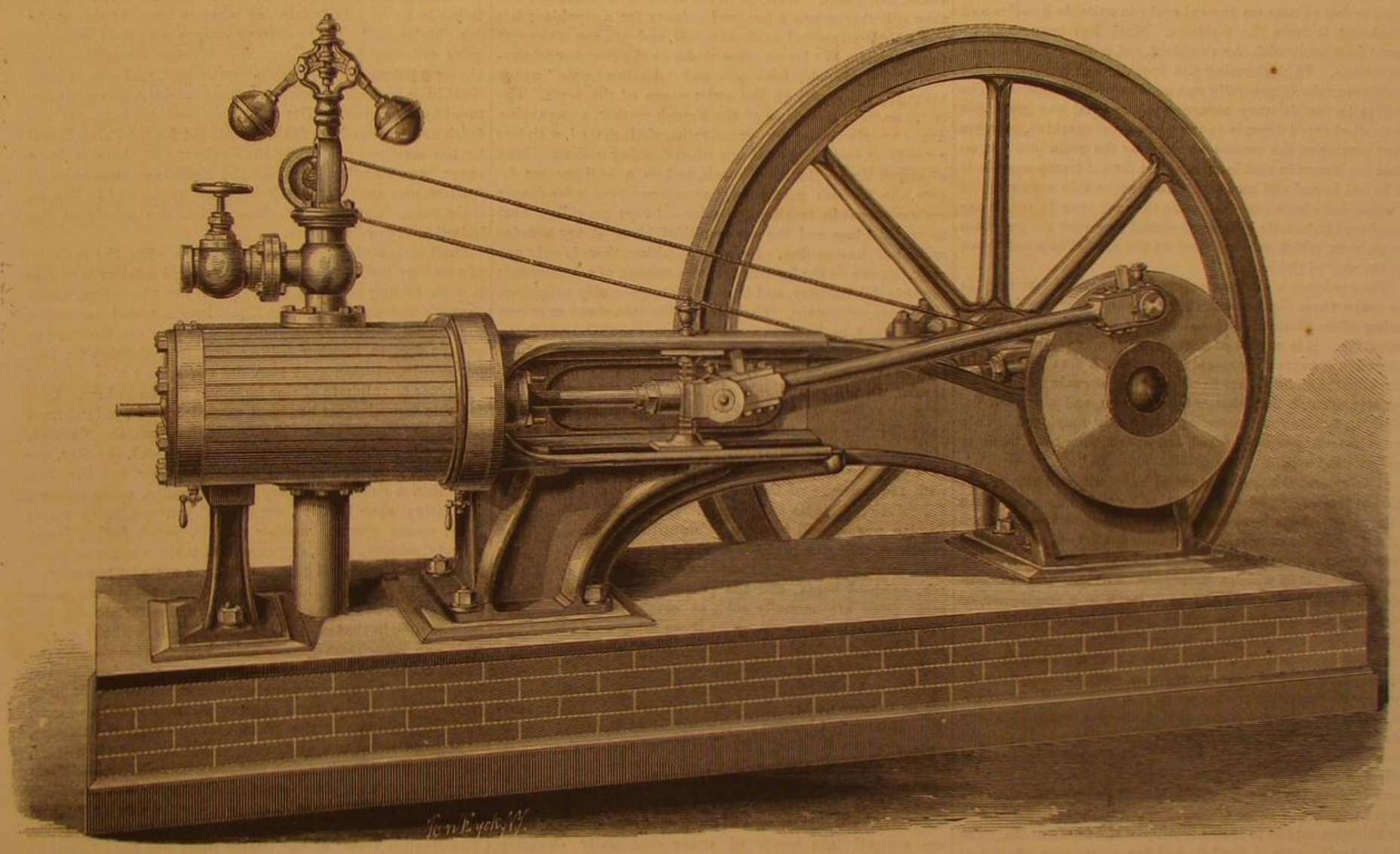
The third class comprises those with steam-jacketed cylinders, fitted with the Babcock & Wilcox patent automatic cut-off, valve gear, and governor.

These engines are especially adapted to use in mills and manufactories where the power is variable; and it is claimed that they combine, in the highest degree, strength and durability, with perfect regularity of motion, and consumption of the least amount of fuel. We are informed that engines of this class having developed a horse power with 2 $\frac{3}{10}$ pounds coal.

In the designing of these engines, the flat slide valve, embodying the most favorable possible conditions for tightness after wear consequent upon long use, has been adopted; also, all the journals and bearings are fitted with self-feeding oil-cups. The piston rods, pins, rods, and connections are of polished steel.

The manufacturers of these stationary engines have also adopted the same principles of construction in their portable engines.

Parties wishing for further information and descriptive circulars, can address the manufacturers, John Cooper & Co. Mount Vernon, Ohio.



COOPER & CO.'S STATIONARY STEAM ENGINE.

Potato Diggers.

Commissioner Capron, in his last report, says:

The number of patents granted, during the year, on potato diggers shows that the zeal of inventors with reference to these machines is unabated. It is questionable whether a really effective machine for digging potatoes has ever been brought before the public; that there have been very many which are utterly worthless, is certain. The large majority of these inventions are too cumbrous and complicated to be sufficient.

It will do well enough to multiply wheels and springs, ratches and pawls, when these are to be employed in shops, and places where there will be no extraneous hinderance to the operation of the machinery; but when it comes to adorning with these appliances a potato digger which has to deal with the insidious soil, penetrating into every crack and crevice, the fewer of these devices, the better the result.

Many of the inventors of potato diggers have put their theoretical ideas into such shape that a person who wants to see the model of machine calculated to clear the vines, remove the earth, raise the potatoes, sift them clean, separate the large from the small, and deposit each sort into different baskets, can have his curiosity gratified by inspecting the cases of the United States Patent Office.

The potato diggers patented are generally a modification of a structure like the following: A rectangular frame mounted on two wheels and provided with a tongue, with a vertically adjustable scoop or shovel, affixed by suitable pendants or hangers, which has been designed to pass under the hill, carrying the earth and potatoes back to a shaker, where they are separated, the earth dropping, and the potatoes being carried to a screen, where they are more thoroughly cleaned. The shaker is often a revolving apron, but more frequently a series of bars or rods, which are occasionally jointed or hinged in such a way as to admit of a "jumping," or vibratory motion. Occasionally one or more revolving shafts is placed beneath the shaker, such shafts being provided with spurs or

teeth passing up between the rods, the more effectually to disintegrate and remove the adhering soil.

During the year, there were two inventions in this line patented, which differ radically from those patented in any previous year, and which promise great effectiveness. The first is provided with wheels, tongue, and frame as above described. To the tongue, about at the juncture with the whiffletree, there is secured a shovel plow, which is intended to remove the soil from the top of the potatoes. Just in the rear of this plow, one on each side of the line of the tongue, are placed two rollers, whose longitudinal axes are parallel with the direction of the draught, and which consequently revolve transversely to the track of the machine. These rollers are revolved by suitable gearing from the traction wheels and are provided with curved teeth, spirally arranged, which enter the soil, raising and cleaning the potatoes. The other machine has, for the digging and cleaning parts, two concave disks arranged at an angle of about 45°, which are perforated or slotted to permit the passage of the earth, the potatoes being delivered in a single line at the rear of the machine and directly in the opened ridge.

HARVESTERS.

In the department of harvesters the inventions patented are directed exclusively to the improvement of standard machines. The beginning of the year found reaping and mowing machines with numerous defects, the chief of which were faulty gathering and delivering devices. Many of the machines belonging to this class require, besides the driver, a man or boy to rake up the cut grain in suitable bundles and discharge it from the platform. Much has been done toward dispensing with the attendant, and making the machine automatic. In performing the operation of gathering, the revolving rake is generally and successfully employed. The defect in the delivery arrangement is this: the grain has been discharged directly in the rear of the machine, or upon that portion of the ground occupied by the grain just cut, so that the horses in making their next circuit tramp upon it if it be not bound and removed. To obviate this a number of patents have been granted during the past year in which are employed automatic binders, designed to secure the cut grain in sheaves, which are deposited on the ground at a point out of the way of the horses.

The tendency of improvements in harvesting machines is to make them lighter and cheaper, the latter desideratum being often obtained at a sacrifice of substantiality in the structure. It is matter of remark how much power is employed in a harvesting machine to effect a small amount of work. It is obvious that to cut a swath of grain requires no greater strength than that in a man's arm, and yet to accomplish it, two to four horses are generally employed. This point has not been overlooked, and efforts have been made to mitigate the evil.

It is esteemed a desideratum to have one machine adaptable to the cutting of both grass and grain. To accomplish this result, efforts have been directed to producing a change of motion, as to cut grass a greater rapidity of the cutting instrument is required than in cutting grain. The common method is that in which a sliding pinion or spur wheel is employed, so that by a change from a large to a small gear, or *vice versâ*, the speed of the cutter may be increased or diminished.

Of the devices used directly to cut the grain, including the endless toothed belt, the rotary saw, and the reciprocating cutter-bar, the latter retains by far the larger number of admirers. Outside of the fact that inventors would naturally endeavor to evade the patent on this device, and to procure some other instrumentality that, without infringing it, would effect the same result, efforts have been made to avoid, by some means, the noise, shaking motion, and jar caused by the rapid working of these machines, as prejudicial to the nerves of the operators as to the durability of the implements. The other devices named, the belt and the rotary saw, are not so obnoxious to the charge, but they do not meet with the favor which is lavished on the reciprocating cutter-bar. To obviate this shaking and noise, an inventor some years ago obtained a patent for a divided cutter-bar, but arranged the dead-centers of the cranks, to which the cutters are connected, at right angles to one another, thereby just doubling the evil. It is obvious, however, that this invention may be turned to advantage by arranging the dead-centers in a line, whereby the shock of one side will be met and counteracted by that of the other, and thus produce a smoothly running and almost noiseless machine for harvesting operations.

ARTIFICIAL JEWELRY.

Condensed from the English Mechanic.

This is a very extensive and important trade. It is of remarkable interest to a superior class of English artisans just now, because the factories, which used to furnish the promenades, the shops, and the pavilions of the Palais Royal, in Paris, are idle and silent for awhile, and the manufacture is coming over to England.

Your Parisian master is a critic of precious stones; he knows how to cut them, he then knows how to mount, and, immediately afterwards, how to imitate them; he is an artist in enamel, mosaic, and gilding; he can amalgamate gold with silver, producing every kind of splendid illusion. Now amongst the objects of human desire, vanity considered, may be reckoned jewels, true or false; they are prized for particular variations of weight, light, and color. There are worshippers of the diamond, and devotees of the opal; the ruby has its adorers, and the emerald its slaves. But we cannot all afford to wear these gems of the earth, with their far-darting rays and gleams of twinkling brilliance. A philosopher's stone, of some sort, must be found, which shall convert cheap substances into glories; and to begin with—what is the false French diamond, for which so enormous a desire has for years been exhibited at Paris, which was, until lately, the very center of this sparkling commerce? It is a bit of colorless paste, super-imposed upon another, with a darting central radiance; both perfectly white, except for the prismatic aurora incessant playing through them. But you may grind, for this most fanciful among the fancies of mankind, an oriental sapphire, a topaz, an amethyst, or a crystal; and out of the gleaming powder shall arise a beautiful imposture, which none except a professional lapidary would pronounce to be other than a diamond. But the process is exceedingly delicate, excessively difficult. The cutting is a most singular art; the tools must be selected with not less scrupulousness than are medicines for delicate children.

And as for the ordinary materials! Fancy a Parisian mechanic, engaged upon these manipulations, employed to make a false diamond out of white sand; first washed with hydrochloric acid, and then with simple water, minium, calcined soda and borax, and oxide of arsenic! Here we have a combination entirely lucid; but when the Parisian artisans came to the sapphire—the second in their estimation, of all precious stones—they have to deal with its wonderful and varying colors as of those, especially, from Pegu and Cambay, from Ceylon and Bohemia. The obstacle lies in the production of that lovely dark light, burning in, and bursting from, its heart, for which the stone is famed, in all its hues—white, (the rarest), pale blue, ruby tinted, vermilion, milk colored, violet, and green. Well, go to the Jews of Amsterdam, and they will charge you a hundred guineas for a sapphire; but buy a little strass and oxide of cobalt, and you can make one for yourself. We lay no great stress on the Parisian fabrication of chrysoberyls, chrysopals, and "floating lights," which are really not jewels in the strict sense of the term. The last, known in the slang of the French market, as aquaphonanes, are of an asparagus green, rather shell-shaped, with two refractions, and pretty enough when flashing under a galaxy of chandeliers. But the French, and, in a still greater degree, the English mechanics, have encountered a far deeper embarassment in treating the ruby—always providing that mere red glass and the other pitiful ideas of toy arcades are out of the question. Properly speaking, there is only one ruby, (known to the lapidaries as the spinel), of a tender red; the Oriental, Barbary, and Brazilian are generally sapphires, amethysts, or topazes. The color of the true stone may best be described, perhaps, as a combination, exquisitely delicate, of rose and cherry; but some are wine-tinted, or of a violet hue, or tinged with yellow. It is astonishing how far a mixture of white lead and pulverized and calcined flints will go in competition with the jewel beds of India. So with emeralds: the same paste as is used for artificial diamonds, is blended with a precipitate of oxide of copper, and the green gem sparkles brilliantly. The garnet requires paste dyed with the "purple of Cassius;" it is, however, exceedingly difficult to imitate its starlike ray. Oxide of cobalt and the Cassian purple will produce a beautiful semblance of the amethyst, though a better is obtained by a mingling of white sand, treated with hydrochloric acid, red lead, calcined potash, calcined borax, and the purple. Thousands of these mock gems are annually sold, at considerable prices; and thousands of them are worn by those who would have the world believe in heirloom jewels.

Do you admire Mademoiselle's coral necklace? It is made of resin and painter's vermilion—about as much of the latter as dazzles on her cheek. Or her pearls? False pearls were absolutely invented in the capital of France—false in so many of its fashions. Thence the art spread throughout Italy. The manufacture is exceedingly curious. As its foundation are used the scales of the blay, a small flat fish, with a green back and a white belly, the latter being of a very silvery appearance, and easily detached. The scales are scraped into bowls of water continually changing, dried in a horse-hair sieve, melted, and converted into "essence of the East," to which is added a little gelatine, and this mixture is spread, with the utmost care, over delicate globes of glass. When cool, these are pierced and filled with white wax, to give them the necessary solidity and weight. Occasionally, real opals, powdered, are used for the more costly kinds. The Turks carry on a great traffic in "pearls of roses," colored from rose leaves crushed in a mortar. The black, red, and blue varieties are mimicked with equal ease, and there is an affectation of adding to their charm by perfuming them during the process with attar and musk. Among the ingredients also employed may be mentioned Japanese cement and rice-paste. The modern romans have a simpler method. They use little alabaster marbles, and the scales from oyster and other shells triturated in spirits of wine, coated with white wax, heated to a high degree. The trinkets imported as "Venetian Pearls" are glass, and their production presents no difficulty.

Now, as to the mounting. Infinite care is bestowed upon this by your French artificer. He has to consider how his sham settings—they must be sham since he must sell them cheap—are likely to suffer from the action of heat, of electricity in the atmosphere, of oxygen, of air and water, and of acids; and he resorts to copper, lead, platinum, iron, steel, gold, silver, and their amalgams accordingly. The history of their manipulation by his or several sets of hands, is worth noting: the softening, the purification, the moulding the washing, the hammering, the melting, the coloring or bleaching, the chiselling, and so forth, through an entire, technical dictionary. There are instruments for stamping instruments for welding, instruments for soldering. One workman chamfers; another flutes; another stands at the laminating machine; the fourth bends over the delicate enameller's knife, sharp as a diamond's edge, and nearly as hard; a fifth subjects the completed work to a microscopical examination. Not fewer than ten differently-shaped hammers are used. This industrial economy is peculiarly interesting. The diversity of aptitude, of course, encourages the division of labor, as will presently be seen more minutely.

For the moment, let us revert to the French meretricious jeweller's other arts—those of coating common with precious materials, and enamelling. Few persons have any idea of the extent to which these tricks in manufacture are carried. The ingenious and cheap French enamel, white or colored, made up into rings, collarets, and bracelets, brings a great profit to the workmen, and is really attractive. But it requires time and study to obtain a mastery over this art. There is the fixing of the translucent glass upon the metallic surface, the painting of the vitreous plane, the choice of tints, the subtle application of heat, the consideration of chemical action exercised by one oxide upon another, and the due admixture of materials. Then, the engraving of enamels is a task requiring all possible exactness and tenderness of touch. We hardly reckon among these galeties—so to call them—of picturesque industry, mock mosaics, damascening, or gilding, although the last is a very important affair in the light of France, which pretends to be the great gilder of the world—gilding even its young men, as Juvenal dares to assert the Romans gilded their goddesses—of flesh and blood. The Parisians style this "gold" coloring—and their methods are extremely various—the oil, the hot, the cold, the bronze, the copper, the steel, and the ether; but the magic of silvering is scarcely less intricate, especially when the surfacing is to be totally false, or what is termed "argenterie des charlatans." As for coating copper with gold, which is quite different from gilding, this belongs altogether to a higher artisanship, applicable also to lead, and even to iron. Next in order are the much esteemed steel trinkets manufactured by the French. The invention is of old date, and the finish and polish of the fancies produced for the Palais Royal by the artificers of the riotous Faubourg St. Antoine have never been excelled, even by the ambitious mechanics of Austria, who are Dutch in their perseverance, and Italian in their taste. But, after all, these artists aim mostly at the imitation of jewels or gold.

Shall we reveal another of their secrets after the manner of a cookery book? Take a little powdered sulphur, sprinkle it with boiling water, mix well; boil the concoction, strain through fine muslin; put the liquid into a vessel containing the substance with which you desire to play the Rosicrucian trick, resort to another boiling, and your Cornish tin is—*presto!*—Babylonian gold! A dash of spring aloe juice, of salt-peter or sulphate of zinc improves the imposture. How far this deceptive art has been carried may be judged from its catalogue of styles: The Lamb, the Arch, the Turkish, the Myrtle branch, the Maltese Cross, the Dead, the Star, the Lance-iron, the Violin, the Hatchet, the Rose, and the Turtle. Into a similar category come agraffes, opera glasses, decorative shoe buckles, ornamental buttons, fancy watch keys, cream spoons, writing pencils, punch ladles, jewel caskets, scissors, pipes, egg cups, and tobacco boxes—all imitations, my friends, all gew-gaw, and yet not a little pretty.

But in no branch is this fraud—for it is a fraud when the prices charged are those due for genuine materials—pushed farther than in that of honorary decorations, without one of which no Frenchman appears able to live. There is the Order of St. Ampoule, or the oil which was brought from heaven by a dove. It is a bit of gilt copper with an attachment of black ribbon. The Palais Royal charges you fifty shillings for it. So with the order of the Weasel, of the Star, of St. Louis, of Mount Carmel, and St. Lazare, of the Dog and Cock of St. Michael and the Holy Spirit, and even of the Legion of Honor. They were all prostituted to the purposes of a jeweller's profit. Nor is it generally known what a manufacture of foreign decorations was, until lately, carried on at Paris. The English Order of the Garter itself has been forged in the French capital, and worn at continental courts. That of the Golden Fleece, the pride of Imperial Austria, has been successfully imitated, though its collar is at once exceedingly rich and of exceedingly delicate workmanship. We have seen Napoleon's Iron Crown—not to be compared with the old and proud *signum* of Lombardy—so perfectly counterfeited as to escape detection more easily than a mock Waterloo bullet. The Danish Government is so jealous of anybody assuming the blue ribbon of the Danish Elephant, that it ordains a perpetual exclusion from court of all individuals buying these spurious sparkles.

Now, not to prolong a series of examples already sufficient, we may again remark that a number of workmen in Paris have, for many years, been dependent upon this industry, and thrived by it. It is not by any means a degrading business. The deception is, in fact, no deception. It is avowed in the market-place; the objects are sold as shams; no one of common sense or knowledge could take them to be anything else; but they bring, or have usually brought, to the artisans of Paris, an enormous annual income.

In our issue of February 18th, we published a short paragraph, stating that no successful advertising agency had been established south of Baltimore. We are in receipt of a letter from Walker, Evans & Cogswell, of Charleston, S. C., who inform us that they have conducted such an agency for many years, with entire success.

SILK CULTURE.—ERRATA.—In the article on "Silk Culture, published in our issue of March 18th, in column 2, paragraph 7, lines 2 and 4, for "*month*" read "*moult.*" In column 3, line 9, read "*hatching out*" for "*hatching only.*" In line 47, same column, for "*less importance*" read "*no less importance.*"

ANNUAL ASSAY OF THE COINAGE.

BY F. A. P. BARNARD, LL.D.

It is provided, by the acts of Congress establishing and regulating the United States mint and its branches, that there shall be an annual scrutiny of the results of the operations of each year, in order to verify the fidelity with which the coinage is kept up to the legal standard, both as to weight and as to the degree of fineness of metal. This scrutiny is conducted by a commission, consisting of three members acting *ex officio*, and ten or twelve others appointed by the President of the United States. The annual assay of the coinage of 1870 was conducted at the mint in Philadelphia, on the 13th, 14th, and 15th days of February, 1871, by a commission composed as follows:

Ex-officio.—Hon. John Cadwalader, Judge of the United States District Court for the Eastern District of Pennsylvania; H. D. Moore, Collector of the Port of Philadelphia; and United States District Attorney, A. H. Smith.

Appointed by the President.—Prof. Joseph Henry, Smithsonian Institution; Prof. John Torrey, United States Assay Office, New York; F. A. P. Barnard, President of Columbia College; J. E. Hilgard, Assistant Superintendent of Weights and Measures; Hon. H. R. Linderman, Philadelphia; Prof. Fairman Rogers, Philadelphia; John J. Knox, Deputy Comptroller of the Currency; Hon. John P. Putnam, Boston, Mass.; E. B. Elliott, Esq., Washington, D. C.; Robert J. Stevens, Esq., San Francisco, Cal.; M. C. Read, Esq., Hudson, Ohio.

In order that the test may extend to every coinage of the year, the law requires that, at each delivery of coins made by the chief coiner to the treasurer, a certain number of pieces of each denomination shall be taken by the treasurer, in presence of the assayer, indiscriminately from the mass, carefully labelled, and placed in a chest having two independent locks, the keys of which are kept, one by the treasurer and one by the assayer. The branch mints being under the direction of the director of the principal mint, the coins reserved, as above described, at those establishments, are transmitted for examination to Philadelphia.

On the meeting of the commission, which takes place annually on the second Monday in February, all the packages of reserved coins are placed before the commissioners, and opened by them in presence of the director of the mint. The coinages of the several mints are kept separa e from each other, and the gold coins are kept separate from the silver. The commission is then arranged by the chairman into two committees, one for the trial of the weights, and the other for assaying the fineness.

The weighing committee thereupon takes, from the gold coins and also from the silver coins, of each mint, a certain number, not less than ten, embracing also more than one denomination, if there are varieties; and these are weighed in bulk. They also take any number of pieces, not less than five, and of differing denominations, if there be such present, to be weighed singly. All these are placed with the mint marks downward, and the weighing is conducted by the committee themselves, or by experts under their scrutiny. It is usual, finally, to weigh the whole mass of the gold coin, and also the whole mass of the silver coin, from each mint, which remains in the hands of the committee after the selection of pieces for assay.

The committee finally examines the weights ordinarily employed in the mint, and tests their accordance with the standards prescribed by law.

The committee on assaying takes, from the coins left by the other committee, a sufficient number for its purposes, and causes a portion of each parcel to be melted into an ingot. From each of these ingots a sample is then taken for assay. A convenient number of single coins, of different denominations, is also selected from each parcel, from which samples are taken in like manner. In the case of silver, the sample for the assay of mass is not cut from the ingot, but taken by granulation in water, previously to pouring the liquid metal nto the mold.

The gold is assayed by cupellation and quartation; the silver, by precipitation. The weight of the metal, to be tested, employed in each assay for gold, is one half a gramme. This is weighed out upon a balance sensitive to the twenty-thousandth of a gramme (the ten-thousandth of the weight employed). All the lesser weights are decimal subdivisions of this half gramme. The weights used in this process are kept in a box, with two independent locks, the key of one of which is in possession of the director of the mint, and that of the other in that of the Judge of the United States District Court for the Eastern District of Pennsylvania, who is *ex officio* chairman of the commission.

The samples, from which the metal for assay is taken, are hammered, and subsequently laminated between rollers, to facilitate the adjustment of the weight by cutting off minute portions. Each lamina is stamped with a distinctive number. Side by side with the coin assays, a test assay is conducted, in which the metal used is pure gold, cut from a roll kept for the purpose in the box containing the weights. As the standard fineness of the coin of the United States is 900 parts by weights of pure gold to 100 of alloy, the test assay is made upon $\frac{900}{1000}$ of a half gramme.

Silver is then weighed out for the quartation, from a roll of the pure metal, kept also in the box with the weights; and the several samples, properly enveloped in sheet lead, are placed in order, according to their numbers, and transferred in like order to the cupels. After being withdrawn from the muffle, the buttons are hammered, annealed, and laminated between rollers, each lamina being finally stamped on one end with its number. The specimens are then rolled into cornets, with the numbers visible on the external end, and are then deposited in the separate cells of a little platinum basket-like apparatus, which suffices to hold, in very small compass, sixteen or twenty specimens, to be treated all at once. This is immersed in a matra s or alembic of platinum, where the specimens are first boiled for ten minutes in nitric acid of 22° Baumé, and then twice successively, for the same length of time, in acid of 32° Baumé.

The specimens are then taken out, washed in distilled water, heated to redness, and finally weighed again.

Out of 8 separate assays of gold made by the commission for the present year, 3 gave exactly 900 parts to the 1,000, 1 deviated $\frac{1}{10}$ of a part, and 4 deviated $\frac{2}{10}$ of a part in 1,000. The law allows a deviation, technically called the "tolerance," of the two whole parts in 1,000, either above or below the legal standard; but the mint officers work, of course, as closely to standard as possible, without regard to tolerance. The results of the mint assays for many years show that the tolerance is unnecessarily large; and in the new bill for the regulation of the mint business, recently proposed by the Treasury Department, the tolerance is reduced to 1 part in 1,000.

The silver assays are made by weighing out 1,115 parts of the metal under trial, these parts being milligrammes. This weight is taken because, at the lowest limit of deviation from standard allowed by law (which, for silver, is 3 parts in 1,000, the standard fineness being, as before, 900 in 1,000), there will be just 1,000 parts of pure silver in the specimen. A test assay is also made by weighing out 1,005 parts of silver absolutely pure, which is subjected to the same processes as the specimens under scrutiny. All the specimens and the proof metal are introduced into numbered bottles, nitric acid is added, and a gentle heat is applied. The solution being complete, precipitation is effected by introducing, from a pipette, into each bottle, 1 decilitre of a standard solution of sodium chloride, so prepared as to contain, in this measure, 542·74 milligrammes of the salt—the quantity necessary to precipitate 1,000 milligrammes, or 1 gramme of silver. As the case never, or at least very rarely, occurs, in which the specimen is at the lower limit of tolerance, this dose of salt leaves some small amount of silver unprecipitated. The precipitate is therefore made to subside by agitation; and for this purpose a mechanical agitator is employed, put in motion by power derived from the shafting in the coining department, which expedient contributes greatly to economy of time.

When the liquid is clear, a small pipette is used, graduated so that each division indicates a quantity of the re-agent sufficient to throw down 1 milligramme of silver; and the number of these parts which are required to complete the precipitation fully, corrected by the indications of the proof assay, exhibits, when added to 897, the proportion of pure silver in 1,000 parts of the metal under trial.

In the recent assay of the silver coinage, out of 7 specimens, 2 were found to be in exact accordance with the standard; 1 was found to be $\frac{4}{10}$ of $\frac{1}{1000}$ above: 2 others were $\frac{8}{10}$ of $\frac{1}{1000}$ above; another, $\frac{1}{1000}$ below; and another, $\frac{1}{1000}$ above. As the tendency of silver alloys is to irregularity of distribution, in a greater degree than is true of those of gold, it is reasonable that the limits of "tolerance" for this metal should be greater; but these assays show that the amount of deviation, from the standard, allowed by law is considerably too great. The new mint bill proposes to reduce it from $\frac{3}{1000}$ to two and a half $\frac{1}{1000}$; but this reduction is by no means sufficient. There is no need that it should exceed $\frac{2}{1000}$.

HOW DO YOU PROVE YOUR PLUMB RULE?

A TECHNICAL LESSON.

The following particulars are authentic, and I remember all the parties. I shall condense from memory. The matter in dispute was a brick wall which fell shortly after its erection, the downfall of which, I believe, was accelerated by a downpour of rain. When the builder put in his bill for payment, his client refused to acknowledge any claim. The wall was certainly built, and the wall was certainly dowr. The client contended that it was badly constructed, and that it was put up in an unworkmanly manner; the builder, on the other side, was ready to swear and prove that it was erected by competent workmen, and that it was executed in a creditable and workmanlike manner.

The case had to be settled in the law courts, the builder being the plaintiff. The defendant secured the services of a clever, well known counsel, who was known to have a knowledge of architecture. When the builder was giving his evidence, he was submitted to a severe cross examination, in which his practical knowledge cut a very sorry figure. The particular point of the question turned upon the plumbing of the wall, whether it was truly perpendicular, and whether the plumb rule was correct. The builder said he was ready to take his oath that the wall was plumb, and that the plumb rule was quite correct.

"Listen for a moment, gentlemen of the jury," cried the defendant's counsel, "while I put this master-builder to the test. You will be able to judge of his practical acquaintance with his profession from the answer he gives. Well, Mr. Builder, you are ready to swear upon your oath that the wall was plumb?" "Yes." "You are?" "Yes."

"Will you be so good, Mr. Builder, as to turn round and tell those twelve intelligent jurymen in the box, how you know that your plumb rule was correct?"

The builder hesitated for a moment, and then replied: "I know it was correct, for my workmen are always careful and particular with their work."

"I am not disputing the character you give your workmen," replied the counsel; "I merely ask you to tell the jury how you know that the plumb rule worked with was correct?"

"I know it was correct," repeated the builder, "because it was made the same as all plumb rules are made, and used by men in the habit of using them."

"I must ask you again, Mr. Builder, to be so kind as to tell the jury and me how you are certain that the plumb rule was true? or, in other words, let us know how you prove your plumb rule?"

This was a poser.

"Now, Mr. Builder," continued the defendant's counsel, "you have come into court to make a claim against my client; you swear that the wall was built properly plumb, and that it did not tumble down from bad workmanship. I now ask you, as a respectable builder, to just explain to the jury the method of practically constructing and proving a plumb rule. You are no doubt aware that if a plumb rule be not correct, the work that it is applied to will not be correct. I am ready to prove that it was not correct, that the wall overhung. Geometrically speaking, it was out of perpendicular; consequently, the work was badly executed, and I deny that you have any claim for payment."

A silence for some minutes reigned, and then the plaintiff made one or two ineffectual att mpts at explanation, but got so confused that he completely broke down.

"It is needless, you see, your lordship, and gentlemen of the jury, for me to carry this case much further. I will simply conclude by saying, here is an instance of the deplorable consequences attending rash assertions and wrongful claims. Men are found to come forward to make a claim for what they have no right to, or have forfeited, and are ready to fortify their unfair demands by swearing that they know practically what they do not know. Well, gentlemen of the jury, as the master-builder, when in the box, was unable to prove his plumb rule, perhaps he will not take it amiss for a lawyer to tell him how to practically construct and at the same time prove a plumb rule, which may be depended upon, for plumbing a straight wall, or any other description of perpendicular work. Take a piece of board a little more than the proper length, breadth, and thickness which you require. With a pair of compasses strike a circle on its face, within a few inches of each end. Plane straight on the edge until the sides of the circles are touched; repeat on opposite edge. When this is done, your piece of board will be of a parallel breadth. Then a line drawn through the center, with a slit for the cord, and an opening for the play of the "bob," will complete your plump rule. I am not an architect, gentlemen of the jury, but I believe no architect, builder, or workman, will say I have not given a practical method for proving a plumb rule. One word more, gentlemen: I think when a master-builder comes into court, and takes it upon himself to swear that his work was properly executed, he ought to be able to give us proof, when asked, of the workmanlike manner of its accomplishment. I now ask a verdict for my client."

The jury unanimously declared in favor of the defendant, the foreman saying that he himself, and his fellow jurors, were of opinion that the wall was badly constructed, and out of plumb, and that that was the reason of its fall.

It may be asked here, was the counsel for the defendant technically correct in his method of proving a plumb rule of any length? And it may be further asked, how many master-builders, and workmen, too, are there at the present hour, who, if called upon suddenly, could practically demonstrate, in proper language, the geometrical construction of a simple plumb rule, or straight edge? However astounding it may seem, I have come across many workmen who could not, without some thinking and groping, properly set out the egg oval opening, or "bob" hole, in their plumb rule. Archimedes is reported to have said, that if a prop, or position, and a lever, were given to him, he would move the world. Technical knowledge is the prop, the position, and the lever; and, without the ambition of the great Greek mathematician, it will enable a man, at some time or other, to lift himself in the world, and, morally and socially speaking, lift up the world at the same time.—*Builder*.

A Subterranean Pond---Eyeless Fish.

It is well known that great trouble and expence have been caused by the sinking of a portion of the track of the new Jefferson Railroad, where it crosses a swamp in Ararat township, Pa. It has been found, says the *Montrose Republican*, that under the swamp is a subterranean pond, of several acres in extent and of considerable depth. This pond is covered by about six feet in depth of black earth, which supports a heavy growth of woods. The trees are mostly soft maple, pine, hemlock and birch, many of them ranging from six inches to three feet in diameter. Last fall it was discovered that the subterranean pond contains many fish, of the kind usually found in ponds in this part of the country—pickerel and "shiners" among others—but all without eyes! In the darkness of their subterranean abode, they have no use for the organ of vision. The Ball Pond, about a mile and a half distant, is now "growing over." A considerable part of it has become subterranean within the last twenty years, and, probably, before many years it will be entirely covered like the other. This pond is about twenty acres in extent. For some distance from the shore, it is filled with a dense growth of water-lilies, and these no doubt, furnish the foundation on which the sup rstructure of earth is commenced.

LUNAR RAINBOWS are not so uncommon after all. We never saw such a sight ourselves, but many of our readers have if we may judge from the testimony now coming in. We cannot however, find room for the letters already received on the subject, and can only express the hope that our numerous correspondents may live to see other equally glorious celestial sights.

THE "LUNA" MOTH.

BY PROFESSOR R. C. H. DAY.

Fairies, those unseen loves of our early, happy, unreasoning childhood, disappear, as years advance, into the category of mythical impossibilities; and, in truth, even with children, they are rapidly becoming an extinct race, exterminated by the hard facts of science; but who that has known them in his fancies, does not feel a pang of regret, when he finds that they may not pass into the realms of reality? Certainly such sprites must have been a great source of contentment to those ever-childish elders of past ages, who unwaveringly believed, all their lives, in fairies and goblins; such convenient agents as they were, to whom to attribute all manner of phenomena that could not otherwise be explained! It was so easy, and, at the same time, savored so delightfully of the marvelous to be able to say "'the good people' have been here this night, and have brought this," or tremblingly to recognize in mischief the hand of some elfin Robin Goodfellow. It was so much easier, we repeat, than to discover by close observation, careful experiment, and strict unimaginative induction, that good things are not fairy gifts special to ourselves, and to learn, worse still, how bad things are but too frequently the certain results of our own stupidity, folly, and viciousness—the most vengeful and inexorable of goblins. And it is to this, good reader, that science brings us. Oh, that we could sometimes believe in imps and fays!

Now, we do not know whether the inhabitants of America were ever blessed with elfin agencies; Indians would hardly have appreciated beings who could

> "Creep into acorn-cups, and hide them there;"

and roystering Dutchmen in their (not acorn) cups amid the lone valleys of the Catskills, would have been all too coarse associates for the monarch to whom

> "The elves present, to quench his thirst,
> A pure seed-pearl of infant dew,
> Brought and be-sweetened in a blue
> And pregnant violet."

As for genuine Yankee fairies and mermaids, never, except in Barnum's! And yet we almost wish that we could certify to the actual existence in America of a fairy queen, who, in a momentary whim, had decked the Luna moth in its beautiful garb; say, that it might attend her majesty's moonlight revels, fittingly adorned. Could we only have brought ourselves to have given to the reader as true such a pleasing myth, it would have saved us the trouble of a vast deal of, what he even now may deem useless, speculation. But first let us quote, from Harris, his admirable picture of this beautiful insect.

"Pre-eminent above all our moths in queenly beauty is the *Attacus* (now *Actias*) *Luna*, or Luna moth, its specific name being the same as that given by the Romans to the moon, poetically styled 'fair empress of the night.' The wings of this fine insect are of a delicate light-green color, and the hinder angles of the posterior wings are prolonged, so as to form a tail to each, of an inch and a half or more in length; there is a broad purple-brown stripe along the front edge of the fore wings, extending also across the thorax, and sending backwards a little branch to an eye-like spot near the middle of the wing; these eye-spots, of which there is one on each of the wings, are transparent in the center, and are encircled by rings of white, red, yellow, and black; the hinder borders of the wings are more or less edged or scalloped with purple brown; the body is covered with a white kind of wool; the antennæ are ocher-yellow; and the legs are purple-brown. The wings expand from four inches and three quarters to five inches and a half."

But to appreciate fully the beauty of the Luna, we should see the living insect, and as it flies by night; but few are fortunate enough to meet with it; and of those who do, there are many, even professing to be persons of taste, who would pass it by, as beneath their notice. Certainly, then, its beauty was not intended especially for the gratification of the eye of man. Some will say, that these colors were intended to gratify the Creator's idea of beauty; then what shall we say of all that is ugly, grotesque, and hideous in nature? And yet there must be some reason why this moth should be so beautiful; or else, we may better, after all, adopt the fairy theory, than any worse alternative. Is this endowment of such peculiar beauty of any value to the creature itself? It is not of a sexual character, for, as far as we know, the sexes are never very dissimilar.

Does its coloration, as is probably the case with some closely-allied, but differently colored, species, serve to protect it? On the contrary, the light color would probably render it more conspicuous to its enemies, so that the fairy gift would be an injury in disguise. The only escape from our difficulty appears to lie in remembering two facts, namely, that the perfect state represents but one phase of the insects whole life history; and, secondly, that all parts of an organism are wonderfully dependent upon, or correlated with, one another. As far as Nature's use of an insect is concerned, the larval is the really important stage of its existence; the reproductive stage, though essential, being only subordinate in purpose to the earlier one. Thus, as it is the caterpillars that do Nature's work in keeping down an excess of vegetation, it is they that have to be especially protected; and as long as a sufficient number of perfect insects are preserved to maintain the necessary supply of larvæ, the rest may perish. If not enough are being preserved, the perfect insects themselves will need protection; but, if too many survive, then the balance which Nature is striving to maintain, will be temporarily disturbed. What a delicate piece of machinery this vast system is!



METAMORPHOSES OF THE ATTACUS LUNA.

The peculiar tails at the hinder angles of the hind wings of the Luna moth fall into the same category as its coloration. As appendages to the insect, they have no purpose. There are butterflies, in which such tails, when the insect is at rest, represent the stem of the leaf imitated by the rest of the wings; but there are numerous species with tails, in which there is no attempt at any such imitation; and, in the case of our moth, any such imitative purpose is out of the question, because its wings do not close over the back in repose, so as to present the leaf-like form, even.

But though neither the color nor the form of the perfect insect appears in itself to have any definite purpose, yet they both must be intimately connected with the structure and conditions of life of the larva, and we may readily suppose them to be, one or both, dependent upon some very essential feature of its organization.

Perhaps—but our column is filled, and the dissatisfied reader asks, why we have wasted it upon such fruitless speculation? We have not, after all, explained why the Luna moth is so beautifully colored. We admit it; we have merely tried to indicate the direction in which such an explanation may be sought. We know that we all have a habit either of looking upon the beauties and wonders of Nature as utterly without meaning, or, at the best, of putting upon them a shallow interpretation, the first and easiest that chances to come to hand; and we have therefore thought it advisable to remind the reader again, that Nature is not an ill-arranged assortment of whims, and that it is quite time for us all to realize, that in Science at least, we must do without fairies.

Plastering.

In lathing for plasterwork, says the *Building News*, laths should break bond—an arrangement technically termed "snatching;" this gives a good hold to the joists, and makes a firm ceiling. Instead of the lathing being executed with rows of laths of equal lengths, joined by other rows of similar lengths, the bond should be broken by changing the length of the laths every five or six feet, and so causing one set to stretch across the joists to which the others have been fastened. This system takes more time than the ordinary system, and will not be adopted by men unless they are well looked after; it requires to be distinctly specified, on account of the extra labor. It is well to examine the cow hair provided for mortar before it is used; hair ought to be long and sound, but often it is brought to the building in bags, of short length and quite rotten, and no strength in it. This sort of hair makes the plaster far worse than it would be without any; the plaster should also be examined before being put upon the ceilings, by holding a little up with the spade; the quality can be detected by the hair hanging down. The finishing coat of plaster is sometimes set with hair in it; the plasterer picks out the white hair and beats it fine, then uses it with plaster of Paris. The last coat should be composed of about one third plaster to two thirds lime putty. The blotches or streaks sometimes seen in wall plastering are generally the result of bad work, though not so in all instances; a sooty or burnt brick in a wall, will sometimes cause an unsightly patch on the plaster; marks from this cause have been known to come, not only through the plaster, but through the papering also. New ceilings ought not to be whitened; whiting eats into the new work and injures it. Lime for mortar should be burnt but little; much burning destroys its nature; the phrase "lime to be well burnt," is apt to mislead. When sluiced, lime is much better than when slaked in the common way, by sluicing we mean letting it fall to pieces, instead of running it with water; it becomes much more durable for mortar, and especially for pebble-dashing in mortar. If, in mixing the lime for mortar or plaster, the least bit remains whole, though as small as a pin head, it will burst in time and throw the plaster off the wall. This explains the bursting occasionally seen on plastered walls. When the lime is run with water, this defect is not so frequent as when the lime is allowed to fall; the latter mode, however, makes a superior mortar, but the lime for this purpose is best prepared two or three months beforehand, which precaution prevents any portion of the lime remaining whole; it involves extra trouble in turning it over, which makes the mortar very expensive. I have known the following practice to be observed in making good mortar: The lime is spread on the ground and a little water thrown over it; the whole is then covered with sand and left for three or four days. The water slakes the lime into a powder; this is then mixed with the sand, and the whole passed through a sieve; it is then ready to mix with water, to form mortar or plaster.

The best way of forming plaster cornices is to run a muffled mold, muffled with plaster of Paris, upon a ground of hair mortar, and leaving about one third of an inch to be run afterwards with plaster of Paris and lime putty; this makes a much stronger cornice than is made by the present system, which is only a result of a wish to expedite the work and make it cheap at the expense of quality of workmanship. Plaster cornices often crack through there being common plaster mixed with the good; the common sets more quickly than the good, and the uneven setting produces cracks. It is a common practice to mix glue with plaster when there is doubt as to its quality; the glue causes the whole to take a longer time in setting.

MATERIAL FOR ICE HOUSES.—It is said that one of the best materials for ice houses is peat; but the genuine moss peat must be employed, and it ought to be cut in pieces fourteen inches long and five to six inches wide and thick. When it is thoroughly dried, it proves to be a poor conductor of heat; and when laid up around ice houses above the ground, is preferred by many persons to sawdust, tan bark, and the like. Peat has also been employed in Europe for building dams, and as protections to coffer dams, in laying subaqueous foundations.

REFINED oil, for fine mechanism, can be prepared by putting zinc and lead shavings, in equal parts, into good Florence olive oil, and placing it in a cool place till the oil becomes colorless.

Improved Screw Wrench.

The object of this invention is to permit the quick adjustment of the movable jaws of screw wrenches where the relative position is changed to receive nuts of various sizes, and thus to save the time occupied in moving it the entire distance by the screw.

The engravings give an excellent representation of the wrench, showing the device in two positions; Fig. 1 showing the wrench adjusted for use, and Fig. 2 showing it in position to permit the rapid movement of the movable jaw to the place desired.

The shank of the wrench has a worm rack cut on the back as shown. The movable jaw has, at the back, two projections, which carry the worm and its pivot. The pivot of the worm is itself pivoted at A, and its free end shuts into a recess formed in the projection at B. When thus shut into the recess, the worm engages with the rack, and by turning it slightly the requisite nicety of adjustment is secured. The edges of the worm are milled so as to afford a good hold for the fingers. When the worm is thrown out of its engagement with the rack, the movable jaw may slide along on the shank till it nearly approaches the required position.

A spring catch in the end of the worm pivot engages with a suitable recess in the projection, B, to lock the pivot in its place, when the worm is in the position shown in Fig. 1; and a thumb piece is used to press back the catch when the worm is to be thrown out of gear, as in Fig. 2. When, however, the jaw is to be moved only a small distance, the worm is used in the usual manner.

The thread of the screw nearest the neck in Fig. 2, is beveled so as to readily enter, the rack, which latter is cut in a rib extending the whole length of the back of the shank.

The wrench, in addition to the facility it affords for rapid adjustment, is strong and light, and, we should judge, durable.

It was patented Nov. 22, 1870. For further information address Conrad Cline, Martinsburg, West Va., or Peter Burress, Braidwood, Ill.

Fig. 1

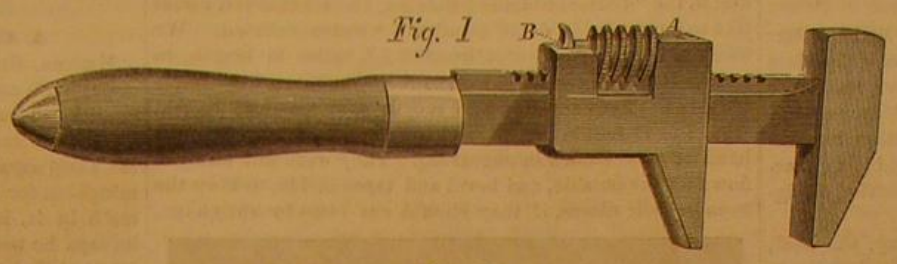
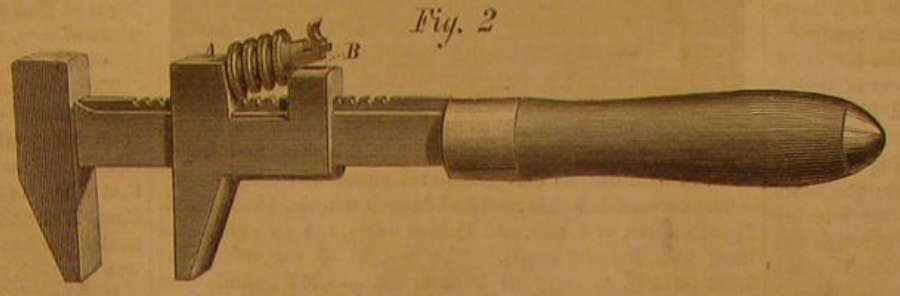
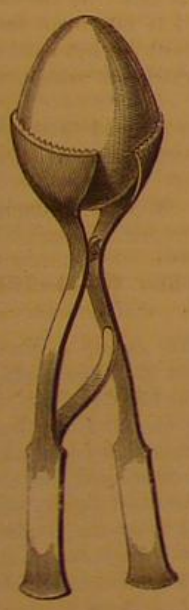


Fig. 2



BURRESS AND CLINE'S IMPROVED SCREW WRENCH.

EGG TONGS.



Mr. W. F. Hellen, of Washington, D. C., has patented, in this device, a very convenient and graceful table implement, by which hot boiled eggs may be handled without injury to the fingers.

The accompanying engraving shows the device so clearly that no explanation is needed. Lovers of hot boiled eggs will find this article a great addition to the luxury of eating them as hot as desired, as by their use, an egg may be held without discomfort; and the end of the shell being removed, the remainder of the shell forms a cup in which the egg may be seasoned and prepared for eating. Another advantage is, that the fingers need not be soiled by the contents of the shell, when eggs are eaten, as they always ought to be, soft boiled.

American Iron Ships.

The Wilmington (Del.) *Commercial* states that on the 11th March, the ship-yards of Wilmington sent away a splendid iron sea-going steamship, of over 1,600 tuns capacity. On the 18th inst., they sent away another iron steamer, intended for the Chesapeake Bay service, of about 500 tuns. Three more iron vessels are now being built in the Wilmington yards, one of which will be a heavy sea-going steam propeller, of 2,000 tuns or over, intended for the Boston and Baltimore trade; another is a Government steamer, built under contract with the Treasury Department; and the other a lighter, of comparatively small tunnage, intended for South America.

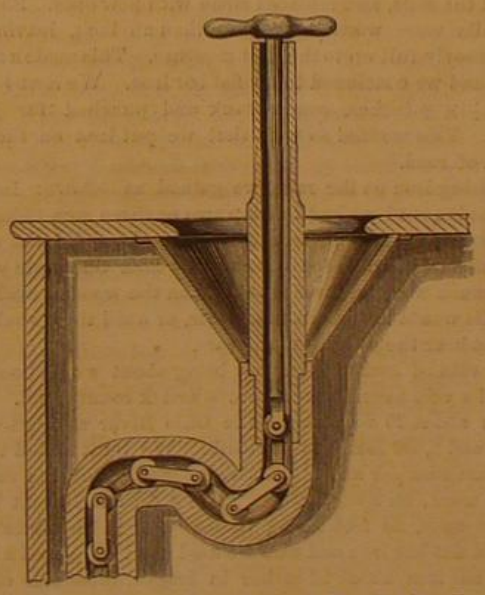
It says that the Wilmington yards can build the like of any ocean steamer now in use, except the *Great Eastern*, and can do the work well and promptly, and adds that they have built more iron vessels than all other yards in the United States put together, which we believe is the fact.

The Denver Artesian Well.

The Denver *News* gives an interesting account of the progress, difficulties encountered, and encouraging prospects of the artesian well, commenced last summer on one of the hills east of the city. The necessary tools, engine, and men were procured, a shaft sunk to the bed rock, and boring commenced. At 250 feet the water rose 80 feet. The strata passed through, being a soft soapstone, there was great difficulty from caving, but the bore was carried down to 430 feet, when casing became indispensable. Two hundred and sixty feet of casing were ordered and put in without trouble, but more was necessary. Two hundred feet more were ordered, but were two months in arriving. Then, after great trouble and some delay, enough casing was put in to make 396 feet, when a slide deflected the column one joint above the lower end. Then came more trouble in straightening it; then came the cold December snap, freezing up everything. Since the weather moderated, the pipe has been straightened and boring recommenced. At 530 feet the soapstone was passed, and a stratum of fine-grained sandstone entered. With it came a powerful stream of water, filling the well 300 feet. Then came more caving, and drilling had to stop at 535 feet. The casing was afterwards driven nine feet, and will be pushed down and drilling recommenced. The water has risen to within 120 feet of the surface, high above the streets of Denver, and is pure and soft. It is believed that 250 or 280 feet further will give a flowing well. The work so far has cost $6,000, and a few citizens have borne the burden. At a meeting of the subscribers it was resolved to ask the city and county each to contribute $2,000 to complete the work. Considering the public benefit conferred if the well be a success, as it seems likely to be, there is little doubt that the city and county both will help the enterprise through. The same machinery will be available to sink many wells in different parts of the country, providing this be carried to a success.

DEVICE FOR CLEANING TRAPS IN SOIL PIPES.

Considerable trouble is often experienced in cleaning the traps of water closets, soil pipes, etc., when they have become clogged. Our engraving shows an ingenious device for this purpose, invented by James Wright, of New York city, and patented in June, 1867. It consists of a series of links, with



friction rollers at the joints, connected with a handle which works through a vertical tubular guide. This is a useful implement. Its operation is so well shown in the engraving that further description is unnecessary.

Curiosities of Genius Relating to Inventions.

It must be taken, we suppose, as a proof of the versatility of genius, that we always find that the professions and trades of these intractable inventors have not the remotest connection with their valuable mechanical, chemical, and warlike discoveries. Thus, a clergyman may send breech-loaders and tremendously destructive shells, while the nurseryman and market-gardener proffers improvements in surgical instruments, and the doctor a contrivance for forwarding the ripening of fruit on walls. One grocer demands space for the exhibition of a new axle, applicable to all carriages, a new projectile for ordnance, and a new method of propelling ships. An M.A. and F.R.G.S. has models of an invulnerable floating battery, a breech-loading gun and carriage, a means of converting guns of old pattern into breech-loaders, a refuge buoy, a beacon, a cork poncho mattress, a life, limb, and treasure preserver, an unfoulable anchor, and some new screw propellers. An accountant asks space for a model of a self-acting water-closet, with water, meter, and apparatus for regulating the flow of water, all in one; the model of an improved theodolite, and an omnitonic flute, all to be shown together! A bookseller seems overflowing with invention. He has a plan of interminable suspension, applicable to bridges, aqueducts, etc., of great span or length, and by which he means to do away with the costly supports hitherto used; a target-shooting protector for the safety of those employed to note the score; a new paddle-wheel, by which to secure a greater amount of power than is attainable by any other arrangement; a self-acting railway signal, for day and night, and bolts for gates at level crossings, whereby to prevent the gates from being opened while a train is within a quarter of a mile, or any convenient distance; a safety-spring mining cage, to secure the safe lodging, or prevent the falling, of the cage, in its ascent or descent, when conveying men or goods up or down the mine shaft, should the rope or chain break, or become disarranged; a new window sash fastening and door bolt, by which to attain perfect security, from the impossibility of unfastening them from the outside. A barrister wishes to exhibit two architectural designs; a pair of spring-heeled boots, and a drawing of a man equipped with them; diagrams of Coryton's system of fairway lighting off the coasts of Great Britain; a type-composing machine and hand-stamp; models and drawings illustrative of Coryton's atmospheric guide propeller, and Coryton's self-adjusting sails. An insurance broker has specimens of wines and other fluids, fined by a new and more effective process, and a model of the apparatus used; electric telegraph cables and conductors; model of an improved ship, and of parts thereof; specimens of improved pavement in carriage roads; specimens of improvements in iron houses, etc.; specimens of building stone, preserved by a new material; model of a machine for dressing stone; specimens of improved junctions of iron pipes, to prevent breakage; specimens of a new description of embroidery; specimens of paper hangings; specimens of an improved floor cloth. These, likewise, are all to be shown together.

[We find the above in one of our exchanges, and we can fully confirm the correctness of the theory, that inventions intended for a specific trade are most apt to originate with those who have no connection with the business—mere lookers on, who see what is needed more than they feel it.

COMBINED PRUNING HOOK AND SAW.



This combination is a useful and convenient one. The saw is used to sever such branches as are too large to be cut off by the hook, and the tool, when placed on a handle of proper length, will save a vast amount of laborious climbing, in the pruning of fruit trees. The engraving well illustrates the form and construction of the implement. It is the invention of Jeremiah Schroy, of Fortville, Ind.

Such inventions as this, which require neither large ingenuity in the devising, nor large capital in the manufacture, if they combine usefulness with cheapness, scarcely ever fail to reward their inventors. The little things that a great many want, pay better than the large ones that are only required by a few.

Malt Without Germination.

The process of malting, as is well known, consists in steeping barley in moisture till germination has commenced, and then roasting the malt to arrest the growth. When done, the product easily yields, to water, a saccharine principle, making a sirup or "wort," easily fermentable; and when fermented, giving a large proportion of alcohol. The time taken in malting, and the troublesome nature of the somewhat delicate process, has led many chemists to search for means of producing a wort artificially, but as yet the organic matter has defied synthetical imitation. But a new invention is announced, by which a wort can be produced from barley, without germination. The process is as follows: The barley (fifty parts by measure) is put into a vessel, and steeped in thirty parts of sulphuric acid diluted to one per cent; the vessel is then covered lightly, and placed in a water bath, kept at a steady temperature of 105° Fah. The vessel must be left in the water bath for seventy-two hours, and the contents frequently stirred to insure contact of the acid with all the barley. At the end of the process of steeping, the barley becomes soft and easily crushable, the silica in the bran being destroyed by the acid. It should be dried, and then has the appearance and smell of malt, and, we are assured, makes an excellent wort. The saving of time and trouble are altogether in favor of this process, which the inventor, Dr. Fleck, of Dresden University, has lately discovered, and on which he is now laboring with a view of rendering it easy and practicable on a large scale.

DRILL LUBRICATOR.—In drilling wrought iron, use one pound of soft soap, mixed with a gallon of boiling water. This is a cheap lubricator; it insures working with great ease, and clean cutting by the drill.

Correspondence.

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

Dangerous Oils vs. Dangerous Lamps.

MESSRS. EDITORS:—I notice on page 148 of present volume, that Mr. Chas. B. Mann aims a blow at glass as a material for kerosene lamps. He has hit the nail on the head. So long as the low value of the light petroleum fluids offers large inducements to cheat, all legislation will fail to protect us from the horrors of kerosene burning. Of all substances, glass is the most unfit for kerosene lamps. A large portion of the accidents which result in death, are caused, not by explosions, but by the accidental breaking of glass lamps, which may occur in a thousand different ways.

Another large class of accidents, though but little understood, are those resulting from unequal expansion of the glass by heat. Being a very poor conductor of heat, the large amount generated by the burner is concentrated around the collar and top of the lamp, while the lower portion remains cool, causing the heated portion to expand, producing fracture. The lamp falls in pieces, and the overheated oil ignites.

Experiment also proves, that in a glass lamp, the heat, which cannot escape, is conducted by the oil in the wick down into the body of the oil, raising the temperature many degrees above that of the outside of the lamp, or the surrounding atmosphere; while in a metal lamp this heat is spread over the whole surface, and is rapidly dispelled by the air, leaving the oil cool. In order to test this matter, I placed, side by side, a glass and a metal lamp, containing the same kind of oil, and using the same kind of burner; the other conditions being as nearly as possible alike. After burning two hours in a room, at 71° Fah., I introduced, through the feeder, the bulb of a thermometer into the oil. In the glass lamp, the mercury indicated 104°, while in the metal lamp it only indicated 79½°. The collar and a small portion of the glass fount were very warm, while the main portion of the glass was cool; showing that the temperature of the glass is no indication of that of the oil within.

Many of the burners now in use conduct downwards but little heat, while others conduct an amount sufficient to bring almost any oil up to the flashing point. No glass lamp is safe from accident. I have known a shuttle to fly from a loom, breaking a glass lamp, and setting fire to the mill, which was saved only by the flames being smothered with a large amount of valuable cloth which happened to be handy.

For household purposes, I believe the rule I have adopted, at my house, to be safe. I have one or more lamps in each room, on stationary brackets, out of the reach of children, and only use one lamp to carry about the house. These lamps are all metal, and cost but $3 per dozen, and are more ornamental than my old glass lamps, costing three times that amount. I believe them to be absolutely safe. My cans are so constructed that the oil in filling the lamp, is filtered through sand, so that no fire can possibly communicate with the interior. Give us safe, cheap, metal lamps and safe cans, and, in spite of legislative failures, we shall be comparatively safe.

J. B. FULLER.

Norwich, Conn.

Petroleum Dangers.

MESSRS. EDITORS:—I am glad to see that petroleum dangers are at last exciting the attention they deserve; and it is to be hoped that we shall soon have the proper remedies. I had intended to write an article on the subject, but your last correspondent, Mr. Mann, of Baltimore, has nearly saved me the trouble, by expressing my views exactly: namely, that all petroleum oils are likely to generate an explosive vapor, when long confined with a vacuum above them, and subjected to a moderate heat; and that although thousands of gallons of positively dangerous oils are daily sold by ignorant and villanous dealers, yet the lamps in common use are as much at fault as the oils, as disasters have occurred with the best of oils. Now this state of things, I think, can be easily remedied, and I would offer the public a few suggestions:

First. Let us have lamps so constructed as to be as far as possible proof against accidents, and on such principles that any oil may be burned in them with perfect safety by careful and intelligent persons. Second. Let us have legal enactments, forbidding, under severe penalties, the sale of all light and volatile oils, for domestic purposes, and requiring all retailers to have their stock inspected, and proved to be unignitable at 110° Fah. Third. Let benzine and all the volatile products of our oil wells be used in specially constructed lamps for street lights, light-houses, etc., superintended by careful and competent hands, and in situations where, if an accident did occur, it could do no great damage.

I have frequently used pure benzine, with great success and economy, for light and for cooking meals, taking great care to have my lamp so full as to leave but little vacuum, and having the wick so tight that the flame could not pass down it; and never letting the bowl get above 80° Fah. But, though I could do this with perfect impunity, I should consider myself a murderer if I introduced such a practice to the public, as the world always will be full of people too stupid or careless to be trusted with even tallow candles.

Now, I would point out some of the defects of our common lamps. Fragile glass bowls, mounted on high stalks often slightly fastened to narrow bases, itching to be knocked over and broken; short wicks passing loosely through short tubes, the flame only an inch above the bowl, in the top of which explosive vapor more or less always accumulates, as the oil heats and exhausts, the looseness of the wick giving free passage from the flame to the vapor: these things seem to be a combination peculiarly designed to invite disaster. I also object to the nicked wheel in the tube; though very convenient for turning the wick up or down, it will not work when the wick is tight enough to prevent the flame from being conducted downwards by the ascending vapor. A simpler and safer plan is to have the top of the burner, with the chimney, to swing over on a hinge, when the wick can be regulated with a pin or an awl.

With better lamps and good oil, the world may use petroleum, and suffer no more from it than it did in past times from tallow.

LINDON PARK.

Brady, Pa.

Wooden Railroads.

MESSRS. EDITORS:—In your valuable paper of February 4th, in the "Correspondence" column, I notice that you would like to hear more in detail about the wooden railroad. We built, in 1865, a wooden railroad, $3\frac{85}{100}$ miles in length, to transport coal, by mule power, to the Ohio River, near Rockport, Ind. The cross ties were mostly split out of white oak, from 7 to 7½ feet in length; and the notches were sawn with hand saws, as shown in engraving. They were cut straight down on the outside, and bevel and taper inside, to keep the keys in their places, if they should get loose by shrinkage.



We placed the ties from 2 to 2½ feet from center to center. We used the best white-oak rails 3 × 6 inches, and keyed them in with oak, so that the bevel space was filled.

The cars used on this road had 24-inch wheels, 4 inch tread, 1½ inch depth of flange, and 2½ inch axles, run in cast boxes lined with Babbitt metal. The weight of car was about 1,500 pounds, to carry 60 bushels coal—4,200 pounds (the Indiana bushel is 70 pounds); in all about 3 tuns per car. The cars ran smoothly and easily for six months, when the rails began to get soft, and to splinter for a quarter of an inch of depth. They were much the worst where the sun shone on them, during the summer months. About two miles of this road was through timbered land, and the rails in the shade lasted much better than those exposed to the sun.

The next trouble we encountered was in frosty weather; the splinters or mashed wood would stick to the wheel, and wind around it like rope, until it would run out with the grain of the timber, or break off at a knot.

In less than twelve months the road was rough, and we turned the rails, and replaced some with new ones. Some of the rails were worn down more than an inch, leaving the knots nearly full up to the first measure. This made a rough road; and we concluded to try flat bar iron. We sent for ten tuns 1½ × ⅝ inches, countersunk and punched for ½-inch spikes. This worked so well that we put iron on the full length of road.

By using iron on the rails, we gained as follows: 1st. On the wooden road we had to keep two or three men to keep it in order; as soon as the iron was on, one hand did the work, and had half his time for other work. 2nd. One mule would do as much work as three would do on the wooden road, and the rails would last about four years, or until they would rot and not bear the weight of the cars.

The vein of coal at this place being about worked out, we opened a vein near Yankeetown, Warrick county, Ind. This vein is about 20 feet above the Ohio River at high-water mark, and 8,530 feet from its bank. We built a road to the river last summer and fall. About 6,000 feet of this road is trestle work, on river bottoms, from 3 feet to 16 feet high, 10 feet span, 20 feet string timber (6 × 11 in white oak.) The old flat bar iron and cars are used here. We used a piece of flat bar iron, about 18 inches in length, alongside of the flat bar at every joint, so that the ends of the iron are not mashed down into the timber to make it rough. This road is properly graded, the steepest grade with the loaded cars being 9 inches to the 100 feet. Three mules bring five cars up this grade, which is on trestle work, 10 feet high, planked with 2-inch lumber. We are not in full operation yet, but expect that one team of three mules will haul from 2,000 to 2,500 bushels per day to the river. We shall put on a small engine, as soon as we are able and find one to suit us. A six tun engine would do our work, we believe.

The flat bar iron cost us near $1,100 per mile; ties, about 12 cents apiece—we used our own timber. (Cutting ties cost 5 cents; sawing notches and trimming out, 5 cents; hauling out of woods, 2 cents.) We had to purchase some oak lumber, not having enough on our land. Price paid was $16 per thousand, delivered along the road. We used near 325 thousand feet of lumber, on the road and a few miners' shanties. Our vein of coal is from 4 feet to 4 feet 2 inches thick (what miners call "blasting coal.")

All that we can say to those building wooden railroads is, they will not be long in using flat bar iron on their roads; by so doing, they will save many a dollar in the way of repairing rails, etc.

Narrow gages and light T iron will take the place of the wooden roads in a short time, if cheap railroads are wanted. The T iron is a little more expensive at first, but in two year's time it will pay for the difference in keeping the road in order.

J. M. SPEER, SR., & SONS.

Warrick county, Ind.

Payne's Electro-motor.

MESSRS. EDITORS:—From the interest I feel in the production of an "electro-magnetic motive power," I am induced to say a word in relation to the article which appeared in the *Telegraph Journal*; and I was very properly placed in doubt by your article of the 11th inst. In the description given by the writer who was privileged to see the wonder that is to turn the world upside down, he distinctly states that there were five magnet cores equidistant in the fixed ring, and six in the revolving set, thereby avoiding any dead center. Now any person giving such an arrangement a little attention, will readily come to the conclusion that there must be a dead center in any and every possible position; therefore the engine's moving at all can only be accounted for by supposing that it was, in some way, coupled to the source of power which drove it, which would, at the same time, solve the problem of the brake. It would not be very difficult to ship and unship a coupling by means of the electro-magnet.

Montreal, C. E. POLAR.

A Circular Saw Eighty Years Old.

MESSRS. EDITORS:—Mr. John Coop came into our factory to-day with an old rusty circular saw, about 16 inches in diameter, 18 gage, with four cross-cutting teeth to the inch, and a one inch and a quarter square hole in the center Mr. Coop says that he made the saw; that is, he sent to Birmingham for the steel, and cut out the saw, and filed the teeth in it, in a dockyard in England, eighty years ago; he says he used it for sawing, running it in a lathe, and calling it at that time a "fly saw." Mr. Coop is now nearly 95 years of age, and made this saw when a boy of about 14 years old.

The old gentleman claims that this is the first circular saw that was ever made in England. I tried to purchase it from him, but he would not dispose of it. He wanted it cleaned up, as he said, to carry to Florida with him, saying that when he dies he means to have that saw with him. Mr. Coop is certainly a rare specimen of longevity and perfect health; he has always lived temperately; eats no meat, never was married, and never has seen a sick day.

Pittsburgh, Pa. J. E. EMERSON.

How to Select Right or Left Hinges Instantly.

MESSRS. EDITORS:—The following simple method of selecting right from left-handed loose jointed butts or hinges, may be useful to many of your readers, as it has often saved me considerable trouble and annoyance in sending inexperienced persons to the stores for such articles: Take up the closed hinge from the counter, and open it from you, holding it in both hands; if you wish for right handed ones, hold fast with the right hand, letting go the left. If the hinge remain intact it is right handed, but if it fall to pieces, or apart, it is left handed. Holding fast with the left hand and letting go with the right, will prove which are which, by a similar test.

I have seen many a score of people puzzled to tell one hinge from another, until I showed them the above simple plan, when it was a mystery no longer.

Eastport, Me. W. A. MACKENZIE.

[For the Scientific American.]

WHAT BECOMES OF ALL THE STEEL PENS?—THEIR MANUFACTURE.

When at the works of Messrs. Thomas Jessop & Sons, in Sheffield, Eng., I was informed that *six hundred and thirty-one tuns* of sheet steel was manufactured and sold in 1868, to be manufactured into steel pens. I was about writing home, and dared not give the quantity, fearing that I was misinformed. Next day I returned to the office, and the clerk turned to the books and showed me the exact figure, which was something over 631 tuns. This is from one establishment, others making steel for pens also. Each tun of steel averages about 1,000,000 pens, making a total of 631,000,000.

What becomes of all the steel pens? Is it not reasonable to presume that the most of them are thrown away? How common it is to pick up a steel pen, the nibs of which are stuck together, to pull it out of the holder and throw it into the stove, and put in a new one! Then this is too soft, or too stiff, too fine, or too coarse, or does not make a fine hair line. For the least trifling fault, it shares a similar fate; and a trifling vexation often empties a whole box into the waste basket. Nobody considers the cost of a steel pen. Well, that's where the most of them go.

Now, this enormous and almost incredible quantity of steel for pens excited my curiosity, and I was curious to see how they were made in England. I took a letter of introduction to Mr. Gillott, and, calling on that gentleman, at his manufactory in Birmingham, was cordially received by him in person; and I was conducted through every department of his immense establishment, employing 600 operatives, mostly women, turning out about 20,000 gross of steel pens daily, comprising, at that time, thirty-three different varieties. First, the sheet steel, as it comes from the steel works, is cut into strips, generally wide enough for two pens in length; the scale is removed by acid, and the steel cold-rolled into strips. One of these strips is now seen feeding into a machine, which first stamps the name on it; at the next move it is under the die, and cut out into flat blanks. These are then formed into proper shape, by dies in a drop press, one by one. They are then taken to the tempering room, placed in small sheet-steel boxes, holding about a pint, and heated in a furnace to a cherry red; then poured into a hardening bath of an oil mixture, falling into a perforated dish. The bath is raised, the oil drained out from among them, and they are wiped clean. Then they are put into a regular coffee roaster (as I called it), holding about half a bushel, and turned slowly, by a hand crank, over a slow charcoal fire, until they are of a proper spring temper. They are then placed in tin cans, holding say half a bushel, and these cans are put into frames, and run by belts, like a tumbling barrel, until the pens are polished, and all the sharp corners worn off. They are then

ground and polished at the points, on one of the most ingenious little machines that I ever witnessed in operation. A small iron cylinder, or wheel, is running horizontally, with a slow motion; a grindstone is also running horizontally, with its edge close enough to the cylinder to grind each point, as it turns past its face; next is a polishing wheel, running in the same direction and position, polishing the pen as it passes. By an ingenious little spring contrivance, the pen is held until it passes the grinding and polishing wheels, when it is let go, and drops into a box. The operator stands and drops them into the receptacles as they pass.

The next operation is slitting the points; this is done after they are tempered. The instrument used for this purpose is similar to a pair of shears. The pen being placed in a guide by hand, the slit is made just deep enough to cut through the steel and allow the points to spring into place again.

Mr. Gillott claims to be the original discoverer of the process for splitting the pen after it was tempered, performing that operation, in a secret room, for years before the process was discovered by others. He commenced life as a penknife grinder, and by this simple discovery was led to fortune. Slitting them while in a soft state, as was formerly done, left the points open, so that it was necessary to close them by hammering, a most tedious and costly operation.

Mr. Gillott informed me that he imported all of his finer quality of paper from France, for the covering of boxes, as it was not manufactured in England. This establishment consumes about 150 tuns of steel per year.

Mr. Gillott, noticing my fondness for mechanics, called a workman and had him take apart several ingenious machines, explaining to me the several parts. This liberality I very much appreciated. J. E. E.

THE WORKING OF THE NEW YORK FIRE DEPARTMENT.

A writer in the *Evening Post* gives a very interesting account of the successful working of the New York City Fire Department.

In 1860, the amount of home and foreign fire insurance capital in this city was $32,000,000. In 1870 it was $51,000,000. The ratio of fires was greater under the old volunteer, than under the new paid system, which went into operation in 1865. Each engine house has one steam fire engine, with two horses; and one tender, with one horse, to carry hose, fuel, and apparatus. Each of these houses has a company of twelve men. They are provided with comfortable lodgings within the houses, and are, night and day, in constant attendance, except when at meals, which are taken near at hand. It provides the requisite hook and ladder companies of twelve men each, with the same quarters and regulations.

There are now 45 engine houses and 15 trucks for hook and ladder use, making a force of 165 horses and 720 men. There are 5 commissioners, who control the department, a central headquarters, chief engineer, secretary, medical officer, telegraph alarms, bureau of combustible materials, and firemen's library. To these officers are to be added 10 district engineers and 1 chief assistant, who devote their entire time to the service.

THE FIRE TELEGRAPH.

The system of telegraphy in use is the patent of John N. Gamewell, but the machinery to carry out a more perfect system for this city—the batteries and automatic street boxes—are the invention and patent of Mr. Charles T. Chester, one of the most accomplished electricians. Colonel Stephen Chester, of the Potomac Army Engineers, directed the surveys and the erection of the lines to complete it. The entire work—posts, wires, and machinery—cost about $600,000. There are 84 stations, including engine houses, insurance patrol stations, and officers' quarters, to which to send messages, and 540 street boxes, from which alarms of fire may be sent to the central office. The telegraph alarm apparatus, under the hand of a good operator, works with a rapidity and certainty before unknown in electrical apparatus. It consists, in brief, of three parts:

1. A receiving apparatus, which has the capacity to receive and note 56 alarms of fire, from all parts of the city, at one and the same time. With this apparatus the modern hotel annunciator is so connected, that it instantly drops a figure, showing the line of wire over which the alarm is coming, and at the same instant marks, upon a coil of paper, the number of the station. Each of the 56 wires, which together cover the whole city, includes a given number of stations, and it required great skill to arrange them that they do not interfere one with another, since a part or all might be in use at the same time. Fifty-six pens, moved by 56 relay magnets, are arranged under this coil of paper. Each pen and magnet is connected with some one of these 56 wires. The street boxes are so arranged that, when an alarm is to be sent to the central office, the current of electricity, which always flows through the line, may be broken so as to cause the discharge of any one of these little magnets. This works 4 results in the receiving apparatus at the office, namely: strikes a loud gong or bell, throws into view the number of the wire on which the alarm comes, starts the register wheel, and marks the number of the box where the alarm is made.

2. A transmitting apparatus, equally beautiful, instantaneous and perfect in its work.

3. An apparatus for testing the condition of all these wires; for discovering at once in the office any break or injury within a few yards of its actual locality; or for testing the connection of any of these lines with exterior lines going out of the city.

At all times, night and day, two operators are on duty at the central office. When an alarm is given, the precise engines and trucks which should answer know it. If the fire spreads, and a second alarm is given, those who should respond know it; and so of a third, which brings into action all the force that can possibly be required.

RAPIDITY OF THE SERVICE.

The horses are all selected, groomed, and kept in the best manner. They are kept in sufficient force already harnessed, and so surprising is their instinct and so admirable their training, when the electric gong strikes in the engine house, they back instantly from the stalls into position before the engine, the doors are flung open, and the engine starts on an average in 22 seconds after the alarm is received, often in 18. An alarm, reaching the central office, is transmitted to every engine house, patrol station, and officers' quarters' all over the city, in 45 to 50 seconds. If we add to this instant movement and rapidity of execution, the most perfect fire apparatus which modern science and skill can devise, the unflagging power of steam, an enlarged and skillful method of instructing the officers and men in classes, which General Shaler, president of the Board, has personally introduced, the effective power of this small force stands in bold relief over that of the volunteers when they numbered even 3,800 men.

The causes which elevate and give a higher moral character to the new force are equally effective. The lyceum, in the hall of the central office, now contains a valuable library of 6,000 volumes, the gift of underwriters and private citizens, comprising largely choice biography, travels, history, and practical science, from which all the members of the force can draw and use. Dr. Charles McMillan, the medical officer of the Board, has done much to this end, in his strict examination for admission to the force, in rejecting men of bad habits or physically unsound, and in maintaining a system of competitive examination for promotion, which rests on merit alone.

LOSSES BY FIRE.

The following table of losses by fire from 1866 to 1870 shows unmistakably the good financial results of the system:

	No. of fires.	Loss.
1866	796	$6,428,000
1867	873	5,711,000
1868	740	4,142,000
1869	850	2,626,000

Of the 850 fires in 1869, 807 were confined each to one building, showing the promptness and efficiency of the efforts to subdue them.

The cost of maintaining the present service is about $950,000 per annum; a sum well invested, when we compare it with the immense losses to which we are exposed, and keep in view the growing intelligence, manly habits, and pride of character which the discipline of the organization most sedulously fosters. It is most favorable, when compared with the service and the cost of the old volunteer department. The direct cost of that, per annum, was above $500,000, but the indirect expense in other forms was proved before a committee of the legislature to have swelled the sum to rising $1,000,000. The above table, from the careful reports of the insurance department, shows a reduction in losses, from 1866 to 1869, of $3,800,000; and the losses in 1870, since the new charter went into operation, were $506,000 less than in 1869, while the moral and effective character of the force has improved more than in any previous period.

Is the Interior of the Earth Solid or Fluid?

Although the doctrine that the earth is a molten sphere, surrounded by a thin crust of solid matter, was once almost universally taught by geologists, there have of late years been brought forward several arguments to the contrary, which, apparently, are more in favor of its being a solid, or nearly solid mass throughout; and these arguments are fully entitled to our consideration, as our object is not to defend any particular theory, but to arrive, as nearly as we can, at the truth. I will, therefore, in the first place, proceed to scrutinize all which has been brought forward in opposition to the older hypothesis, and then to consider whether any other explanation yet advanced is more in accordance with the facts of the case.

First of all, we are to answer the question as to whether it is possible for such a thin crust to remain solid, and not at once to become melted up and absorbed into the much greater mass of molten matter beneath it? This latter would doubtless be the case, if the fluid mass had any means of keeping up its high temperature, independently of the amount of heat it actually possessed when it originally assumed the form of an igneous globe. The question, however, in reality answers itself in the negative, since it is evident that no crust could even commence to form on the surface, unless the sphere itself was at the moment actually giving off more heat, from its outer surface to the surrounding atmosphere, than it could supply from its more central parts, in order to keep the whole in a perfectly fluid condition; so that, when once such a crust, however thin, had formed upon the surface, it is self-evident that it could not again become melted up or re-absorbed into the fluid mass below.

This external process, of solidification due to refrigeration, would then continue going on from the outside inwards, until a thickness of crust had been attained sufficient to arrest, or neutralize (owing to its bad conductibility of heat) both the cooling action of the surrounding air and the loss of more heat from the molten mass within; and thus a stage would soon be arrived at when both these actions would so counterbalance one another, that the further cooling down of the earth could be all but arrested: a condition ruling at the present time, since the earth-surface, at this moment, so far from receiving any, or more than a minute amount of heat from the interior, appears to depend entirely, as regards its temperature, upon the heat which it receives from the sun's rays.

We have next to consider the argument that, if the earth's exterior were in reality only such a thin covering, or crust, like the shell of an egg, to which it has often been likened, that such a thickness would be altogether insufficient to give to it that stability which we know it to possess, and that, consequently, it could never sustain the enormous weight of its mountain ranges, such as, for example, the Himalayas of Asia, or the Andes of America, which are, as it were, masses of rock piled up high above its mean surface-level.

At first sight, this style of reasoning not only appears plausible, but even seems to threaten to upset the entire hypothesis altogether. It requires but little sober consideration, however, to prove that it is rather, so to speak, sensational in character than actually founded on the facts of the case; for it is only requisite for us to be able to form in our minds some tangible idea of the relative proportion which the size of even the highest mountain bears to that of the entire globe itself, to convince us, if such a crust could once form and support itself, that it could with ease support the weight of the mountains also. The great Himalayan chain of mountains rises to a maximum altitude of 31,860 feet, or six miles above the level of the sea; and if the earth could be seen reduced in scale down to the size of an orange, to all intents and purposes it would look like an almost smooth ball, since even the highest mountains and deepest valleys upon its surface would present to the eye no greater inequalities in outline than the little pimples and hollows on the outside of the skin of an ordinary orange. If this thin crust of the earth can support itself, it is not at all likely to be crushed in by the, comparatively speaking, insignificant weight of our greatest mountain chains; for, in point of fact, it would be quite as unreasonable to maintain such a disposition, as to declare that the shell of a hen's egg would be crushed in by simply laying a piece of a similar egg-shell upon its outside.

That a very thin spheroidal crust, or shell, enclosing a body of liquid matter, such as an ordinary fowl's egg, does possess in itself an enormous degree of stability and power to resist pressure from without, is easily demonstrated by merely loading a small portion of its surface with weights, as long as it does not give way under them. Even when placed on its side (or least strong position), it is found that a portion of the shell, only one quarter of an inch square, will sustain several pounds' weight without showing any symptoms of either cracking or crushing; or, in other words, this simple experiment indicates that if the external crust of the earth were but as thick and strong in proportion as an egg-shell, it would be fully capable of sustaining masses, equal in volume and weight to many Himalayas, piled up one atop of another, without any danger whatever to its stability.—*Extract from a Lecture by David Forbes, F. R. S.*

The Revenue of the Patent Office.

For several years past, the funds received at the Patent Office, from inventors, for the transaction of their business, have been, by act of Congress, turned over to the Treasury, and the Patent Office sustained by specific appropriations, yearly made for that purpose. We desire to call attention to the injustice and unfairness of this matter. The Patent Office is not only a self-supporting office, but its revenues are large and flourishing, and steadily increasing. Transferring to the Treasury, the moneys received by this bureau from inventors and other applicants for patents, is raising revenue from a source whence it should not be done; while appropriating from the Treasury to sustain the Patent Office, tends to create the impression that it does not support itself.

The money paid to this office is not a legitimate source of revenue to the Government. It comes from individuals, and is paid into the exchequer of the Patent Office for a specific purpose, that of facilitating the business of these individuals. It is unjust and unfair to divert a cent of it for other purposes. In our opinion, all the moneys received at the Patent Office should be used solely to carry on the business of that office, and to give increased facilities for the transaction of that business.

As the law now stands, we apprehend there is more of delay and obstruction in the dispatch of current work in this office, than there should be. The office is crowded for want of room, and inventors are compelled to wait for months ere their affairs are brought to a final and successful termination. The Commissioner of Patents and his entire force of assistants devote themselves with unusual and most commendable energy and faithfulness to the prompt and speedy performance of their duties, but they find it a matter of impossibility to proceed as fast as they desire, and as rapidly as the necessities of the work demand.

Every application for a patent, or claim for an extension, etc., should be made almost immediately upon its being filed in the Patent Office, thereby assisting inventors and tending to increase the business of the office. If the Commissioner of Patents were empowered to retain and disburse, as the necessities of the office demanded, the moneys received therein, the speedy transaction of business would be insured. And we think Congress should look into this matter, and change the present mode of transferring Patent Office funds to the Treasury. Its revenues should be expended solely upon itself, and should not be diverted to any other purpose whatever.

[We copy the above remarks from the *Republican* (Washington city), and are glad to find that influential journal interesting itself in Patent Office reforms. The suggestions are worthy of consideration.

THE Glue Works, at Peabody, Mass., manufacture 2,260,000 lbs. per annum.

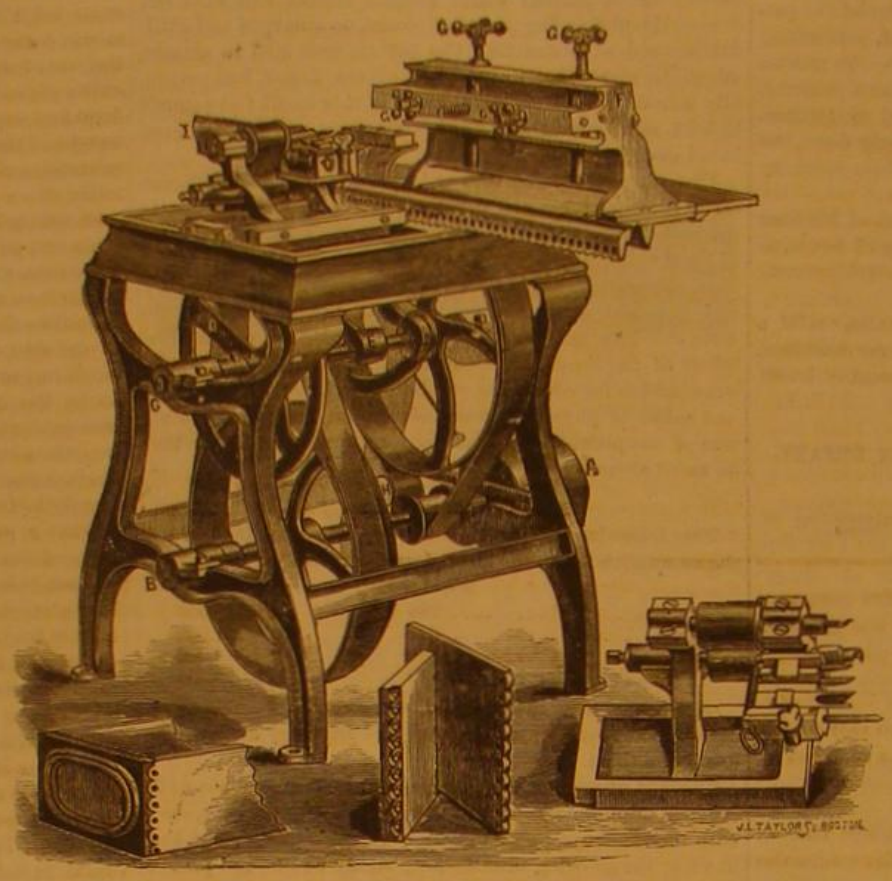
Knapp's Dovetailing Machine.

This machine is called a dovetailing machine, yet, although it makes an admirable substitute for the dovetail joint, the work it performs cannot strictly speaking be called dovetailing. The joint made by it is shown in the details at the bottom of the accompanying engraving. This joint, which is a combination of scollop and dowel work, will, we think, commend itself to all mechanics who examine it, as not only elegant in form and appearance, but strong, durable, and easily put together. It, therefore, matters little what name is applied to it.

The machine which does this beautiful work is extremely neat and compact, only occupying about a square yard of floor room. It receives its power from a belt passing over the tight and loose pulley, A, on the lower shaft, B, on which are a flange pulley, and a twenty-inch pulley, that, in connection with two arbor pulleys, runs a portion of the cutting tools.

On the upper shaft, C, is a pulley, connected by a belt with the flange pulley, and two cams, D and E. The cam, D, moves the tools into and from the stock being worked, while the cam, E, with a pawl attached, plays in a ratchet at the base of the sliding table, F, on which is placed the stock, moving it along to receive the operation of the cutting tools. On this table are placed four pieces of drawer stock, two fronts and two ends, which are securely held in their positions by means of the four compression screws, G G G G. This table carries along the work of two drawers at a time, taking drawers from eighteen inches in depth down; on this table are arranged groove gages, adjustable to the various sizes of drawer.

H is a binder pulley, worked by a cam and spring, which operates to stop the movement of the tool carriage, I; this carriage contains on the lower tier, a hollow augur that cuts the spindles on the fronts and backs of drawers, and on the upper tier, four tools to cut the ends, a bit that cuts the holes in the scollops, followed by two V tools and a gouge that form the scollop. The three latter tools are on an adjustable head, which may be thrown back or entirely removed while the pins and holes are being made for the backs of the drawers, or for any other purpose; these knives are retained in position by a thumb screw.



KNAPP'S DOVETAILING MACHINE.

The cam, D, in addition to moving the tool carriage, I, moves a guide pin in and out of the guide holes at the base of the stock table, F. The tools are all adjustable to suit light and heavy work, by a nut at the back of the tool carriage.

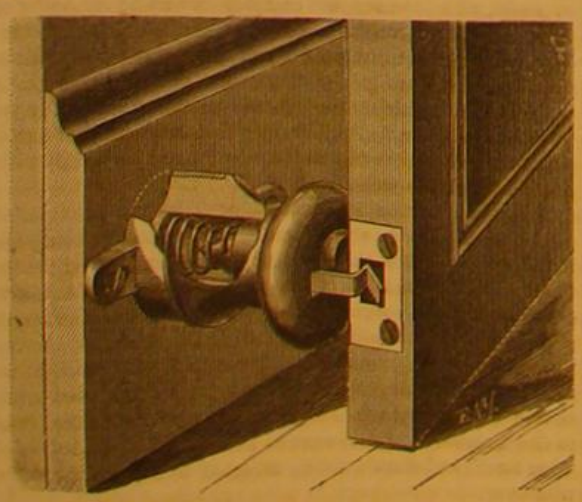
All the parts of the machine are made so that they can be reduplicated, in case of any accident or breakage. The countershafts are of tempered cast steel, and the boxes are all chambered and Babbitted.

It is claimed that an ordinary workman can make from 250 to 300 cabinet drawers per day with this machine, with an expenditure of only fifteen minutes per day in keeping the tools in order.

The machine has, we are informed, been introduced into some of the largest and best furniture manufactories in the country, and is giving the best satisfaction, as attested by many certificates shown us. Parties desiring to witness its operation can do so by calling at the furniture factory of J. T. Allen & Co., 48 Elizabeth street, New York. Further information may be obtained by addressing the Knapp Dovetailing Machine Company, Northampton, Mass.

IMPROVED DOOR STOP.

The device herewith illustrated is not open to an objection made to some other elastic door stops, viz., that, when the door strikes the stop, it is thrown back again. In this stop the door is not only stopped without shock, but is caught and held from rebounding.



Its construction will be readily understood on reference to the engraving.

A hollow pillar of wood, or other suitable material, is attached to a metallic foot-plate, screwed to the base board, in such a position that, when the door is swung open, a catch plate, let into the edge of the door, near the bottom, engages with a spring catch which projects from the hollow pillar.

In the hollow of the pillar is a cushion of wood or other suitable material, which rests upon a spiral spring, as shown, a portion of the pillar being broken away to show the arrangement of the interior. This cushion receives the shock, while the catch holds the door from recoiling.

Patented May 31 and December 13, 1870. Address, for further information, Fahrney & Donaldson, Rockford, Ill.

Proposed Revision of the English Patent Laws.

It appears, at last, that there is hope that the English patent laws are about to undergo wholesome revision. Mr. Hinde Palmer, Queen's counsel, who is reported to be a friend of the working man, has taken the business in hand, and proposes to bring in a new bill, based upon sounder principles. It is expected that Mr. Macfie and Mr. Samuelson, who go for the get-all-for-nothing principle, will do all they can to defeat Mr. Palmer's reforms. The patent system in England ought to be amended, so as to recognize the primary right of the inventor to take the patent, and thus put a stop to the legal stealing of other men's ideas.

JOHNSON'S IMPROVED ADJUSTING PLUMB AND LEVEL.

The quick and accurate adjustment of a plumb and level is something which will appeal to the common sense of every mechanic as a great convenience. The level shown in the engraving has attached to it a provision for leveling which is both extremely simple and accurate.



The spirit glass in the level is set in an iron case, which is connected to the top plate by means of the screws, which pass through a flange at each end into a brass nut below. A spiral spring surrounds each screw, and the adjustment or inclination of the level is secured by contracting or expanding either one by means of the screw.

The level can also be adjusted by means of the long spiral springs, so as to work at an incline of a considerable angle.

The plumb tube is connected with a pivoted arrangement, which enables it to be adjusted by means of a center screw in the face plate, on the edge of the level. Therefore, to adjust plumb, it is necessary to simply turn the center screw to the right or the left, as the case requires.

The action of the center screw on the plumb tube operates to move it radially about the pivot, a very slight movement of the screw being sufficient to perform the adjustment.

The length of the springs enables the user of the instrument to set his own glasses easily and perfectly, while the liability to breakage is decreased.

A point of superiority claimed for this improvement, besides those already mentioned, is, that the iron case slides on screws which are threaded in brass nuts below. This enables the box to move through greater space, and does not strain the thread of either screw or nut; while brass will hold a stronger thread than gray cast iron.

This tool is more especially designed for machinists and other mechanics requiring great accuracy in levels and plumbs. In the old way of setting the glasses in plaster, no matter how perfect the level may be at first, there is a liability to some change by shrinkage in the wood, which impairs the extreme delicacy of the instrument, so that while it is perhaps sufficiently accurate for ordinary kinds of work, it will not do for the leveling of very nice machinery, etc.

Patented Jan. 20, 1868. For further particulars address William Johnson, Hedenberg Works, Newark, N. J.

How to Keep a Situation.

The following bit of good advice is from the *Working Man*, and is worthy the attention of all our readers:—

Lay it down as a foundation rule, that you will be "faithful in that which is least." Pick up the loose nails, bits of twine, clean wrapping paper, and put them in their places. Be ready to throw in an odd half hour or hour's time, when it will be an accommodation, and don't seem to make a merit of it. Do it heartily. Though not a word be said, be sure your employer will make a note it. Make yourself indispensable to him, and he will lose many of the opposite kind before he will part with you.

Those young men who watch the time to see the very second their working hour is up—who leave, no matter what state the work may be in, at precisely the instant—who calculate the extra amount they can slight their work, and yet not get reproved—who are lavish of their employer's goods, will always be the first to receive notice that times are dull, and their services are no longer required.

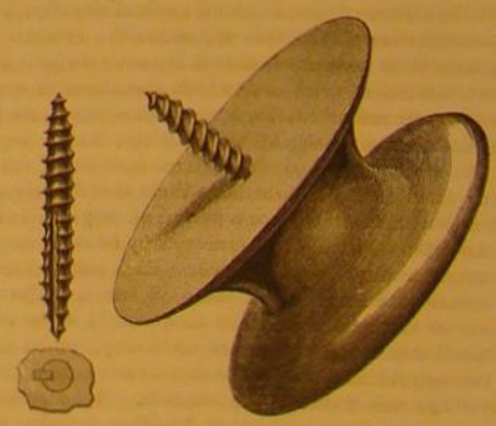
Method of Tinning Copper, Brass, and Iron in the Cold and without Apparatus.

F. Stolba contributes to Dingler's *Polytechnic Journal* the following method, of performing the above processes, which we find condensed in the *American Chemist:* The requisites for accomplishing this object are: 1st. The object to be coated with tin must be entirely free from oxide. It must be carefully cleaned, and care be taken that no grease spots are left; it makes no difference whether the object be cleaned mechanically or chemically. 2d. Zinc powder; the best is that prepared artificially by melting zinc and pouring it into an iron mortar. It can be easily pulverized immediately after solidification; it should be about as fine as writing sand. 3d. A solution of protochloride of tin, containing 5 to 10 per cent, to which as much pulverized cream of tartar must be added as will go on the point of a knife. The object to be tinned is moistened with the tin solution, after which it is rubbed hard with the zinc powder. The tinning appears at once. The tin salt is decomposed by the zinc, metallic tin being deposited. When the object tinned is polished brass or copper, it appears as beautiful as if silvered, and retains its luster for a long time. The author uses this method in his laboratory to preserve his iron, steel, and copper apparatus from rust. This method would become of great importance if the tinning could be made as thick as in the dry way, but this has not as yet been accomplished.

IMPROVED METHOD OF ATTACHING KNOBS TO SCREWS.

Mineral knobs are usually made with screws inserted while the material, of which the knobs are made, is in a plastic state. Wooden knobs, are, however, usually attached to drawers or doors by passing a screw through the drawer or door from the inside into the knob, which is awkward; or by passing the screw through the knob from the outside, which is unsightly. It is obvious that wooden knobs, provided with fixed screws like porcelain knobs, would be much more convenient in use.

This is accomplished in the simple and useful invention illustrated herewith. The screw is made with a gimlet point



at each end, and has a key seat cut in it from the middle to the end which enters the knob. The end having the key seat is then inserted in the knob; and a brad, being driven down into the wood so that it partially enters the wood and fills the key seat, effectually holds the screw, so that it may be screwed into a drawer in the same way as porcelain knobs are now inserted.

The manufacture of the improvement, except the driving of the brads, may be done entirely by machinery, and the inventor has, by this means, undoubtedly opened the way to a much more extended use of wooden knobs than has hitherto been the case. Patented May 5th, 1868. Address, for further information, C. H. Thurston, Marlboro', N. H.

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WE are gratified to announce that General M. D. Leggett, the new Commissioner of Patents, has entered upon the discharge of his duties. We have found the Commissioner a very affable gentleman, and are assured by him that he will use his utmost endeavor to bring up the business of the office; and he hopes that he may be able to have cases examined within two or three weeks after they are filed. Gen. Leggett has our best wishes for his future success, and, unless we mistake his character, he will avoid falling into the hands of the lobby clique, who usually attempt to worm themselves into the confidence of every new Commissioner, as soon as he gets into his seat. It has been recently charged, in the press of this city, that favoritism ruled in certain departments of the office. This inference was unjust to ex-Commissioner Fisher, and we believe that the officers, as a body, are high-toned, honorable men; but the Bible maxim, which urges us to avoid the very appearance of evil, is a safe one to practice.

PRACTICAL INSTRUCTION IN MECHANICS AND PHYSICS.

Baron Liebig solved the problem of practical instruction in chemistry, by founding a working laboratory in Giessen, more than thirty years ago. Previous to that time, there were no schools of chemistry on the continent, and it was only in the laboratories of private teachers that students were able to acquire a practical knowledge of the science. He met with great opposition at first, and it was only by dint of great perseverance and indomitable will, that he was successful. The professors in the other departments of the University objected to the appropriation of so much money to a science which, at that time, was hardly recognized as of the first rank. They were not permitted to have assistants and servants, and a large building for their special use, and they could not see why a chemist should be more highly favored. The young professor was not to be put down, and was finally able to secure the requisite funds for the erection of the famous Giessen laboratory. The school, thus founded by Liebig, soon become renowned in all countries, and students flocked to it from every nation. The inhabitants of Giessen, in recognition of the services thus rendered to the cause of education, and as a tangible proof of their regard, presented to Liebig a handsome residence in the city; and the Duke of Hesse ennobled him with the rank of Baron.

The foundation of this school was to chemistry what the establishment of the dissecting room was to anatomy. It is now difficult to conceive of there ever having been a time when chemistry was actually studied without apparatus or experiments; but such is the fact, and it is not necessary to go very far back to find that benighted period. The illustrious example set by Liebig has been followed in all countries, and everywhere laboratories for chemistry have sprung up, and an army of men have been at work making the discoveries which have been of such importance to mankind.

But how does the case stand with reference to physics? Where are the laboratories for practical instruction in this most important branch of knowledge? Where can the student go for practical instruction in the laws of light, magnetism, heat, sound, electricity, and mechanics? It is true that some of the practice in light he can learn from the photographer; and magnetism may be practically unfolded in the office of the telegraph company. The laws of heat are so poorly understood that most of this force is wasted in attempts to apply it; and sound gives a very faint report for itself in the curriculum of the student. The truth is, we need a Liebig in physics, some one who will found a school where heat, light, electricity, and sound, can be studied, just as the chemist acquires a knowledge of the properties of matter by handling it in his laboratory. Some of our most illustrious physicists have shrunk from making the attempt, as they have been too much absorbed in their own researches, and have not felt that they could spare the time. Perhaps it is well that Arago, Oersted, Faraday, and Ohm, were not interrupted in their studies and discoveries by the necessity of giving instruction to a class of students; and yet it may be queried if they could not have accomplished more by the aid of skillful assistants, just as Liebig, Woehler, and Bunsen, have done in chemistry. However this may be, it is with great satisfaction that we observe a movement in England and this country, to establish schools for practical instruction in physics. At Manchester, in England, Professor Stewart is to have a completely appointed laboratory, where the classes can acquire practical knowledge of the use of instruments, where they can perform all the common experiments in physics, and learn how to make original investigations. In fact, the same principles that have been found to apply so well in chemistry, will here be tried and modified as experience may dictate to be necessary.

The same thing is to be done in London. Already at King's College, two large rooms, adjoining the Museum of Physical Apparatus, are fitted up for a physical laboratory; and a third room has been built for the battery and supplies. "Fixed tables in both large rooms are supplied with water and gas, and with pipes passing to gasholders containing oxygen and hydrogen; also with thick copper wires, insulated with one another, passing to the battery room, so that, in electrical work, the fumes from batteries are entirely got rid of.

"The principal instruments have their fixed places on the tables, and a description of the measurement to be made is given to each student; and, while in progress, his work is examined by the professor or demonstrator. The course of study includes the subjects of pneumatics, heat, light, electricity, and magnetism; and with the regular class a definite order, in each subject, is kept to, as nearly as possible. When, as has sometimes been the case, there are twelve or more students beginning their laboratory course at the same time, it is necessary to deviate from the regular routine, and to set some to begin with heat, some with light, and others with electricity. For some experiments, such as the determination of the relation between the pressure and volume of a gas, or the measurement of the expansion of a gas for given changes of temperature, requiring the use of the manometer and cathetometer, it is found better to have two students working together, each student making in his turn, and so checking every part of, the measurement or determination."

A somewhat similar plan to the above has been adopted by Professor Pickering, of the Institute of Technology, Boston; and the results everywhere are pronouced to be of the most encouraging character. We see no reason why a school of physics may not be established in every institution where there is adequate room and sufficient capital to bear the expense. Without handling the instruments, students obtain very indefinite notions of the subjects; and as it would now be regarded as absurd to teach anatomy without dissection, or chemistry without a laboratory, so it ought to be pronounced as equally irrational to study physics without practical demonstration.

INSPECTION OF STEAM BOILERS IN OHIO.

We have been favored with a copy of an excellent bill introduced in the Legislature of the State of Ohio, by the Hon. T. J. Haldeman. The bill requires the Governor to appoint a theoretical and practical engineer as a supervising inspector, to hold his office for three years unless removed for cause.

The supervising inspector is to appoint a local inspector for each Congressional district in the State, and the local inspector, so appointed, is to be a thoroughly competent theoretical and practical engineer, removable by the supervisory inspector for incompetency or other sufficient cause. The local inspectors are to be furnished with blank certificates of inspection, and with necessary apparatus (at the expense of the State) by the supervising inspector, who is required to keep a record of all inspections of steam boilers as reported to him by the local inspectors.

Within thirty days after the passage of the act, any person, owning or controlling a boiler in use in the State, is required to give notice of the location thereof to the local inspector of the district, and the inspector, as soon as practicable, must proceed to inspect and test the same. He shall prescribe a limit of steam pressure, and shall give a certificate of such inspection and limit of pressure to the owner of the boiler. The limit desired by the owner shall be the one certified, if safe, and the hydrostatic test is not to be—unless consented to by the owners—more than one fourth greater than the working pressure allowed.

The local inspector must satisfy himself that the boiler is of good material and substantially constructed, and of proper proportions in all its parts. He is also to see that the safety valve is well arranged, in good working order, and of the dimensions prescribed by the act, which also prescribes minutely the location and arrangement of gage cocks, and the attachment of steam and water gages. But the owner is allowed, if he prefers it, to attach, instead of the water gage, a low-water indicator.

The inspectors may pass safety valves on boilers now in use, if satisfied that such valves are of sufficient size; but upon all boilers hereafter constructed, the diameters of the safety valve must be not less than two inches for one boiler; three inches for a battery of two boilers; three and a half inches for a battery of three boilers; for a battery of four boilers, a valve, on each outside boiler, of not less than three inches; for a battery of five boilers, a valve, on each outside boiler, of not less than four and a half inches; and on a battery of six or more boilers, a valve, on each outside boiler, of not less than five inches, and no spring-loaded piston or balance valve is allowed except on locomotive boilers.

This rating of the size of safety valves, in proportion to the number of boilers instead of their capacity for steam production, is defective. Mr. Haldeman should reconsider this feature of the bill.

One hundred and ten pounds to the square inch is fixed as the maximum pressure allowed as a working power for a new boiler forty-two inches in diameter, and of the proper construction and material, and with plates at least one fourth of an inch thick; and the working power of all high-pressure boilers is to be rated according to their strength, compared with this standard. In high-pressure flue boilers, flues of sixteen inches diameter are to have a thickness of no less than a quarter of an inch, and in that proportion of strength for flues of a greater or less diameter. If, on inspection, the local inspector approve the boiler, he is required to make a complete record of the test and inspection, with a minute and particular description of the boiler, and of the dimensions, proportions, and conditions of every important part and appliance thereof, and to certify that the boiler and its appliances are safe, a copy of which record and a certificate is to be given the owner or controller of the boiler.

The bill also provides for the inspection of, and granting to, persons placed in charge of boilers, certificates of qualification, and imposes a penalty of ten dollars for each day they attend a boiler without such certificate.

It requires manufacturers of boiler iron to stamp their plates, at two diagonal corners and in the center of the plate with the letter C for charcoal iron not hammered before rolling; P for puddled iron, and C H for charcoal iron hammered before rolling, together with the name of the manufacturer, and numbers indicating the quality of the iron. And it also imposes a penalty upon manufacturers of boilers who shall use iron not so stamped, for boiler making. If steel plates are used they must be marked steel, and possess a tensile strength equal to that of charcoal hammered plates.

These are the general features of the proposed law; but there are many details omitted in our summary. In short, the bill is extremely minute in its requirements, but we think not too much so to be effective. It will repay a careful reading by those who are interested in perfecting systems of boiler inspection.

PROGRESS OF THE DARIEN SHIP CANAL.

A year ago we illustrated the route, for a canal across the Isthmus of Darien, which the experience of many explorers up to that time had indicated as the one preferable to all others. As the readers of our paper are aware, the final result of Com. Selfridge's exploration of the San Blas route was against its adoption. Now the same officer is examining carefully the proposed line of the Atrato river, and at the same time Com. Shufeldt is making a survey of the route across the Tehuantepec Peninsula. The route alongside the Panama Railroad seems to have been passed by, because of the poor harbors on both sides.

The Tehuantepec route, with all its disadvantages, has many earnest advocates; yet it would hardly seem probable that a canal which even its best friends admit must have at least 25 locks, can be adopted as the great highway of nations. There is, too, a doubt as to the supply of water for lockage, which the present survey will either confirm or dispel.

The route *via* the Atrato River has been many times reconnoitred, but never in the exact locality where Com. Selfridge is running his line. Trautwine went up to its very source, and passed over the "divide" in a distance of a few hundred yards, and at no great elevation; but that route was utterly impracticable. He again struck an air line from the mouth of the Napipi to Kelly's Bay, a fine harbor on the Pacific, and he estimated the cost of the canal at $225,000,000. This route was still later surveyed by a Government corps with the same result.

The route now taken by Com. Selfridge is one indicated by Trautwine, as probably affording a better route than those directly surveyed by him. It enters one of the northern mouths of the Atrato, goes into the main stream, then up the Cascarica river, which flows from the northwest into the Atrato. Leaving this, it strikes the waters of the Tuyara on the Pacific side, passing over an elevation of not more than 300 feet. The Tuyara is navigable for large vessels for 40 miles from the Pacific ocean, while on the Atlantic side, good river navigation extends up from the Gulf of Darien for 45 miles. Between these points is about 30 miles, the greater part of which will be deepening of the Tuyara river. The Gulf of San Miguel on the Pacific, and that of Darien on the Atlantic, are excellent harbors, landlocked, and having great depth of water. The Gulf of San Miguel is the same terminus as indicated for the route from Caledonia Bay, which we illustrated last year. This is a *resumé* of the latest information from the Darien Expedition. Accurate surveys may alter these conclusions, and it may yet be determined to use the Panama route, even with expensive docks, or making an artificial harbor, as at Port Said.

THE material interests of Bellaire, Ohio, are greatly prospering, in consequence of the union of capital, in the nail mills, factories, glass houses, and agricultural works, which are not afflicted with strikes. Nearly all the operatives are personally interested in the welfare of the concern they work for; hence their whole aim is to render it successful.

SCIENTIFIC EDUCATION AND RELIGION.

The race of Don Quixotes is not yet extinct, and Sancho Panzas are still to be found, to follow the lead of such doughty knights; the modern champion fights, however, with the pen instead of the lance, and aims his blows against the realities of science, instead of against the figments of a distempered imagination. Last year our attention was called to a remarkable instance of such Quixotic undertakings, remarkable, however, only in its utter absurdity. "Creation a Recent Work of God" is utterly beyond the pale of scientific criticism. It is written to give to the world a new scientific (!) version of creation, and is an endeavor to make geological facts accord with a *literal* interpretation of the Mosaic record, in opposition to what has been deliberately affirmed by the highest experts in science, as well as by thoughtful and qualified theologians. The author believes that the entire geological history can be compressed within the limits 6,000 years, and that man lived amongst palæozoic trilobites! And this wonderfully original theory, worthy of the days of Burnet and Whiston, is supported by equally original data and arguments. What will Sterry Hunt say to this passage: "The Psalmist says God founded the earth on its 'bases,' and modern science teaches that the bulk of the materials of the earth consists of three great acid, alkaline, and neutral bases"? Or Agassiz, to this statement: "In his [man's] first embryonic stage, he resembles a fish; in his second, a reptile; in the third, a bird; in the fourth, a mammal, and lastly, he is a man," etc.? The following, we suspect, must have been plagiarized from the showman of the Cardiff giant: "Scientists say that human flesh will not become fossil, but living witnesses say, a dozen bodies have been found in that state in America within the last twenty five years." "In California a pig, toads, and lizards have also been found petrified;" whilst this is far too good to have been plagiarized from anybody: "The richest deposit of mammals has been found in the secondary series of stratified rocks, and the tracks of quadrupeds, birds and men have been discovered in the old red sandstone, which is the beginning of that series"—a most successful sentence, as it could not possibly have been worded to convey more error! As the entire book is written in the same strain, the reader may well ask why we draw attention to such a farrago of nonsense. We do so, because it is written professedly in the interests of religion, by the rector of an Episcopal church in this city, who should, therefore, we presume, be a clergyman of some educational standing; and because it is not a solitary example, though perhaps it is the worst we could quote, of such burlesques of a serious subject.

We have been credibly informed that this book, foolish as it is, has been favorably reviewed by more than one religious paper; and, since our attention was drawn to it, we have seen a brief notice, in the daily papers, of a lecture by another clergyman, which seemed to have been similarly directed against the teachings of geology. From this, we infer that these clerical Quixotes and their lay supporters must be more numerous than we had supposed, and we therefore think it time to say a few words, not against the knights themselves, but in regard to the system of education and moral culture which permits—shall we say, promotes?—the production of such out-of-date champions of mediæval ignorance.

The knight of La Mancha's first bane was his library. Now, a library is not a bad thing in itself; but, by itself, it may be worse than useless as an intellectual possession; and the Don lived in his, and forgot for a time the world outside; he became a believer in written authorities, whose statements he had no means of verifying; he passed his existence amidst a waste of words, and lost the use of his own perceptions; and thus, when he wandered into the realities of life, animated, as he was, by all the follies of the past, and utterly ignoring or misconceiving the facts of the present, he is wisely represented by the satirist as an egregious madman. Had Cervantes been a recent writer, we might have read in his satire a caricature of the victims of our conventional system of education, substituting for the tales, and the phraseology, and principles of knight-errantry, the study of dead languages, the myths and unapplied lessons of history, and the philosophy of the dark ages. A knowledge of languages, ancient and modern, and of history, and of mathematics, are certainly essential elements of a liberal education; but, by themselves, not supplemented by other studies and training, they leave their possessor utterly unqualified to meet the requirements of the age in which he lives, and to discuss intelligently the vital questions, social, political, and religious, that at present agitate society. But such absolute ignorance is necessarily passive, and it is only when a man thus uneducated, relying upon a knowledge of terms not realized and formulas not comprehended, and without any practical experience in scientific methods of experiment, research, and reasoning, ventures into scientific discussion, that we find how far he is behind the age. He then becomes actively ignorant, and will assuredly injure any cause that he endeavors to support; and of such active ignorance, the author we have cited is an unusually forcible illustration. He has evidently never mastered the first elements of the sciences which he so boldly calls to his aid; and he ignores every principle of inductive philosophy.

Unfortunately, if we take the trouble to test the majority of our so-called well educated men, we shall find in them, unless their education has been leavened by some sound scientific instruction, more or less of these same deficiencies; the same in kind, but, thanks to common sense, less in degree, decreased, probably, by the lessons of practical life. However few the number of such men who feel called upon to display their ignorance in print or in the lecture, it is the want of higher knowledge in the mass that encourages these exhibitions, which, without impeding the advance of the science they attack, bring ridicule upon the religious doctrines they are supposed to be defending. It seems to us imperative upon those who are interested in religious progress, to have scientific instruction of a broad and liberal character introduced into all school and college education. Its omission from a general education is worse than a blunder. Science is merely the interpreter of the works and the will of the Creator, as recorded by Himself, and no religious mind need fear evil from its progress, nor from the dissemination of the truths it teaches. On the contrary, a fear of possible results of scientific inquiry and, worse still, misstatements, or wilful ignorance and unsound arguments based upon it, are derogatory to the wisdom of the Creator, and are, if used by its advocates, the surest means of injuring the cause of religion. We trust, however, that such travesties of scientific subjects as those here alluded to will yet serve a good purpose; we believe that they will bring such ignorance of science and of truth as they display into discredit, and thus indirectly promote the development of a system of sound and enlightened education.

CAISSON FOR THE NEW YORK END OF THE EAST RIVER BRIDGE.

It is thought that this structure, which is now rapidly approaching completion, will be ready to launch about the middle of May. At a recent visit, however, we found that there were yet many courses of timber to lay, and we hardly think the launch will take place quite as early as anticipated, though there will probably not be much delay.

It is thought that, although this caisson will be sunk much deeper than the first one—that is, to eighty feet below high-water mark, to the bed-rock—it will take no longer to sink it, on account of the greater ease of excavation in the sandy soil on the New York side. The structure is, however, altered somewhat from the one on the Brooklyn side, to fit it for the greater depth to which it will be sunk, and also in the adoption of improvements suggested by experience gained in the sinking of the Brooklyn caisson. The construction is proceeding at the yard of W. H. Webb, at the foot of Sixth street, on the East river; the contractors for the timber work being the same who built the Brooklyn caisson, Messrs. Webb & Bell. The iron work is supplied by Messrs. Roach & Son, of the Morgan iron works.

The dimensions of the caisson are 102 by 172 feet at the base, the interior chamber being nine feet in hight. The side walls of this chamber are inclined at a sharp angle toward the center, and the interior is entirely lined with boiler iron. This will obviate the danger of obstruction of the work by fire, which occurred in putting down the first caisson. When completed, the top will be about fifteen feet in thickness of solid timber, and nearly 400,000 cubic feet will be used in the entire structure. The timber is Georgia pine, bolted together by almost numberless drift-bolts and screw-bolts of iron, and the structure already presents a most massive and imposing appearance.

The interior chamber is subdivided into six chambers, the walls of which are to be four feet thick when completed. The chambers communicate with each other by suitable doors.

The air locks are constructed to give greater convenience in ascending and descending than those on the Brooklyn caisson. There are, to each of them, two separate entrances from the principal tube into the caisson, either or both of which may be used, as occasion requires. No important change will be made in the arrangements of water shafts and pipes for the sand pumps.

The lining of boiler iron subserves two important ends, namely: the prevention of fire, which, under the great pressure to which the air in the caisson must be subjected, would otherwise be difficult, and the obviation of the necessity for thoroughly caulking every part of the timber work, to prevent leakage.

This is probably the largest caisson ever constructed, and the event of its launching and towing down to its future position will be anticipated with much interest.

THE MORAL LUBRICATOR.

The great moral lubricator which makes everything in human life run without friction, is good temper. As soon as this is exhausted, the journals of the human machine begin to heat, and wear, and screech, and the entire mechanism becomes noisy and ruinously wasteful of power.

"The horse that frets, is the horse that sweats," is an old saying of horsemen, and it is just as true of men as of horses. The man that allows himself to get irritated at every little thing that goes amiss in his business, or in the ordinary affairs of life, is a man that, as a rule, will accomplish little, and wear out early. He is a man for whom bile and dyspepsia have a particular fondness, and for whom children have a particular aversion. He is a man with a perpetual thorn, in his flesh, which pricks and wounds at the slightest movement; a man for whom life has little pleasure, and the future small hope.

To "keep jolly" under all provocations is perhaps a task which only Dickens' Mark Tapley could perform. We never have met Mark Tapley in our experience of human nature, but we have seen him closely approximated; and it would be well if people in general could approach more nearly that inimitable character.

In all the phases, emergencies, and occupations of human life, good temper is a commodity for which there is great demand; but in those which bring an individual into daily contact with many others, it is perhaps in greatest demand and most limited supply.

We have often suffered in our personal feelings, from the incivility of telegraph operators, railroad conductors, ticket agents, etc. No doubt these officials have much to try their patience, and are called upon to answer many foolish questions. We are certain, however, that we never asked one of them a foolish question, and we are just as certain that it is very rare to get a reply from such people, that is not in word, or in manner, uncivil. Perhaps it is not meant to be uncivil, but it is given in an impatient petulant way, very grating to the sensibilities of refined people.

Were these men good-natured, they could not help being civil. Civility is as natural to a good-natured man as breathing. Even if rude and unpolished in manner, inborn goodness of heart makes itself pleasantly felt in all the relations of life; while the most polished manners and refined language may cut deep, and leave lasting wounds.

To foremen in shops, and superintendents of large manufacturing establishments, good temper is a most valuable qualification. Indeed, this article was suggested by a notable want of good temper, in the treatment of subordinates, by a foreman in an establishment recently visited by us. It was evident that this establishment was pervaded by a spirit of revolt, begotten by the brow-beating insolent language and manner of the foreman. The men were sulky and obstinate, being undoubtedly rendered unmanageable and restless by the total disregard of amenity in the man placed over them. Surely, thought we, whatever skill in his profession this man might possess, it was dearly purchased at the expense of willing service on the part of the workmen.

When, from any cause, a man is forced to add, to his physical toil, the burden of a discontented mind, he will neither do as much nor as good work as when his heart is light, and his mind easy.

It requires more than technical knowledge and skill to make a good foreman. The power to manage and control men is an essential, which can never be found apart from good nature. Of course we do not mean that sort of "good nature" which results from want of firmness, but that broad, wholesome, breezy heartiness that feels good itself, and loves to have others feel good, and which shows itself as much in rebuke, as in praise.

WHISKEY, NEW AND OLD.

A correspondent asks: "Why is old whiskey more pleasant to drink than new—proof being the same? What chemical change takes place by age? and is it more injurious to drink new (same proof) than old?" We do not advise any body to drink whiskey, but we counsel those who have already acquired the bad habit, to confine their attentions to the old rather than to the new. There is always more or less glutinous or nitrogenous matter in liquors derived from starch, even after they have been subjected to distillation; and this undergoes slow oxidation in the course of time, and settles in the bottom of the cask. There is also frequently more or less fusel oil, which is also oxidised and rendered less poisonous in process of time. Hence old whiskey has a less disagreeable taste, and will not kill off quite so rapidly as the new article, which is freshly primed with the elements of destruction. When physicians prescribe whiskey as a medicine, they direct the patient to use the old article, as experience has proved its greater efficacy. It is only as a medicine, and in small quantities, that a liquor of this strength ought to be employed.

It contains so much alcohol that it abstracts water from the tissues, converting them into a species of parchment; and while it stimulates for a short time, the re-action leaves the system weaker and more exhausted than before.

DANGEROUS DENTISTRY.

An article with the above caption has been sent to us for criticism. It is well known that the best substance with which to give the peculiar flesh tint to india-rubber is vermilion; and as a considerable quantity of this compound must be used, it is natural for persons, who make the study of mercurial poisons a specialty, to raise the inquiry how far hard rubber in dental plates may be the source of disease. A question of this kind can only be determined by a careful record of cases, made by dispassionate physicians. We are not in a condition to decide it, but we would suggest the possibility of the opposition to hard rubber plates having its origin in the desire of interested parties to make a larger margin of profit from gold plates. Hard rubber plates are cheap, and it is for this reason that many poor persons can have a full set of false teeth, when, if the old price for gold plates were maintained, they would be compelled to do without these ornamental and useful appendages.

Vermilion is sometimes prepared by dissolving sulphur in caustic potash, and shaking the liquid well with metallic mercury—the red powder settling in the bottom. The sulphur is not considered dangerous, and it is very uncertain whether the mercury becomes separated from the sulphur in a way to produce injurious effects. The testimony of physicians would be valuable on this point, but sensational articles by interested persons, ought to have little weight.

NITRO GLYCERIN AGAIN.—On Sunday morning, March 12th, seven hundred pounds of nitro-glycerin exploded, in a small wooden building on the west side of the Hoosac tunnel. The building was of course blown to splinters. The cans, in which the glycerin was kept, were spread out in ragged shapes. A young growth of birch and maple was cut through for a distance of twenty rods, the path being six rods wide. The trees, three inches in diameter, were torn and twisted into withes. The village of North Adams, two and a half miles distant, was shaken as if by an earthquake. No lives were lost, but the explosion was terrific.

OBITUARY NOTICES.

DEATH OF JOSEPH POOLE PIRSSON.

One after another, our cotemporaries are passing away. Last week we announced the death of Mr. Aaron R. Haight, for many years employed in our office, and now we have to chronicle another death, that of Joseph Poole Pirsson, who died at his residence in this city, on March 17th. Mr. Pirsson was the son of Joseph Poole Pirsson, a prominent member of the New York Bar, and distinguished as a chancery practitioner. The subject of the present obituary notice was, by profession, a civil engineer and solicitor of patents, possessing superior knowledge of practical and theoretical mechanics. As a solicitor of patents, he attained a large practice, and was skillful and comprehensive in the preparation of his cases. He published several useful works relating to his profession, the most prominent of which was entitled, "Laws and Practice of all Nations and Governments Relating to Patents and Inventions." The *Eureka*, a magazine devoted to Mechanism, Inventions, Patents, Science, and News, was also published by him and his partner, Mr. Kingsley, now deceased, who also assisted in the preparation of the above-mentioned treatise. The magazine was discontinued in 1850 or 1851. It was well conducted and well patronized, and was also one of the first of that kind of publications printed in the United States. Mr. Pirsson was also the author of a set of forms of patent practice, which were very generally used at home and abroad. He was also an inventor of considerable skill, and the originator of the "Pirsson Condenser" for supplying marine engines with fresh water, the first successful invention of the kind. It was not only placed in many of our first vessels of the mercantile marine, but in vessels of the United States Navy. Mr. Pirsson derived, for a time, a handsome revenue from this invention, but it was subsequently extensively pirated. He was well read in elementary chemistry, and an enthusiastic astronomer. He was also well read in ecclesiastical history, and the traditions of the Protestant Episcopal Church, of which he was a zealous and active member. He was an amiable and estimable citizen, and highly esteemed in the private relations of life. He was obliged, some years since, to withdraw, on account of ill health, from the large and lucrative practice he had secured, and though he rallied for a time upon the cessation of his labors, he never fully recovered his health. His remains were interred in Trinity Cemetery, the funeral being largely attended by the most distinguished citizens of New York.

DEATH OF PROFSSOR WETHERILL.

We regret to have to announce the death of Dr. Charles M. Wetherill, Professor of Chemistry at Lehigh University, Bethlehem, Pa., which took place on March 5, 1871. Professor Wetherill had acquired a national reputation by his researches and publications, more particularly in agricultural and organic chemistry. He was at one time connected with the chemical laboratory of the Agricultural Department in Washington, and at that time made an exhaustive investigation into the chemistry of American wines. He also published an important paper on the peculiar fat of dead bodies, called adipocere. His loss will be severely felt, not only by the institution with which he was connected, but by the country at large.

DEATH OF WALTER B. FORBUSH.

Mr. Forbush, who was killed at the recent New Hamburgh disaster, was a solicitor of patents at Buffalo, N. Y.

He was a son of E. B. Forbush, who was also killed, at the disaster at Angola, several years ago.

At the time of his death, Walter B. Forbush was about thirty years of age, had a good business, and was noted for his clear understanding of mechanical inventions, having been gifted by nature with a remarkable mechanical mind. He left a wife and three children, and we are pleased to learn that his life was insured for $25,000; consequently his family is left in comfortable circumstances.

SCIENTIFIC INTELLIGENCE.

REMEDY FOR FESTERING WOUNDS AND CANCERS.

Professor Böttger recommends gun cotton, saturated with a solution of permanganate of potash, put up in the form of a poultice, and held over an open wound by a bandage, as the best disinfectant for bad odors that can be conveniently applied. The strength of the solution of permanganate, best adapted for the purpose, is one part, by weight, of dry salt in one hundred parts of water.

Ordinary cotton cannot be taken, as it readily decomposes, but gun cotton is permanent, and not liable to explosion when in a moist state.

LIQUID FOR ELECTRIC BATTERIES.

According to Dr. Bradley, there is a wide difference in the composition of these liquids. We subjoin some of the most approved admixtures: One consists of 800 grammes water, 50 grammes bichromate of potash, 50 grammes sulphuric acid, and 2 grammes chromic acid.

McCracken liquid: 1 pound bichromate of potash, 1 gallon of water, 3 pounds sulphuric acid.

Poggendorff liquid: 3 pounds bichromate of potash, 4 pounds concentrated sulphuric acid, 8 pounds (1 gallon) water.

U. S. Telegraph Company's liquid: 5 gallons water, 6 pounds bichromate of potash, 1 gallon sulphuric acid.

Western Union Telegraph Company's liquid: 18 pounds water, 1 pound saturated solution of bichromate of potash, 1 pound sulphuric acid.

Newton's solution for destroying organic matter: 12 fluid ounces water, 1 fluid ounce sulphuric acid, 1 ounce bichromate of potash.

PRESERVATION OF WOOD UNDER WATER.

A correspondent inquires if there are other substances besides chloride of zinc that have been used for protecting timber under water. We find an elaborate paper, by Dr. Ott, in the *Journal of Applied Chemistry*, which may serve as an answer to the inquiry. A committee of *savants* was appointed, by the Dutch Academy of Sciences, to conduct experiments; and in their report, they classify the experiments into three groups: First, the coating or alteration of the surface; second, the impregnation with various preparations; and third, the use of timber different from that usually employed.

I.—THE COATING OR ALTERATION OF THE SURFACE.

In this group the following alleged remedies were tried:

1. A mixture of tallow, coal tar, resin, sulphur, and powdered glass, applied warm, upon the previously roughened wood, to the thickness of several millimeters.

2. Paraffin varnish, obtained by dry distillation of peat.

3. Coal tar, applied cold and warm upon the superficially charred wood. Into some piles, holes were bored, which were stopped up, after being filled with the hot tar, which then had a chance to penetrate into the interior. Others were coated with a mixture of coal tar and oil of vitriol, to which some sal ammoniac and olive oil had been added.

4. The piles were coated with a paint consisting of linseed oil, turpentine, chrome green, and verdigris.

5. The surface was carbonized.

The thus prepared piles were immersed in May, 1859; on being examined in September of the same year, it was found that, with the exception of the wood mentioned in No. 3, which only presented traces of the teredo, none of the preparations had furnished protection. In the fall of 1860, or after one year and a half, the wood treated with coal tar was also thoroughly infested by the worm. From the results of these experiments, it seems therefore to be fully established that, although external coating may for some time prevent the attaching of the larvæ and young worms, the least abrasion, such as may be caused by floating ice or other means, or the cracking of the wood, will allow the entrance of the teredo to an injurious extent.

II.—THE IMPREGNATION WITH PREPARATIONS.

Under this head trials were made with:

1. Sulphate of copper,

2. Sulphate of iron.

3. Acetate of lead, which proved ineffective.

4. The wood was first impregnated with soluble glass and then with chloride of calcium, in order to form a silicate of lime in the interior. Before being immersed, it was exposed to the air for half a year, so that the chemical combination might be complete. In March, 1862, the wood was sunk into the sea, and in October of the same year was found to be thoroughly invested.

5. Oil of creosote.—This is a well-known product of the dry distillation of coal, which, in being subjected to a second distillation, is freed from the very volatile as well as from the semi-solid portions. In May, 1859, creosoted piles were immersed in different harbors, and when examined in the following September, no indications of the worm could be discovered, while non-creosoted piles were thoroughly infested. Another trial was made in July, 1860, with ten piles of oak and pine, saturated in the same manner; later on, piles of beech and poplar were immersed, which had been treated by Boulton, in England. On examining these piles in the falls of 1862, 1863, and 1864, they were all found to be perfectly sound, with the exception of the piles of oak; while the non-prepared woods were more or less affected by the worms. In sawing through one of the oaken piles, it was ascertained that it had only been partly saturated. However, the piles of pine, beech, and poplar, treated in the establishment of Boulton, presented in 1864—or after three years' exposure—not the least indication of the teredo, and, after detaching the outer portions, they resisted equally well. The same result was obtained with piles, saturated by a firm in Amsterdam, that had been exposed for five years.

Of the non-impregnated piles, nothing had been left but the small head pieces projecting beyond the surface of the water. The rest had become a spongy mass, yielding to the least pressure. Petroleum had been recommended to the committee, but, owing to its high price, no experiments were undertaken with it.

III.—USE OF EXOTIC TIMBER.

With regard to exotic woods, the experience of the committee is but moderate. It can only be stated, with certainty, that some kinds of wood from Surinam, the American oak and several others, were not spared. Besides, the committee was presented with a perforated piece of heavy guajac wood, which had been laying in the sea, near Curaçoa, a proof that even the densest wood is not impregnable. Finally, the committee had received information about various woods, reputed to be poisonous, and by which the fishes are said to become stupefied, and die, but no opportunity was afforded to experiment with them We are assured, however, that the Dutch Government is making investigations in regard to this matter in the East and West Indies.

The report of the committee may be summed up as follows:

1. That mere external coating with paint or other substances furnishes no protection, since it is impossible to maintain an unbroken surface; the young teredo will enter the slightest crack or abrasion. The lining with iron, copper, or zinc plates, or the driving full of broad-headed nails is not only expensive, but protects the timber only as long as the lining remains perfect; and since this is impossible, it is of no use.

2. Impregnating timber with soluble inorganic salts, which are poisonous to animal life, constitutes no protection, owing, firstly, to the fact that the teredo does not nourish itself from the ligneous tissue, but simply perforates it in order to secure a lodgment; and, secondly, to the circumstances that the water washes out the salt.

3. The density of the wood, as far as known, is of no avail.

4. The only true protection against the worm is found to be creosote oil, to which attention ought to be directed, as well as to the kinds of wood most absorbent of it; and to the most effective methods of impregnating it with this material.

The experiments were conducted in salt water, chiefly in reference to the teredo or ship worm, but they apply equally well for fresh water. In Germany, extensive use is made of chloride of zinc, by placing timber in boilers, partly exhausting the air, and driving the vapor of chloride of zinc into it. The amount to be taken can only be determined by experiment. Metallic zinc has also been used in a similar way.

ENDLESS PLATFORM BELT RAILWAY FOR NEW YORK.

There has been no end of schemes, mostly absurd, for steam conveyance to accommodate the local travel of New York. We leave it to the reader to decide in what category a plan proposed by Mr. Robert Taylor, of 527 West Twenty-second street, New York, should be placed. The plan proposes that a series of endless rule-jointed aprons, running side by side, should be kept in motion by steam power, and extend entirely about the city, elevated, of course, and skirting the coast of the island. The outside one is proposed to be moved at three miles per hour, and each one in the succession inward is to move three miles per hour faster; so that three being employed, the inner one will run at nine miles per hour, the maximum speed. Mr. Taylor thinks it will be easy for people to step upon the outside apron, and from that to the next, and so on to the last, where they can be seated until they reach their destination. We hardly deem the subject worthy of serious discussion, but it is interesting, as being one of the many curious ideas, evolved by the pressing needs of the city for better traveling facilities.

TELEGRAPHIC COMMUNICATION WITH THE EASTERN WORLD.—The attention of the New York Chamber of Commerce has been called to the pressing necessity of establishing a submarine cable under the Pacific ocean, and placing this continent in electric communication with Japan, China, and the Sandwich Islands. There is enough telegraphic traffic to pay good dividends on the outlay. Even at present rates, *viâ* Europe, namely, about $50 gold for twenty words, the number of messages forwarded is considerable; and, besides the inducement of low rates, the new cable would be a great benefit in saving of time.

THE DAVIS' SEWING MACHINE, manufactured at Watertown, N. Y., has been before the public some ten years, and is probably familiar to many of our readers. The Company, having recently greatly increased its facilities for supplying this machine, now calls for agents throughout the United States and Canada, as will be seen by its advertisement in this paper.

WHITE SPONGE.—Sponge can be bleached by soaking it in a weak dilution of hydrochloric acid, which removes the calcareous matter, and then washing it several times in cold water; after which it must be soaked in water holding a little sulphurous acid, or chlorine in solution.

A MAN in England has recently patented a hand garden-seed sower, which, he claims, will always drop just the desired number of seeds, and thus save the after-expense and trouble of thinning out.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.]

1.—SHELLAC POLISHING.—How shall I prepare and use shellac, for polishing on a wheel?—J. L.

2.—SOLDERING CAST IRON.—In my query No. 5, in issue of March 4th, please substitute chloride of zinc for chloride of lime.—W. L. B.

3.—YELLOW RAIN.—We had a rain storm, at New Orleans, on the night of March 8th, leaving on the pavement a deposit of something resembling sulphur in color, but not having the fumes of sulphur when heated. I understand it has occurred frequently in different places, but find no one who has ever seen it before. I would like an explanation from some of your correspondents.—W. H. B.

4.—STOVE POLISH.—Will some of your numerous readers please give me a good preparation for polishing stoves—something that does not require so much rubbing as the usual compounds do?—W. J. N.

5.—GRINDING OCHER, ETC.—I wish to learn how to reduce a substance like chalk or ocher to a very fine powder. Is there any process better than grinding through mill stones? Is there any process of separating the same better than a bolt such as is used in flour mills? A No. 12 bolt is not fine enough. What is the advantage of running the under mill stone, and how large diameter can such a stone be run to advantage?—C. E. H.

6.—WIRE SPRINGS.—How can iron wire be tempered, so as to make good elastic springs?

7.—DISTILLING ESSENTIAL OILS.—Can the oil be distilled from wintergreen or peppermint, by connecting a steam pipe from a boiler to the still, just as well as by setting the still in a furnace?—A. V. S.

8.—FROSTING SILVER.—How can polished silver be given a frosted appearance?—D. E. K.

9.—CLARIFYING OLIVE OIL.—I have some olive oil that has become discolored by standing. How can I render it white and marketable again?—R. A.

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 advertisements at $1 00 a line, under the head of "Business and Personal."

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

BURSTING OF FURNACE.—In answer to your correspondent's query, I will say that I have witnessed about a dozen explosions of furnaces within the last six months. In all these cases the roof was blown off; and, in a few of them, workmen were seriously burnt. I believe the explosion is due to the sudden conversion of water into steam of high tension. This happens in the least harmless way, when you strike with a wet hammer on a white hot tool, or when you drop the end of a hot tool into the liquid cinder in a furnace. In either case steam of high tension, and under some pressure, is suddenly formed. If the cinder be very hot, and the wet surface very large, and the weight of the body considerable (*e. g.*, a wet brick or a bucket full of water), the explosion will be as certain as serious. A careful puddler, in cooling off a furnace, will at first throw only small quantities of water upon the foreplate, or against the sides of a furnace. In this way the water spreads harmlessly on the hot cinder. I have known such puddlers to work furnaces for twelve years, without blowing up a single one. It is the general opinion of puddlers that small pieces of scale or cinder, in the water thrown in, cause the explosion, but I doubt if this be sufficient for a serious explosion, especially as they will, at every heat, sweep small pieces of cinder off the fireplate into the furnace when throwing in water. Accordingly, the certainty and force of the explosion will stand in a definite ratio to the temperature of the cinder, the area of the wet surface, and to the rapidity and force with which it is brought into contact with the hot cinder.—P. M. B., of Pa.

SOLDERING CASTINGS.—W. S. B. can solder gray cast iron as follows: First dip the castings in alcohol, after which, sprinkle muriate of ammonia (sal ammoniac) over the surface to be soldered. Then hold the casting over a charcoal fire till the sal ammoniac begins to smoke; then dip it into melted tin (not solder). This prepares the metal for soldering, which can then be done in the ordinary way.—J. R., of Mo.

SPINNING TIN PLATE.—It is not practicable to spin common tin plate like brass, (except in the form of plates or covers). But T. J. R. can take the iron without the plate, and make it red hot, spin it or press it, and afterwards plate it. If he fail in this *modus operandi*, let him hire a practical man to work it out for him.—J. R., of Md.

L. A. M., of Mass.—There is no difficulty in dissolving amber in chloroform, but people are apt to think they fail, from the circumstance that it is only partially soluble. Take some broken amber mouth-pieces of pipes (your tobacconist will set you up with them), reduce to a coarse powder and place in a bottle with rather more than enough chloroform to cover them well; shake often, and in a few days if you try it by pouring a drop or two of the clear liquid on a glass plate, you will find you have a varnish of good body, which gives a strong glaze. Or you can make an amber varnish as follows: Take of amber, 3 ounces; benzole, 50 ounces; heat the amber in a closed vessel to a temperature of about 570° Fah. When it begins to soften and swell, emitting white fumes, then dissolve in the benzole.

R. H., of Ala.—To prepare a plaster cast for electrotyping, first dry the plaster cast in the oven thoroughly, then get equal parts of beeswax and common resin, melt them together, and boil the cast until it will not absorb any more; when cold, get some good blacklead and cover the cast entirely, not thick but a bright surface, then you can electroplate in your battery as usual.

SILVER SOLDER.—Let your querist get 1 pwt., of pure silver, and ½ dwt. of common pins, and melt them together; he will have an easy flowing solder, but must use a gas jet to solder with.

C. D. of Ga.—You can cement cloth to polished iron shafts, by first giving them a coat of best white lead paint; this being dried hard, coat with best Russian glue, dissolved in water containing a little vinegar or acetic acid.

PASTE THAT WILL KEEP.—Take one tablespoonful of flour, add gradually one pint of cold water; boil slowly, and stir well to prevent burning, till it thickens. Keep it boiling till it becomes thin; then add one teaspoonful of nitro-muriatic acid, and boil till it again thickens, when it is ready for use. This paste is harmless, cheap, and less difficult to prepare than the formulæ in your last issue, and will neither turn sour nor mold.—H.

CEMENT FOR GLASS SYRINGES.—Let P. E. G. take resin two parts, gutta percha one part, melt together over a slow fire, apply hot, and trim with a hot knife.—H.

SOLDERING FLUID.—Let C. W. take muriatic acid and dissolve as much zinc in it as the acid will take.—J. K., of Mo.

COATING FOR BOAT BOTTOMS.—Let A. A. B. take 5 gallons boiled linseed oil, 4 gallons raw oil, 1 gallon benzine, and 80 pounds of Rocky Mountain vermilion.—H.

IVORY KEYS.—To glue on the ivory veneers, let J. H. take two parts pulverized gum arabic, and one part calomel, and add water sufficient to make a paste.—H.

PULVERIZED SOAP.—To pulverize hard soap, let M. B. C. pare it very thin with a hot knife, or spatula, and pulverize it in a mortar.—H.

PAINT FOR OLD WEATHER BOARDING.—The recipe for coating for boat bottoms, given above, is also excellent for old weather boarding.—H.

W. R. B., of Wis.—You can carry steam 200 feet from boiler to engine, without serious loss. We advise you to use the cement felting noticed in our last issue. Use a 1¼-inch pipe, which, though larger than is theoretically necessary, will, on account of its size, reduce the loss of pressure from boiler to engine.

W. A. M., of Me.—We are of the opinion that iron rails made of cast iron, cast upon wrought iron bars, would not prove desirable in use. However, the experiment could be easily tried, and that is the true way to determine their value.

C. O., of ——.—Any hollow sphere containing air will not float as high on the surface of water, as the same with the air exhausted.

S. P., of Quebec.—The filling of your mill with smoke from the forges is owing to the flue having too small capacity. The smoke and gas discharged into the mill is decidedly deleterious to the workmen.

H. R. O., of Mass.—It is probable that the acids used in making shoe polish do injure the leather more or less. Their action is, however, not very decided. In the recipe given recently in this column, in our issue of March 11, we think there is too large a proportion of acid, for a good blacking.

B. Y. C., of Va.—We know of no cheaper pipe than the tinned lead pipe that combines *all* the requisites of a first-class water pipe you specify.

D. C. R., of Ill.—We have not investigated into the nature of the anti-incrustation powders to which you refer, but we have usually found such preparations harmless.

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

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Carpenters wanted—$10 per day—to sell the Burglar Proof Sash Lock. Address G. S. Lacey, 27 Park Row, New York.

Manufacturers' and Patentees' Agencies, for the sale of manufactured goods on the Pacific coast, wanted by Nathan Joseph & Co., 619 Washington street, San Francisco, who are already acting for several firms in the United States and Europe, to whom they can give references.

Columbus, O., Feb. 27, 1871.—Messrs. McBeth, Bentel & Margedant:—Your Universal Wood Worker is giving entire satisfaction. Shall be most happy to inform any one of the many advantages that it certainly possesses over any other wood-working machine with which I have had experience. Yours truly, M. P. Ford, Master Car Builder, P. C. & St. L. R. R. Co.

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Improved mode of Graining Wood, pat. July 5, '70, by J. J. Callow, Cleveland, O. See illustrated S. A., Dec. 17, '70. Send stamp for circular.

All parties wanting a water wheel will learn something of interest by addressing P. H. Walt, Sandy Hill, N. Y., for a free circular of his Hudson River Champion Turbine.

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Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N.Y.

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For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., Fair Haven, Conn.

Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N.Y. (Send for Circular.)

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N.Y. Send for catalogue.

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To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year.

APPLICATIONS FOR EXTENSION OF PATENTS.

STEAM PRESSURE GAGE.—Clara A. Eastman, Boston, Mass., has petitioned for an extension of the above patent. Day of hearing, May 31, 1871.

HYDRANT.—George P. Perrini, Richmond, Va., and James E. Boyle, New York city, have petitioned for an extension of the above patent. Day of hearing, June 7, 1871.

PICKER SEWING MACHINE.—John Haw, Hanover County, Va., has petitioned for an extension of the above patent. Day of hearing, June 7, 1871.

PASSENGER FARE BOXES.—John B. Slawson, New York city, has petitioned for an extension of the above patent. Day of hearing, July 12, 1871.

SELF-ACTING RAKE FOR HARVESTERS.—Salem T. Lamb, New Albany, Ind. has petitioned for an extension of the above patent. Day of hearing, June 14, 1871.

MACHINE FOR RIVETING BOILERS.—Silvester Bennett, Jefferson Parish La., has petitioned for an extension of the above patent. Day of hearing, June 14, 1871.

New Patent Law of 1870.

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Recent American and Foreign Patents.

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

COMBINED ORE CRUSHER AND AMALGAMATOR.—Lyman Griswold, Denver, Colorado.—This invention relates to a new ore crusher, which is so constructed, by being provided with a set of inclined copper plates, that it will also serve as an amalgamator for the matter reduced on its dies. The invention consists in a new manner of securing and retaining the amalgamating copper plates; also in a novel set of elastic clamps for the same, and in a novel connection of casing and shute.

LEGISLATIVE TELLER AND RECORDER.—Dr. Adam Weston, Keeseville, N. Y.—This invention relates to a machine intended specially for use in legislative bodies, and which enables each member, by pulling one knob when he intends to vote, to display the number of his seat, either in the aye or nay column, in a conspicuous manner, on a plate elevated in full view from all parts of the hall; and also in a mechanism for conspicuously displaying the footing up of the whole number of ayes and noes, and in an apparatus for effecting the simultaneous printing of two separate and complete lists of ayes and noes.

LIQUID MEASURER.—Dr W. M. Wright, Chambersburg, Pa.—This invention consists mainly of two separate chambers, or two chambers combined in one, and of different capacities, the same being provided with a cock, so contrived, that, when turned in one direction, both chambers receive a supply of liquid at the same time, and when reversed, the supply passage is closed, and one or other of the chambers opened. The invention also consists in locating the mouths of the passage, whence the liquid escapes from the chambers, at the center of the bottoms thereof, in order that all the liquid may escape from the chambers, even when they stand inclined.

FILING AND SETTING MACHINE.—T. L. Shaw, Omaha, Nebraska.—This invention relates to a machine that accurately files, sets, and feeds a saw, and s provided with means for adapting itself to saws of any and all widths, and for giving the teeth a set of any required degree of inclination.

COMBINED SAD AND FLUTING IRON.—Frederick Myers, New York city.—This invention relates to improvements in combined sad irons and fluting irons, of that class in which two cast metal plates, consisting of a lower one and an upper one, are used, the lower one having a smooth sad iron face on the bottom, and a corrugated upper face, and the upper one being corrugated on the lower side, and both being provided with connecting devices, by which they may be connected together when the instrument is to be used as a sad iron, and disconnected when it is to be used for fluting. And the invention consists in the construction of the two plates with convex fluted surfaces, for acting on the goods by a rolling motion, and the employment, in connection therewith, of connecting apparatus, which will admit of such rolling or oscillating motion, and at the same time be capable of holding them firmly together when the instrument is used as a sad iron.

DAMPER.—L. S. Taylor, Sigel, Mo.—This invention relates to improvements in dampers for stove-pipes and other flues, and it consists in a tube arranged transversely through the pipe or flue, open at both ends, and having slots opening into the pipe or flue, in which tube is placed an other, having corresponding slots, and arranged for rotating for bringing its openings into coincidence with those in the first-mentioned tube, or to close said openings.

MANUFACTURE OF PICTURE NAIL HEADS.—Leopold Wolf, Meriden, Conn.—This invention relates to improvements in the manufacture of the metallic cups for picture nail heads, and consists in shaping the said cups in hand or power drawing presses, by a drawing process, whereby the inventor is enabled to accomplish the work by fewer operations and annealings than is required by the common mode.

COMPOSITION FOR STAINING WOOD.—John Winger, Kansas City, Mo.—This invention relates to a new and useful improvement in a composition for for staining wood of the color of black walnut.

SYSTEM OF BALANCING VERTICAL RECIPROCATING MASSES.—William F. Durfee, Bridgeport, Conn.—This invention relates to a new and improved mode of balancing the weight of vertical reciprocating masses of matter, in order that the power applied to give such masses their vertical reciprocating movement may be no greater in their upward than in their downward direction.

WINE BASKET.—J. Roussillon, Epernay, France.—This invention relates to a new and useful improvement in willow baskets for holding and transporting bottles of wine and other articles, more especially intended as a "pic-nic" basket.

WIRE SCREEN.—Samuel Holdsworth, Maspeth, N. Y.—This invention relates to a new and useful improvement in wire screens for masons' use in screening sand, and also for screening grain and coal.

WINDOW CURTAIN FIXTURE.—Thomas C. Williams, East Randolph, Wis.—This invention relates to a new and useful improvement in mode of operating window shades or curtains of textile material or paper.

PLATEN FEED GUIDES.—Edward L. Megill, Brooklyn, N. Y.—This invention has for its object to furnish an improved feed guide, for platen printing presses, which is designed to take the place of the inconvenient contrivances, such as common pins, quads, reglets, cardboards, etc., generally employed upon such presses by printers for the purpose of registering sheets of paper or other material.

SAWING MACHINE.—Jacob Felton, Fairmount, Ind.—This invention relates to a new drag saw, which is constructed with the object of avoiding excessive friction during the operation of sawing, and for permitting a ready adjustment of parts.

GREEN GLAZE FOR FLOWER POTS.—John E. Brooks, Yarmouth, Me.—This invention has for its object to furnish an improved green glaze for flower pots, which shall be so inexpensive as to adapt it for use upon common earthenware, while at the same time giving to the ware a beautiful finish.

LUBRICATOR FOR STEAM CYLINDERS.—Tapping Reeves, Little River, Cal.—This invention has for its object to furnish an improved lubricator for steam cylinders, which shall be so constructed that it may be supplied with oil when the cylinder is under steam pressure, and which will enable the water of condensation to be readily blown off when it is necessary to replenish the reservoir with oil.

ANIMAL TRAP.—James D. Pell, New York city.—This invention has for its object to improve the construction of the ordinary wooden animal traps, so as to make them more convenient in use, and more effective in operation.

MACHINE FOR COILING DOUBLE BED SPRINGS.—Matthew Van Vleck Albany, N. Y.—This invention consists in the application of single or double winding cones, to two separate slides, the cones revolving in opposite directions to produce the right and left cones or coils of a double bed spring from one wire.

NAIL MACHINE.—Henry Reese, Baltimore, Md.—In our notice of this invention, in the issue of the 11th inst., we stated that the operation of the machine produces a "headless nail;" and that "the head of the nail is formed by a subsequent operation." This is not true. The nail is finished and cut from the rod by one operation.

BLIND WIRING MACHINE.—Elijah F. Dunaway, Cincinnati, Ohio.—This invention relates to a new machine for wiring blind slats and rods, and has for its object to make the apparatus entirely adjustable for applying staples of suitable length to articles of various thicknesses.

HAY FORK.—Benjamin F. Brown, Catlin, Ind.—This invention relates to improvements in hay forks, and consists in a pair of bars, barbed at one end, and pivoted together so that the bars being closed against each other, the said barbed ends constitute one point which may be readily forced into the hay, after which they may be separated to hold it for elevating, in which position they are held by a pair of bars and a trip catch, one of which bars is connected to the lifting bars where they are pivoted, and the other to a part of toggle-pointed bars, pivoted to the said lifting bars, and this latter slides on the other as the lifting bars open and close, and is held in one position, to keep them open, by the trip catch.

MACHINES FOR WEAVING EMBROIDERY.—Joseph Clough and Joseph Crompton, Chicopee, Mass.—This invention relates to improvements in machines for weaving embroidery, and it consists in an improved arrangement of adjustable corners and connecting rods with the needle bars and a pattern wheel or former, having for its object the weaving of three distinct patterns simultaneously. It also consists in an arrangement of the driving gear for working the pattern wheel calculated to facilitate the setting of the pattern wheel back, or adjusting it with exactness to make the exact adjustments of the needles with the patterns, often required in case of accidents.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

533.—IMPROVED SAND, GLASS, OR EMERY PAPER OR CLOTH.—G. C. Taft, Worcester Mass., and J. H. Armbruster, Philadelphia, Pa. Feb. 28, 1871.

549.—APPARATUS FOR REGULATING PRESSURE OF STEAM IN DRIVING CYLINDERS, ETC.—Benaiah Fitts, Worcester, Mass. March 1, 1871.

575.—SUGAR MANUFACTURING APPARATUS.—Claus Spreckles, San Francisco, Cal. March 3, 1871.

578.—FLEXIBLE SHAFTING AND OTHER APPARATUS FOR TRANSMITTING POWER.—J. B. Morrison, St. Louis, Mo. March 3, 1871.

587.—LAMPWICKS.—H. O. Whipple, New York city. March 4, 1871.

590.—MEASUREMENT OF FOLDED OR ROLLED FABRICS.—Edward Morgan, Washington, D. C. March 4, 1871.

596.—GASELIERS, SLIDING GAS PENDANTS, AND SLIDING GAS BRACKETS.—John Horton, 620 Broadway, New York city, now residing at 113 Hagley Road, Edgbaston, near Birmingham, England.

600.—TYPE-DISTRIBUTING MACHINERY.—D. B. Thompson, Brooklyn, N. Y. March 6, 1871.

602.—COMBINED SAFETY VALVE AND WHISTLE.—G. H. Clemens, Chicago, Ill. March 6, 1871.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING MARCH 21, 1871.

Reported Officially for the Scientific American.

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MUNN & CO.,
Patent Solicitors, 37 Park Row, New York.

112,764.—COMPOSITION FOR PAVEMENTS.—Nathan S. Abbott, Brooklyn, N. Y.

112,765.—BED BOTTOM.—John H. Allyn, Whitesborough, N. Y.

112,766—PRESSING AND BALING HAY.—George H. Aylworth, Brighton, Ill.

112,767.—HAT AND CAP HOLDER.—Charles Beeny, Albany, N. Y.

112,768.—PUMP PISTON.—Daniel W. Bell, St. Louis, Mo.

112,769.—HORSESHOE MACHINE.—Uriah Billings, Cambridgeport, Mass.

112,770.—PISTON-ROD PACKING.—James H. Blessing (assignor to himself and Frederick Townsend), Albany, N. Y.

112,771.—TAP AND NOZZLE FOR OIL CANS.—J. A. Bostwick, New York city.

112,772.—GLASS-BLOWER'S MOLD.—Samuel R. Bowie (assignor to himself and William L. Libbey & Brother), New Bedford, Mass.

112,773.—HORSESHOE.—Joseph Brackett, Lynn, Mass.

112,774.—STREET LAMP.—George Brandon, New York city.

112,775.—MACHINE FOR UPSETTING BOLTS.—Benjamin Briscoe and Joseph A. Briscoe (assignors to the Michigan Bolt and Nut Company), Detroit, Mich.

112,776.—GREEN GLAZE FOR FLOWER POTS.—John E. Brooks, Yarmouth, Me.

112,777.—HORSE HAY FORK.—Benjamin F. Brown, Catlin, Ind.

112,778.—DEVICE FOR TRANSPORTING EGGS.—A. H. Bryant, Chicago, Ill. Antedated March 9, 1871.

112,779.—PNEUMATIC TELEGRAPH.—Edward A. Calahan, Brooklyn, and George B. Field, New York city.

112,780.—COMBINED GAGE AND TRY SQUARE.—Frederic Castle (assignor to himself and Newbury J. Eaton), Montana, Iowa. Antedated March 18, 1871.

112,781.—PEN HOLDER.—Benjamin Charles, Akron, Ohio.

112,782.—THRASHING MACHINE.—Francis G. Chesman, Lemont, Ill.

112,783.—THILL COUPLING.—Newton J. Clark (assignor to himself and Milton H. Clark), Clarkston, Mich.

112,784.—EGG AND FRUIT CARRIER.—Wm. J. Clark, Lena, Ill.

112,785.—LAPPET LOOM.—Joseph Clough and Joseph Crompton, Chicopee, Mass.

112,786.—COATING GAS AND WATER-PIPE.—Nicholas Clute, Schenectady, N. Y.

112,787.—BLOTTING PAD.—Alfred Q. Collins, Cambridge, Mass.

112,788.—SAWING MACHINE TABLE.—Jonathan Creager, Cincinnati, Ohio.

112,789.—FIRE SHOVEL.—Isaac W. Denning, Allegheny City, Pa.

112,790.—WASHING MACHINE.—William James Dodge, Syracuse, N. Y., assignor to himself, Alanson T. Briggs, and Wm. B. Thrall, New York city.

112,791.—BLIND WIRING MACHINE.—Elijah F. Dunaway, Cincinnati, Ohio.

112,792.—BALANCING VERTICAL-RECIPROCATING MASSES.—Wm. F. Durfee, Bridgeport, Conn., assignor to himself and Jackson & Wiley, Detroit, Mich.

112,793.—ADJUSTABLE BEVEL.—Willard C. Ellis (assignor of one-half his right to Rufus A. Russell), Springfield, Mass.

112,794.—SAWING MACHINE.—Jacob Felton, Fairmount, Ind.

112,795.—MAGAZINE FIREARM.—Harbert K. Forbis, Danville, Ky. Antedated March 10, 1871.

112,796.—CHURN.—David Frankfoder, Wakarusa, Ind.

112,797.—HORSE-COLLAR PAD.—John Fraser (assignor to himself and John J. Hardy), Dowagiac, Mich.

112,798.—TELEGRAPH SWITCH.—Alexander H. Freeman, Chicago, Ill.

112,799.—BIT BRACE.—Raymond French, Seymour, Conn.

112,800.—LOOP FOR STIRRUPS.—J. B. Gathright, Louisville, Ky.

112,801.—VISE FOR JOINER'S USE.—Jonathan Good, Lancaster, Pa.

112,802.—MACHINE FOR SEWING BOOTS AND SHOES.—Chas. Goodyear, Jr., New Rochelle, N. Y.

112,803.—BREECH-LOADING FIREARMS.—G. B. Gray and J. H. Romans, Mount Vernon, Ohio.

112,804.—COMBINED ORE CRUSHER AND AMALGAMATOR.—Lyman Griswold, Denver, Colorado Territory.

112,805.—RAILWAY-RAIL CHAIR.—Samuel M. Guest, Ypsilanti, Mich.

112,806.—CHURN.—H. S. Gurney and Horace Merrill, Memphis, Mich.

112,807.—MOUSE AND ANIMAL TRAP.—George L. Hart, New Britain, Conn.

112,808.—APPARATUS FOR CUTTING THE ENDS OF CIGARS.—Mathias Joseph Hinden (assignor to Adolph Freund), Detroit, Mich.

112,809.—SAND SCREEN.—Samuel Holdsworth, Maspeth, N. Y.

112,810.—CORD-GUIDE FOR SEWING MACHINES.—Henry Horn (assignor to John O. Fairbairn), Milwaukee, Wis.

112,811.—THILL COUPLING.—Benjamin F. Horton, Ithaca N. Y.

112,812.—SASH HOLDER.—Philo B. Hovey, New London Conn.

112,813.—BEE HIVE.—Washington J. Kelly, Commerce, Mich

112,814.—CURTAIN FIXTURES.—Wm. C. Kennedy, Commerce Mich.

112,815.—CLOTHES WRINGER.—Alexander King, Philadelphia, Pa.

112,816.—DRAWER PULL.—Joseph Kintz (assignor to himself and P. J. Clark), West Meriden, Conn.

112,817.—SHAFT COUPLING.—Darius Knickerbocker and Samuel Knickerbocker, Allegan, Mich.

112,818.—RECTIFYING HIGH WINES.—Archibald K. Lee, Galveston, Texas.

111,819.—PHYSICIAN'S SADDLE-BAG.—A. M. Leslie, St. Louis, Mo.

112,820.—WASHBOARD.—Charles Letterman, Syracuse, N. Y., assignor to John W. Throop.

112,821.—PLANING MACHINE.—Charles Levey, Toronto, Canada.

112,822.—COTTON PRESS.—Eli W. Long and Isaac N. Patten, Memphis, Tenn.

112,823.—TOY PUZZLE.—Samuel Loyd, New York city.

112,824.—BOILER FOR HEATING PURPOSES.—J. A. Maynard, Newtonville, Mass.

112,825.—HYDRANT.—John McCann, Albany, N. Y. Antedated March 2, 1871.

112,826.—RAILWAY SHIFTING TRUCK.—P. H. McWilliams, Detroit, Mich.

112,827.—PLATEN FEED GUIDE.—Edward L. Megill, Brooklyn N. Y.

112,828.—MANUFACTURE OF IRON AND STEEL.—John W. Middleton, Philadelphia, Pa.

112,829.—CRANE.—John W. Middleton, Philadelphia, Pa.

112,830.—PEAT MACHINE.—Herman Mielisch, Racine, Wis.

112,831.—APPARATUS FOR REFINING METALS.—Adolph Millochau, New York city.

112,832.—APPARATUS FOR REMOVING PAINT, VARNISH, ETC.—Theodore F. Moody, Toledo, Ohio. Antedated March 14, 1871.

112,833.—SASH HOLDER.—James B. Morgan, Davenport, Iowa assignor to himself and Maurice J. Keating, Rock Island, Ill.

112,834.—WAGON SEAT.—Valentine Myers (assignor to himself and John M. Phelps), Cogan Station, Pa.

112,835.—ROAD SCRAPER.—William T. Nichols, Chicago, Ill

112,836.—TELEGRAPH APPARATUS.—Henry C. Nicholson, Mt Washington, Ohio.

112,837.—SWEEPING MACHINE.—George S. Norris, Baltimore, Md.

112,838.—MACHINE FOR GRINDING SAW TEETH.—John L. Otis, Leeds, Mass.

112,839.—PREPARING TIN SALTS FROM TINNERS' WASTE.—Adolph Ott (assignor to New York Metal and Chemical Manufacturing Company), New York city.

112,840.—SHUTTER FASTENER.—Charles Pabst, Wilmington Del.

112,841.—ELECTRO-MAGNETIC MOTOR.—Henry M. Paine, Newark, N. J., assignor to Mahlon S. Frost, New York city.

112,842.—BIT AND DRILL BRACE.—George G. Parker, and William P. Dodge, Prospect, New York.

112,843.—GATE.—Noah Parker, Thimble County, Ky.

112,844.—ANIMAL TRAP.—James D. Pell, New York city.

112,845.—PREPARING SEED CORN.—John Meek Petit, Monroe Township, Ohio.

112,846.—BROILER.—Edward B. Phelps and James P. McLean, Brooklyn, N. Y.

112,847.—LUBRICATOR.—Tapping Reeves, Little River, Cal.

112,848.—MANUFACTURE OF NITRO-GLYCERIN.—Edward A. L. Roberts, Titusville, Pa.

112,849.—MANUFACTURE OF NITRO-GLYCERIN.—Edward A. L. Roberts, Titusville, Pa.

112,850.—ELECTRIC AND OTHER FUSE HEADS.—Edward A. L. Roberts, Titusville, Pa.

112,851.—"CHAFE IRONS" FOR WHEELED VEHICLES.—Edward P. Roche, Bath, Me.

112,852.—WINE BASKET.—Jean Roussillon, Epernay, France.

112,853.—STEAM ENGINE.—Stephen P. Ruggles, Boston, Mass.

112,854.—HORSE HAY RAKE.—John H. Schoonmaker, Bethlehem, assignor to himself and Alexander Selkirk, Albany, N. Y. Antedated March 10, 1871.

112,855.—HOISTING MACHINE.—John Scott, Pontiac, Mich.

112,856.—HOISTING MACHINE.—William Sellers, Philadelphia, Pa.

112,857.—BUCKLE FOR SUSPENDERS.—Abraham Shenfield, New York city.

112,858.—COMPOUND FOR TREATING CATARRH, ETC., BY INHALATION.—Dana Slade, Chicago, Ill.

112,859.—ELECTRIC FUSE.—Henry Julius Smith, Boston, Mass. Antedated March 7, 1871.

112,860.—HAND TOOL FOR CARVING AND ENGRAVING.—Geo. B. Soley, Philadelphia, Pa.

112,861.—GAGE FOR SAW TABLES.—Franklin L. Sprague, Keene, N. H., assignor to William H. Doane, Cincinnati, Ohio.

112,862.—CULTIVATOR.—William D. Stroud, Oshkosh, Wis.

112,863.—DAMPER.—Leonard S. Taylor, Sigel, Mo.

112,864.—STUMP EXTRACTOR.—Albert D. Tilyon, Norwich assignor to Cornelius A. Church, New Berlin, N. Y.

112,865.—BRAKE FOR RAILWAY CARS.—Lewis W. Tracy (assignor to himself and James E. Granniss), New York city.

112,866.—TWEER.—Eben Trasy, Vermontville, Mich.

112,867.—ROLL FOR THE MANUFACTURE OF PLANTERS' HOES.—John T. Tyler, Pittsburgh, Pa.

112,868.—MACHINE FOR COILING BED SPRINGS.—Matthew Van Vleck, Albany, N. Y.

112,869.—COMBINED HARROW, SEEDER, AND ROLLER.—Joseph Vessot, Sr., and Samuel Vessot, Jr., Joliette, Canada.

112,870.—COMPOUND POTATO PLANTER AND DIGGER.—James Carroll Walker, Farmington, Mich.

112,871.—HAND STAMP.—John Walters, Norfolk, Va., assignor to William O. Hickok, Harrisburg, Pa.

112,872.—VEGETABLE GRATER.—Jacob Wehrle and William Wittlinger, Cincinnati, Ohio.

112,873.—MACHINE FOR GRINDING CARRIAGE SPRINGS.—Hebron Mayhew Wentworth, Gardiner, Me.

112,874.—FINISHING PAPER BOXES.—Seth Wheeler and Edgar Jerome, Albany, N. Y. Antedated March 16, 1871.

112,875.—BARREL.—Henderson Willard, Grand Rapids, Mich.

112,876.—WINDOW CURTAIN FIXTURE.—Thomas Charles Williams, East Randolph, Wis.

112,877.—GLASS FOR THE MANUFACTURE OF SPECTACLES.—Thomas Atwood Willson, Reading, Pa.

112,878.—BOLSTER BLOCK, AND PIER OR ABUTMENT PLATE FOR BRIDGES AND ROOF TRUSSES.—Joseph M. Wilson, Philadelphia, Pa.

112,879.—COMPOSITION FOR STAINING WOOD.—John Winger, Kansas City, Mo.

112,880.—MECHANISM FOR MANUFACTURING HEADS FOR PICTURE NAILS.—Leopold Wolf (assignor to the Meriden Malleable Iron Company), Meriden, Conn.

112,881.—STEAM HEATER.—Charles J. Wood, Baltimore, Md.

112,882.—RUFFLING ATTACHMENT FOR SEWING MACHINES.—Frederick B. Zay, Findlay, Ohio.

112,883.—SAW MILL.—Emanuel Andrews, Williamsport, Pa. Antedated March 10, 1871.

112,884.—CLOTHES WRINGER.—Alfred M. Bailey (assignor to "The Metropolitan Washing Machine Company), Middlefield, Conn.

112,885.—ROCK DRILL.—Albert Ball (assignor to Sullivan Machine Company), Claremont, N. H.

112,886.—SASH HOLDER.—William Thomas Bausmith, Aberdeen, Md.

112,887.—IRON RAILING.—Samuel S. Bent, Port Chester, N. Y.

112,888.—CLEVIS HOOK FOR DOUBLE TREES.—Warren W. Bentley, Lee Township, Mich.

112,889.—ATTACHMENT FOR HARNESS.—William A. Blundell, St. Louis, Mo., assignor to himself, William P. Nelson and Mathew C Tully.

112,890.—ADVERTISING LAMP.—Emil Boesch, San Francisco, Cal.
112,891.—WHIP STOCK.—John J. Bohler, Westfield, Mass.
112,892.—MOWING MACHINE.—Aaron Bolander, Akron, Ohio.
112,893.—PORTABLE RAILWAY.—Theodore Bootsman, Tompkinsville, N. Y.
112,894.—CORN PLANTER.—Richard A. Boulware, Doniphan, Kansas.
112,895.—DEVICE FOR OPENING OYSTERS.—Michael C. Boyer, Norristown, Pa.
112,896.—APPARATUS FOR TEMPERING SAND.—John C. Broadmeadow, Bridgeport, Conn.
112,897.—RAILWAY CAR TRUCK.—Chauncey S. Buck (assignor to himself and James Lovett), St. Louis, Mo.
112,898.—ROOFING BRACKET.—Jonathan W. Cadwell, Springfield, Mass.
112,899.—VALVE GEAR FOR STEAM ENGINE.—A. S. Cameron, New York city.
112,900.—STILL.—James A. Campbell, Dayton, Va., assignor to himself, A. K. Layman, and L. W. Myers.
112,901.—THREAD GUIDE FOR WINDING MACHINES.—D. M. Church, Holyoke, Mass.
112,902.—SHOEMAKERS' HAMMER.—Arthur Clarke, Boston, Mass.
112,903.—DOOR BELL.—John P. Connell, Kensington, Conn.
112,904.—GATE.—Peter S. Crawford, Union, Ill.
112,905.—CARRIAGE GEARING.—Cornelius Custer, Norristown, Pa.
112,906.—HARNESS ROSETTE.—W. D. Davis, C. W. Blakeslee, and J. C. Peck, Watertown, Conn.
112,907.—CALL BELL.—H. A. Dierkes and John Fretts, New York city; John Fretts assigns his right to H. A. Dierkes.
112,908.—CIRCULAR SAW BENCH.—B. F. Dunklee, Concord, N. H.
112,909.—ADJUSTABLE MILL FEED.—Wm. T. Duvall, Washington, D. C.
112,910.—LOCKED COCK.—Henry Essex, Meadeville, Pa.
112,911.—SAND SCREEN.—G. W. Fair, Dayton, Ohio.
112,912.—BED BOTTOM.—Matthew Faloon, Bloomington, Ill.
112,913.—PLOW.—L. F. Frazee, Jersey City, N. J.
112,914.—TWEER FOR BLAST FURNACES.—John Fry, Salisbury, Conn.
112,915.—CENTER POINT TRIMMING.—Ansel Hecht, New York city.
112,916.—CULINARY VESSEL.—Levi Hermance (assignor of one half his right to P. J. Marsh), Lansingburgh, N. Y.
112,917.—PENCIL CASE.—W. S. Hicks, New York city.
1.2,918.—ORE SEPARATOR.—Wm. Hooper, Ticonderoga, N. Y. Antedated March 16, 1871.
112,919.—ORE SEPARATOR.—Wm. Hooper, Ticonderoga, N. Y. Antedated March 16, 1871.
112,920.—MEDICAL COMPOUND OR SALVE.—Martha Huddleston, Jackson, Tenn.
112,921.—FAN AND FLY DRIVER.—Frank M. Hunt, Clinton, Ga.
112,922.—CATTLE TIE.—Seth T. Hutchins, North Anson, Me.
112,924.—ROLLING MILL.—Asa Johnson, Brooklyn, N. Y., assignor to himself and W. H. Johnson, New York city.
112,925.—HOLLOW TILE WALL.—G. H. Johnson, New York city.
112,926.—HOLLOW TILE FLOOR.—G. H. Johnson and Balthasar Kreischer, New York city.
112,927.—RESERVOIR FOR GRAIN AND OTHER MATERIALS.—G. H. Johnson and Balthasar Kreischer, New York city.
112,928.—FIRE ESCAPE.—C. P. Kenyon (assignor to himself and J. W. Sharp), Selma, N. C.
112,929.—COMPOSITION TILE FOR FIRE-PROOFING BUILDINGS.—Balthasar Kreischer, New York city.
112,930.—HOLLOW TILE.—Balthasar Kreischer, New York city.
112,931.—STOVEPIPE SHELF AND CLOTHES DRIER.—Geo. W. Langdon (assignor to himself and Lewis Sencare), Greene, N. Y.
112,932.—BELL HANGING.—A. L. Sas Slyhens, near Ostend, Belgium.
112,933.—LEGGOTYPING.—W. A. Leggo, Montreal, Canada.
112,934.—HINGE.—M. R. Lemman, Hamilton, Ohio.
112,935.—WOOD SCREW.—Andrew B. Lipsey, West Hoboken, N. J.
112,936.—BASE-BURNING STOVE.—Lyman Litchfield, Gouverneur, N. Y., assignor to himself and H. K. Osborne, Arlington, Mass.
112,937.—TRAVELING TRUNK.—John C. Locke, Rochester, N. Y.
112,938.—CHAIN FOR HANGING SASH.—Michael McGrath, New York city.
112,939.—BOAT-LOWERING APPARATUS.—George W. Mallory, Mystic Bridge, Conn.
112,940.—HARVESTER RAKE.—John P. Manny, Rockford, Ill.
112,941.—HARVESTER RAKE.—John P. Manny, Rockford, Ill.
112,942.—HARVESTER.—John P. Manny, Rockford, Ill.
112,943.—SAW WITH DETACHABLE TEETH.—T. P. Marshall, Trenton, N. J.
112,944.—APPARATUS FOR MANUFACTURING WIRE.—B. A. Mason (assignor to T. L. Carpenter), New York city.
112,945.—WOOD PAVEMENT.—G. A. May, Chicago, Ill.
112,946.—BRAIDING MACHINE.—John McCahey and Stephen B. Salisbury (assignors to the New England Butt Company), Providence, R. I.
112,947.—BUCKLE.—Duncan McMillan and Abram Rowan, Webster City, Iowa.
112,948.—STEAMING ATTACHMENT FOR KEROSENE STOVES.—R. B. Mitchell, Chicago, Ill.
112,949.—MOLDING PLANE.—Ellis H. Morris, Canton, Ohio.
112,950.—KEEP AND BRACE FOR FIFTH WHEELS.—Francis B. Morse (assignor to H. D. Smith & Co.), Plantsville, Conn.
112,951.—PENCIL SHARPENER.—Elias P. Needham, New York city.
112,952.—ANKLE BRACE.—Jacob S. Niswander, Oakland, Cal.
112,953.—PIE CASE.—H. H. Olds, New Haven, Conn.
112,954.—CAR BRAKE AND STARTER.—Joseph Caradis (assignor to himself and Sarah Parker), Brooklyn, N. Y.
112,955.—LIFTER FOR FRUIT JAR.—S. R. Pinckney, New York city.
112,956.—GATE FOR TURBINE WATER WHEEL.—Samuel A. Prescott, Sutton, Mass.
112,957.—APPARATUS FOR ESTABLISHING ELECTRICAL COMMUNICATION IN RAILROAD TRAINS.—P. D. Prud'homme, Paris, France, assignor to Charles De Frondat and Alfred Michant, Boston, Mass.
112,958.—PIPE COUPLING.—J. B. Ramp, Cuyagoga Falls, Ohio.
112,959.—PRESSED FRUIT LIFTER.—Ennis A. Raymond, Waterloo, Iowa.
112,960.—BROOM.—C. L. Reid, Louisville, Ky.
112,961.—PORTABLE FURNACE.—Jesse Reynolds, Philadelphia, Pa.
112,962.—REVERSIBLE BOOT HEEL.—Frederick Richardson and Francis Hacker (assignors to Reversible Boot Heel Co.), Providence, R. I.
112,963.—FRUIT DRIER AND FOOD WARMER.—Seelye Richmond (assignor of one half his right to Joseph E. Dickson), Annapolis, Md.
112,964.—TILE STOVE.—E. Y. Robbins, Cincinnati, Ohio. Antedated March 15, 1871.
112,965.—PORTABLE FURNACE.—W. D. Robertson, Knoxville, Tenn.
112,966.—HAY AND COTTON PRESS.—C. A. Robinson, Florence, Ind.
112,967.—MACHINE FOR HUSKING CORN.—Jacob Russell, N. Y.
112,968.—END GATE FOR WAGONS.—J. F. Sener, Lancaster, Pa.
112,969.—HYDRAULIC NOZZLE.—Henry Shaw, Nevada City, Cal.
112,970.—SAW-SET AND FILER.—T. L. Shaw, Omaha, Neb.
112,971.—TURNING LATHE.—S. D. Sheldon, Fitchburg, Mass.
112,972.—SHAFT COUPLING.—James Sherry, Watertown, N. Y.
112,973.—MANUFACTURE OF EYELET STOCK.—S. N. Smith, Providence, R. I.
112,974.—HOLDER FOR DRINKING GLASSES.—J. V. Snider, Philadelphia, Pa.
112,975.—GAS MACHINE.—T. G. Springer, St. Louis, Mo. Antedated March 10, 1871.
112,976.—WHISK BROOM.—Greenleaf Stackpole, Elizabeth, N. J.
112,977.—CHEESE HOOP.—William Sternberg, Bridgeport, N. Y.
112,978.—HINGE FOR SEWING MACHINES.—R. H. St. John, Bellefontaine, Ohio.
112,979.—SAW GUMMER.—N. F. Stone, deceased (Amanda Stone and Benjamin Holbrook, administrators), Chicago, Ill. Antedated March 14, 1871.
112,980.—NEEDLE FOR SEWING MACHINES.—Edwin Strain, Newton, Mass.
112,981.—HYDROCARBON GAS APPARATUS.—M. H. Strong and W. I. Reid, Brooklyn, N. Y.
112,982.—FIRE ESCAPE.—T. L. Summeril, Juda, Wis.
112,983.—SOAP DISH.—J. M. Thatcher, Bergen, N. J.
112,984.—BOOK SUPPORT.—S. M. Thompson, Providence, R. I.
112,985.—SASH HOLDER.—Alexander Thomson, Champaign, Ill.
112,986.—FIRE-PLACE GRATE.—J. W. Thornley, New Brighton, Pa.
112,987.—ALARM LOCK.—J. H. Thorp, New York city.
112,988.—ELASTIC ROLL.—W. H. Towers, Boston, Mass.
112,989.—THILL COUPLING.—Charles Twombly, Boston, Mass.
112,990.—WALKING CULTIVATOR.—John Vanluvanee and Hugh Smith, Moline, Ill.
112,991.—APPARATUS FOR CONVERTING RECIPROCATING INTO ROTARY MOTION.—Franz Wagner, New York city.
112,992.—METER.—Franz Wagner, New York city.
112,993.—COOKING STOVE.—G. W. Walker, Boston, Mass.
112,994.—CULTIVATOR.—F. N. Welden, Rockford, Ill.
112,995.—FUEL AND KINDLING WOOD.—W. E. Wertenbaker, Washington, D. C.
112,996.—ZINC BOARD FOR STOVES.—William Westlake, Chicago, Ill.
112,997.—BREECH LOADING FIRE-ARM.—Eli Whitney, New Haven, Conn.
112,998.—RAILWAY RAIL AND CHAIR.—W. E. Winby, Edgbaston, England.
112,999.—SHIP'S COMPASS.—G. W. Wood (assignor to M. A. Wood), Brooklyn, N. Y.
113,000.—TYING BROOMS AND BRUSHES.—J. H. Anderson, Terre Haute, Ind., assignor to Thomas Marston, Jr., W. L. Peck, and C. I. Peck, Chicago, Ill. Antedated Feb. 14, 1871.

REISSUES.

4,305.—SEWING MACHINE.—C. O. Crosby, New Haven, assignor to N. A. Baldwin, Milford, Conn.—Patent No. 11,745, dated October 12, 1858.
4,306.—COPYING PRESS.—E. W. Frost, New York city, assignee of Francis Hovey.—Patent No. 42,141, dated March 29, 1864.
4,307.—SEED DRILL.—F. H. Manny, Rockford, Ill., assignee of M. C. Younglove.—Patent No. 20,603, dated June 15, 1858.

DESIGNS.

4,721.—CARPET PATTERN.—Jonathan Crabtree (assignor to Leedom, Shaw & Stewart), Philadelphia, Pa.
4,722.—ORNAMENTAL CHAIN LINK.—Virgil Draper (assignor to O. M. Draper), Attleborough, Mass.
4,723.—CHAIN LINK.—Virgil Draper (assignor to O. M. Draper), Attleborough, Mass.
4,724.—SHOW CASE.—W. H. Grove, Philadelphia, Pa.
4,725.—SIDE FRAME OF SCHOOL DESKS.—A. F. Old (assignor to J. A. Bancroft & Co.), Philadelphia, Pa.
4,726 and 4,727.—TYPE.—W. H. Page (assignor to W. H. Page & Co.), Norwich, Conn. Two patents.
4,728.—TYPE BORDER.—W. H. Page (assignor to W. H. Page & Co.), Norwich, Conn.
4,729.—WHISK BROOM.—Greenleaf Stackpole, Elizabeth, N. J.
4,730.—SWORD.—E. S. Warren, Springfield, Mass.
4,731.—HANDLE FOR SPOONS OR FORKS.—George Wilkinson (assignor to Gorham Manufacturing Co.), Providence, R. I.

TRADE-MARKS.

197.—PLUMBAGO GREASE.—American Graphite Co., New York city.
198.—PUMP.—C. G. Blatchley, Philadelphia, Pa.
199.—WOOLEN GOODS.—W. P. Gibbs, R. G. Ross, I. N. Field, and W. B. Field, St. Charles City, Mo.
200.—WEIGHING SCALE.—E. F. Jones, Binghampton, N. Y.
201.—WHISKEY.—Mills, Johnson & Co., Cincinnati, Ohio.
202.—SHIRT.—Morison, Son & Hutchinson, New York city.
203.—TOBACCO.—E. J. Oppelt, Baltimore, Md.
204.—BURNING FLUID.—R. G. Richards, New York city.
205.—SLATES, ETC.—The Silicate Slate Co., N. Y.
206.—WINE.—M. Werk & Sons, Cincinnati, Ohio.

EXTENSIONS.

WATER WHEEL.—Samuel Reynolds, of Ellisburg, N.Y.—Letters Patent No. 16,881, dated March 24, 1857.
STEAM BRAKES FOR RAILROAD CARS.—T. E. Sickels, of Omaha, Neb. Letters Patent No. 16,884, dated March 24, 1857.

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Vol. XXIV.—No. 15. [NEW SERIES.] NEW YORK, APRIL 8, 1871. $3 per Annum. [IN ADVANCE.]

BROWN'S PATENT TYPE-SETTING AND DISTRIBUTING MACHINERY.

Several plans have been proposed for setting and distributing types, but all have failed from one cause or another; and many have concluded that this was one of the things that could not be done by machinery. But the demand for greater expedition has now become so great that there can be little doubt that the supply is near at hand.

We present to our readers illustrations of machinery, which is stated to have been working successfully for the past year, and bids fair to revolutionize this branch of the printing business.

The type-setting machine stands upon a table, and consists of a case, a stick, a justifier, and a galley. Two machines, arranged back to back, occupy a table five feet by two.

The case consists of a series of inclined channels, in which the type stand, and the case is set at such an angle that they slide downward by their own gravity, and rest upon a bar which closes the lower ends of the channels. Across the lower end of the case is placed a shield provided with openings for the type to pass through as they are set. To this shield is attached an index showing the letters and sorts which the case contains.

Openings in the rear of the case allow a thin tongue to enter, which, coming in contact with the lower end of a type, forces it from the case directly into the stick, which consists of a frame of thin sheet steel, fitted to slide easily in guides which are so placed that it will be in line with the top of the types. On the upper side of this frame is the channel which receives the type; it is a quarter circle in form, its sides of thin steel, forming springs, which, pressing against the edge of the type as it is forced from the case, hold it in place.

To the frame is also attached a pivoted lever or key, by means of which the frame is moved back and forth from letter to letter. To one end of the key, by means of a rod, is attached the tongue which forces out the types. As the tongue moves up it takes the letter before it, and forces it between the springs which are formed by the upper end of the channel of the stick.

The whole, weighing but a few ounces is moved with the greatest ease from letter to letter. The operator, seizing the handle with thumb and finger, runs it nearly opposite the letter required. As the handle is depressed, the type is thrust out into the stick; as the handle is raised again, the follower pushes the type just lifted sufficiently down the semi-circular channel to allow the next one to be taken in the same way. At the left of the case is a handle attached to a cam which operates the gage on the case, throwing it in communication with the capitals or small letters, as the operator may desire; the case being so arranged that these stand side by side. When the stick is full it moves to the right, where its lower end connects with the horizontal channel which forms the communication between the stick and the justifier. The type slide into this channel; the arm swings back to its first position, and the stick is ready for another line.

In this channel the type stand in a long line, which can be divided into lines of the length required. This can be done by the operator who sets the type, or two can work at the same machine, as the two operations require about equal time.

The justifier operates as follows: At the outer end, a part of the horizontal channel is separated, and is attached to arms which are pivoted directly under the end of the galley. It is supported exactly in line with the stationary part of the channel; the line slides upon it, until its end rests against the adjustable stop (which can be adjusted to any length of line). The line is then divided at the proper place; the movable part is then slightly raised, bringing the line between the projecting edge of the galley and the adjustable stop, which form rigid supports for both ends of the line.

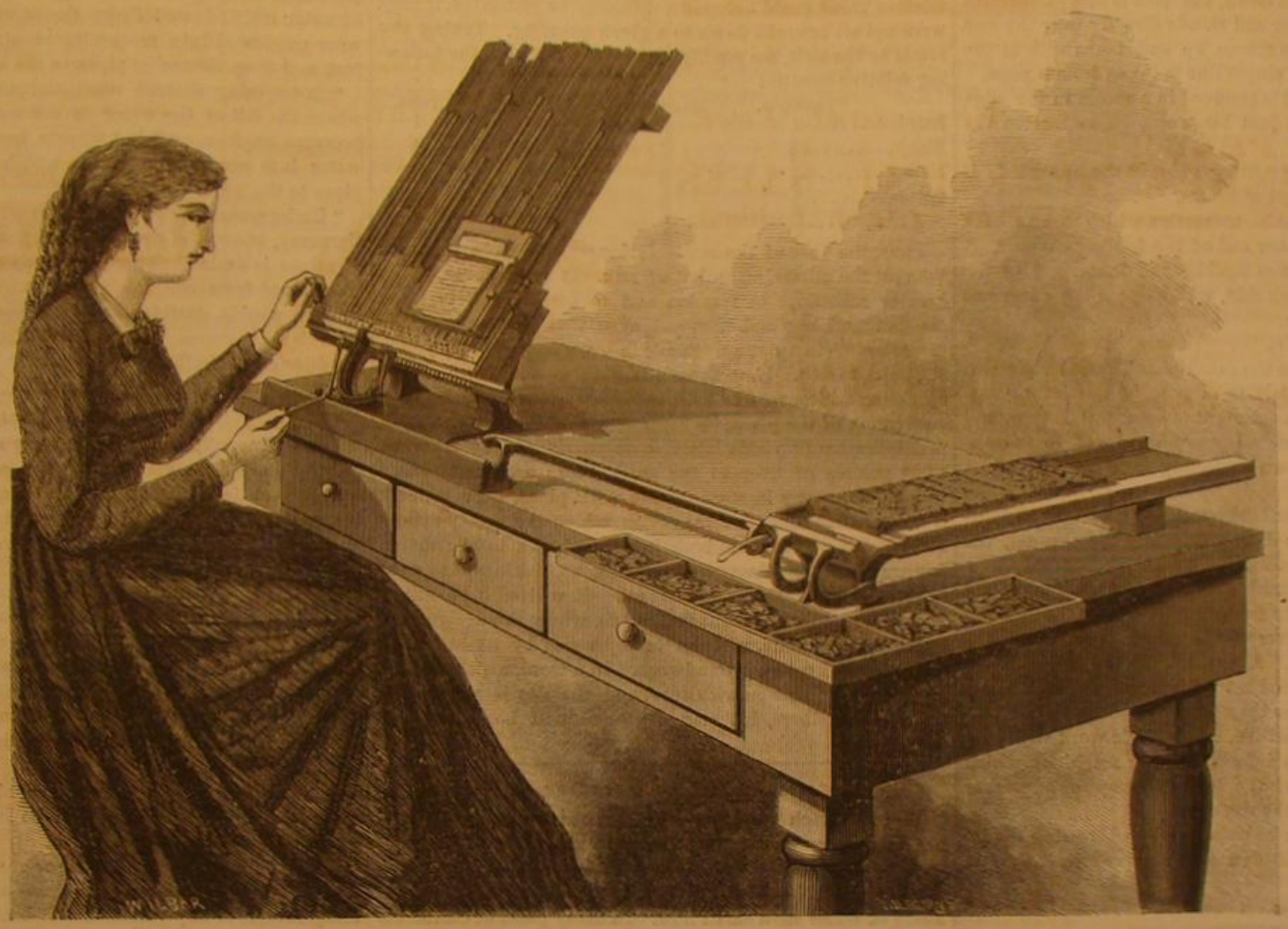
If the line be too short, the spaces between the words are taken out and replaced by thicker ones, until the line exactly fills the measure.

The line is then carried up until it stands in an upright position over the end of the galley, into which it drops. The justifier drops down to its first position, and is ready for another line.

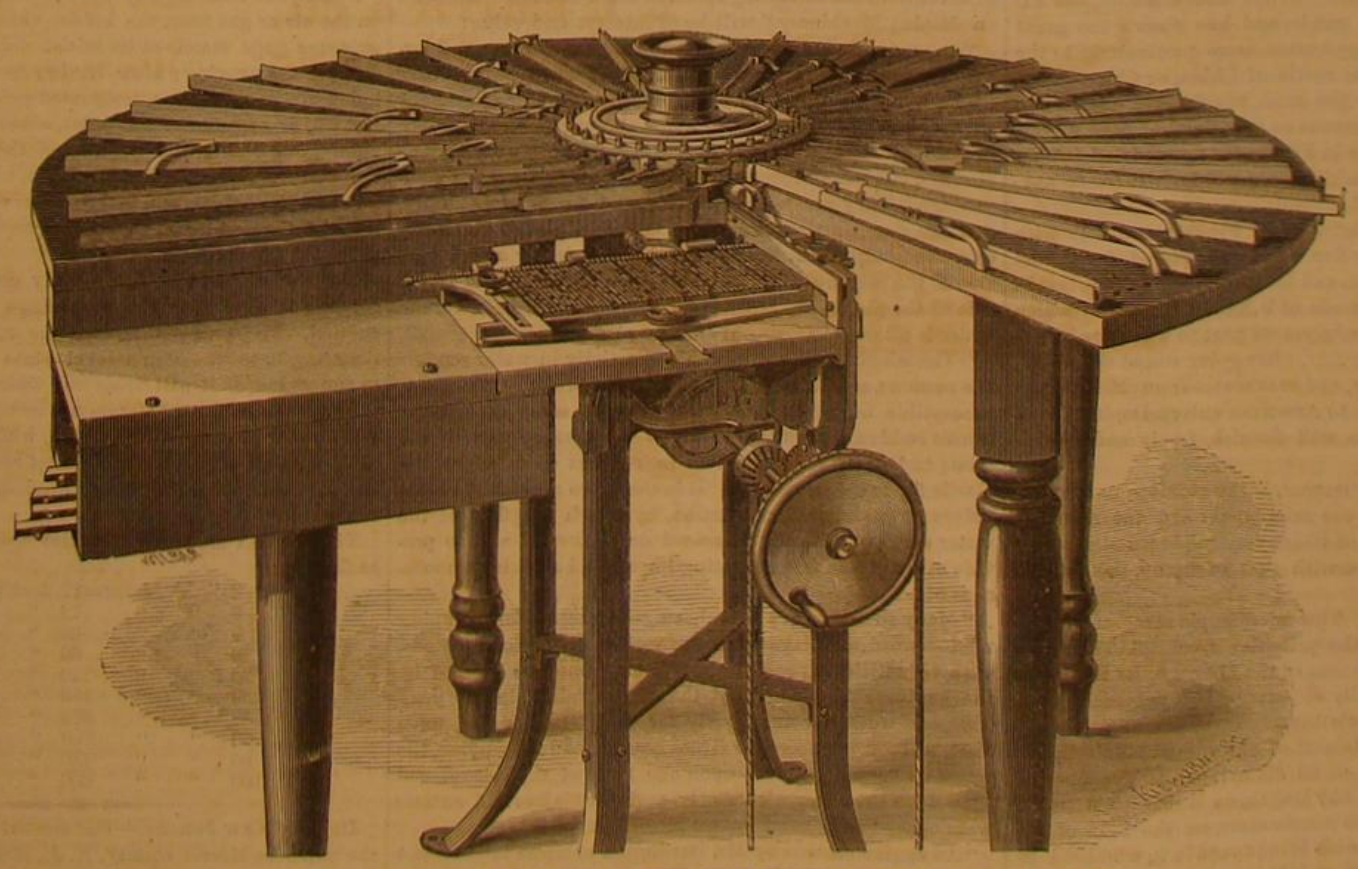
Type can be set by this method much faster than by the old, inasmuch as every downward motion of the hand places a type in the stick, while, by the common method, at least one motion must be made to pick up the letter, another to place it in the stick, but oftener several motions are required to accomplish this.

These machines are very simple, and can consequently be learned very quickly; and, we are told, actual experience proves that at least double the work can be done by the use of the machine, with an expenditure of one half the labor.

The key is of the simplest form; and if the case contain one hundred letters, only one key is required, whereas, if stationary keys were employed, one would be required for each letter, increasing the cost one hundred times; and the liability to get out of order would increase in the same ratio, to say nothing of other mechanism required to dispose of the letters as they are indicated by the keys, which has been the prime cause of



ORREN L. BROWN'S PATENT TYPE-SETTING MACHINE.



ORREN L. BROWN'S PATENT TYPE-DISTRIBUTING MACHINE.

failure in other machines. In this machine, the letters are moved the shortest possible distance (only the length and the thickness of the letter) reducing the wear and liability of damage to the lowest possible degree.

THE TYPE DISTRIBUTER.

To the full utility of a type setting machine a distributer is essential. The machine of which we present an illustration, does the work by means of a system of levers or tumblers acting upon nicks in the edge of the type. The operation is as follows: The page being placed in the galley at the front of machine, it is lifted, one line at a time, into a feeding channel, just wide enough to receive a single line, which is fed endwise, towards the edge of the distributing ring, by a ratchet acting upon a follower, which presses against the outer end of the line. This channel is below the ring, and the wall which closes its inner end is inside the circumference of the ring, a distance equal to the thickness of the thickest type.

At the inner end of the channel is a thin tongue or plunger, which is moved up and down by a cam on the main shaft. This tongue moves down, the line is moved forward until the letter at the inner end stands directly over the end of the tongue, which then moves up and takes with it the letter; in the same way a single line is taken from a page.

As the type passes up, it is received in a recess in the edge of the ring; this recess is just large enough to receive the largest type.

This recess is formed by cutting a slot in the upper side of the ring, and inserting a set of levers.

The ring has an intermittent motion which brings each recess directly over the inner end of the feeding channel. A finger advances and presses against the inner end of the levers, moving them all one side, which opens the outer end ready to receive the letter.

The channels that receive the type are in two parts. A short section is attached to the machine. The outer sections are movable, and when full, form part of the setting machine. The fourth one on the right is seen full of type, and separated from the machine ready to be removed to the setter. Empty ones are shown projecting from the box under the galley at the left.

The outer end of the line is supported by a slight weight, one part of which projects downwards into the channel, the other end rests upon the table.

These machines can be used to distribute type that is set by hand, and will distribute from 12,000 to 18,000 types per hour. They require but very little power, and handle the type with perfect safety. A boy can attend several machines, as all that is required is to put the page in the galley, and remove the channels as they are filled.

The motions are all positive, doing their work with certainty; thus obviating the defects of other machines which depend upon the weight of the letter, springs, or any other delicate mechanism to do the work.

Further information can be obtained by addressing the inventor, Orren L. Brown, 30 and 40 Hanover street, Boston, Mass.

RAMIE.

Translated from the Gazette des Campagnes, by H. R. de La Reintre, for the Scientific American.

Dr. Ozanam, a distinguished writer and scientist, has examined the subject of the ramie, and has shown the great merits of this plant. It appertains more particularly to the species known as the white nettle of China, or China grass, of which it appears to be the most remarkable and useful variety. This plant, indigenous to the island of Java, China, and India, has been known in France for upwards of twenty years, though this knowledge never attained there to anything beyond the limits of curiosity.

In England, the manufacturers of stuffs procure it with great difficulty, pay sixty-five cents per pound for it, and keep secret the composition and texture of the brilliant stuffs —of a silky appearance—made of it, and of those into which the ramie fiber enters as a component part to a greater or less degree. At present, the ramie, after going round the world, comes by an inverse route, and reaches us from Mexico and Louisiana. There, thanks to American enterprise, it will not be long before the ramie will flourish freely and abundantly.

The following, says Dr. Ozanam, is the result of an examination of this plant with the micrometer and the microdynamometer, in the course of which the simple primitive fiber of the ramie was compared with that of hemp, flax, cotton, and silk.

This study relates to: 1. The microscopic structure of the fiber. 2. The length of the primitive fiber. 3. The width of the fiber. 4. The thickness of the fiber. 5. Its resistance to traction. 6. Its elasticity of stretch before breaking. 7. Its resistance to torsion (twisting).

The following is a statement of the results obtained, the magnifying power being of 80 diameters: 1. The fiber of ramie is, so to speak, of any length, as it has been traced throughout a length of 25 centimeters, on the field of the microscope, without any break being found in it, whether it be constituted of a continuous cellula, or whether the different cellulas which succeed each other have lost their points of separation, by reason of a more intimate fusion one with the other. Hence, the fiber of ramie possesses great strength. 2d. The fiber of flax and hemp, which appears so long, is, in fact, very short: these are cellular fusiform fibers, of about 3 centimeters long, in juxtaposition at their extremities, and imbricated one upon the other. The breaks always occur at the weak points of their junction. 3. The fiber of ordinary cotton is not more than from 2 to 3 centimeters in length. Cotton, which has a long staple, averages from 6 to 7 centimeters; hence the weakness which exists in cotton thread, notwithstanding the strength imparted to its united particles by the twisting process.

The results of the analysis are as follows:

Ramie,	50 centimeters long,	$\frac{6}{100}$	mill broad,	$\frac{7}{100}$	mill thick.
Flax,	5 "	$\frac{3}{100}$	"	$\frac{3}{100}$	"
Hemp,	5 "	$\frac{5}{100}$	"	$\frac{3}{100}$	"
Cotton,	5 "	$\frac{4}{100}$	"	$\frac{5}{100}$	"
Silk,	1 meter long,	$\frac{2}{100}$	"	$\frac{1}{100}$	"

Measurements obtained by the use of the microdynamometer, and Professor Alcan's instrument of arts and trades, upon fibers of 5 centimeters in length:

	Resistance to traction.	Stretch.	Resistance to torsion.
Ramie,	24 grains.	3 mills.	180 turns.
Flax,	3 "	2 "	140 "
Hemp,	6 "	2½ "	176 "
Cotton,	2 "	4 "	696 "
Silk,	1 "	11 "	1,038 "

But these several fibers being of different thicknesses, their relative value could only with difficulty be estimated, if they were not all brought down to a given quantity. Taking the ramie as the unit, we readily and clearly arrive at the following relative results:

	Thickness.	Traction.	Elasticity.	Twist.
Ramie	1	1	1	1
Flax	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{2}{3}$	$\frac{4}{5}$
Hemp	$\frac{2}{3}$	$\frac{1}{3}$	$\frac{3}{4}$	$\frac{13}{20}$
Cotton	$\frac{1}{3}$	$\frac{1}{3}$	1	1
Silk	$\frac{1}{4}$	$\frac{1}{6}$	4	6

Thus, the fiber of the ramie is longer and more uniform, than all the others, after that of silk. It is stronger, offers greater resistance to traction and to torsion, and is more elastic than hemp and flax, and even than cotton, which is more flexible in twisting. Ramie in these respects only yields the palm to silk. If, to these qualities, we add those of the sparkling whiteness and brilliant luster of its fiber, the easy cultivation of the plant, its rapid reproduction and excessive multiplication (it yields three crops yearly, and as many as 1,000 pounds of fiber to the acre), there are surely many chances of success in store for the ramie plant. Nevertheless it is not called upon to rival cotton, which it scarcely resembles; but it will surpass both hemp and flax in the manufacture of fine and damasked table linens, tickings, fine cambrics, and body linens (shirtings). It will also be mixed with cotton, to make damasked stuffs, where the design, produced by the ramie, will be brought out by its brilliancy upon the dull cotton groundwork. In a word, a rich field is presented by this new culture, and the day is not distant when these fibers, hitherto neglected, will be in demand everywhere.

Water-pressure Engines for Mines.

There is much room for improvement yet in water pressure engines, and we know that many accomplished engineers are studying to make such advances, in this branch of engineering, as shall better adapt these engines to use under great heads of water with small flow. In many parts of California especially, such engines could be employed to great advantage, and in the mountainous regions of the west there are many other localities where the water power is of the character above mentioned. To such as are interested in this field of invention, the following remarks from Blake's "Treatise on Mining Machinery" will be of interest and value:

"In mountainous regions, where water under a considerable head or pressure can be had, it may be advantageously utilized, for pumping, hoisting, or other mining operations requiring power, by means of hydraulic engines and surface or underground wheels. There are many places on the Pacific coast where these engines can be introduced with advantage. They are usually constructed for pumping only, and are single-acting, with long cylinders placed vertically over the pump shaft, the pump-rod being simply a prolongation of the piston-rod. The water is admitted to the under side of the piston, and when it has run its upward stroke, the water is allowed to flow out and the piston descends.

"The absence of any sensible elasticity in water renders the motions, resulting from its use under pressure in engines, susceptible of perfect control; but the same inelasticity causes sudden shocks and blows to the moving parts if the inlets and outlets be made as in engines operated by the elastic fluids steam and air. It is therefore necessary to use valves of peculiar construction, by which the flow of the water may be gradually increased or slackened, and to provide other means for preventing impact and securing smoothness of action.

"Many such engines have been constructed for pumping mines abroad, and have operated successfully for long periods, with very little expense or attention. One was erected by the engineer Trevethick at the Alport mines, in the year 1803, and worked continuously for forty seven years, until 1850, when work upon the mines ceased. In this engine, the water was admitted first upon one face of the piston and then upon the other, alternately, and the inlets and outlets were opened and closed by two pistons at the side.

"An engine erected by Mr. Darlington at these mines had a cylinder 50 inches in diameter and a stroke of 10 feet. The cylinder was placed directly over the shaft, and the piston and pump-rod were continuous. The column of water was 132 feet high, and gave a pressure upon the piston of about 58 pounds to the square inch, or more than 50 tuns upon its area. Water was raised from a depth of 22 fathoms, by means of a plunger 42 inches in diameter, and when the mine was very wet, nearly 5,000 gallons of water per minute were discharged into the adit. The water under pressure was admitted under the piston only; cylindrical valves admitted a full flow for seven eighths of the stroke only, and then commenced closing, while a small valve opened and allowed enough water to pass in to complete the stroke.

"The largest engine erected by Mr. Darlington was similar in its general construction to that just described. It had a cylinder 35 inches in diameter; stroke, 10 feet; pressure column, 227 feet high. Its average speed was 80 feet per minute, and its greatest speed 140 feet per minute. The pressure of the water was 98 pounds per square inch, giving a total weight of 40 tuns upon the piston. This engine was automatic, the motion was certain and regular, and the cost of maintenance trifling.

"Sir William Armstrong has made use of water pressure, obtained from natural falls, to produce rotary motion by means of a pair of cylinders and pistons, with slide valves, in some degree resembling those of high pressure steam engines, but provided also with relief valves. Water-pressure engines of this description were erected at the lead mines at Allenheads, in Northumberland, and are used for the various operations of crushing the ores, hoisting, pumping, and driving the machinery of the concentrating works. Small streams of water which flowed down the slopes of adjoining hills were conducted into reservoirs at elevations of about 200 feet, and from thence by pipes to the engines.

"In a mining district upon the river Allen, in England, where the fall of the water is not sufficient to work water-pressure engines, overshot wheels have been used to force water into accumulators, from which it can be conveyed in pipes to the required points.

"Underground water wheels are used in various parts of Germany, where the circumstances permit. Where a system of mines is drained through a deep adit, the water can be transferred from one mine to another, and its fall utilized by such wheels, until it finally reaches the level of the adit by which it escapes. Instances of this may be observed in the district of Freiberg, Saxony."

Testing Gas Meters.

The testing of gas meters is a very nice operation, and can only be properly performed by the constant observance of certain conditions. The instrument employed, called a prover, is a gasholder, inverted in water, and made to hold a given quantity of air, under conditions, hereinafter set forth, extracted from Harris & Bro.'s *Gas Superintendent's Pocket Companion*. The prover is constructed like an ordinary gasholder, but smaller, and it has a compensating balance, which adjusts for the variation in pressure, as the holder sinks in the water cistern. The conditions to be strictly observed are:

1st. The prover should be mathematically correct.

2d. For a uniform pressure from top to bottom, the meter prover should be carefully counterpoised and adjusted with a compensating balance.

3d. The air in the proving room, also the air or gas, and the water in the holder, should be kept uniformly of the same temperature.

4th. A thermometer in the air or gas holder, and one in the proving room, will always indicate the uniformity of the temperature, or any variation which arises.

Due attention being paid to these points, connect the meter to the holder. Then try your connections if they be tight. To do this, you require a pressure gage between the meter prover and meter.

Place your hand tightly upon the outlet of the meter, turn on the air or gas from the holder, then turn it off, and if the pressure gage stands at its initial point, you are ready to go on with the proving; after having brought the hand on the index of the meter to a designated point, the holder starting from 0, or any other fixed point, observe carefully these two points, the one on the holder and the other on the index of the meter. Thus prepared, turn on, to the meter, the gas or air from the holder, and make one or more complete revolutions of the pointer on the dial, always stopping exactly on the point started from.

If the meter and holder exactly correspond, the meter is correct; if they vary, the percentage of error is easily calculated. To prove wet meters, the only additional observations are, to set them on a level plate and allow the water to run as low as it will from the water line or side screw—the true water level. Meters are usually proved under from 1 to 1½ inch pressure at inlet pipe, which should be well supplied with air or gas, and the outlet reduced to a given quantity per hour, according to the English standard, as per table below.

The English standard of outlet openings, after testing, is as follows:

2	light	Meter=	12	feet	per hour.
3	"	"	18	"	"
5	"	"	30	"	"
10	"	"	60	"	"
20	"	"	120	"	"
30	"	"	180	"	"
45	"	"	270	"	"
60	"	"	360	"	"
80	"	"	480	"	"
100	"	"	600	"	"

IRON IN NEW JERSEY.—The annual yield of iron ore, from the mines in Morris county, N. J., is over 600,000 tuns; and the greater portion of this is sent to the Lehigh valley, Pa., to be smelted. The value reaches $3,000,000 per annum. The ore deposits are continuous, and follow the course of the granitic strata, in a northeast to southwest direction. The mines have long been in work, and are some of them as deep as 700 feet. The supply of paying earth is inexhaustible.

THERE are six millions of real estate owners in the United States, the farmers being four millions of the number.

DYERS' RECIPES.

From Haserick's Secrets of Dyeing.

PONCEON.—100 pounds of fabric. Color scarlet first, as given in recipe for scarlet on wool, in previous issue, but leave out the flavine, or yellow dyestuff. After the goods are well rinsed, prepare a kettle with fresh water; heat it to 180° Fah.; strain into it 5 pounds of cochineal paste; stir all well together, and enter the fabric; handle it for half an hour without boiling; rinse and dry. Instead of ammoniated cochineal, 3 ounces of magenta crystals may be used.

PINK FOR LISTINGS.—To 100 pounds of wool use 8 pounds of cochineal, 5 pounds of tartar, 10 pounds of scarlet spirit, ¼ pound of tin crystals. Boil all together until dissolved; then cool off the dye to 170° Fah.; enter and handle well; boil for half an hour. If the wool should not color even in ten minutes, use a few pounds of muriatic acid. (See scarlet on wool, as above.) If this color be used for listings on white flannels, add about 6 pounds more scarlet spirit to the wool, just before taking it out. This additional tin acid will fasten the cochineal more, without rotting the wool. The color will stand the soap better; and to keep the color from running before bleaching entirely, the scourer must add a solution of 1 pound of muriatic acid to the last rinsing of the flannel. If the cochineal should have stained the white, then rinse in cold water before fastening the spots, by the sulphur, when bleaching.

MADDER RED.—This color is mostly used for army uniforms. To 100 pounds of fabric, use 20 pounds of alum, 5 pounds of tartar, and 5 pounds of scarlet spirit. After these are dissolved, enter the goods, and let them boil for two hours; then take them out, let cool, and lay over night. Into fresh water stir 75 pounds of good Holland madder. Enter the fabric at 120° Fah., and bring it up to 200° in the course of an hour, during which time it must be handled well to secure evenness; then rinse and dry.

HYPERNIC RED is generally used for carpets and zephyrs. 100 pounds of yarn are boiled in a solution of 15 pounds alum, and 3 pounds half-refined tartar, for one hour, or, what is just as well, laid over night in the hot liquid. The color is much improved if this prepared yarn can lay a few days in the atmosphere before coloring it red. In fresh water, boil 30 pounds of hypernic, or beechwood, for ten minutes. Cool the liquid to 170° Fah.; then add 3 pounds of whiting, or chalk; handle in this the prepared yarn, for ten minutes; bring up the heat to 200°, when the yarn will be a fine red; in half an hour it will be ready to take out and cool. For carpet yarn, it is not necessary to rinse, but to dry as it is. If hard water is to be used, as in some localities, the chalk is unnecessary; but the latter surely adds brilliancy to the color, equaling cochineal. Use in the preparation no blue vitriol, which dulls the color.

Indian Mode of Casting Delicate Objects in Metal.

Many of the ornaments brought from India, are cast in a very delicate and refined manner. Those curious to know how they are made will gain some information from the following extract, communicated to the *English Mechanic* over the signature "Eos:"

The goldsmiths and silver workers always prefer the curious clay compound prepared by the white ants, and taken out of their huge honeycomb abodes, for forming the tiny crucibles used in their arts; it burns beautifully without cracking, when taken from a proper locality, but is more frequently found as here—in Jubbulpoor—full of grit, and too friable after repeated washings, to hold together. The stomachs of these "white ants" are evidently supplied with a powerful chemical secretion, and this, doubtless combining with certain clays and earths, constitutes the useful crucible product I now speak of. It burns to a hard white vessel, on which the borax of the artisan gives a brilliant internal glaze; but I have never seen this earth used for any but the diminutive melting pots alluded to. White ants, if they "swarm" or "lodge" for a short time on sheet glass, corrode the same in zigzag patterns, as if etched by fluoric acid; occasionally these marks resemble Persian characters or Egyptian hieroglyphics. Hence some potent chemical acid enters into their building composition, of which the tenacity in some countries, when it has been well kneaded, pounded, and sun-dried, renders it a fine cheap flooring for settlers' houses. It is very generally used in South Africa, where I employed it for the upper portion of a rough stone floor to my verandah.

But I must return to my artistic Indians and their primitive "dodges." In casting small articles in brass and the cheaper metals, they fix the mold with iron wire to the mouth of the melting pot, well luting the connections repeatedly with a mixture of stiff clay and cow-dung kneaded together till quite strong and safe, gradually warming the luting at the mouth of the furnace, and repairing all cracks and fissures as they may appear; when thoroughly dry, the whole mass is put in the rude native furnace of common clay; and on the contents of the melting pot being fused, it is turned gently "topsy turvy" and the metal runs from its inverted mouth into the attached mold. For articles of ornament and elaborate design, of any size, even to a field piece, the native workman makes a composition of two parts "dammar" resin, and one part beeswax (common resin will replace the first in England); these are very slowly and carefully melted over charcoal, and stirred together (in the open air, and not under a roof), and when almost hard are molded by the hands, the lathe, or in metallic shapes. These models in their turn are then encased in suitable mold clay, and very carefully and slowly dried in a shady spot until perfectly hard and seasoned. The workman then, over charcoal, gently heats the mold and pours out the composition from the hole he left as a future "ingate;" when every particle of the mixture has flowed out into a vessel held to catch it for future use, he increases his fire till smoke rises from the interior of his mold, and it is gradually brought to a condition to receive the molten metal. From an earring to an idol this is the favorite *modus operandi* of casting, and I can most thoroughly recommend it to the ingenious amateur, if he be not already practising it. Bismuth is so very highly priced in India that I never employ "fusible metal;" the present mode, besides being cheaper, gives a sharper casting, especially for small jewellery, and tiny silver ornaments, to say nothing of avoiding the contamination of precious metals by the lead of the alloy.

There is great reason for supposing that in the days of "human sacrifices," models of the entire figure were obtained by casts of the victims who were immolated, in substantial clay coverings, which, when red hot, were filled with molten gold or silver, and gave the perfect images required by the priesthood. The delicate German castings of flowers and insects are nowadays cast in the same fashion—"burning out." Fish and reptiles, such as snakes and lizards, may be so cast very life-like in tin, and afterwards bronzed. I lately amused myself by getting the perfect nature model of a water snake about 2ft. long, in the above manner. I got a split bamboo equally divided; I placed good fire-clay in each half of this bamboo; I then put the snake carefully between the two pieces, secured the halves of bamboo firmly by binding wire at intervals of a few inches; I dried the whole slowly before a fire; I then slowly in a long charcoal stove of clay gradually burnt out the snake, and poured in pewterer's solder—that is 2 parts tin, 1 part lead.

I have a small box in "ormolu" of foreign manufacture, surmounted by a "horned beetle," evidently modelled in this fashion, which I recommend to the amateur mechanic as a most satisfactory and interesting amusement.

Water Power on Steam Vessels.

An important auxiliary in the working of large steam vessels consists in the use of hydrostatic engines or turbines, set in motion by a current of water, admitted through pipes in the bottom of the hull.

Many of the large war steamers draw from 20 to 30 feet of water, so that the hydrostatic force, applicable to the turbine, will be equal to a column of water of the above hight.

The British war steamer *Achilles*, and other vessels, have had these water engines attached to their steering gear, with great success; and it is proposed to apply them to the rotating of the turrets.

A more recent application of the idea relates to the propellers. Says the London *Artizan:*

"One of the great inconveniences in screw vessels when sailing is the dragging of the propeller. There are other obstructions and difficulties encountered in navigating, which are only to be got rid of by a temporary application of force. Steam cannot be expected to be constantly maintained against every emergency, and, indeed, is not always available. The hydrostatic pressure is always at hand, and requires no lighting of fires or any other preparation. It is not only ever present, but economic. It has only to be applied when required, and the waste water discharged into the bilge can be pumped out at any convenient opportunity. When the screw shaft has been some time at rest it cannot be started unless a considerable speed has been got upon the ship, not, indeed, less than five or six knots; but once started, the screw would continne to revolve until the ship's speed had fallen to about three knots. Indeed, every practical sailor will be very well aware of the immense advantages of being able to start the end of the screw shaft into motion or to continue it in action, under occasional circumstances, for a short period.

"An apparatus proposed by Admiral Inglefield has been manufactured at the works of Messrs. Kittoe and Brotherhood, in Clerkenwell, and was tested a short time ago. It consists of a hydraulic cylinder, to be placed on the keel of the ship, with a piston and rod, very much after the manner of the ordinary steam cylinder. Into this the water will be admitted, through an ordinary Kingston valve. The diameter of the cylinder is 30 inches; the length of stroke 12 inches; and the machine is capable of making from 18 to 20 strokes a minute. To the piston-rod of this cylinder is attached a plunger pump, of the diameter of 3 inches, thus giving an accumulated force in the pump of say 100 times the pressure in the working cylinder, or equal to 1,000 pounds on the square inch. The water is conveyed, from a chamber surrounding the pump, by a pipe to a 4-inch hydraulic ram attached to the end of the lever of a ratchet brace, the ratchet-wheel of which is keyed fast to the stern shaft of the propeller. There is a valve box attached to the ram cylinder, which is actuated by a pin in the ratchet lever, to which is connected a rod working the valve, thus causing a continuous action of the ram as long as the water pressure is permitted to act. When the screw is started into motion the ratchet wheel runs away from the pawl, and leaves it behind in its revolutions. To prevent the clicking noise under such circumstances, and to guard against accidents to the gear when the ship's main steam engines are started, the pawl is lifted out of the way, and secured by a pin specially provided for the purpose. The joints in the hydraulic pipes are exceedingly well made, upon a patented principle. The two ends are merely placed together and secured by a nut packed with an india-rubber ring, which, pressed upon by the water, packs the joint as close and as tight as in the case of the leather packing in a hydraulic ram gland. These joints are part of the highest merit, as one of the great difficulties to be overcome, in the application of the hydrostatic machines, has been that of securing good connections in fitting the apparatus so low in the hull, and in making perfect the orifices where the pipes have to pass through bulkheads.

"During the testing of the machine, the pressure gage steadily registered 1,000 pounds to the inch, and was brought to a standstill at very considerably higher pressure when the discharge cock was shut off. Under this pressure the whole machine and its accessories were perfectly tight, not "weeping" at any of the points, nor was a "tear" anywhere to be discovered.

"The value of such a power, always ready as soon as the valve is opened, for any work, steering, turning turrets or screw shafts, raising guns, or, in ships provided with the proper wells, raising the screw bodily, is scarcely to be over-rated."

Prevention of Fermentation.

Professor Williamson, in a lecture on Fermentation, speaks of substances which prevent it. Among the foremost is creosote, the active material of smoke; and there is no doubt that the antiseptic action, which smoke is said to exert upon ourselves, is due to the presence of this creosote, or carbolic acid. Every one is aware that one process, for preserving meat, which has long been in use, is to suspend it in a chimney in which the smoke of wood is present. The smoke of wood, like that of coal, contains this substance, or one nearly allied to it; and, among antiseptic agents, it is one of the most energetic. A small quantity of this carbolic acid, thrown into a fermenting liquid, would completely kill the organisms. In the same way, if a little sulphuric acid were introduced into any of these mixtures, it would immediately kill the organisms and arrest the fermentation. Sulphurous acid is now largely used for this purpose, being employed, in combination with lime and water, to saturate the casks in which beer is to be stored, so that the wood being impregnated with it, any germs which might find their way from the atmosphere, and set up a process of decomposition, are arrested and destroyed.

Another very powerful antiseptic agent is prussic acid, one of the most powerful of poisons to all animal organisms; and it is particularly powerful in stopping the action of these ferments. Another substance worthy of consideration, in the same point of view, is a mixture which is, to a great extent, of unknown composition, namely, the poisonous matter which is given off in tobacco smoke. It must, when present in the air, exert a very powerful antiseptic action upon these organisms. It has been shown, by the experiments of Professor Tyndall, that in the lower vessel of the lungs there are considerable deposits of the dust which floats about in the air; and we are, of course, exposed in that manner to the action of a number of the seeds of these ferments, and, for aught we know, of diseases, because many malignant diseases are attributed to processes of decomposition analogous to those which we have been considering; and they may be, and, as some persons think, are, carried by germs in the air. Now, any powerful substance which would kill these germs must of course exert a beneficial action, and when persons are exposed to the smoke of tobacco, there is no doubt that some of it enters the lungs with the air which is vitiated, and that some of the smoke must be deposited in the lower passages of the lungs, with these little mischievous germs, and must certainly somewhat astonish them. It would seem, then, that, although tobacco smoke is, on the whole, injurious to the human system, its effects are not wholly bad.

Manufacture of Hair Cloth.

Our readers have, no doubt, often wondered where all the hair is obtained for the manufacture of hair cloth, and how the manufacture is conducted. There is a hair cloth factory in Central Falls, R. I. The hair used is that of horses' tails, and is imported from South America and Russia; mostly from the latter country. It is purchased at the great annual fairs of Isbilt and Nijni Novgorod. That purchased in June, at the latter place, will be received in about sixty days; and that bought at Isbilt, in February, in about six months. As it comes of various colors, it is, for the purpose of this manufacture, all dyed black. A certain proportion, however, is purchased in England and France, already prepared for the loom. It is worth from fifty cents to four dollars per pound, according to length, the price increasing in rapid ratio after the length attains twenty-four inches.

The "rough hair," or that which is imported in its natural state, is hackled, and the shortest sold to the manufacturers of mattresses, it being first curled. After being hackled, the different lengths are combed out, assorted, tied in bunches, and made ready for coloring. After this process, the bunches are carefully inspected, measured, and put away for the loom. The cloth is made in widths of from fourteen to thirty-two inches.

Contrary to the popular idea, the hair is not, as a rule, round. A section under the microscope shows a form as though a third of a circle had been cut off, and the flat portion slightly indented. This conformation causes some difficulties in the manipulation, which require great skill and the most delicate machinery to overcome. The warp used is made of cotton, and prepared with great care. A bunch of hair which has been soaked in water is placed in position, and the individual hairs are picked up, to be, by the shuttle, laid carefully in the weft. If the machine fail to take a hair, which occasionally happens in practice, it continues its efforts until it succeeds, the other portions of the machinery standing still in the mean time. The shuttle is an awkward looking, but most delicately operating implement. The hair must not be bruised, and it must not be stretched; the necessity for such gentle manipulation has led to the idea that no machinery could be constructed capable of performing the operation with sufficient exactitude and regularity; but this, as we have seen, is now shown to be a fallacy.

Steam Water Elevator for Raising Water in Houses.

The pump here described is a simple and durable apparatus, by which steam, generated in the ordinary fire of a cooking range or stove, is made to act directly on the water to be raised, without the intervention of machinery, and to force it to the tank at the top of the house. In the engraving annexed, the kitchen range, L, and usual hot-water boiler, M, are shown on the left, the pump standing at the right.

A chamber, A, which may be of any form most convenient (preferably a cylinder 6 to 8 inches in diameter, and 4 to 5 feet long), is a receptacle, alternately for water and steam. A suction pipe, B, from the chamber, A, reaches to the bottom of the cistern or well, from whence the water is to be drawn. This pipe has a valve, C, opening upwards, which is held closed by the pressure above, and prevents the water from returning to the cistern or well. An outlet pipe, D, from the bottom of the chamber, A, leads to the tank to be filled at the top of the house. This also has a valve, E, opening upwards, which prevents the return of water from above. A steam generator, in the firebox of the cooking range or stove, L, which may, and usually will, be the hot-water back by which the water in the boiler is heated, is connected by a steam pipe, F, with the top of the chamber, A. A condense pipe, G, which may be brought from the tank at the top of the house, or from any cold-water pipe leading from the tank, is carried down a little below the top of the chamber, A, and turning upwards, is entered into it through the steam pipe, F. In this condense pipe is a valve, H, opening upwards, which will prevent the escape of steam or water up the pipe.

There is also a water supply pipe, I, shown in the engraving, through which a supply of water is maintained in the hot-water back in the range, L; and in this pipe, I, is a valve, J, opening upwards, and towards the hot-water back, which prevents egress of steam or water through the pipe. This pipe, I, is taken from the lower bend of the condense pipe, G, or the bottom of the boiler, M, as shown. The supply for the hot-water back, when pumping, may be drawn from either.

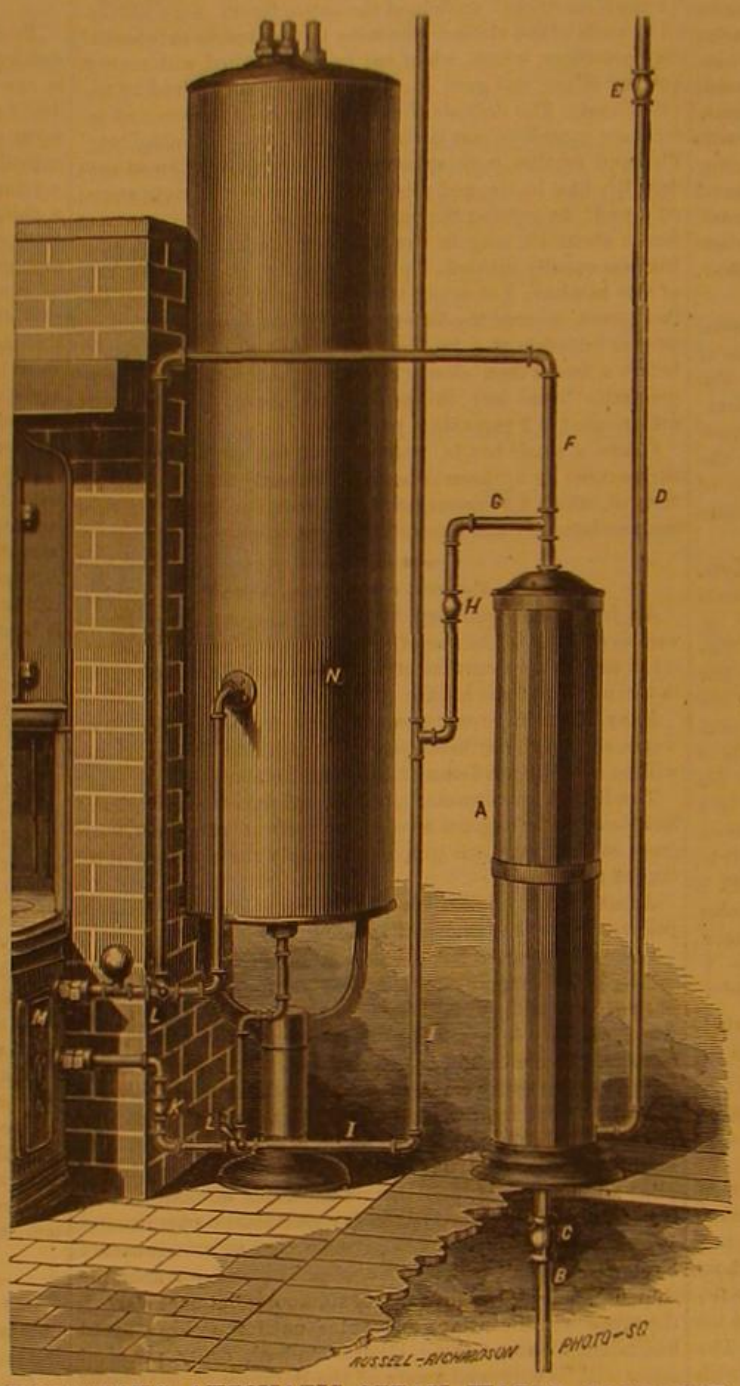
At the junction of the pipe, F, and the upper opening of the hot-water back, and the pipe leading from the hot-water back to the boiler, M, there is inserted a cock, K, which will close either the steam pipe, F, or the pipe to the hot-water boiler, but will not close both of them at once, and will not close the opening towards the hot-water back; so that the passage to the hot-water back, and through one of the pipes mentioned, will always be open. There is also a similar cock, K, at the junction of the pipe, I, and the pipe from the bottom of the boiler, M.

The apparatus, being properly connected, as shown in the engraving, will fill with water through the pipe, G. The cock, K, is turned to open a connection from the hot-water back through the steam pipe, F, to the chamber, A. Steam, being generated in the hot-water back, will then pass through the pipe, F, into the chamber, A, and expel the water therefrom up the outlet pipe, D, to the tank at the top of the house. The steam, having expelled the water from the chamber, A, will also follow, and expel it from the outlet pipe, D. When the water has been all expelled from the outlet pipe, D, or with a light pressure of steam, when it has been driven above the valve, E, the pressure of steam in the chamber, A, will not be sufficient to sustain the column of water in the condense pipe; and a small jet of water will flow through it into the chamber, A, and condense the steam there; at the same time, water will flow into the hot-water back through the pipe, I, replenishing what has been expended in steam. A vacuum being produced by condensation of steam in the chamber, A, and the hot-water back, water from the well, or cistern, flows past the valve, C, through the inlet pipe, B, and fills the chamber, A. The hot-water back having been filled, as described, steam is again generated; and the water in the chamber, A, is again driven to the tank at the top of the house. Condensation again takes place; and the operation will be repeated as long as steam is generated, or until a supply of water is raised, when the cock, K, is turned, and connection with the hot-water boiler, M, made, and the heating of water in it goes on.

The operation of this apparatus is certain and uniform, but not rapid; the size here described raises about sixty gallons of water an hour, which is amply sufficient for the wants of ordinary houses.

The economy of its use is apparent, as it requires no extra fuel. It will not wear out, having no working part. It is not liable to get out of order, and is not dangerous, as the pressure of steam is never greater than the pressure of water in the hot-water boiler, M. Should any greater amount of steam be generated than is needed to raise the water, it escapes up the outlet pipe; the water to be raised being the only obstruction between it and the open air.

We are informed that this apparatus has been used, under circumstances calculated to test its efficiency and utility, for several months, in a number of dwellings in Boston, and has given good satisfaction. It was patented, Feb. 7, 1871, by Charles Houghton, who may be addressed, for further particulars, at 41 State street, Boston, Mass.



HOUGHTON'S AUTOMATIC STEAM WATER ELEVATOR.

The Planet Venus.

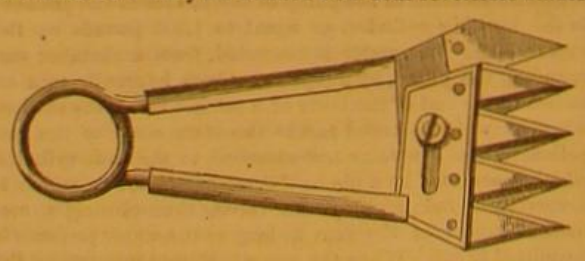
A provincial astronomical society in England has decided to make a series of observations of the planet Venus, to extend throughout a complete revolution of that planet, which occupies about 225 days of our time. Venus, being the nearest of all the planets to the earth, affords observers an opportunity of using the powerful instruments of modern times to the greatest advantage, and of obtaining information concerning planetary phenomena which must be of the highest interest to all students.

Her orbit is more nearly a circle than that of Mercury, and consequently her distance from the sun is more nearly uniform. Her phases are easily visible with a telescope of very low power. Her light is frequently brilliant enough to cast a distinct shadow; and she may be, during her perihelion, seen in the daytime. She was conspicuous at two o'clock in the afternoon, in Massachusetts, in January, 1870, the sun shining brilliantly at the time.

Her proximity to the earth and to the sun intensifies her light so much that an accurate observation of her disc is very seldom to be obtained. The irregularities of her surface, the mountains and valleys, are sufficiently obvious, however, to decide, by their appearance and disappearance, the duration of her axial rotation, which is a little shorter than the earth's, namely, twenty-four hours. The diminishing of the shadows on the margin of her illuminated portion is distinctly visible, and shows the fact that there is a dispersive medium for light, that is, an atmosphere, upon the planet.

IMPROVED SHEEP SHEARS.

These shears are the invention of Ebenezer Mathers, of Elderville, Pa. They are formed with four reversible blades



on each handle, and each edge of the blades is a cutting edge. The handles are connected by a coiled spring, instead of the ordinary flat spring, by which, it is claimed, sufficient strength is obtained to open the shears after the clip, while it is so flexible that the hand is not fatigued by its use. One of the plates, to which the blades are fastened, is slotted; and through the slots a broad-headed set screw is inserted, which holds the edges of the blades in close contact with each other, so as to make a clean, sharp cut.

FARMING stock in California has lately been increased by the addition of ninety-eight sheep of pure merino breed, selected in Vermont, and forwarded overland.

How to Prevent Spring Sickness.

Dr. A. L. Wood, in the *Herald of Health*, writes:—There are a great many people who are subject to a "bilious attack" every spring, and who expect it as a matter of course. Now there is no more need for people being thus sick in the spring, than at any other time of the year, if they only know how to live. This periodical sickness can be prevented simply by regulating the diet. Not that all persons, who have been subject to such attacks year after year, for a long time, can always overcome the difficulty at once. We are all such creatures of habit, that when any thing becomes established in this way, it has a strong tendency to return at the regular time, even after the producing cause has ceased to operate; consequently, in bad cases, it sometimes takes several years to overcome it entirely. Under a proper regimen, the attacks will grow less severe every year, until they entirely disappear.

During cold weather people eat larger quantities than usual of carbonaceous food, such as fat meats, sugar, butter, bread, cakes, and other preparations of white or superfine flour, nuts, fats, sirup, etc. Of course, a much larger quantity of carbonaceous food is required by the system in cold weather than in warm, but as a general thing people eat too much of it, clog up their systems with the excess, and overburden the excretory organs, particularly the liver, in vain efforts to get rid of it. Those who take a great deal of out-door exercise are usually enabled to work it off, and seldom suffer much in consequence, except in hot weather; while those who lead a sedentary in-door life suffer most. When warm weather comes on in the spring, people require much less carbonaceous food, but instead of changing their diet, as the weather changes, they continue to eat the same kinds of food they have been eating during the coldest weather of the winter, and the consequence is that the already overburdened liver is unable to bear up under this extra load, and utterly refuses to perform its function until it has had a chance to rest and to throw off its accumulated burdens. Now, to prevent this state of things, two things are necessary. First, people must eat a less proportion of carbonaceous food at all times. Second, as the weather grows warmer in the spring, they must eat a much less quantity of it than they do in cold weather, and substitute, instead, more vegetables and acid fruits. Every family should have a large supply of canned fruits and green vegetables to use at this time of year. For a single article, there is nothing so good as tart apples, and they should be used in unlimited quantities.

Manufacture of Vegetable Parchment.

The artificial parchment, made by the well known process of dipping sheets of unsized paper in dilute sulphuric acid, is likely to fall into disuse, as a very superior mode of preparing this useful substance has been discovered and patented by Mr. Colin Campbell of Buffalo. The old method was too delicate in operation for ordinary use, as, if the dilution were, in the slightest degree, too weak, or the least variation from the correct time of immersion were made, the attempt would lead to failure. In the new process, the paper is dipped in a strong solution of alum, and thoroughly dried; it is then passed through undiluted sulphuric acid, the alum protecting the paper from undue action of the corrosive fluid. The patentee proposes to make the parchment in continuous lengths, by attaching the baths of alum and sulphuric acid to a paper-making machine. Apart from the protection of the paper by alum, the effect of the acid can be adjusted by running the web through an alkaline solution. The process is simple, and can be made generally available, as documents and writings worthy of preservation can be treated by it, without injury to the printing or writing ink, or the paper.

Sickness a Nuisance.

The *Herald of Health*, for April, has many interesting articles, and, among other things, it says:—"The truth is, sickness is the most expensive nuisance on the face of the globe. There may be instances where it makes people better, but generally it makes people selfish, sad, misanthropic, nervous, mean, and miserable. The best way to make ourselves happy and good is to keep ourselves well. Then we are apt to be sweet and kind and wholesome.

THE GROWTH OF PITTSBURGH.—The journals of this city keep the world informed of the constant improvement of its vast manufacturing capabilities. We are assured that there has not been so busy a time as the present, in making additions and extensions to buildings and factories. Sixty new puddling furnaces have been, and are being, erected; and new blast furnaces are in contemplation. The owners and manufacturers are all busy, and expect a most prosperous trade throughout the year.

OXYGEN GAS FROM BLEACHING POWDER.—Oxygen gas can be readily prepared by boiling bleaching powder and nitrate of cobalt in a flask. Make a clear solution of the powder in water, put it into any convenient flask provided with a perforated cork and tube, and pour in a few drops of a solution of nitrate or chloride of cobalt, and set it to boil. The oxygen of the hypochlorous acid is expelled, and chloride of calcium remains in the flask. It is difficult to explain the reaction, but it is generally supposed that the oxygen first goes to the cobalt, from which it is subsequently expelled by heat.

MATTISON'S IMPROVED PACKING MACHINE.

This is an ingenious machine for automatically packing and uniformly weighing small packages of flour, starch, saleratus, soda, and, in short, any pulverulent material required to be put in small packages, having cloth, wood, tin, starch-board, paper, or foil wrappings, of cylindrical, angular, or other shapes.

The general principles of the machine are, first, a beater, situated at the top, whereby the substance to be prepared is made to descend through the hopper in a granular state, and free from lumps, which might interfere with nice graduation in weighing; second, an automatic weighing apparatus at the bottom of the chute, whereby a stop motion is controlled.



The paper bags, or folded papers, sustained by a suitable case, being placed upon the weighing apparatus, in such a manner that the chute discharges its contents into them, upon receiving their proper charge, cause the platform on which they stand to descend. This movement cuts off the discharge of the chute until the filled package is removed and replaced by an empty one.

The machine is in full operation, putting up the celebrated Oswego starch and maizena, in which operation it has, we are assured, demonstrated the truth of the claims made for it. For further information, address J. Mattison, Oswego, N. Y.

Is Electricity produced by the Living Body?

Mr. Cromwell F. Varley, the well-known English electrician, has published some valuable remarks on the supposed production of electricity by the living human body. He first remarks that the sparks produced in certain cases, by combing the hair, by drawing off silk stockings, or by rubbing the feet on a carpet, are illustrations of frictional electricity, which in no way depend on vitality, but are due solely to proper conditions in the substances rubbed together and in the atmosphere. He then comments on another form of supposed bodily electrification, which has led many people to suppose that the brain was an electrical battery sending electricity through the nerves to contract the muscles, and which is produced as follows: The two terminals of a very sensitive galvanometer are connected each with a separate basin of water. If the hands be then placed one in each basin, on squeezing one hand violently a positive current is almost always found to flow from that hand, through the galvanometer, to the other hand, which is not compressed. While experimenting night after night on this subject in 1854, Mr. Varley found that, after squeezing the hand, opening the clenched fist produced a momentary increase of power instead of a decrease; and when the wind is from the south-west, the power is less than one fourth as strong as when it was from the north-east. The former wind was found to be slightly negative to the earth; the latter was invariably powerfully electro-positive. On trying to exhibit these currents on one occasion, and finding them to be very weak, Mr. Varley washed his hands thoroughly in water containing a little liquid ammonia, in order to decompose the grease in the pores of the skin. The result was a diminution instead of an increase of the power. On washing his hands, however, with very weak nitric acid, and afterwards with water, he obtained more power on squeezing his hands than he had ever done during the most persistent east wind. This lead to an explanation of the phenomena as one due to chemical action alone, the act of squeezing the hand violently forcing some perspiration out of the pores. By dipping one hand in a solution of ammonia and the other in one of nitric acid, and then washing both in water, squeezing either hand produced a current in the *same* direction; and when both hands were placed in the water and a little acid dropped on one of them, a current was instantly generated without any muscular exertion. Mr. Varley finds no evidence that electricity exists in or about the human body, either as a source of motive power or otherwise; and would explain all the feeble electricity which has been obtained from the muscles as due to different chemical conditions of the parts of the muscle itself. The nerves are bad conductors, and are not insulated. The force which is transmitted by them cannot therefore be electricity; and the fact that this force is transmitted at a rate about 200,000 times slower than an electric current is additional proof of their non-identity. It is to be hoped that a detailed account of Mr. Varley's experiments on this interesting subject will soon be given to the scientific world.

The Geological Museum of the School of Mines.

The trustees of Columbia college have purchased the entire geological collection of Dr. John S. Newberry, Professor in the School of Mines, and State geologist of Ohio. This collection, which represents the labor of a lifetime, is believed to be one of the most complete in the country, and in certain departments is not equaled by any cabinet at home or abroad.

It consists of over 60,000 specimens, forming the following groups;

1st. A systematic series of the rocks and fossils characteristic of each geological epoch, numbering over 20,000 specimens.

2d. A collection of ores, coals, oils, clays, building materials, and other useful minerals, illustrative of the course of lectures on economic geology, and believed to give the fullest representation of our mineral resources of any collection yet made.

3d. A collection of 5,000 specimens of rocks, and the minerals which form rocks, to illustrate the lectures on lithology.

4th. A palæontological series, which includes specimens of recent and fossil vertebrates, articulates, mollusks, radiates, and plants. In this series is to be found the largest collection of fossil plants in the world, including many remarkably large and fine specimens, and over 200 new species of which other representatives are not known to exist. Also, the most extensive series of fossil fishes in the country, including, among many new and remarkable forms, the only specimens known of the gigantic *dinichthys;* also a suite of Ward's casts of extinct saurians and mammals.

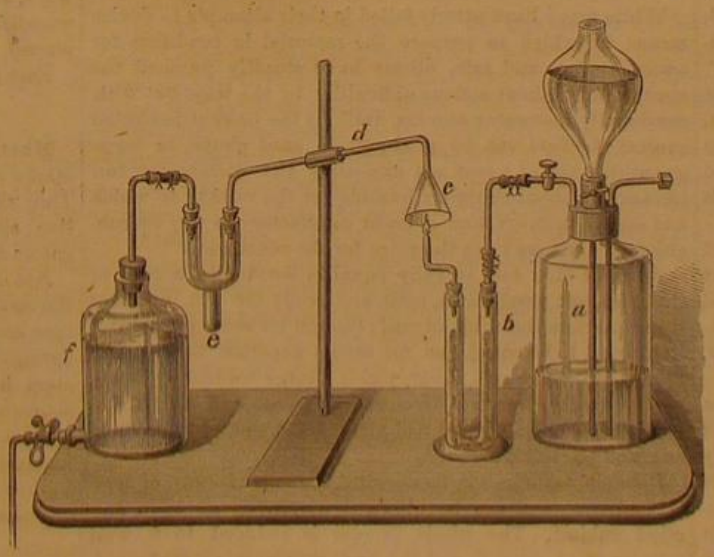
A perfect skeleton of the Irish elk was presented to the cabinet by Mr. George Cabot Ward; and remarkably fine specimens of fossil plants were given by the Delaware and Hudson Coal Company, and by Mr. Percy R. Pyne.

The trustees have been at great expense in providing suitable wall cases and tables for the exhibition of the specimens; and we understand that the museum is opened to the public every day, and that many of the pupils of our schools avail themselves of the opportunity thus freely offered to study the specimens in company with their teachers. It is a pity that so valuable a collection could not be placed in a fire-proof building of some architectural merit, rather than in its present unsightly barracks.—*The Cap and Gown.*

PRODUCTION OF WATER FROM HYDROGEN.

The cut represents a very simple form of apparatus, for demonstrating the formation of water by burning hydrogen, invented by Professor Woehler, of Göttingen. *a* is the gas holder for hydrogen; *b*, a chloride of calcium tube; *c*, a glass funnel, 6 to 8 centimeters in diameter at the mouth; *d*, a tube about 1 centimeter in diameter, and ¾ to 1 meter long, attached to the funnel, and connected with *e*, designed to catch the water; *f* is an aspirator filled with sulphuric acid.

The flame of hydrogen at *c*, ought to be made small at first; and the flow of sulphuric acid for the aspirator should



be so regulated as to prevent the passage of unconsumed hydrogen into the apparatus.

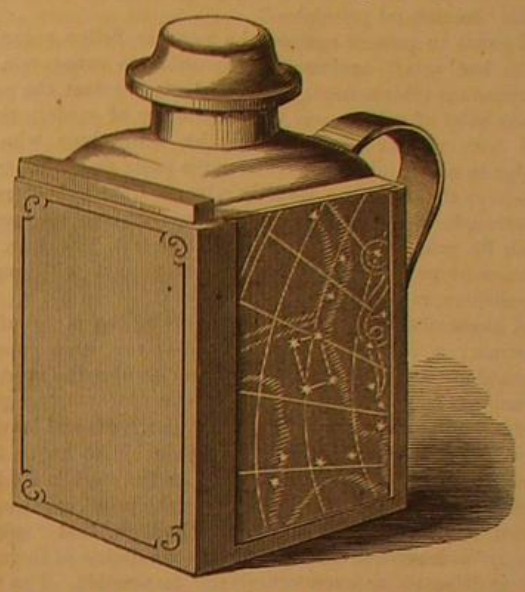
From 20 liters of hydrogen, Woehler obtained 15 to 16 grammes of water, in the course of half an hour. A slight modification of the apparatus admits of its being used to show the products of combustion of illuminating gas, carbonic oxide gas, or of a candle.

A Liberal Education.

That man, I think, has had a liberal education, who has been so trained in youth that his body is the ready servant of his will, and does with ease and pleasure all the work that, as a mechanism, it is capable of; whose intellect is a clear, cold, logic engine, with all its parts of equal strength, and in smooth, working order, ready, like a steam engine, to be turned to any kind of work, and spin the gossamers as well as forge the anchors of the mind; whose mind is stored with a knowledge of the great and fundamental truths of nature, and of the laws of her operations; one who—no stunted ascetic—is full of life and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience; who has learned to love all beauty, whether of nature or of art; to hate all vileness, and to respect others as himself. Such an one, and no other, I conceive, has had a liberal education; for he is, as completely as man can be, in harmony with nature. He will make the best of her, and she of him. They will get on together rarely; she as his ever beneficent mother; he as her mouthpiece, her conscious self, her minister and interpreter.—*Huxley.*

ASTRONOMICAL LANTERN.

The object of this invention is to facilitate the study of stellar astronomy. It is intended for beginners, for astronomical classes in the high schools or private schools, and, in fact, for all who desire to become acquainted with the constellations.



The difficulty hitherto experienced in this study, and which will be obviated by the use of the lantern, is this: In order to study the starry heavens, it has been necessary to use an astronomical atlas, or a celestial globe. These must be examined in the house, by the light of a lamp. The observer, having found his constellation on the atlas, goes out to look for it in the sky. But, by the time he gets out of doors, he has forgotten how it looked on the atlas. And when he has found it in the sky, he has forgotten how it looked there, before he gets back to his atlas or globe. All who have studied the constellations have met with this difficulty.

Now, the astronomical lantern will make the study of the stars perfectly simple and easy. It is constructed like a dark lantern, dark on three sides, and on the fourth provided with a ground glass, in front of which slides can be inserted. On each of these slides, which are semi-transparent, is represented a constellation, the places of the stars being indicated by perforations, through which the light shines. The largest perforations in these slides are for the stars of the first magnitude, and they are made smaller, in due proportion, for the lesser stars. The student, therefore, wishing to observe any particular constellation or cluster, has only to light the lamp within the lantern, insert the appropriate slide, and go out into the night. He holds up the lantern in one hand, and can compare, at his leisure, the constellation as it appears on the lantern, with that in the sky, until he becomes perfectly familiar with the latter.

It is easy to see how much the use of such a lantern must facilitate the whole study. In fact, we think that henceforth no one wishing to become acquainted with the heavens can afford to dispense with it. The increased ease of the study will probably also enlarge the number of students in this interesting department of science. We all would be glad to know the names and positions of the stars. For, though Shakespeare has said:

> "Those earthly godfathers of Heaven's lights,
> Who give a name to every wandering star,
> Have no more profit of their shining nights
> Than we who walk and know not what they are:"

yet it must be confessed that to recognize the famous stars and groups which have been referred to since the days of Job, in the literature of all nations, is no small satisfaction.

This invention was patented December, 1870. We give a diagram, showing the lantern with its slide. It is, however, not yet for sale; but we understand that any one wishing to purchase the patent can apply to the patentee, James Freeman Clarke, Boston, Mass.

A Shower of Insects.

Charles W. Libby, of Cambridgeport, Mass., writes us as follows: "In May, 1867, while at Panther Springs, Western Texas, I observed a curious phenomenon. Early in the morning, after a heavy thunder shower had passed over, the air appeared to be full of snow flakes, which gave the appearance of a driving snow storm. Upon examination, I found the white objects, which were descending, were small insects, and the instant they touched the ground, their white wings dropped off, and left them in the form of small worms, resembling maggots. This continued for twenty minutes, when the insects disappeared."

THE first knitting mill in the United States was erected at Cohoes, N.Y., in the year 1832.

Correspondence.

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

Ancient and Modern Brick-Making.

Messrs. Editors:—In your issue of March 25, there appears an article entitled "Artificial Roman and Egyptian Stones," in which the writer enters into a dissertation upon brick-making, "and the best mode of burning bricks generally;" indulging, also, in some rather questionable statements, and including the burning of bricks in the category of the "lost arts," which he, fortunately, is able to remedy by means of his "self-regulating" patent back action kiln, built "on natural principles."

I pause to protest against the popular fiction regarding "the lost arts;" against the disposition to exaggerate the stupendous achievements of the ancients; against the pernicious habit of railing over the degeneracy of modern times.

I have no patience nor sympathy with those who indulge in mournful platitudes over the past; on the contrary, I believe the world has steadily advanced, instead of retrograding, in wisdom. It is true, a personal secret may perish with its possessor, but I hold that no art, principle, nor science of general utility, having once met with public recognition, can be lost.

A quacksalver may die and never reveal the secret of his nostrum; a solitary artisan may discover some superior method of tempering copper, and never divulge the mystery; or another may devise some novel means for staining glass, and, after decorating palaces and temples, "die and leave no sign." Yet it would scarcely be reasonable to argue from such premises any general decline in the world's stock of knowledge. On the other hand, take the printing press, the steam engine, and the magnetic telegraph, that "mighty trinity" of human inventions: can the possibility of their loss be anticipated, or even conceived? Impossible. The very nature of these inventions perpetuates their use.

Nations, it is true, like those of ancient Greece and Rome, may languish and decay, but all that has really been worth preserving among the useful sciences, has been transplanted into younger and more vigorous soils, and to-day is nourishing higher and nobler races of men. The burden of your correspondent's story is, what he has been able to accomplish by following out the ancient Egyptian and Roman modes.

His researches in that direction lead him to some queer conclusions; among others, he informs us "that it is not so much the materials of which the bricks are made, as the right composition of the ingredients, and the manner in which the burning is done," which give certain desirable qualities to the brick. He then proceeds to give a formula of the "ancient Egyptian and Roman" modes of preparing the material, by aid of "one of James Bogardus' machines." At this announcement we can almost fancy we behold the gummed visage of some embalmed brick-making descendant of Pharaoh relaxing with "a smile that is childlike and bland."

Modern brick-makers have heretofore found it quite a difficult matter to obtain just the right material to produce certain qualities of brick. Every region furnishes materials requiring different treatment, both in composition and burning, and preserving distinct peculiarities.

Your correspondent volunteers the assertion that the ancient built their kilns on principles "pure, simple, natural, and scientific;" and he goes on to assume that the main features consisted in "burning the gases arising from the fuel," and in "drawing the flame, by a very simple and scientific arrangement, through every portion of the furnace or kiln, on the natural principle, that when a vacuum is formed by the atmospheric or damp air becoming rarefied and expelled by the heat, so surely will the preparing heat rush to the vacuum formed," etc.

We are grateful for this simple and lucid explanation of the "ancient Egyptian and Roman" methods, but so far as the description goes, it seems precisely the traditional method employed ever since the descendants of Noah assembled upon the plains of Shinar, and said, one to another, "Go to, let us make brick and burn them thoroughly."

This is exactly the *modus operandi:* when fires are built in arches underneath, the heat rises, comes in unequal contact with the materials contained in the kiln, and escapes speedily into the open air, without completely doing the work, as is evinced by very imperfect results, familiar to every manufacturer. Heat "rushes to fill a vacuum" today, just as it did before the tower of Babel was built, and will continue so to do, while permitted to pursue a course "pure, simple, and natural;" but both phenomenon and ultimate results are entirely different when the heat is harnessed, and becomes your obedient servant, as it may be forced to do by more modern improvements, by inverting the traditional mode of burning from below upwards, in accordance with natural law and scientific guidance.

The fire may be built entirely outside the chambers containing the material to be burned, and the products of combustion caused to enter the kiln proper, at the top of the room; while exhaustion may be effected from the bottom, underneath a substantial and elevated floor. This process of burning takes place from above downwards, the entire contents of the kiln being immersed in a steady bath, of an uniform temperature of a sufficiently high degree to accomplish any desirable object, up to complete fusion if necessary.

The contents of a kiln, constructed in this way, by being exposed to a steady uniform heat throughout, will turn out stock of an even grade, without depreciation. Such a kiln is exceedingly simple in construction, consisting merely of a series of chambers (tight rooms) with an aperture leading from the furnace into the room, for an inlet, and an aperture under the floor (connecting with a chimney) for an outlet.

Then again, it may be so constructed as to accomplish perfect combustion, igniting all the gases, and consuming every vestige of smoke; also so as to economise or utilize all that enormous amount of heat remaining in the incandescent mass just burned. The heat contained in the chamber just burned may be transferred to an adjoining compartment, filled with green material, where it will carry the process of driving off "the water smoke" and of burning half way to completion before it is necessary to resort again to fire in the furnace. In this way, the process of burning brick may be carried on continuously, cooling in one compartment, burning in another, charging the third and discharging the fourth, all at the same time.

This method, if faithfully carried out, is preferable, in my judgment, to any other mode, either of Egyptian, Jew, or Gentile, "wheresoever dispersed." A. R. Morgan, M.D.

New York city.

Peat Fuel.

Messrs. Editors:—The subject of peat fuel is again attracting public attention all through the country, not so much among speculators, as was the case a few years ago, but among the more sober-minded, practical consumers of fuel, with whom it is an item of prominent importance, as relating to the cost and quality of their wares, and the power required to prosecute their operations.

Irrespective of the present difficulties in the coal market, which, however, can hardly fail to give additional interest to any new source of fuel supply, especially if it be free from the curse of monopoly, the merits of peat, as discovered and demonstrated, have slowly but steadily won for it a degree of favor which is rapidly becoming manifest, and seem now likely to command, for the enterprise, that substantial encouragement which shall place the production of the fuel among the prominent industries of the land, and by the supply of it, secure beneficial results to numerous interests.

An account of what has been done during the past season, by numerous parties, in various sections of the country, would form a narrative of no little interest to fuel consumers, owners of peat properties, and perhaps to inventors and builders of machinery.

The quantity of peat fuel actually produced during the last season has, in many cases, been small; in others, considerable, amounting to thousands of tuns; but the very general and almost universal expression of opinion, among those who have used it, is, that it is an excellent fuel, possessing many characteristics which give it just claim to public favor, and that, when once fairly introduced, it cannot fail to be largely in demand. This question of demand, however, may be considered as fairly settled, for a good fuel at a low price commands purchasers, and there are now numerous large concerns which would gladly use peat, and give it preference over coal, if they could be assured of a constant and steady supply equal to their requirements, which are satisfied only by thousands of tuns; and many who use only hundreds and less, are equally anxious.

This, then, opens a large field for a legitimate business in the production of an article, the demand for which is universal and enormous, and which, while it gives promise of large gains to the producer, is also a source of relief and economy to the consumer.

While many have utterly failed in their attempts to devise means by which to prepare the material in condition for transportation and sale, others have steadily pursued the matter, not without serious difficulties by the way, but with continually increasing success, until, by the present perfected process, the fuel can be produced in good shape, in large quantities, and at a cost not exceeding two dollars per tun (measuring about thirty-six bushels), at the works; to which add cost of delivery, and a profit satisfactory to any reasonable man, and we have the price for the consumer.

A tun of this fuel is fully equal in service to a cord of the best oak wood, sawn, split, and ready for use, or about three quarters the value of coal; though for some purposes it is claimed to be equal, and for others superior, to coal. It ignites quickly, burns freely, yields a large volume of flame, gives a quick, clear, and intense heat, throws off no sparks, very little smoke, no soot, and yields but a small residuum of ash, and no clinker.

Reliable information concerning the manufacture of peat is available, and can be obtained as readily as upon any other subject. The whole process is reduced to a well demonstrated system, and the business can be entered upon as prudently and understandingly, and on as fair an estimate of expenditure and return, as any other; and it is to be hoped that it may be prosecuted for practical ends, untainted or disturbed by speculation.

Did space permit, abundant testimony could be recounted as to the value of this fuel for locomotive, and steam purposes generally; for the smelting, re-heating, working, welding, tempering, and annealing of metals; for burning bricks and lime; in the composition of gunpowder; for generating illuminating gas, and for all domestic purposes.

Not only does the intolerable oppression of coal monopolies give cause for attention to other sources of supply, but the immense destruction of our forests by fires, and the rapid consumption of wood, which, for railroad purposes alone, amounted in 1869 (according to published reports) to upwards of $56,000,000 in value, afford additional reason why prudent men should be awake to the importance of utilizing any other available combustible substance.

Facts bearing upon this whole subject are rapidly accumulating; the indications of public favor are plain and unmistakable, and there is probably no one enterprise now before the community which may be made to tell so directly and powerfully as this, upon the great question of cheap fuel for the people. T. H. Leavitt.

Boston, Mass.

Hydrocarbon Oil Lamps.

Messrs. Editors:—I have read with interest the articles in your paper, on the explosions of carbon oil, and suppose that a considerable portion, of the oils sold, does not come up to the required standard; but I think that one reason of so many lamps exploding, has been overlooked. When lamp burners are new, the holes that are punched in all of them, to admit air to the flame, are open, and allow the air to pass through freely, and thus keep the burner and collar on the lamp cool; but after being used for some time, they get gummed up (and in the old-fashioned or cross-shaped burners, the cinders falling from the wick are allowed to accumulate) until sufficient air cannot get through the burner to keep it cool and support combustion. Then two things occur; the light is not perfect, and the burner heats to such an extent that gas is formed rapidly, and where fragments are allowed to accumulate, they take fire and result in an explosion.

If lamps were examined, I think, and, in fact, know that many would be found in the dangerous state above mentioned. I have been present when the cinders in lamp burners have taken fire, and the flame had to be smothered to prevent its bursting the lamp, and perhaps endangering the house.

I would recommend that all persons using carbon oil lamps should see that they are kept clean, the air holes kept open, and the top of the wick tubes free from cinder. By this means, they will have a pure white light; and the danger from explosions, with even tolerably good oil, will be greatly lessened. A.

Freeport, Pa.

Singular Effects of a Tornado.

Messrs. Editors:—The terrible tornado which swept through this place on March 8th, the general account of which appeared in the papers, would, I think, puzzle scientific men attempting to explain some of its strange freaks.

How can it be accounted for, that one house in a row (and the row in a line with the course of the tornado) is utterly demolished; and the others not touched? I have seen two such instances.

Will wind alone drive the little iron rods, used to expand umbrellas, through a ¼-inch, well-seasoned poplar board? I have seen that; and the rods were not even bent. Or, will the wind drive sixpenny nails through a similar board? Or will it drive small stones through glass without making cracks? Will it lift a thirty-tun locomotive up, and pitch it entirely off the track? or drive a small piece of shingle through a thick rubber belt? Is it possible for wind to demolish a building just as if it were full of steam boilers, and they all exploded at once? The well-built system of derricks, at the east abutment pier of the great bridge, was shivered to atoms. The splendid freight house (new, and second largest in the State), of the St. Louis and Vandalia Railroad, was knocked down. Three round houses, and several freight depots belonging to other railroads were destroyed.

I have also seen a piece of glass driven into a board edgeways, about an inch, and there it remained in powder. Do scientific men know all the elements that are in the atmosphere? John O'Connell.

East St. Louis, Ill.

Effect of Heat and Cold on Iron.

Messrs. Editors:—I was much pleased with your remarks upon the effect of "heat and cold upon iron and steel." They showed the incompleteness of the experiments in question; and incomplete observation or experiment leads investigators astray.

Not only the suddenness of the strain, but, in my opinion, the suddenness of change of temperature, has to be taken into account in this matter. My experience with watch springs shows that sudden changes, colder or warmer, will start the flaw (who knows how minute?) which leads to subsequent breakage. Want of stop-winding works has nothing to do with these particular cases, as there will, in sudden changes, be just as great, if not greater, proportion of springs broken in watches with stops as in those without them.

Philadelphia, Pa. J. A. Solliday.

Lamp Wicks.

Messrs. Editors:—In a recent number of the Scientific American, a call was made for longer wicks, to be used in the common coal or kerosene oil lamps. During an experience of five years in the sale of lamp burners, etc., I have found that where burners have been thrown aside as worthless, on account of the difficulty of raising and lowering the wick, the fault has been almost invariably with the wick itself. After remaining in the oil some time the wick becomes hard, and thickens to such an extent that it will not pass up the tube, while a new wick would work perfectly well in the old burner.

Unless a wick can be made which will not be affected by the oil in this respect, no longer wicks than those now in use are needed. E. W. B.

Pocket Chronometers.

Messrs. Editors:—The challenge published in the Scientific American of November 26, 1870, has not yet been accepted; and, although there is plenty of time, and the trial is to extend over many years (the watches to be examined twice in 24 hours), I will make the following concession: I

am not to use rounded teeth in any of the wheels of an eight-day train, nor rounded leaves in any of the pinions—no metal outside the "primitive circle."

Hanover, Pa. J. MUMA.

Reciprocating Parts of Steam Engines.

MESSRS. EDITORS:—I did not propose to say anything further on this subject, but cannot omit to express the gratification with which I have read the note of Mr. Hendricks, in your issue of March 25. It is refreshing to meet with such a candid, straightforward admission of error, exhibiting a love of truth and fairness.

Now, I would ask your correspondent to go a little further:

Is not the acceleration greatest precisely at the commencement of the stroke?

Is not the retardation greatest precisely at the termination of the stroke?

Is not the force producing retardation, and then acceleration in the opposite direction, the same force?

At the instant when the crank passes the centers, is not the direction of this force radial?

Can the resistance of the piston to this force, at this point, be distinguished from the resistance to deflection, or the centrifugal force of a revolving body?

New York city. CHARLES T. PORTER.

THE PRESENT AND THE PAST.

NUMBER VII.—RECONSTRUCTION.

Now let us turn to those mineral substances, contributing to form rocks, which are held in solution by the waters of rivers and of the sea; or, rather, to one of them, the one which is of the most universal importance in this connection, and to which, alone, we have here space to devote our attention. Carbonate of lime, derived from the disintegration and decomposition of calcareous rocks, is held in solution by the presence of free carbonic acid; drive this off, by boiling, and the lime-salt is deposited in your kettle. Let it be set free by gradual evaporation of the water, and you have formed the stalagmites and stalactites that ornament caverns in limestone regions, or in such a rock as "travertine," or "calcareous tufa." It seems, however, that comparatively little carbonate of lime is thus disposed of. It has another office to perform in the economy of nature; the myriads of fish that people the waters require it to give a certain amount of firmness to their bones; countless mollusca and crustaceans need it for their shells; the tiny polyp segregates it to form the plant-like coral; while the vegetable coralines disguise their seaweed hues beneath a coat of it, and thousands of square miles of lowly organisms, standing on the confines of the two kingdoms of life, are covering the bed of the ocean with calcareous particles secreted by their vital power.

Think, but for a moment, of the mass of this carbonate of lime contained in the shells of a single oyster bed of recent growth; think of the tuns annually added to a single coral reef by the incessant labors of the vast community, and then consider how many thousands of miles of such reefs gird the coasts of tropical continents and islands; how vast the surface of the ocean is, as compared to one oyster patch, and how it teems with manufacturers, large and small, from high water to its lowest depths, and you will realize that the amount of material held in solution, invisible to your eyes, in the waters of the earth, must be enormous.

But the wonders of this submarine manufactory do not cease with the production of the organic bone, or shell, or coral. Nature allows no waste in her workshops; and when these bones, and shells, and corals, have ceased to be of use to the animals which formed them, they are worked up again into the framework of a future continent. The shells, water-worn, and frequently ground to fragments by the waves, are accumulated in beds, which will hereafter appear as shell limestones; the skeletons of the deep sea organisms are being massed into vast deposits of chalk; while the coral reef is a nucleus for what will, in the course of time, become crystalline limestone, marble for the builder and the statuary.

To the contemplative mind, the ocean appears not less sublime in its calm than it does in its anger. Grand and terrible as it is when, urged by the winter's storm, it rears itself in foam-crowned masses, and rushes headlong against the trembling rocks, roaring and bellowing in their caverned sides, holding the largest ship at its mercy, and quenching the agonies and hopes of hundreds, as it drowns their death cry, there is something yet more awful in its smiling slumber. Its duty, of working vast and perpetual changes, is performed unceasingly, though it does appear to be so quiet. The secrets of countries, of nations, and of ages, lie buried in its unrevealing depths; the last thoughts of the dying, and the fluttering hope of those in whom life is still strong, are untold and unsolved by its laughing ripples. These thoughts oppress the mind with undefined images, many of which are saddening to our feelings, and create within us a sensation of awe unequaled by anything in nature. Man's pride in his manhood rises above the storm. He can brave it or perish in it, if required; but, in the calm, he looks upon a boundless and unfathomable world, whose depths he cannot pierce, whose history he cannot read, and upon which, he himself lies a helpless waif, uncertain of an hour. But to the naturalist and geologist this world partially reveals its secrets and its history; to him it is, from the pebbly beach to those depths

"Where the line sounds not, and the wrecks lie low,"

a world of life and of labor; and its history to him, from the pregeologic periods of its early existence to the present day, has ever been uniform; its wasted shores have changed, and are unceasingly changing, but, to the ocean itself he well may say,

"Such as Creation's dawn beheld, thou rollest now."

He sees the same handiwork in the coral reefs of the coast of Florida that formed the Silurian limestones; and, in the depths of the Atlantic, he reads, repeated, the story that is preserved in those most ancient of records, the Laurentian rocks of Canada.

From the mode of origin of limestone rocks, their presence, even though so metamorphosed as to have lost all vestiges of fossils, is, now-a-days, held to indicate the existence of life at the time of their formation, and this although the rocks with which they are associated are equally destitute of organic remains. Hence no "Azoic," or absolutely lifeless period in geologic history, is now recognized, by many geologists, who have substituted the term "Eozoic," signifying "the dawn of life," as more appropriate to the most ancient of known formations. "But, surely, you do not mean to intimate that life had no commencement on this earth?" Certainly not; we merely infer that its introduction dates back to a period anterior to the earliest records accessible to the geologist; to a mythical period, which we leave to the researches of that geological archæologist, the cosmogonist.

As regions of the sea, thick with sediment, are unfavorable to the existence of shell and coral forming animals, and as, consequently, the greatest variety of molluscs, as well as of those forming the most massive shells, are to be found in clear waters, where also, in tropical regions, coral reefs alone are constructed, the existence of limestones in a geological formation indicates a different set of conditions, as existing over the region in which they occur, from those which obtained while sediments were deposited from suspension. They tell us that they were formed either far from shore, or around coasts where no large rivers sullied the clearness of the neighboring waters.

But as coral reefs and most shell accumulations are first formed within the limits of breaker action, they are continually being partially broken up, and the resulting *débris* is dispersed by marine currents over the bed of the surrounding sea, under the same rule that controls the dispersion of the sediments derived directly from the land. The heaviest pieces of shell sink nearest the original source; the finer particles are carried further away. The largest fragments of coral are cast down to the foot of the reef, while almost impalpable lime mud is swept far away out to sea. This regularly graduated dispersion of materials will not obtain, however, in the disposition of the calcareous deposits accumulating in the quiet depths of the ocean. There we shall expect to find widespread deposits of uniform character, consisting chiefly of the minute shells of creatures which have lived and died on the spot.

Painting on Leather.

This is an important part of carriage finishing, and it often gives much trouble. The following directions are given in Arlot's "Guide for Coach Painters," a new publication recently noticed in this journal:

When a swelling appears upon a panel, it is evident that the leather has become separated from the wood, and this defect appears only when the paint has been varnished. This accident, therefore, arises from the infiltrated water used in pumicing and polishing, the leather becoming damp and the glue soft; hence the swelling.

Crimples are due to the same cause; water has penetrated the leather without reaching the glueing paste, and we must notice that these crimples are to be found almost always at the base of the panels, and above the lunette (dormer window), which is a proof that the water has penetrated the edges of the leather.

Cracks will also take place on the roof, and on the barrelled seats of ceremonial carriages. The reason, in the first case, is, that the boards or the roof become disjoined by heat after the laying on of the leather, which causes it to bend. When dampness occurs, the boards become tight, the leather swells, and the paint, which has become hard, scales off.

The cracks on the barrelled seats are not due to the same cause; I have often seen an empty space between the wood and the leather. Add to this the rolling and the shocks of the carriage in motion, and we can understand why the leather becomes stretched and breaks.

There are also small cavities which appear, at regular distances, after the spreading of the last coats of paint. These small holes are occasioned by the stretching action of the small tacks employed on the wooden panels, when they have been too much punched in.

But if, instead of these cavities, there appear small swellings, the cause is due to the tacks, which have not been sufficiently driven in, and which, by the motion of the carriage, have a tendency to come out, and push the leather back.

It is customary to give a priming coat to wooden panels which are to be covered with leather, and I have myself followed this old custom, although I have often protested against it. It is evident that the watery paste employed for glueing leather is incompatible with fatty substances; and this is so true that, if we glue leather upon two boards, one of which has been painted, and the other not, the leather will be found more adhesive and firmer on the unpainted board.

The small swellings, cavities, etc., must be avoided by driving the tacks into the wood not deeper than one millimeter (about one twenty seventh of one inch), and afterwards passing a wet sponge over them. The wood swells and covers the heads of the tacks. When the wood has become dry again, lay on the leather, previously stretched.

When the leather is sufficiently dry, it is nailed very carefully, taking especial care that no air penetrates between the leather and the panels, because the air will, by dilatation, cause swellings. Unless very dry, the leather does not receive a priming coat; and, to be doubly sure, we should pass a hot sadiron over its surface, with the interposition of a sheet of paper between the iron and the leather, so as not to burn the latter. When no trace of dampness is left, we may lay on the priming coat. This process has also the advantage of stretching the leather, and rendering it tougher.

I especially recommend a careful puttying, with the oil putty, of the moldings of the lunettes (dormer windows) and those of the lower parts of the Custolde panels, before pumicing.

Leathers thus prepared can scarcely become loose.

The small roughnesses which may appear after the pumicing of the body must be leveled with a sadiron, and then rendered smooth by another pumicing with turpentine. Should the preparing coats be too thin, we must give two coats of gray lead before the last pumicing. But, when defects appear after varnishing, we must pumice with water, and then give a glazing coat with Japan varnish.

The molding strips, when they are to be painted black, are put in their place only after the dressing of the body; and by all means the infiltration of water into the tack holes must be avoided. The workmen should use slender awls for marking the places for the tacks, and must not make deep holes, because it would become necessary to remove the tool violently, the leather would be raised, and water could penetrate underneath.

For the barrelled seats, when the leathers are fractured, I do not know any other process but removing the old paint, and painting afresh. I think that a good preservative would be the stretching of a piece of canvas before the leather is laid on, and making a flexible paint by a good supply of fatty oil.

The cracks on the roofs should be filled with rough stuff kept fat.

It remains for us to consider the painting afresh of old leathers. When the paint is thoroughly cracked, there is other way but burning it. A great amount of care is needed not to burn or raise the leather; a burning cannot be repaired, but raised leather may be levelled down. As soon as the leather rises, the raised parts must be immediately wetted, so as to soften the leather, which is afterwards pressed in place with a hot iron.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in February, 1871:

During the month, there were 529 visits of inspection made, and 896 boilers examined—833 externally and 252 internally, while there were 119 tested by hydraulic pressure. The number of defects in all discovered were 413, of which 52 were regarded as dangerous. These defects in detail are as follows:

Furnaces out of shape, 17. These cases are generally the result of ignorance in firing, or because of too limited boiler power. Coal is heaped upon the grate, making it impossible for air to circulate, and it becomes a heated mass, doing great injury to grate bars and those portions of the furnace with which it comes in direct contact. The gases under such management escape unconsumed, and the result generally is far from economical. We speak now more particularly of anthracite coal. Ashes are often allowed to accumulate in the ash pit to the injury of furnace and grate bars. In managing fires, spread the coal evenly over the grate so that the air can mingle freely with the gases. See that there is a sufficient supply of air, and very perfect combustion will be secured. Keep the ash pit clean, and have abundant boiler power for the work to be done, and "furnaces out of shape" would be comparatively rare. Fractures, in all, 16—3 dangerous; burned plates, 21—2 dangerous; blistered plates, 48—5 dangerous; cases of sediment and deposit, 79—8 dangerous; cases of incrustation and scale, 74—8 dangerous; cases of external corrosion, 19—3 dangerous; cases of internal corrosion, 9—1 dangerous; water gages out of order, 46—3 dangerous; blow-out apparatus out of order, 4—2 dangerous; feed apparatus out of order, 1—1 dangerous; safety valves out of order, 19—4 dangerous; pressure gages out of order, 94—4 dangerous, cases of deficiency of water, 7—3 dangerous; broken braces and stays, 21—1 dangerous; boilers condemned, 5—5 dangerous.

During the month there were nine serious explosions, killing 15 and wounding 7.

DEEP SEA CURRENTS.—It is known that, not long since, the cable between Lisbon and Gibraltar was disabled. After considerable labor, it was grappled, on February 11th, in 500 fathoms water. It is supposed that, at that depth, the ocean is generally at rest, and that there are no currents below 200 or 300 feet from the surface. When brought to the deck of the repair ship, however, there appeared on the cable most evident indications of chafing of very heavy character. We believe that this is the only case of abrasion at such a depth known, and it is important to those who study the geography of the seas, inasmuch as the chafe of the cable indicates the existence of a powerful ocean current, at a depth of 3,000 feet, along the Spanish or Portuguese coast.—*Journal of the Telegraph.*

LOCOMOTIVE WATER TROUGHS.—Troughs for supplying locomotives with water, while in motion, have been laid on the Pennsylvania Central Railway, one at Derry and another near Johnstown. The troughs are 18 inches wide, 6 inches deep, and 1,500 feet long. The scoop let down from the locomotive will take up a quantity of 2,300 gallons of water from each trough.

A WESTERN writer gives it as his belief that if as much attention were paid to improving corn as is given to grapes, a hundred million bushels might be added to the annual crop.

WICKERSHAM'S SYSTEM OF LUBRICATING DEVICES FOR RAILWAY CAR JOURNALS, MACHINERY, ETC.

The waste of oil attendant upon the old system of lubricating journals, though utterly inconsistent with the advances made in mechanical appliances, is only one of its numerous evils. The slovenliness of dripping oil only partially removed by the use of drip cups, and the unequal application of the oil, which is deluged upon bearings at intervals to drain off and leave the journals to dry and heat, if neglected by inadvertence or carelessness, are other evils which do

Fig. 1.



Fig. 4.



Fig. 5.



not exhaust the category. These facts are, however, so familiar to all users of machinery that it is superfluous even to allude to them. What excuse is there, then, for the continuance, even in small establishments, of such a rude, slovenly, and wasteful system?

Among those who have successfully labored to introduce a more refined and economical system of lubrication is Mr. J. B. Wickersham, manufacturer of the "American Oil Feeder," No. 152 South Fourth street, Philadelphia, Pa., and we this week present to our readers, as matter of general mechanical interest, the series of devices by which so much oil is saved, that only a fraction of what is used in the old method is needed to produce better and more uniform results, with less attention in keeping the boxes supplied with oil, and with much greater cleanliness.

Fig. 1 is an illustration of a glass oil cup, with a spiral metal guard and metal mountings. The cup contains an adjustable bonnet or sleeve stem, Fig. 2, with the American oil feeder. This bonnet stem is intended for oil cups in motion, such as on cranks, crossheads, slides, loose pulleys, etc. The bonnet may be screwed either up or down, opening or shutting the slot through which the feeder

Fig. 3.

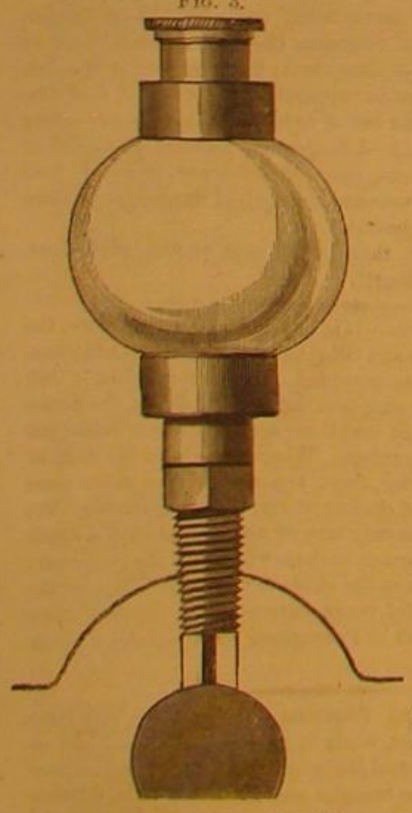
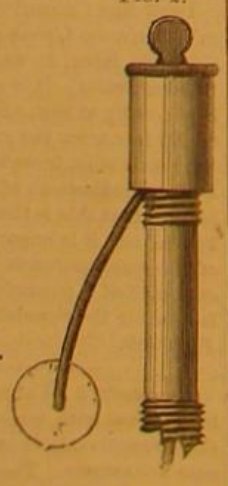


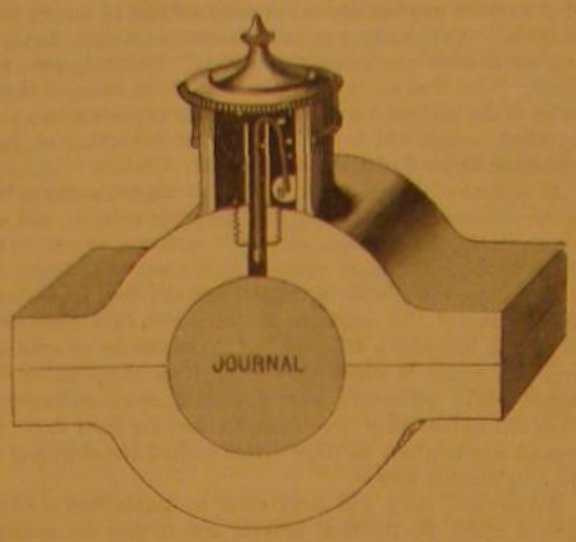
Fig. 2.



passes, and regulating the delivery of the oil. The spiral guard is preferable to upright rods, as it protects the glass all round the cup.

In the oil cup, Fig. 3, the valves, Figs. 4, and 5, are used. This style of oil cup comes under the category of air-tight cups, and has the advantage that it can be filled at the top without taking it off from its place. When the valve, Fig. 4, is used, it is called the "Pendulum Valve Oil Cup," as it is operated by the vibrating motion of the journal; the valve shuts off the flow of oil when the machinery stops, making it a desirable oiler where machinery is not in constant use. When the valve, Fig. 1, is used, it is called the "Atmospheric or Barometric Oil Cup." This valve is adjusted in the same way as the bonnet stem, with the difference that there is no feeder used, except the opening made by the slot, which aperture can be opened, more or less, to allow the oil to escape to the parts to be lubricated.

Fig. 6.



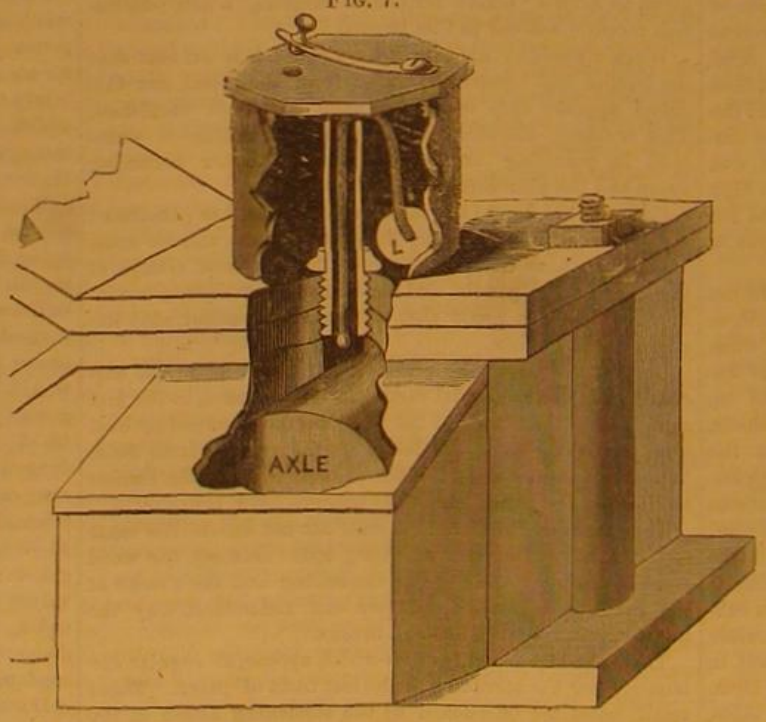
This latter oil cup is operated by the surrounding atmosphere and the jarring of the journal.

Fig. 6 shows how the oil cup may be cast with, and on the top of, the journal cover, in building new machinery where small journals are used. In this cup a metal stem, containing the American oil feeder, is placed. It is believed that, by the application of this simple device to many kinds of machinery, the saving in oil and in the wear of the journals, will pay the interest on the cost of the machine.

Fig. 7 shows the adaptation of the American oil feeder to railroad car journals—dispensing entirely with cotton waste, and, at the same time, saving 50 per cent of the oil. By dropping the oil directly on the bearing surface of the journal, every drop is used to advantage, and deposited clean, without grit, on the center of the journal.

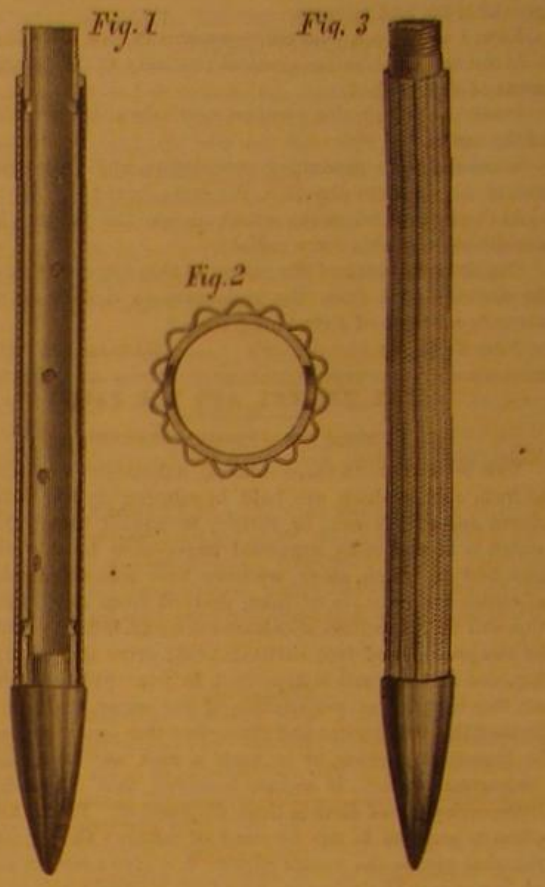
With such devices available, the slovenly and inefficient methods of lubrication existing in many establishments is a blot upon the mechanical progress of the age. We are glad to say, however, that mechanics are gradually waking up to the fact, and that there has been great improvement in practice, as regards lubrication, during the last few years.

Fig. 7.



EDSON'S IMPROVED DRIVE-WELL POINT AND STRAINER

Persons who have had experience in driving wells, feel the need of a strainer of sufficient capacity, and, at the same time, so compact and strong as to drive easily, and not bend or break in the operation. But it must be so constructed that it will supply an abundance of water without clogging, and will not allow sand to pass up, to injure the boxes and render the pump useless. In ordinary strainers it has been difficult get a sufficient number of holes to admit the water, without making the strainer too weak or too large, or else so long that one or the other end would come above or below the stratum that supplies the water.



The improvement shown in our engravings is designed to obviate these difficulties. Fig. 1 is a longitudinal section of the device, Fig. 2 is a cross section, and Fig. 3 a perspective view of the same.

The point is thoroughly welded within the lower end of the pipe, and is of a proper form to be driven easily, and sufficiently large to make a good passage for the strainer.

There are two spiral rows of induction holes twisting around the pipe; these holes are bored and countersunk in such a manner as to give a free passage for the water, without unnecessarily reducing the strength of the iron. Over these holes, a corrugated cylinder made of perforated brass is sprung on, so as to stiffen the corrugations and reinforce the point. These corrugations form channels in which the water flows freely up or down to the holes of the spiral induction course which supplies the pump.

The corrugated form of this strainer presents a large and reliable filtering surface. In one of these strainers, with pipe 1¼ inches in diameter, and 18 inches long, there are upwards of thirty-eight thousand holes, coarse enough to allow mud to pass through, and yet fine enough to hold such particles of sand as should be retained for a proper filtering medium.

Further information may be obtained of the manufacturer, Henry N. Stone, 132 Commercial street, Boston, Mass.

LADLE FOR POURING METAL.

A most convenient implement is shown in the accompanying engraving. It is a ladle for pouring metal, furnished with an automatic skimming device, so that it may be manipulated with one hand, while the mold may be held with the other. It is one of those simple inventions which are really, of much value, though requiring little inventive skill for their contrivance. It was invented and patented in July 1867, by H. W. Benton, of Lebanon, N. H.



Testing Gas in London.—The argand burner of Sugg is the official standard for the measurement of gas in London. The burner for testing the ordinary gas of the Gas Light and Coke Company, which ought to have 16 candle power, must be the London argand No. 1, of Sugg, with a glass cylinder 2 inches in diameter and 6 inches high. For the gas of the Imperial Gas Company and the South Metropolitan Gas Company, which must possess an illuminating power of 14 candles, the glass chimney may have 1¾ inches diameter and 6 inches hight. The chimney may be made 7 inches tall if the flame leaps over the top. The London gas is regularly inspected, and the companies are required to keep up to a fixed standard.

The successful sinking of the great caisson for the east pier of the St. Louis bridge, to its final position, is announced. The event was celebrated by the ringing of bells, firing of cannon, etc. A full description of this caisson, with engraving, will probably appear in our next issue.

The measurements, in our article, published March 18th giving a comparison of the area of the territory acquired by Germany, in the late war, with the areas of other countries in Europe, were expressed in *German square miles*.

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VOL. XXIV., NO. 15 . . . [NEW SERIES.] *Twenty-sixth Year*

NEW YORK, SATURDAY, APRIL 8, 1871.

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MORE ABOUT RATING BOILERS.

The correspondent who wrote us regarding a certain proposition, under consideration by a committee of the Franklin Institute, relative to rating boilers, now berates us, because we made use of the information sent us. His letter asked the very pertinent question, "how do you think this plan will suit engineers throughout the country?" or words to that effect. It did not request a reply by mail, and we simply conformed to our usual custom of answering such queries in our paper.

He also complained that we "*applied to the committee*" such terms as "too absurd to be adopted," and "not tolerable for one moment to common sense." Well, really, we thought we were discussing a proposition said to be under consideration by the committee, and not the committee itself.

At the time of our former writing, we did not know a single name of the gentlemen who constitute the committee. Our correspondent's second letter has put us in possession of *one* name, which is all we know of the committee now, except that one of its members is a "proprietor of an engine shop, and two others superintendents of the largest works," and also that the proposition under discussion originated with one of the members, which accounts for the tenderness evinced under our criticism of it.

The first letter seemed a candid inquiry for our opinion upon an important subject. We gave it accordingly.

A paper, read by Edward Brown before the Franklin Institute, at its stated meeting in January, "On the Horse Power of Steam Engines and Boilers," etc., accompanies the second communication, which paper, having been read and published, we suppose it is lawful to discuss, leaving out of the argument the committee, whose callings imply that they are possessed of too well-disciplined judgment to agree upon the plan proposed.

Passing all that is said of rating engines without reference to boiler power, we shall only review what is said upon the subject of rating boilers.

On page 4, of the printed copy, we find these words: "Whilst the horse power of a boiler depends somewhat upon the engine it supplies, still it is only to a limited extent. A three-port D-valve engine is realizing within 12 per cent of the power *which that engine would produce with a shorter cut-off*." The looseness of expression which characterizes the first part of this quotation is little remedied by the words we have italicized, which we find in pencil writing on the margin of the page, to be inserted at the end of the sentence which ends with the word "power."

We infer that Mr. Brown means effective horse power, when he speaks of horse power of boilers, as influenced by engines. But we fail to see what need there is of considering boilers in connection with engines, so far as their power to develop steam is concerned, further than to determine whether particular boilers are capable of supplying sufficient steam to run particular engines to their full capacity. In our former article we dwelt upon this point to sufficient length. Rating boilers with reference to engines is one thing, and a fixed standard rating of boilers is another. Any such rating to be anything more than a farce, must proceed upon the supposition that all things outside of the boiler are equal. Irregularities in the performance of engines cannot be charged to boilers, any more than deficiencies in boilers can be charged to engines.

The power of a boiler lies wholly in its capacity for producing steam, and its maximum power is its capacity when fired and fed under the best circumstances, and in the best manner. It will not do to charge defective firing to the boiler. The rating should, therefore, proceed upon the supposition that the boiler will be properly attended in practice.

Neither should defective setting, and bad engineering in placing the boiler, be charged to it. In the case of boilers combined with furnaces, as is the case with a great many boilers now made, the manufacturer should be held responsible for proper proportions of grate and heating surface. With plain cylinder boilers where the grate is set in masonry, and the proper proportions of grate surface, correct position of bridge walls, etc., are not supplied, the maker is not responsible.

"It is quite safe," says Mr. Brown, "to assume that the evaporation of 1 foot of water is abundance for a horse power, provided the consumption of coal be taken into account; for a small boiler with good draft, burning much coal, will give out as much power as a larger boiler burning less coal. Therefore, the commercial value of a steam boiler, estimated by the horse power, depends upon its ability to evaporate a given amount of water into dry steam, on a basis of a certain amount of coal, say, about 8 pounds. The conclusion arrived at in reference to this subject would be, that neither the test by the engine nor by evaporation is a positive test. By the engine test, the efficiency of the engine is always liable to be called in question. The steam pipe may be long and contracted, and the pipe and cylinder uncovered, and a large back pressure, for which allowance must be made. The boiler may also be forced for a trial of ten hours, and more coal burnt than usual.

"And by the evaporation test it will be found that some boilers are notorious for lifting water; that is, carrying it over bodily. Exceptional cases will always occur in which either test is unsatisfactory; then the only way is to combine the two methods."

The first sentence in our last quotation from the paper referred to is, in substance, the basis of a plan which the Franklin Institute Committee have under consideration. Now, we ask whether a cubic foot of steam, produced by the combustion of 6 pounds of coal, has not the same amount of heat motion, capable of being converted into work, as a cubic foot of steam made by the combustion of 8 pounds? To use the words of the immortal and sapient Bunsby: "If so, why so, and if not so, why so also?" How are we going to rate boilers by draft and power to burn coal, except in cases where the grate surface, furnace, and smoke stack being made with, and combined with, the boiler, are properly to be considered as part of it? When a manufacturer finishes a boiler and rates it, how is he to take into account the defective chimney of a purchaser, whom he may not see till months after the boiler is made, and how can he make allowance for all the bad practice which still disgraces this department of engineering?

The rating of evaporative capacity should be made when the boiler is fired with skill and with the economy of fuel the manufacturer finds he can attain to advantageously, whether it be 6 pounds of coal per cubic foot of water evaporated, or 8 pounds, or 10 pounds. It is not profitable to reduce the consumption so low, as to require a huge boiler for a small amount of power, nor to urge it so far as to develop an excessive power from a small boiler. This is bad practice. Good rating should be based on good practice.

We showed in our last article that two boilers, rated by combining coal consumption and evaporation on the plan before the committee, might show the same evaporative power, though one was rated at twice the horse power of the other.

If the committee wish to make a standard rule for rating boilers, they should define the conditions of testing, and then rate for power, that is, evaporative capacity, and for economy of fuel separately. We maintain that any attempt to combine the two ratings is as absurd, as it would be to rate a boiler and engine together, and call that the horse power of the engine.

When an engine is said to have a capacity of performing a work of 100-horse power, it is meant that, with a proper supply of steam, it will develop that amount of work. When a boiler is rated at 100-horse power, the rating should imply that, properly set, supplied with sufficient grate surface and draft, and all the other conditions essential to efficient working complied with, it will evaporate a given amount of water per hour. "*Only this and nothing more.*"

We omit to mention the name of the gifted author of the line of poetry which rounds off the preceding paragraph, lest our too sensitive correspondent, overlooking orthography, should suppose it a sneer at the committee.

As economy is a primary consideration with most purchasers of boilers, no manufacturer will, even in a test, push his coal consumption so far as to reduce his rating for economy, in order to secure a greater horse power rating than can be profitably attained. And as for the "lifting of water by boilers," and consequent difficulty in determining the amount of dry steam produced, we fail to see how that can be any better determined by complicating the evaporation with coal consumption. But we do not admit the difficulty. If Mr. Brown wishes to learn how to determine the evaporation of boilers, expressed in units of *dry steam*, we assure him there are those from whom the art can be learned.

WATER-TIGHT CLOTHING.—Balard recommends the application of acetate of alumina for the purpose of rendering clothing impervious to water. The cloth is to be immersed in a mixture of solutions of acetate of lead and sulphate of alumina; by mutual decomposition of the salts, acetate of alumina is produced on the cloth, and when the goods are dried, basic acetate of alumina adheres to the fiber, and thus protects it from the action of moisture. The process is particularly recommended for military goods

IMPORTANT EXPERIMENTS ON THE PRODUCTION OF BEET SUGAR IN MASSACHUSETTS.

Important experiments have been tried, at the Massachusetts Agricultural College, by Professor Charles A. Goessmann, to test the question whether, with intelligent management, the production of beet sugar, as an industrial enterprise, can be profitably undertaken in the Northern States, as it has been in many countries of Europe. These experiments were not conducted on a sufficiently extensive scale to decide all the questions of soil, manure, variety of beet, etc., but were enough to show that it is by no means improbable that the farmers, on the exhausted lands of New England, will be assisted by capitalists to enter upon the cultivation of the sugar beet, as a profitable crop.

We have been favored with an advanced copy of Professor Goessmann's report, to the Legislature of Massachusetts, from which we gather many interesting and valuable facts. It appears that European agriculturists have devoted themselves to the task of producing a sugar beet which contains the largest possible amount of sugar, in the most favorable condition for extraction. It is not enough that the sugar is there, but it must be free from certain nitrogenous matters and minerals, that prevent the extraction of sugar, and have a tendency to produce molasses. To determine what variety of beet was best adapted to our climate and soil, Professor Goessmann procured samples of seeds from successful sugar beet cultivators in Germany; and, on the first year's crop, he has determined the percentage of sugar of each of the varieties employed. These results will be used as the basis of future experiments.

The sugar beet is a variety of an unsightly biennial plant, *beta maritima*, which grows wild along the coast of the Mediterranean, in Southwestern Europe; and in its present useful form, is entirely the product of cultivation. In its original condition, it is a soda plant, while the cultivated sugar beet is decidedly a potash plant. This is shown by a comparison of the analyses of the ash constituents of the cultivated and wild plant:

WILD BEET ROOT (WAY).

Potassa	30·1
Soda	34·2
Lime	3·1
Magnesia	3·2
Chlorine	18·5
Sulphuric acid	3·8
Phosphoric acid	3·5
Silicic acid	3·6
	100·0

CULTIVATED SUGAR BEET (BOUSSINGAULT).

Potassa	48·9
Soda	7·6
Lime	8·8
Magnesia	5·5
Chlorine	6·5
Sulphuric acid	2·0
Phosphoric acid	7·6
Silicic acid	13·1
	100·0

The above analyses afford one of the most striking illustrations of what cultivation can do for a plant; from a weed, abounding in soda and chlorine, is raised up one of the most valuable agricultural products known to the industry of Europe.

The report gives advice in reference to the selection of varieties of beets, and goes very thoroughly into the preparation of the soil, the proper system of manuring, mechanical appliances, time for planting, and proper treatment of the sugar beet; all of which will prove of great value to the farmers of the country. For purposes of sugar, quality, and not quantity, is what is wanted. This is shown in a comparison of the Metz fodder beet and the Silesian sugar beet. The Metz beet yields 86,457 pounds of roots to the acre, containing 3,890 pounds of sugar; whereas the Silesian beet, producing 52,787 pounds of roots to the acre, yields 7,200 pounds of sugar. The beet juice ought to contain from 11 to 13 per cent of sugar; and those who sell at the factories in Europe receive from 25 to 27 cents per hundred pounds of beets, together with one half of the vegetable refuse and press cake. Eight per cent of sugar from the beet is at present assumed to be the actual result of most factories with improved modes of operation and superior sets of apparatus; this allows from 1,520 to 2,270 pounds of sugar to the acre. In France, the yield is said to be from 1,706 to 2,650 pounds per acre. The average expenses in Germany, for the production of sugar, per acre, amount to from $132 to $133, of which the Government takes, in the form of taxes, from $45 to $46. In France, the average is $161 to $162 per acre, and the tax is $50·75. These data will enable American farmers to judge whether it will be possible for them to enter with profit upon this new industry.

After considering all the questions at issue, the report sums up the probable value of the various products of one acre of sugar beets, in New England, as follows:

Sugar, 1,500 pounds, at 7 cents	$105·00
Molasses	2·90
Press cakes	13·60
Preserved leaf mass	6·30
Manure	3·50
Total	$131·30

Every cent of increase in the price of sugar would be equal to fifteen dollars additional profit per acre.

How much the expenses of the production of the above articles, per acre, would be, must be left to experience; the author of the report does not attempt to decide the question. Taking into consideration the cheapness of our lands, the superiority of our agricultural machinery, and the freedom from Government taxation, the conclusions of the report

would appear to be well founded; "That money can be made if the business be intelligently managed."

The report, comprising thirty-six large octavo pages, is one of the most valuable contributions to agricultural science that has been made in our country, and reflects great credit upon its author, Professor Goessmann, and the management of the Agricultural College of Massachusetts.

EFFECTS OF MODERN TRAVELING ON HEALTH AND LONGEVITY.

An impression has prevailed that persons traveling by the modern methods of railways and steamers assume risks not pertaining to the more common and ancient means of conveyance, and hazards exceeding those to which they are liable when remaining at home, engaged in their ordinary avocations. The accounts of railway and steamboat disasters, which appear so often in the papers, give some ground for the impression, yet the general estimate of risks involved in railway and steamer transit is undoubtedly exaggerated.

In England some investigations have been made calculated to throw some light upon this subject. In America, very little is accurately known as to the general effect of traveling upon health and longevity. At least one American life insurance company has taken the ground that traveling does not shorten the average duration of life, and therefore makes no restrictions in this particular upon those it insures.

It is obvious that where so many causes and changes are combining to affect the health of the general public, those who travel occasionally cannot be made the subjects of carefully compiled statistics; but those who are habitual travelers, employés on railroads, traveling salesmen, expressmen, etc., may be, and from the examination of the death records of such persons, a fair estimate may be made as to general effect of continued travel upon human life.

Among those who have paid particular attention to this subject in England is Dr. James O. Fletcher, of Manchester; and in France, Drs. Duchesne and Santa. From the statements of Dr. Fletcher, we learn that he has never been able to trace any disease to which habitual travelers are more liable than others. The testimony of such persons seems to establish the fact that traveling by railway is better for the health than any other means employed. An examination of railway conductors (guards) who stand for ten hours, or sit on hard seats, destitute of either cushions or springs, developed the fact that, of seventy-four, some of whom had followed the avocation for twenty years, none had suffered any permanent injury from accidents, none had rheumatism, loss of muscular power, or other diseases, supposed by many peculiarly to attend the exposure to weather and vibration, pertaining to the occupations named.

Dr. Duchesne thought he discovered among locomotive engineers a disease which he styles the mechanic's disease (*maladie des méchaniciens*), of which the symptoms are enumerated by him as "rheumatic pains, weariness, numbness, difficulty of locomotion, neuralgia, sciatica in the right side, and cramps." It would appear that this comprehensive disease of Dr. Duchesne's naming includes what are generally considered as separate and distinct ailments.

On the contrary, he states that engineers on locomotives generally get stout after two or three years of service, about eighty per cent of them showing this peculiarity, and that a general increase of vigor is noticeable. Examples of persons in delicate health recovering from their ailments upon entering this occupation, are adduced by him, and he adds that out of seventy-three engineers employed on the *Chemin de fer du Nord*, there have been scarcely ever more than two sick at once. For five months in one year there was not one sick, and one is mentioned who enjoyed perfect health for ten years in succession. It would seem that the usual health of engineers and firemen is even better than that of people in general.

As to risks to passengers, the statistics show that in Europe railway traveling is the safest of all means of conveyance. We wish we could say this of America; but, though railway way accidents are far more frequent here than in Europe, it is probable that, in proportion to the number of people traveling by rail, there are as few killed or injured as in any other mode of traveling. The following quotation from an exchange, places in a striking light the small risks assumed by travelers on European railways:

"An Englishman's risk of dying by strangulation is 6 times as great as of being killed on a railroad, whether by his own carelessness or by an accident. If his own carelessness be excluded from the estimate, his risk of death by hanging is 130 times as great. Ninety-nine times as many people die of cancer in England as are killed on railways. Excluding, as before, the element of carelessness, 2,165 persons will die of cancer to one killed on a railroad. In England, during 5 years, 333 accidents occurred, 200 from collision, 77 from getting off the track, 36 from damage to machinery, and 20 from other causes. For 14 years, from 1855 to 1869, 1 person was killed in every 7,161,301 transported. In Prussia, 1 is killed in 24,411,488, and 1 is injured in 3,892,998. The statistics of stage coaches in France, covering a period of 10 years, show that 1 passenger in 355,463 is killed, and 1 in 29,871 is injured."

It would seem from these facts (even admitting that a large allowance must be made before they can apply to traveling in America) that the restrictions upon traveling made by some life insurance companies, are absurd; and also that the rates charged by accident insurance companies are extravagant.

A CORRESPONDENT of Forney's (Phila.) *Press* has received a circular from Hamburg, Germany, offering sand, of a peculiar color, for sale for the adulteration of clover seed.

NEW METHOD OF MAKING PAPER PULP FROM WOOD STRAW, ETC.—THE DEININGER PROCESS.

Referring to an article published in No. III., current volume, of the SCIENTIFIC AMERICAN, entitled "Waste Liquors of Paper Mills," a correspondent from Baltimore has put us in possession of the details of a new process invented by Mr A. Deininger, of Berlin, Prussia, who, we are informed, has already successfully introduced his invention in several paper mills in Prussia. The method is applicable to all kinds of vegetable fibrous material.

In the previous article referred to, is pointed out the advantage of recovering the alkali from the waste alkaline solutions, in which the raw material has been converted into pulp by boiling. The expense of chemicals in the manufacture of paper pulp from wood, straw, etc., requires the greatest economy, in order to render the business profitable. A method of recovering the alkali was mentioned as employed in a manufactory at Manayunk, Pa. Without this recovery of the alkali, the process employed would be commercially a failure, as, otherwise, the consumption of alkali would be more than could be profitably sustained. This recovery of the alkali consists essentially in the concentration of the waste liquors by evaporation and subsequent calcination. This process of recovery, however, requires expensive apparatus, and is in itself expensive.

The Deininger process, it is said, greatly lessens the amount of chemicals required to reduce the vegetable fiber to pulp, and also the amount of chemicals used in bleaching; and if its claims are really sustained in practice, it must prove of great importance in this branch of industry. Besides economy of chemicals, secured by the process, it is claimed that it yields a larger quantity, and a better quality of pulp, than processes hitherto employed.

The alkaline solution used is weak, and the material to be reduced is submitted to its action under a pressure of 60 lbs., while the solution of the material immersed in it is kept at a temperature of 210° F., so that, under the combined influence of heat and pressure, without actual boiling, the material is disintegrated, as in other methods, but without the use of strong solutions and high temperatures.

The apparatus employed is a vat capable of being hermetically sealed, and of sustaining the required pressure of 60 lbs. of steam, received from a boiler with which it is connected. At first we thought it seemed paradoxical that the contents of a vat receiving steam under a pressure of sixty pounds could be kept down to 210° F., but we are assured that the manner of admitting the steam, and the prevention of its accumulation in the top of the vat, by means of try-cocks, does keep the temperature down, while the pressure is maintained. We confess that we cannot, from the information at hand, understand how this is accomplished, but are willing to accept the statement, as this peculiarity is claimed to be a marked feature of the Deininger process, and probably the matter would prove simple enough if the details of the apparatus were fully explained.

The raw material is cut up into pieces, from one fourth to one half inch long, and then introduced in the above described vat, and steeped with a solution of soda in water, of about 1° B., heated to about 175° F. When the vat is filled with raw material, the steam is turned on, and the temperature of the contents of the vat is thereby raised from 175° to about 212° F., the vat being kept at this temperature, and under the above named pressure of sixty pounds to the square inch, for from four to six hours, and care taken that no steam shall form in the interior of the vat. A thermometer serves to regulate the temperature, and a pressure gage indicates the pressure in the vat.

By the combined action of the heat and pressure, the silicic acid, the chlorophyl, and a portion of the gelatin, are dissolved, and the horny scale, the marrow rays, and the knots of the raw material, are softened and split by the lye, while the cellular texture remains intact, thus obviating the use of the strong leys and high temperatures essential to other processes, by which the texture of the fiber is more or less injured. When treated in this manner, the fiber obtained is said to be nearly white, and can be readily bleached and used for the manufacture of paper.

The material is exposed to the above described action, for from four to six hours, when it is removed from the vat, washed in a suitable drum, and reduced to pulp, in ordinary pulp engines, with, it is claimed, but little expenditure of power.

In bleaching, the pulp is spread upon a floor, to a depth of from two to three feet, and moistened with diluted sulphuric acid of about ¼° B. In this state it is left for two or three days, and during this time the acid combines with the coloring matter and gelatin still present, and the acid reaction ceases. The bleaching liquid is prepared by making a solution of chloride of lime in water, of 4° B.; and, after the clear liquid has been drawn off, it is treated with soda (using about one fourth, by weight, as much soda as chloride of lime), until all the lime is precipitated, it being essential to prevent any free lime from coming in contact with the gelatin and silicic acid, as it would adhere to the fibers, and render the bleaching process exceedingly difficult. By the addition of soda, as above stated, a solution of hypochlorite of soda is obtained, which is brought into contact with the pulp, the action of the liquid being facilitated by imparting to the mass a revolving motion, in a suitable drum, and by admitting a sufficient quantity of steam to raise the temperature to about 96° F. Under this heat, the pulp remains soft, and bleaching action becomes uniform, and the bleaching liquid is completely spent. The yield of bleached pulp is from sixty to seventy-five per cent of the raw material, according to the nature of the latter.

SUPPLY OF AIR TO COMBUSTIBLES IN FURNACES.

We lately visited the engine room of an establishment in a neighboring city, and while there, were appealed to on the part of the proprietor, as to what was the probable cause of the enormous consumption of coal in the establishment, in proportion to the power obtained. Looking out of the window, at the moment the question was put, our eye took in the outline of a gigantic shadow, dancing and flickering over the pile of old iron and rubbish which decorated the courtyard of the building. "What causes that shadow?" said we. "Oh, that is caused by the smoke from our chimney," was the reply. "Ah!" we replied, "judging from your statement of coal consumption, it is quite probable that for every hundred pounds of coal your boiler tender puts into your furnace, he puts in about sixty per cent of fuel, of which you can, at best, get only about one tenth the full value of the heat in the form of useful work, twenty per cent, or thereabouts, of cinder, ashes, and slate, and twenty per cent of shadow. That shadow costs a good deal of money, my friend, and perhaps there is even less fuel and more shadow than the proportions made in our rude guess."

In the subsequent conversation we found this gentleman entirely ignorant of the amount of air necessary to support combustion of various fuels, and when we told him it would take about 150 cubic feet of air to completely burn every pound of carbon he put in his furnace, he exclaimed, "Well, really, I don't believe my furnace has draft enough." Yet it had draft enough and to spare, only the air was not admitted so as to reach the combustible in right quantity, and at the time and place when and where the fuel was at the right temperature to unite with the oxygen. It was all admitted from the front, and the products of distillation, one of the first effects of heating coal, passed off without their share of oxygen, as smoke, or carbon suspended in a gaseous medium.

We have said enough about the importance of bringing air into contact with the heated gases in furnaces, and do not intend to repeat the lesson at this time. The conversation, however, led us to think of the probable general want of information among steam users, as to the proportions of air required to completely consume various kinds of fuel, and the temperatures at which, as above, combustion takes place, and below which there must necessarily be imperfect combustion, and more or less distillation, and consequent waste of fuel.

The fuels in general use are mineral coal, coke, wood, peat, and charcoal, mentioned in the order of their importance as steam producing fuels. To burn a pound of mineral coal, of average quality, requires all the oxygen contained in 147·6 cubic feet of common air at 60°. Coke requires a supply of 134·3 cubic feet of air, at 60°, to consume one pound. Wood of average dryness and quality requires 64·5 cubic feet of air for the combustion of one pound. Peat requires 81·3 cubic feet of air per pound of the fuel. Charcoal requires 147 cubic feet of air for each pound consumed. These figures make no allowance for waste, but suppose the chemical combination of the oxygen with the carbon and hydrogen of the fuel, to be absolutely perfect and complete, before a particle of either passes through the uptake. This is hardly ever the case. In the instance alluded to at the commencement of this article we have no doubt the amount of air admitted was 250 cubic feet per pound of fuel; but the contact with the heated fuel was not sufficiently intimate to effect perfect combustion before the gases and vapors had cooled to a point below which combustion cannot take place. In fact, the practical rule has been adopted—so great is the waste in most cases—to make the supply of air twice what is needed to theoretically consume the fuel. The gases and vapors distilled from coal will not burn below a temperature of from 900° to 1000° Fah., a temperature much higher than usually exists in the uptakes of the furnaces of steam boilers. Besides, the combustion, to be of full utility, ought to be rendered as complete as possible in the furnace under the boiler, and should not extend into the uptake at all.

As general principles, it may be stated that the greater the amount of air admitted, beyond the theoretical quantity required for perfect combustion, the greater will be the loss of heat through the uptake; that the greater the amount below the theoretical quantity, the more partial, slow, and incomplete will be the combustion on the grate, and the greater will be the loss of fuel through the uptake, provided air enough be admitted to maintain a combustion of sufficient intensity to distil over the fuel; and, lastly, that the less perfectly the air is brought into contact with the gaseous and vaporized combustibles beyond the grate, while they are hot enough to burn, the greater will be the loss of fuel through the chimney.

We shall not extend this article by a discussion of the proper methods of introducing air behind the bridge walls of furnaces, for the consumption of smoke. These topics have already been discussed, theoretically and practically, in this journal. We would, however, close by urging upon all men who use steam, to provide themselves with some convenient and handy book of reference on the subject of heat, and to inform themselves thoroughly in regard to all the practical details concerning its application to the production of mechanical power. For this purpose, we have no hesitation in recommending Box's "Practical Treatise on Heat," published by Henry Carey Baird, of Philadelphia, as the best work on the subject extant.

BRICK MACHINE CHALLENGE.—In our advertising columns, last week, Messrs. Wright & Winn, of Lock Haven, Pa., threw down the gauntlet to brick machine manufacturers in the United States. Here is a chance for a sharp and decisive competition.

PAPER HANGING.

Again the season has arrived for the renovation of dwellings, in which process the operation of paper hanging is one of the most prominent. In cities, this is either a trade by itself, or is carried on as an adjunct to the painter's trade. In rural districts, however, there are many housekeepers who are obliged to do this work for themselves. We shall, therefore, not attempt to adapt the present article to the wants of the professional paper hanger, but to those of the general reader.

The first thing to be thought of is the selection of paper hangings. In purchasing, every one, of course, tries to secure that which is most in accordance with good taste and with the means of the buyer. No specific directions can be given on this head, but it is a doubtful economy to let a difference in price, of a few cents a roll, lead to the purchase of a very inferior article, that will not only give great trouble in hanging, but will be an eyesore so long as it disfigures the walls upon which it is hung.

The paper being purchased, the walls should next be looked to, in order to be sure that they are in proper condition to hold the paper. A new unwhitewashed wall will absorb the paste so rapidly that, before drying, there will be left too little body of paste on the surface to hold the paper. A coating of good glue size, made by dissolving a half a pound of glue in a gallon of water, or a coating of good paste, put on and allowed to dry before the paper is hung, will provide for this difficulty.

If the wall be whitewashed, it should be scratched with a stiff brush, to remove every particle of loose lime from the surface; after which it should be thoroughly swept down with a broom, and coated with the glue size or thin paste.

A long table of thin boards cleated together and placed on wooden horses, such as are used by carpenters, a pair of sharp shears—with long blades if possible—a whitewash brush, a pail for paste, and a yard of cotton cloth, are the implements required. The table or board platform should be level on its upper surface to facilitate the distribution of the paste. The latter should be free from lumps, and should be laid on as evenly as possible. It should be made of good sweet rye or wheat flour, beaten smooth in cold water before boiling, and should not be allowed to boil more than a minute or two, but should be raised to the boiling point slowly, being continually stirred till it is taken from the fire.

Inexpert hands often find difficulty in making the patterns match in the juxtaposed pieces. No general directions can be given for this, but a little study at the outset will often save cutting to waste, and other difficulties. In this matter, as in others, it is wise to "first be sure you are right, then go ahead," As soon as the proper way to cut the paper is decided upon, a whole roll, or more, may be cut at once, and the pieces laid, printed side downwards, upon the table, weights being placed upon the ends to prevent curling. The paste should then be applied to the back of the uppermost piece, as expeditiously as possible, as the longer the time employed in this part of the operation, the more tender will the paper get, and the more difficult it will be to lay it properly.

The upper end of the piece should then be taken by the corners, and the operator, stepping upon a bench or step-ladder, should barely stick the piece at the top, and in such a manner that the edge shall coincide with the piece previously hung; this can be done by sighting down the trimmed edge of the piece, while it is held in the hands. The cloth should now be held in a loose bunch, and the paper smoothed with it from top to bottom, care being taken to work out all air from under the paper, which, if not thoroughly done, will give it a very unsightly blistered appearance.

If the wall be uneven or crooked, as is often the case in old houses, it will be difficult to avoid wrinkles, but they can be mostly got rid of, by cutting the paper and allowing the cut edges to lap over each other, in places where there would otherwise be a wrinkle.

By following these directions the most inexperienced will be able to do a reasonably tidy piece of work, but of course much skill is only secured by practice.

AN "ANCIENT AND FISH-LIKE" STRANGER---THE "ICHTHYOSAURUS," OR FISH LIZARD.

The scientific man is often at a loss to tell whether he is most astonished at the remarkable credulity, or at the no less extraordinary incredulity, that characterizes ignorance. Let the showman set up a palpable hoax, like the fish with legs, or the Cardiff giant, and people will freely pour their fifty-cent stamps by the thousand into the cash box of the the exhibitor; but let a geologist exhibit and undertake to say a few words concerning the veritable bones of a genuine extinct animal, and of the habits of the ancient monster, and folks will scarcely deign to listen to him, or, listening, will not be induced to believe. They very generally succeed in placing their faith upon the wrong object.

There has been on exhibition, during the past week, at the College of the City of New York, a remarkably interesting specimen of the skeleton of the ichthyosaurus, or fish lizard; a creature which abounded in the seas that covered Europe during the middle ages of the earth's geological history, but which has altogether disappeared since that time. The first question that naturally suggests itself to the popular mind regarding this specimen, is: Is it a genuine fossil, or is it made up by human ingenuity? and the next that will occur to persons ignorant of geology, will be: Were these bones ever the framework of an actually live animal? To the first question, we reply, even setting aside the endorsement of authenticity which the specimen has, we believe, received from an eminent German geologist (it being from Germany); that it presents to the cursory examination of one who has had considerable experience in such specimens, every appearance of being a perfectly genuine fossil. Of course, there is no doubt that the bones are all actual bone; they are not plaster casts; the only question would be whether any bones not belonging to this individual, have been added to make the skeleton appear more complete. Such tricks are well known to the trade, and more than one great authority has been before now grievously misled by such injurious reconstructions. We have every reason to think that, in this case, all the parts undoubtedly belong to one individual ichthyosaur; why we lay stress on this, we will presently explain.

Next: Is this the skeleton of an animal that ever actually lived? Of this really few in these days would be so foolish as to doubt; but we may say that Nature must have carried out her scheme of hoaxing mankind in a remarkably complete manner, if these bones are but her sports, since she leaves between the ribs traces of food, and of food precisely such as we should credit an animal of this particular structure with devouring. Nay, even in the hard fæces (coprolites) of these creatures which occur, associated with their remains, in abundance in some parts of England, we find the evidences of the form of the intestines and impressions of the "minute vessels and folds of the mucous membranes by which they were lined!"

Here, then, we have an authentic specimen of the skeleton of a creature of strange structure, embodying characters the analogues of which are now to be found separately in the fish, the saurian, the ornithorynchus (or duck bill) of Australia, and the whale, laid out before us in the ooze of a sea, in the waters of which this creature lived, long before the Andes, the Rocky Mountains, or the mighty Himalayas had been raised out of the ocean's depths. This age of the specimen before us alone overwhelms the mind with astonishment; but how much more suggestive is it that, after the lapse of these unnumbered ages, man should be able to indicate the affinities of this creature to forms still existing, in such manner as to fix exactly the place it occupied in the system of animal life! Who could desire a more striking illustration than is afforded by the ichthyosaur, of the uniformity of design, combined with an endless diversity of execution, that pervades the entire scheme of creation?

We sincerely trust that this fine specimen (for it is not only far above the average degree of perfection amongst such fossils, but also above the general average of size of anything like well-preserved individuals) will be secured by the public for educational purposes, and that it will be placed where it will be accessible to all—to the young and the old, the poor as well as the rich. Such a specimen is especially invaluable in the education of the youthful mind. In the first place it is truthful; the teacher can say "these are genuine bones, and the bones lie there much as when the flesh perished from them." There is no need, with such an object, of roundabout explanation or of mental reservations. The child will not be misled by any false representation or actual deception; and our strong impression is, that with children, a single good downright truism, even in stone, is morally worth a whole host of the most ingeniously devised substitutes. Let children be told that the shale in which the bones are imbedded is the actual mud of an ancient sea bed; let them learn where this sea was, interest them with an account of the habits of these creatures, and of the creatures with which they were associated, and their minds will conceive vividly that the earth has had a history—a history as interesting as it is vast, opening up new views of the completeness and perfection of nature. By this means, these dry and ancient bones may be made to do efficient service to the community, for they will promote the cause of truth, and aid in freeing us from the multitudinous humbugs that thrive upon general ignorance.

The New Steamship "Oceanic."

This new steamship arrived from Liverpool, at this port, on Tuesday, March 28th. Since the *Great Eastern* left these waters, nothing has been seen to rival the *Oceanic* in size. Her length is 432 feet, breadth of beam 41 feet, depth of hold 33 feet, entire burden 6,000 tuns, engines 3,000 horse power, and she draws, at the load line, 25 feet of water. Her four masts tower above all the shipping on the Jersey side, and the flags at their heads can be seen from the corner of Chambers street and Broadway. The *Oceanic* was built by Harland & Wolff, of Belfast, and five other vessels of equal tunnage, power, and equipment, named the *Atlantic, Baltic, Pacific, Arctic,* and *Adriatic,* will follow during the year from the same yard. The decks are entirely of iron, cased above and below with wood, and she is furnished with that "great Yankee improvement"—a straight stem. The saloon is elegantly finished and upholstered. Four large tables run the entire length, with seats cushioned in magenta-colored silk velvet, and the whole saloon is resplendent with silver plating and mirrors. Two coal grates with marble mantles, surmounted by delicately-fashioned bronzes, are in the aft end near the entrance doors. Between these stand the library and secretary. The ladies' cabin, 10 by 18 feet, situated on the starboard side, directly aft of the saloon, is upholstered in green velvet. The smoking room—finished in buff—on the *spar* deck, affords from the windows a complete view of the decks. The state rooms have perfect ventilation, which those lying in the upper berths have it in their power to control. Each state room is furnished with eight life preservers. An electric bell, leading to the steward's room, is fitted to every sleeping berth.

These vessels are undoubtedly the largest, handsomest, and best furnished of any now plying in the trans-Atlantic service.

NEW BOOKS AND PUBLICATIONS.

ANNUAL OF SCIENTIFIC DISCOVERY; or, Year-Book of Facts in Science and Art, for 1871. Exhibiting the most Important Discoveries in Mechanics, Useful Arts, Natural Philosophy, Chemistry, Astronomy, Geology, Biology, Botany, Mineralogy, Meteorology, Geography, Antiquities, etc. Edited by John Trowbridge, S.B., Assistant Professor of Physics in Harvard College, aided by W. R. Nichols, Assistant Professor of Chemistry in Massachusetts Institute of Technology, and C. R. Cross, Graduate of the Institute. Boston: Gould & Lincoln, 59 Washington street. New York: Sheldon & Co. London: Trubner & Co.

This volume contains the usual summary of advances made in the respective departments named in its title. The character of this annual is too generally known to render it necessary for us to dwell upon it. The present volume records no very startling discoveries or very remarkable inventions. In this respect the past year has been uneventful. But a good deal of steady progress in science, and many improvements in the arts of that kind, which, though they do not revolutionize processes, still greatly aid in industrial progress, have been made. The volume for 1871 fully sustains the character which in previous issues has won for this annual, great popularity and a wide circulation.

WHAT I KNOW ABOUT FARMING. By Horace Greeley. Published by the Tribune Association. New York.

We are indebted to the distinguished author for a copy of the above volume. It is dedicated "To the man of our age who shall make the first plow, propelled by steam or other mechanical power, whereby no less than ten acres per day shall be thoroughly pulverized to a depth of two feet, at a cost of not more than two dollars per acre." The work itself contains 221 pages of very instructive matter upon almost every aspect of farming as viewed by the author, who is a veteran thinker and observer; and we are quite sure that whoever procures this work will peruse it with interest, and gain thereby, not only much information, but will get a new idea also of the versatile character of Mr. Greeley as a writer and thinker. The force of Mr. Greeley's dedication to the coming steam plow man is rendered obvious by the fact that there are three thousand such plows in England and less than a dozen in this country.

THE HUMAN FEET; their Dress and Care, showing their Natural, Perfect Shape and Construction; their Present Deformed Condition; and how Flat Feet, Distorted Toes, and other Defects are to be Prevented or Corrected, with Directions for Dressing them elegantly, yet comfortably, and Hints upon various matters relating to the whole subject, with Illustrations. 12mo, 202 pp. Price, $1·25. New York: S. R. Wells, 389 Broadway.

The object of this book is to teach the reader how to treat and dress the feet that there may be no more corns, bunions, aches, or pains. It is possible to have sound feet on sound bodies, and this work sho s how. Written in a plain, practical manner, with physiological and me hanical illustrations, it is at once scientific, philosophical, and instructive.

THE QUARTZ OPERATOR'S HAND-BOOK. By P. M. Randall. Revised and Enlarged Edition. New York: D. Van Nostrand, Publisher, 23 Murray street and 27 Warren street.

This is a plainly-worded, practical treatise upon the machinery necessary in quartz mining, assaying, and testing metals and ore, analysis of ores containing special substances, the use of the blowpipe, examination of minerals, treatment of gold ores in the different ways employed for reducing such ores, species, formation, exploration, and exploitation of mineral veins ventilation of mines, silver, its ores, their analysis, assay treatment in reduction, etc., etc. The directions given are of the kind suited to the practical miner in the system of mining most prevalent in the rich mineral districts of the United States. A good work, and one largely needed by practical miners.

WORCESTER CO. FREE INSTITUTE OF INDUSTRIAL SCIENCE. Addresses of Inauguration and Dedication, Worcester, November 11, 1868; Memorial Notice of John Boynton, Founder of the Institute; Memorial Notice of Hon. Ichabod Washburn, Founder of the Practical and Mechanical Department, Worcester. Printed by Charles Hamilton, *Palladium* office.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.]

1.—CLEANING VIOLIN.—How can I best remove, from the belly of a violin, the coat of rosin which has accumulated on it, without injury to the varnish or the instrument?—G. D.

2.—CLEANING GUNS.—What is the most convenient and practical method of cleaning a gun, either at home or in the field? I find the old way, with rod and water, and the use of tow or cotton for drying, rather a tedious and disagreeable process; especially inconvenient, too when one is hunting where no water is to be had.—G. D.

3.—MAGNET AND BATTERY.—Can a magnet be made, that will draw its keeper to the poles, from a distance of five or ten inches? How can I make a cheap but very powerful battery?—W. B. F.

4.—SCREW PROPELLER.—Will a screw 3 feet in diameter, made of ¼ inch boiler iron, propel a canal boat three or four miles per hour? and will two or three such screws work well side by side?—S. C.

5.—VARNISH FOR GUN BARRELS.—Will some one tell me how and what to use in making the stain or varnish used on gun barrels, and how to apply it properly when made?—D. M. S.

6.—FURNITURE VARNISH.—The recipe given, in answer to my query, on page 9, current volume, for a cheap furniture varnish makes, I find upon trial, a varnish that will not dry. Will some one correct it, or give me a recipe that will work?—B. H.

7.—MATCHES.—Will some one give me a recipe for composition for lucifer matches, and directions how to make them?—B. H.

8.—VERMILION VARNISH.—We wish a recipe for a nice vermilion varnish to varnish edge tools, one that will dry quickly.—B. & Co.

9.—LEAKY SHINGLED ROOF.—How can I remedy the leaking of a shingled roof, that is a little too flat? Is there any composition that can be applied for this purpose? I want something cheap, simple, and durable.—S. R.

10.—MILL SPINDLE JOURNAL.—The mill spindle journal, suggested by B. and W. in answer to my query, is without objection; but it is hardly applicable to my case, as my mill is a cast iron one, with the grinding surface and journal in one piece, and the latter made large and filled with soft solder.—H. A. S.

11.—TELESCOPE.—I want to construct a telescope of sufficient power, for instance, to observe the planet Saturn and its satellites; what lenses do I require, and what are their focal lengths? Should they be fixed in tin or wooden tubes, and what should be the construction of the eye piece?—W. B.

12.—PICKLE FOR CASTINGS.—What is the best pickle for cleaning castings, preparatory to galvanizing them with zinc, tin, and lead What work gives the best information on this subject?—J. R. P.

Recent American and Foreign Patents.

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

CULTIVATOR.—Jacob S. Thomas, Mifflintown, Pa.—This invention consists in the combination of shanks, having shovels attached at their lower rear ends, and pivoted themselves at their upper front ends to the sides of the cultivator beam, with a bar, having in its under side as many grooves as there are shanks, and placed upon the latter crosswise of them, and of the beam, on which it is adjustable lengthwise, for the purpose of producing a contraction or expansion of the shanks with reference to each other.

FRUIT-GROWERS' CHECK AND HOLDER.—Andrew A. Baker, Camden, Del.—This invention consists of a box, provided with a number of vertical fingers, for holding metallic checks, which are stamped with the abbreviation "qts.," or other denomination in dry measure, and with numerals, which signify number of quarts, and are intended for fruit-growers' use, to be delivered by them to their fruit pickers and canners in lieu of money.

PLASTIC COMPOUND FOR SADDLETREE, STIRRUPS, GUNSTOCK, ETC.—Ernst B. Newman, St. Louis, Mo.—This invention consists in a saddletree, molded from a certain plastic composition, and hardened by drying or exposure to the air.

HAY RAKE.—John F. Henkle, Fredericktown, Mo.—This invention has for its object to furnish an improvement in that class of horse hay rakes, in which the rake-head is jointed to adapt it to the inequalities or undulations of the surface of the ground; and the invention consists in the peculiar arrangement of caster wheels with the jointed rake head.

BURNER FOR LAMPS.—Charles B. Mann, Baltimore, Md.—This invention relates to an improved safety-filling tube, and a wick tube, for kerosene lamps, designed to prevent the frequently recurring explosions of the same, and the loss of life and property occasioned thereby.

EXCAVATOR.—Barna T. Stowell, Quincy, Ill.—This invention relates to an improvement upon the machine for which letters patent of the United States were granted to same party November 17, 1868. It aims at combining simpler means of cutting or digging in the earth, and elevating the portion thus loosened, and consis of a toothed digger, and an endless chain which rotates said digger, and carries the loosened earth up an inclined plane to the horizontal apron or conveyer, by means of scrapers attached to it (the chain) in a suitable manner.

SUBSOIL PLOW.—Joseph R. Morris, Houston, Texas.—This invention consists in a shaft bearing spades, and combined with plows located in front thereof, and arranged so as to cut furrows, so that the shaft and spades, at the rear end of the same frame which carries the plows, may penetrate beneath the surface of the earth and pulverize the subsoil, said shaft being connected with the interposed gearing in such manner as to revolve against the line of motion of the frame and master wheels.

SADDLE BAG.—A. M. Leslie, St. Louis, Mo.—This invention consists in so cutting or forming, and so applying a plate of leather to the metallic cases of saddle bags employed for containing medicines and other articles, that while it encloses and protects said cases, it forms also the hinge between them, so that convenient and ready access may be had to the interior of the cases, and certain other advantages may be secured.

OXY-HYDROGEN CUPOLA OR FURNACE.—J. R. Morris, Houston, Texas.—This invention relates to a cupola or furnace, in which a water chamber more or less completely encloses the fire chamber, and absorbs therefrom all the heat that would otherwise be wasted, by which absorption of heat steam is generated in the water chamber, whence it rises into a steam chamber, inclosing the fire chamber above the water chamber, in which upper chamber the steam is superheated, and from which its own pressure forces it (by the only outlet afforded) through vessels loosely filled with iron scraps, or filings, said vessels being placed either within or next to the fire chamber, and their iron contents being consequently heated to redness, so that the contact of superheated steam therewith results in decomposition of the latter into oxygen and hydrogen, the former of which, uniting with the iron, forms oxide of iron—a merchantable article—while the hydrogen rushes into the fire chamber, mingles with the ignited fuel therein, and not only burns itself, thereby increasing the amount of heat, but also attacks and drives off the impurities in the iron and coal.

STEAMING APPARATUS.—Otto Lehmann, Columbus city, Iowa.—The object of this invention is to provide efficient and convenient means for generating steam for domestic purposes, for instance, for cooking feed for animals, steaming grain, heating water for washing, and other purposes.

GRATE BARS.—Capt. William H. Farris, Cairo, Ill.—This invention has for its object to furnish an improved grate bar, for the furnaces of steam boilers, which shall be so constructed as to allow water to circulate through it and the boiler, to protect the bars from the intense heat of the fire, and to assist in heating the water and generating steam.

HAND TURNING AND BORING MACHINE.—J. F. Finger, Wilmington, N. C.—The object of this invention is to provide suitable and convenient means or turning and repairing wrist pins in steam engine and other cranks, and also for boring out cranks, or "trueing" the wrist pin holes.

WASHING MACHINE.—Edwin Knock, Vermont, Ill.—This invention has for its object to furnish an improved washing machine, simple in construction, effective in operation, and convenient in use.

APPARATUS FOR DRAWING BEER, ETC.—Jacob Van Norman, Easton, Pa.—This invention has for its object to furnish an improved apparatus, simple in construction, convenient in use, and effective in operation, by means of which hydraulic pressure may be employed to force air automatically into the cask to take the place of the beer, as it is withdrawn from said cask, so that the last beer drawn from the cask may be as good as the first.

LIQUID INHALER.—Richard M. Moyle, M. D., New York city.—This invention has for its object to furnish a simple and convenient apparatus for inhaling liquid preparations for the treatment of catarrh, colds in the head, and other diseases, and which shall be so constructed as to cause, when in use, no undue pressure in the passages.

NAIL PLATE ROLLING.—Orville C. Dewey, Joseph Dudley, and Frederick Linderman, Wheeling, Va.—This invention has for its object to furnish an improved attachment for the finishing rolls for finishing nail plates, which shall be so constructed as to remove the necessity of turning the end of the plate between the rolls by hand, and which shall be simple in construction and easily applied and operated.

SHEET-METAL FRUIT CANS.—C. F. Sturgis, Buena Vista, Ala.—This invention has for its object to furnish an improved fruit can, made in parts, so that it may be conveniently nested for transportation, and that the parts may be easily put together by the user of the can, and which shall, at the same time, be readily and cheaply made, and without waste of the material.

TENSION GUIDE FOR SEWING MACHINES.—Edwin L. Crumb, Southwest, Pa.—This invention relates to an improvement in the construction of the guide pin which is attached to the needle bar of a sewing machine, for guiding the thread to the needle.

MORTISING CHISELS.—E. McConnell, Sharon, Pa.—This invention has for its object to furnish improved mortising chisels, which shall be so constructed that they may be used for mortising rectangular or dovetailed mortises without reversing, and which will draw its own core while cutting the mortise, thus saving time and labor.

COMBINED SAWING MACHINE.—Pierson Jacobus, Romulus, N. Y.—The object of this invention is to combine in one compact and portable machine two valuable and indispensable machines, whereby much expense in construction is saved, while each machine is perfect in itself; the two being so constructed that they may be used separately, or both at the same time.

CLOTHES DRYER.—August Stechschutt, Glandorf, Ohio.—This invention relates to a new and useful improvement in clothes drying apparatus, and consists in a series of arms, jointed to centers around an upright revolving post, or stand, connected together by lines, and arranged to be raised and lowered by means of other lines and cords.

GRAIN DRILL.—Jesse W. Craven and Albert Clarke, Center Valley, Ind.—This invention relates to improvements in grain drills, and it consists in a triangular, adjustable frame, similar to harrow or cultivator frames, mounted on a guide wheel and slide operating wheel, with drills arranged in the order of cultivator teeth, on which frame is a hopper and dropping apparatus, of novel construction, with spouts leading to the drills. It also consists in an improved arrangement of adjusting apparatus, for spreading or contracting the machine, and an arrangement of the drill opening devices, for holding them above the ground when moving the apparatus along on the wheels, where the sowing is not to be done.

MANUFACTURE OF WHITE LEAD.—Ludwig Brumlen, Hoboken, N.J.—This invention has for its object to effect an uniform and thorough distribution of the carbonic acid through the entire quantity of the solution being operated upon.

WASHING MACHINE.—Elias Crick, Phillipsburg, N. J.—This invention has for its object to furnish an improved washing machine, simple in construction, effective in operation, and easily operated.

COMBINED HAY RAKE AND TEDDER.—Charles La Dow, South Galway, N. Y.—This invention has for its object to furnish an improved combined hay rake and tedder, which shall be simple in construction, easily operated, and effective in operation, doing its work equally well in either capacity.

CANDLE MOLDING MACHINE.—Joseph Wales, New York city.—This invention relates to improvements in machines for molding candles, and it consists in improvements in the lifting rods used for closing the molds when the melted substance is poured in, and for lifting them out, whereby the inventor is enabled to make candles of different lengths in one machine; also in packing the pistons around the holes for the wick. It also consists in a novel construction of the clamping apparatus used for receiving the candles when lifted on it to the molds, holding them till the next batch is molded, and then removing them. It also consists in certain details of construction, in relation to the application of the molding tubes to the supporting plates, and to the introducing and drawing off of the water employed for cooling the molds.

HOISTING APPARATUS.—Elias Ziegler, Harmony, Pa.—This invention relates to improvements in hoisting apparatus, for lifting heavy stones and other heavy weights, and it consists in an improved grappling tongs.

FLOWER STAND.—Garrett Erkson, Brooklyn, N. Y.—This invention relates to a new and useful improvement in stands for supporting flower pots, whereby the stand is made both convenient and ornamental.

ROCK DRILL.—J. M. Stevenson, Pendleton, Ind.—This invention relates to a new and useful improvement in drills for boring rock, and consists in the mode of raising, releasing, and revolving the drill.

SHOVEL.—I. W. Denning, Allegheny, Pa.—This invention relates to a new and useful improvement in shovels, of the kind used for feeding stoves with coal, and for taking up ashes, but applicable to other kinds of shovels, whereby they are made with less expense, and are more durable than when made in the ordinary manner, and it consists in the mode of attaching the shank to the blade.

CHURN.—G. S. Perfater, Camp Point, Ill.—This invention relates to improvements in churns of that kind in which a twisted dasher rod is employed, the vertical movement of which, in a narrow slotted guide, will produce rotation of the dasher.

CULINARY VESSEL.—Peter Boesen and Michael Bedessem, Kenosha, Wis.—This invention relates to a new culinary vessel, which has for its object to enable the treatment of food by a suitable process, and of several articles of food in one vessel.

ANTI-FRICTION BALANCED VALVE.—William Seifert, New York city.—This invention relates to a new construction of valve for regulating the admission of steam to the ports of a cylinder, and consists in the use of a tubular rock valve, which, containing the steam within its bore, will thereby be fully balanced throughout, and operate without friction.

FIRE-ARMS.—S. S. Hopkins, Norwich, Conn.—The object of this invention is to improve revolving fire-arms in such manner that the cylinder can be readily cleaned and charged, without requiring its detachment, or that of the base pin, from the stock or barrel. The invention consists in providing a pivoted link at the end of the stock or frame for holding the base pin, while the same is withdrawn from the cylinder, allowing it to be moved laterally and brought in line with the chamber of the cylinder to be cleaned. This link contains a stop, whereby the pin is prevented from being entirely withdrawn.

LIQUID METER.—Anna Buettner, New York city.—This invention relates to a new apparatus for measuring the quantity of water or other liquid flowing through the same. The invention consists in the combination of a pair of floats, with a swinging box containing mercury, and with a swinging trough or distributing vessel. The floats serve to oscillate the mercury vessel, which, by the motion of the quicksilver, will rapidly change the position of the trough, and the consequent distribution of water.

DEVICE FOR PIERCING AND LINING EAR LOBES.—W. C. Edge, Newark, N. J.—The object of this invention is to provide a device whereby ladies' ear lobes can be readily perforated, and the apertures lined, so that the same cannot grow up or be torn out.

CUT-OFF ATTACHMENT TO SLIDE VALVES.—Thomas Sault, New Haven, Conn.—This invention relates to a new automatic valve, which is applied to the aperture or port of an ordinary slide valve, to close the same at the required time, and thereby regulate the admission of steam to the cylinder. The invention consists chiefly in the application to the ordinary slide valve of a secondary hinged valve, which closes the steam port in the former, and holds it closed for a greater or less part of the stroke, according to the velocity of the governor.

SKATE.—Moses Kinsey, Newark, N. J.—This invention relates to a new means of securing skates to the heels and soles of boots or shoes, and consists in the use of perforated ears or jaws, which project from the foot support of the skate.

PLANING MACHINE.—Charles Levey, Toronto, Canada.—This invention has for its object to improve the construction of planing, matching, molding, and other wood-working machines, so as to enable them to be more readily adjusted, and so as to make them more effective in operation than machines constructed in the ordinary manner.

DRAWER PULL.—Joseph Kintz, West Meriden, Conn.—This invention relates to improvements in that class of drawer pulls, in which the handles are jointed to a shank, so as to hang downwards therefrom, the shank being attached to the drawer, and it consists in the employment of a ball and socket joint for connecting the handle, the socketed part, which is on the shank in this example, having a notch at the lower side, into which the stem which connects the ball with the handle swings when suspended. The invention also consists in the construction of the escutcheon plate of the shank, to which the handle is connected, of an iron or other cheap metal base, and a covering of thin soft metal spun upon or otherwise attached to the base, and having the socket for the ball formed on or attached to it.

BEE HIVE.—Philip Nicolls, Lindsay, Canada.—This invention relates to a new bee-hive, which is so constructed as to be useful during the hot and cold seasons, and readily inspected whenever desired.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

608.—BOXES, CARTRIDGE CASES, ETC.—Chas. S. Wells, Springfield, Mass. March 7, 1871.

610.—APPARATUS FOR ARRESTING THE MOTION OF RAILROAD TRAINS.—F. R. Schettler, New York city. March 7, 1871.

633.—APPARATUS FOR RETAINING, ADJUSTING, AND SEWING UMBRELLAS AND PARASOLS.—W. A. Drown, Jr., Philadelphia, Pa. March 9, 1871.

635.—REDUCTION OF IRON ORES.—T. S. Blair, Pittsburgh, Pa. March 10, 1871.

640.—RUBBER COMPOUND FOR STEAM PACKING.—M. A. Sutherland, Passaic, N. J. March 10, 1871.

APPLICATIONS FOR EXTENSION OF PATENTS.

MANUFACTURE OF IRON.—William Kelly, Louisville, Ky., has petitioned for an extension of the above patent. Day of hearing, June 7, 1871.

MACHINE FOR MAKING HORSESHOES.—James A. Burden and I. Townsend Burden, of Troy, N. Y., have petitioned for an extension of the above patent. Day of hearing, June 14, 1871.

ELASTIC GORE CLOTH.—Charles Winslow, of Lynn, Mass., has petitioned for an extension of the above patent. Day of hearing, July 19, 1871.

TRUCKS FOR LOCOMOTIVES.—Levi Bissell, New York city, has petitioned for an extension of the above patent. Day of hearing, July 19, 1871.

TYPE SETTING AND DISTRIBUTING MACHINE.—Henry W. Alden, New York city, has petitioned for an extension of the above patent. Day of hearing, August 30, 1871.

EXTENSION GAS TUBES.—Charles Monson, New Haven, Conn., has petitioned for an extension of the above patent. Day of hearing, August 23, 1871.

New Patent Law of 1870.

INSTRUCTIONS

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LETTERS-PATENT

FOR

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See advertisement of L. & J. W. Feuchtwanger, Chemists, N.Y.

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Carpenters wanted—$10 per day—to sell the Burglar Proof Sash Lock. Address G. S. Lacey, 27 Park Row, New York.

Manufacturers' and Patentees' Agencies, for the sale of manufactured goods on the Pacific coast, wanted by Nathan Joseph & Co., 619 Washington street, San Francisco, who are already acting for several firms in the United States and Europe, to whom they can give references.

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Improved mode of Graining Wood, pat. July 5, '70, by J. J. Callow, Cleveland, O. See illustrated S. A., Dec. 17, '70. Send stamp for circular.

All parties wanting a water wheel will learn something of interest by addressing P. H. Walt, Sandy Hill, N.Y., for a free circular of his Hudson River Champion Turbine.

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For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20, 1869. 64 Nassau st., New York.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N.Y.

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Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N.Y. (Send for Circular.)

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

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2d hand Worthington, Woodward and Novelty Pumps, Engines 25 to 100 H.P., 60 Horse Loc. Boiler. W. D. Andrews & Bro., 414 Water st., N.Y.

English and American Cotton Machinery and Yarns, Beam Warps and Machine Tools. Thos. Pray, Jr., 57 Weybosset st., Providence, R.I.

Scientific American—If you want back Nos. and Vols. of the Scientific American, at low prices, address Theo. Tusch, 37 Park Row, N.Y.

Winans' Boiler Bowder.—15 years' practical use proves this a cheap, efficient, safe prevention of Incrustations. 11 Wall st., New York.

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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 advertisements at 1 00 a line, under the head of "Business and Personal."

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

SUPERHEATING STEAM.—For P. W. G.'s benefit, I will say that I have put up many superheaters (on Carvalho's plan), for various operations of boiling, heating, drying, etc., as well as for power. I place the superheaters under the boiler, a few feet behind the bridge wall, and support them so that they will be moderately and uniformly heated. The steam superheated to 400°, as shown by the pyrometer, may then be carried long distances without very much condensation (none at all if the pipes are covered), and then used in the cylinder with very great advantage. No water settles in the latter, and the action of the piston is quick and unembarrassed. The saving in fuel is considerable (where boilers work water), amounting to 20 to 25 per cent or more, and more power is obtained with a less pressure of steam than where ordinary steam is employed. The superheating is uniform, and easily regulated.—H. W. B., of N. Y.

SILVERED ARCS.—Let B. G. substitute nickel-plated arcs for silvered ones on his mathematical instruments, and he will never be troubled with tarnishing. He can have the arcs replated if he wishes, without injuring them in the least.—G. L. S., of N. Y.

A. H. A., of Mich., writes us that "a gallon or two of black oil, put into a boiler, before filling, will loosen and prevent incrustation. If a small quantity be occasionally pumped in with the feed water, the boiler is easily kept clean. Is there danger attending the use of oil in that way? A great many are using it, and would like to, if there be no attending danger." We see no cause for apprehension in the use of "black oil" for this purpose.

TEMPERING OLD FILES.—If your querist will grind out the cuttings on one side, he will then have a bright surface; then damp the said surface with a little oil: then lay the file on a piece of red-hot iron, bright side upwards. In about a minute he will see the bright surface turning yellow; and when the yellow has deepened to about the color of straw, plunge in cold water. He must not put any more files in the fire.—E., of Ohio.

PULVERIZED SOAP.—Hard bar soap should be scraped or planed into fine shavings, dried in the sun, or by heat, thoroughly, and then pounded or crushed. After this, it should be placed in a bowl or kettle, and a small cannon ball should be used to pulverize it; and it may then be sifted through a very fine sieve. This is the way that my father made shaving powder, in 1842; and he received a medal for the preparation, from the King of Prussia, in 1845.—L. D., of La.

CEMENT FOR GLASS SYRINGES.—I have, at present, a glass ear syringe, that has been in use over six years. The cap came loose from the plaster of Paris, and I fastened it with gum shellac. I have never had any trouble with it since.—L. D., of La.

EMERY WHEELS.—Let F. W. take a solid wheel, made of pine, or any other soft wood, and of the size required for his purpose. Turn the wheel true, and then turn rounds or hollows in its face, to suit the tools he wishes to grind, gouges, rounds, etc., mentioned by him. Then let him prepare some best glue, and, using it hot and thin, put it on the face of the wheel with a brush. The first coat of glue should be a light one, and when it is dry a second one should be applied, and as quickly as possible, as much emery should be sifted upon the wet surface as the glue will hold. When this is dry another coat of glue and emery should be applied in the same way. This will make a wheel that will last for months, and grind faster than anything else. I use No. 0 emery.—A. D. S., of Mo.

BRASS TOPS OF LAMPS.—Let your correspondent mix about two tablespoonfuls of plaster of Paris in a little clean water, as thick as possible; then fix the parts on, and hold them down for about five minutes; the top must then not be removed till the next morning. Or, he may dissolve a little glue in hot water; when cold, add a sufficient quantity to some plaster of Paris, and make a paste of it; then fill the neck of the burner and place it on the glass cistern; it must be done very quickly. The glue prevents the composition from hardening too quickly, and makes it firmer. Putty will also answer very well for this purpose.—A. L., of Wis.

FROSTED SILVER.—To produce a frosted surface on polished silver, use cyanide of potassium with a brush, but do not handle it more than you can help. Get a piece of lance wood or box, and make a pair of wood pliers. The proportion should be an ounce dissolved in a half pint of water. It is very poisonous.—W. B., of N. J.

GRAFTING WAX.—For the benefit of J. H. A., I will state that, for early use, I melt together rosin four parts, tallow two parts, and beeswax one part; and in this I dip pieces of partly worn cotton cloth. Cloth thus prepared is better than that done with clear wax, as it does not crack. As the weather gets warmer, a larger proportion of beeswax should be used. For an application where limbs are removed in pruning, I have found nothing to equal coal tar.

E. W. B., of Ill.—Your plan of spiked iron plates, for pavements is substantially like others which have been tried and failed. Iron wears too smooth for road surfaces. Your plan for railways to transport ships over necks of land, namely, multiple tracks with trucks running on each, seems practical; but we hardly think such railways would be preferred to canals.

SETTING BOILERS.—If N. H. is about to re-set his boilers, I would advise him to have them set on the Nelson plan, which will carry the fire around and over the top, and into the smoke stack at the back end of his boiler. I would advise him to have built, from the end of the grate bar, an arch of brick work, three feet in diameter, and fifteen inches below his boiler. The distance I usually observe, from the back wall to the end of the boiler, is two feet, with a brick arch overhead, to return the fire through the flues or tubes.—C. T., of Mass.

D. F. F., of Vt.—The sugar contained in living vegetable and woody structures, is formed in them from substances absorbed in their growth, and assimilated by them. It is not formed in the soil, nor absorbed, as sugar, by the roots.

A. K., of Ill.—The mineral you send us is iron pyrites, which has no commercial value.

SILVER CIRCLES.—After cleaning with solution of carbonate of ammonia and cotton wool (which is better than chalk or any powder as it does not scratch), let your correspondent, using a little cotton wool, smear the circles with a thin layer of "zinc ointment;" this makes the bright silver "matt," or a dead white, without in the least obscuring the clearness of the fine divisions. Indeed, the microscope acts much better on them, from the total absence of glitter. The circles so treated will never become discolored, but the excessively thin unctuous layer requires to be renewed every few months on account of dust particles.—J. A., of N. Y.

J. H. S., of Ohio.—Your method of setting fence posts, making the part which enters the ground of concrete, with iron spindle rising from the center, upon which the wood post is set, would, we think, prove cheap and durable.

A. B. F., of La.—The loss of muscular power, in the case you mention, was undoubtedly an instance of paralysis, caused by injury to a nerve, either directly or indirectly, by the passage of the shot near it, in its course through the limb. Such cases are not rare, as you will find upon consulting any good work on surgery.

R. H., of Mass.—Your arrangement of segmental gearing is all wrong. It will not work as you anticipate. No matter how many teeth there may be in one segment, it will only impart that amount of motion, to the driven segment, due to the number of teeth in the latter.

MEDAL CASTS.—If J. E. M., has the opportunity to look into the "Brass and Iron Founder's Guide," by James Larkin, he will find information on medal casts. It is one of the books in Baird's catalogue.—W. B., of La.

W. B., of R. I.—The parties, to whom you refer, at Augusta, Me., are the publishers of a literary journal, and we do not for a moment suppose they have any connection with Wade & Co., the counterfeit money swindlers. We don't advertise such business, if we know it.

W. D., of N. Y.—We do not care to open our columns to a discussion of Swedenborg's views of natural philosophy. He was a subtle thinker, no doubt. Some people think he was crazy, others regard him as the only true expounder of philosophy and theology, but we do not propose to invite a controversy respecting his views.

G. S., of Md.—We cannot give up space in our paper to the publication of articles from correspondents, intended especially to advance their own private interests. Should we yield this position to one, we could not deny it to others, and our paper would thus become the vehicle of individual interests. A little reflection will convince you of the soundness of our position.

W. B., of N. Y.—We cannot now turn to the article to which you refer; but it is well settled that an employer cannot claim the ownership of an invention made by an employé, unless the latter was especially engaged to bring out the invention for the former. Any other theory than this would be absurd and unjust.

J. S. R., of Quebec.—The subject of your letter is one that we have not studied. It does not belong to the category of the practical arts. We think S. R. Wells, editor of the *Phrenological Journal*, can give you the information.

J. Y. S., of Conn.—There is escape of coal gas into your well from some source, but as you say the nearest gas pipe is sixty feet from its there must be some fissure by which the leaking gas finds its way to the water. The only remedy is to either stop the fissure or the leak.

Official List of Patents.

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FOR THE WEEK ENDING MARCH 28, 1871.

Reported Officially for the Scientific American.

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113,001.—FLOOD GATE.—August H. Adams, Piqua, Ohio.

113,002.—APPARATUS FOR OPERATING RAILWAY SWITCHES.—James Alcorn (assignor to George R. Kelso), Charlestown, Mass.

113,003.—PLANE STOCK.—Leonard Bailey, New Britain, Conn.

113,004.—PATCH FOR RAILROAD RAILS.—John T. Barnett, Decatur, Ill.

113,005.—ROTARY STEAM ENGINE.—William Barry, Carthage, N.Y.

113,006.—WOOD SCREWS.—Jason A. Bidwell, East Boston, Mass.

113,007.—COMBINED BORDERING AND DRAIN TILE.—Charles Biehl, Albany, N.Y.

113,008.—AWL FOR HEEL MACHINES.—Horace H. Bigelow, Worcester, Mass.

113,009.—MACHINE FOR TURNING RANDS FOR SHOES.—Horace H. Bigelow, Worcester, Mass.

113,010.—NEEDLE FOR SEWING MACHINES.—Joseph B. Blanchard, Boston, Mass.

113,011.—CULINARY BOILER.—Peter Boesen and Michael Bedessem, Kenosha, Wis.

113,012.—LOUNGE BED.—John Brada, New York city.

113,013.—DUMPING CAR.—Daniel J. Brimmer, North Petersburg, assignor to Martin E. Brimmer, Rensselaer county, N.Y.

113,014.—MANUFACTURE OF WHITE LEAD.—Ludwig Brumlen, Hoboken, N.J.

113,015.—INDEX.—O. Flagg Bullard, Media, Pa.

113,016.—REGULATING CLASP FOR ELASTIC TUBES.—William Bunce, Oberlin, Ohio.

113,017.—LIQUID METER.—Anna Buttner, administratrix of the estate of Friedrich Buttner, New York city.

113,018.—CORN PLANTER.—James B. Conaty and Milton Catt, Indianapolis, Ind.

113,019.—CULTIVATOR.—Lee W. Conner and Richard G. Conner, Troy, Iowa.

113,020.—GATE.—James B. Cotton, Dayton, Ohio.

113,021.—CONDENSER FOR STEAM ENGINES.—William Craig, Newark, N.J., and Henry L. Brevoort, Brooklyn, N.Y.

113,022.—GRAIN DRILL.—Jesse W. Craven and Albert Clark, Center Valley, Ind.

113,023.—APPARATUS FOR PURIFYING COAL OIL.—Benjamin Crawford, Allegheny, Pa.

113,024.—WASHING MACHINE.—Elias Crick, Phillipsburg, N.J.

113,025.—STEERING APPARATUS.—Alonzo G. Crossman, Huntington, N.Y.

113,026.—PAPER CLIP.—Jacob M. Crull (assignor of one half his right to George S. Crull), Harrisburg, Pa.

113,027.—NEEDLE HOLDER AND TENSION DEVICE FOR SEWING MACHINES.—Edwin L. Crumb, South West, Pa.

113,028.—STOP MOTION FOR WARPING MACHINES.—Edwin H. Cummings, Lewiston, Me., and Grimshaw Heyes and Thomas Entwistle, Accrington, England.

113,029.—NAIL PLATE ROLLING.—Orville C. Dewey, Joseph Dudley, and Friedrich Lindemann, Wheeling, W. Va.

113,030.—BRIDGE.—Ferdinand Dieckmann, Cincinnati, Ohio.

113,031.—DEVICE FOR PIERCING AND LINING EARS FOR THE RECEPTION OF EAR RINGS.—William Charles Edge, Newark, N. J.

113,032.—PURCHASE FOR CAPSTANS.—Joseph Edgecomb, Gardiner, Me.

113,033.—PRINTING TELEGRAPH APPARATUS.—Thomas A. Edison, Newark, N. J.

113,034.—PRINTING TELEGRAPH APPARATUS.—Thomas A. Edison, Newark, N. J., assignor to the Gold and Stock Telegraph Company, New York city.

113,035.—FLOWER STAND.—Garrett Erkson, Brooklyn, N. Y.

113,036.—ELECTRO-MAGNETIC BURGLAR ALARM.—Wilson E. Facer, Philadelphia, Pa.

113,037.—WATER GRATE BAR.—William H. Farris, Cairo, Ill.

113,038.—HAND TURNING AND BORING MACHINE.—John Franklin Finger, Wilmington, N. C.

113,039.—PITMAN ROD CONNECTION.—Edward G. Fish, Colfax, Iowa.

113,040.—COATING IRON AND STEEL WITH MOLTEN IRON.—Rufus B. Fowler and Daniel F. Brandon, Chicago, Ill.

113,041.—MECHANICAL TELEGRAPH INSTRUMENT.—James Gamble, San Francisco.

113,042.—SCROLL SAW.—William Gardner, Glen Gardner Station (Clarksville Post Office), N. J.

113,043.—STAVE SAWING MACHINE.—Robert W. George, Boston, Mass. Antedated March 25, 1871.

113,044.—METHOD OF BANDING COMPRESSED WOOD.—Charles B. Gilman, Brooklyn, N. Y.

113,045.—MANUFACTURE OF SALT FROM BRINES.—Samuel D. Gilson, Syracuse, N. Y.

113,046.—CONSTRUCTION OF PIER GLASS FRAMES AND CORNICES.—Daniel A. Hall and David Garrison, Philadelphia, Pa.

113,047.—CONFECTIONERY OR COCOANUT CANDY.—Horatio N. Harbach and Theodore J. Harbach, Philadelphia, Pa.

113,048.—TURNING LATHE.—Pierre J. Hardy, New York city. Antedated March 24, 1871.

113,049.—COACH PAINTER'S EASEL.—D. R. Harris, South New Berlin, N. Y. Antedated March 16, 1871.

113,050.—WHEEL FOR VEHICLES.—James Harris, San Francisco, Cal.

113,051.—MOUSE TRAP.—Hubert C. Hart, Unionville, Conn.

113,052.—TUBULAR STEAM GENERATOR.—James M. Hicks, New York city. Antedated March 11, 1871.

113,053.—REVOLVING FIREARM.—Samuel S. Hopkins (assignor to "The Hopkins & Allen Manufacturing Company"), Norwich, Conn.

113,054.—VENTILATOR FOR HATS.—Henry A. House, Bridgeport, Conn.

113,055.—DENTAL PLATE FROM PYROXYLINE.—Isaiah Smith Hyatt, John Wesley Hyatt, Jr., and Jesse A. Perkins (assignors to "Albany Dental Plate Company"), Albany, N. Y.

113,056.—REFRIGERATOR AND WATER COOLER.—Anthony Iske (assignor to Daniel H. Lintner), Lancaster, Pa.

113,057.—SAWING MACHINE.—Pierson Jacobus, Romulus, N. Y.

113,058.—FORMER FOR BASKETS.—Horace C. Jones, Dowagiac, Mich.

113,059.—STAVE BASKET.—Horace C. Jones, Dowagiac, Mich.

113,060.—ADJUSTABLE SEAT FOR VEHICLES.—Richard E. Jones, Goldsborough, N. C.

113,061.—POLICE BATON.—Charles Kast, Williamsport, Pa.

113,062.—SKATE.—David Kerr and Asa Ebenezer Hovey, San Francisco, Cal.

113,063.—MEAT BISCUIT.—Alexander Kirkwood, Toronto, Canada.

113,064.—WASHING MACHINE.—Edwin Knock, Vermont, Ill.

113,065.—CHECK REIN HOOK.—Alexander Ladd, St. Lawrence, N. Y.

113,066.—COMBINED HAY RAKE AND TEDDER.—Charles La Dow, South Galway, N. Y.

113,067.—PHOTOGRAPHIC CAMERA.—William A. Leggo, Montreal, Canada.

113,068.—STEAMING APPARATUS.—Otto Lehmann, Columbus City, Iowa.

113,069.—STEAM AND WATER-PRESSURE REGULATOR.—N. C. Locke, Salem, Mass.

113,070.—SASH HOLDER FOR RAILROAD CARS.—Adam Loeffelholz and Anton Prier, Milwaukee, Wis.

113,071.—MACHINE FOR CUTTING VENEERING INTO STRIPS.—G. W. Manton, Fredonia, N. Y.

113,072.—MACHINE FOR THREADING BOLTS.—Henry Martin, Louisville, Ky.

113,073.—PIANO.—Frederick Mathushek, New York city.

113,074.—PIANOFORTE ACTION.—Frederick Mathushek, New York city.

113,075.—CHISEL FOR MORTISING MACHINES.—Edgar McConnell, Sharon, Pa.

113,076.—SEPARATOR FOR THRASHING MACHINES.—Curtis Miller, Clay township (Lincoln Post Office), Pa., assignor to himself and J. R. Rogers.

113,077.—FOLDING CHAIR.—George Miller and Phillip Hannah (assignors to themselves and John Gorton, Jr.), Rochester, N. Y.

113,078.—MACHINE FOR TURNING AXLES.—Arthur F. Moore, Florence, Ind.

113,079.—MAKING FLOUR.—George Motley (assignor to himself and Jirah B. Mosley), Rochester, N. Y.

113,080.—CATARRHAL DOUCHE.—Richard M. Moylt, New York city.

113,081.—GANG PLOW.—John Murray, Silveyville, Cal.

113,082.—BURGLAR ALARM.—J. T. Mygatt and John Downing, Binghampton, N. Y. Antedated March 15, 1871.

113,083.—COMPOSITION FUEL.—Jotham Newton, Providence, R. I.

113,084.—BEEHIVE.—Philip Nicolle, Lindsay, Canada.

113,085.—GRINDING MILL FOR ORES.—Jacob S. Niswander, Oakland, Cal.

113,086.—COOKING STOVE.—Daniel Eldon Paris, Troy, N. Y.

113,087.—REVERSIBLE SETTEE.—Robert H. Paton, New York city.

113,088.—HORSE POWER.—Thos. D. Pennington (assignor to himself and R. G. Anderson), Forsyth, Ga.

113,089.—CHURN.—G. S. Perfater, Camp Point, Ill.

113,090.—ELECTRO-PLATING LETTERS AND NUMBERS ON METALLIC PLATES FOR SIGNS, ETC.—John J. Pratt, New York city.

113,091.—SHOE BRAKE FOR WAGONS.—Abraham Quinn, Brooklyn, N. Y.

113,092.—RUNNING GEAR FOR CARRIAGES.—John Rancevan, Carthage, Ohio.

113,093.—BUTTON-HOLE CLAMP AND GUIDE.—Loyal Reding (assignor to N. S. C. Perkins and M. P. Smith), Norwalk, Ohio.

113,094.—MACHINE FOR PULLING FLAX.—Benj. M. Reeves, Franklin, Pa. Antedated March 16, 1871.

113,095.—CHUCK FOR LATHES.—John Rich, Painesville, Ohio Antedated March 27, 1871.

113,096.—REVERSIBLE KNOB LATCH.—H. M. Ritter, Cincinnati, Ohio.

113,097.—REVERSIBLE KNOB LATCH.—H. M. Ritter, Cincinnati, Ohio.

113,098.—PLOW.—Hamilton Roney, Dayton, Ohio.

113,099.—SOLDERING SPIRAL BANDS.—Elijah H. Russell, Providence, R. I.

113,100.—SUSPENSION TOILET MIRROR.—R. T. Sargent, Norwich, Vt.

113,101.—CUT-OFF ATTACHMENT TO SLIDE VALVES.—Thos. Sault, New Haven, Conn.

113,102.—ANTI-FRICTION BALANCED VALVE.—Wm. Siefert, (assignor to himself and M. T. Kane), New York city.

113,103.—BABY TENDER.—S. M. Simonds, Lynn, Mass.

113,104.—LAMP BURNER.—Geo. L. Smith, Bridgeport, Conn., assignor to the Bridgeport Brass Co.

113,105.—PORTABLE FENCE.—Frank Sproul, Doniphan, Kansas.

113,106.—CLOTHES DRYER.—August Stechschult, Glendorf, Ohio.

113,107.—ROCK DRILL.—James M. Stephenson, Pendleton, Ind.

113,108.—AUTOMATIC WATER SPOUT CUT-OFF.—Edward Stewart, Fort Madison, Iowa.

113,109.—CULTIVATOR.—Michael Stoll (assignor to himself and J. Peters), Conestoga township, Pa.

113,110.—BOILER FURNACE.—Uriah B. Stribling, Madison, Ind.

113,111.—SHEET-METAL FRUIT CAN.—C. F. Sturgis, Buena Vista, Ala.

113,112.—RAILWAY SWITCH LOCK.—Archibald Thomson, St. Louis, Mo.

113,113.—APPARATUS FOR TRANSMITTING POWER TO MACHINERY.—W. H. Thorne, Philadelphia, Pa.

113,114.—MANUFACTURE OF COMPOSITION ROLLER BUSHINGS.—F. B. Torrey, Bath, Me.

113,115.—FORCING LIQUIDS.—Jacob Van Norman, Easton, Pa.

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113,118.—WASHING MACHINE.—G. S. Walker, (assignor to himself and F. F. Adams), Erie, Pa.

113,119.—MEN'S GAITER.—E. R. Ware (assignor to W. A. S. Smyth and R. L. Smyth), Worcester, Mass.

113,120.—MEANS FOR DETECTING AND SIGNALING FIRES.—W. B. Watkins, Jersey City, N. J.

113,121.—HORSE RAKE.—Benjamin Webb, Unadilla Forks, N. Y.

113,122.—BUTTER TUB.—Chas. H. White, Emmett township, Mich.

113,123.—SASH HOLDER.—Barnet M. Whiting, San Francisco, Cal.

113,124.—TINTED GLASS FOR SPECTACLES, ETC.—Thomas A Willson, Reading, Pa.

113,125.—BEAN HARVESTER.—J. A. Wood and Thos. Wood, Chemung, Ill.

113,126.—GRAPPLING HOOK.—Elias Ziegler and Chas. Cable, Harmony, Pa.

113,127.—COLORING AND STAINING MARBLE.—John Zengeler, Chicago, Ill. Antedated March 25, 1871.

113,128.—SKIN UNDER-GARMENT.—J. H. Andrus, New York city.

113,129.—CLOTHES RACK.—H. M. Andrus and J. H. Cleveland. North Bay, N. Y.

113,130.—WASHING MACHINE.—A. M. Bailey, Middlefield, Conn., assignor to the Metropolitan Washing Machine Co.

113,131.—CHECK HOLDER.—A. A. Baker, Camden, N. J.

113,132.—DOUBLE-ACTING FORCE PUMP.—Jeremiah Barney, Perry's Mills, N. Y.

113,133.—GRAIN WEIGHING REGISTER.—W. H. Baxter, Brixton Hill, England.

113,134.—HARVESTER.—J. H. Beam, Springfield, Ill.

113,135.—SEWING MACHINE CASTER.—T. J. Bishop and H. J. Merret, Evansville, Ind.

113,136.—HARNESS SADDLE.—Valentin Borst, New York city.

113,137.—NOZZLE FOR OIL CANS.—J. A. Bostwick, New York city.

113,138.—COMPOSITION BURIAL CASE.—F. W. Brown, Albany, N. Y.

113,139.—SHOT CHARGER.—G. D. Capewell, G. A. Capewell, and J. T. Capewell, Woodbury, Conn., assignors to G. D. Capewell and G. A. Capewell.

113,140.—TOP-ROLL FOR SPINNING, ETC.—W. A. Caswell (assignor to himself, A. F. Allen, and W. D. Hilton), Providence, R. I.

113,141.—ROTARY HARROW.—J. F. Chase, Westbrook, Me.

113,142.—STOVE LEG.—T. J. Close, Philadelphia, Pa.

113,143.—MARINE PROPELLER.—G. B. Cocks, Cincinnati, Ohio. Antedated March 24, 1871.

113,144.—PUMP.—N. T. Coffin, Knightstown, Ind.

113,145.—GARDEN BED BORDER.—J. E. Dickson and Seelye Richmond, Annapolis, Md.

113,146.—SASH HOLDER.—J. J. Diehl, Harrisburg, Pa.

113,147.—CARBURETING MACHINE.—A. E. Dupas and Arthur Barbarin, New Orleans, La.

113,148.—CULTIVATOR.—David Edwards, Marong, near Sandhurst, Australia.

113,149.—SHOE AND OVER GAITER.—T. R. Evans, Philadelphia, Pa.

113,150.—CHIMNEY.—A. B. Ewing, Lewisburg, Tenn.

113,151.—MEDICAL COMPOUND FOR CURE OF SCROFULA, LIVER COMPLAINT, ETC.—Philip Fay, Sr., Lacon, Ill.

113,152.—SPUR.—Henry Fellows, Bloomington, Ill.

113,153.—VALVE FOR OIL TANKS.—Daniel Fisher and William Cumming, Oil City, Pa.

113,154.—LIGHTNING ROD.—D. A. Foot and G. S. Knapp, Winona, Minn.

113,155.—SPARK ARRESTER FOR LOCOMOTIVES.—B. P. Freeman and Pat. Payton, Macon, Ga.

113,156.—COFFEE POT.—D. S. French, Montgomery, Ala.

113,157.—FEATHER RENOVATOR.—Jonathan Garrett and J. Rauch, Selin's Grove, Pa.

113,158.—TREATING THE TIMBER OF OLD FIELD PINES.—J. H. Gatling, Murfreesborough, N. C.

113,159.—COTTON PICKER.—Williamson Goodwin and S. D. G. Niles, Helena, Ark.

113,160.—CAR COUPLING.—Stephen Gregory, Jonesville, Mich.

113,161.—HORSE COLLAR.—Lyman Guinnip, Danville, Ill.

113,162.—WATER METER.—T. C. Hargrave, Boston, Mass.

113,163.—PROPELLER FOR VESSELS.—C. A. S. Harris, St. Louis, Mo. Antedated March 21, 1871.

113,164.—MACHINE FOR FORMING CARRIAGE SPRINGS.—William Harty, Bridgeport, Conn. Antedated March 20, 1871.

113,165.—HORSE HAY RAKE.—J. F. Henkle, St. Louis, Mo.

113,166.—TORSION SPRING FOR CARS.—Benjamin Hershey, Erie, Pa.

113,167.—MACHINE FOR FORMING PIPE ELBOWS.—Charles Hoeller (assignor to himself and H. S. Hoeller), Cincinnati, Ohio.

113,168.—ANIMAL TRAP.—J. W. F. How, Douglas county, Oregon.

113,169.—LAND ROLLER.—J. T. Hudnet, Reaville, and H. W. Mathews, Brenchtown, N. J., assignors to J. W. Priestly & Co.

113,170.—COTTON PICKER.—John Hughes, New Berne, N. C.

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113,173.—HORSE-SHOE MACHINE.—W. R. Justus (assignor to Shoenberger & Co.), Pittsburgh, Pa.

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113,175.—HARVESTER CUTTER.—W. G. Kenyon, Wakefield, R. I.

113,176.—COMPOSITION FOR LUBRICATING JOURNALS.—R. C. Klein, St. Louis, Mo.

113,177.—FASTENING FOR NECK-TIES.—A. Komp, New York city.

113,178.—VAPOR BURNER.—W. H. Lawrence, Baltimore, Md.

113,179.—GRINDING MILL.—E. D. Little and E. C. Little, Shabbonas Grove, Ill.

113,180.—PEAT MACHINE.—Zalmon Ludington, Fayette county, Pa.

113,181.—SHADE HOLDER FOR LAMPS.—J. W. Lyon, Brooklyn, N. Y. Antedated March 18, 1871.

113,182.—MACHINE FOR SCOURING NEEDLES.—F. W. Mallett, New Haven, Conn.

113,183.—LAMP BURNER.—C. B. Mann (assignor to himself and S. S. Mann), Baltimore, Md.

113,184.—SIEVE.—R. J. Mann, Dallas City, Ill.

113,185.—BRICK KILN.—J. M. McCarthy, Canal Dover, Ohio.

113,186.—EARTH CLOSET.—James Megratten, Wilmington, Del.

113,187.—BEE HIVE.—J. F. Metherd and Solomon Young, Union City, Ind.

118,188.—VEGETABLE CUTTER.—Francisque Monnet, New York city.

113,189.—MACHINE FOR STRIPING AND CUTTING LEATHER.—J. E. Coffin, Portland, and C. E. Morrill, and G. F. Hall, Westbrook, Me.; Coffin and Hall assignor to C. E. Morrill.

113,190.—ROTARY PLOW.—J. R. Morris, Houston, Texas.

113,191.—FURNACE FOR PRODUCING HYDROGEN AND TREATING ORES.—J. R. Morris, Houston, Texas.

113,192.—PRODUCING GAS FROM HYDROCARBONS.—Xavier Mousard, Paris, France.

113,193.—BUGGY BRAKE.—I. L. Myers, Ferguson Township, Pa.

113,194.—BREECH-LOADING FIRE-ARM.—Robert Nenninger, Newark, N. J.

113,195.—SKIRT BOARD.—J. F. Nettleton, New Haven, Conn.

113,196.—MOLDED SADDLE-TREE AND COMPOSITION FOR THE SAME.—E. B. Newman (assignor to Newman Erb), St. Louis, Mo.

113,197.—HOT-AIR FURNACE.—J. R. Nichols, Boston, Mass.

113,198.—MEDICINE OR POWDER FOR HORSES, ETC.—John Norcross, West Newton, Pa.

113,199.—OILER FOR LOOSE PULLEYS.—S. R. Norris, New York city.

113,200.—LUBRICATOR.—T. J. Nottingham, Cincinnati, Ohio.

113,201.—SEWING MACHINE.—C. O. Parmenter, Amherst, Mass.

113,202.—METHOD OF SCENE SHIFTING FOR THEATRICAL AND ANALOGOUS PURPOSES.—John L. Peake, New York city.

113,203.—ROCK DRILL.—George B. Phillips (assignor to himself, A. M. Cornell, and J. B. Harbottle), Poughkeepsie, N. Y.

112,204.—CLOTHES DRYER.—Edward N. Porter, Morrisville, and Israel J. Currier, Wolcott, Vt.

113,205.—CORN DRILL.—B. W. Remy and N. T. Remy, Brookville, Ind.

113,206.—CORN PLOW.—B. W. Remy and N. T. Remy, Brookville, Ind.

113,207.—BEE HIVE.—Wm. Reynolds and J. V. Brooks, Lexington, Ill.

113,208.—CHLORALIZED SILVER ORE.—Eugene N. Riotte, (assignor of five fourteenths interest to Charles A. Stetefeldt), San Francisco, Cal., and five fourteenths to John H. Boalt, Sandusky, Ohio.

113,209.—WARDROBE OR HAT HOOK.—Charles Roe Scott, New York city.

113,210.—TREADLE.—Ai B. Shaw, Medford, Mass.

113,211.—PUNCH AND EYELETTING MACHINE.—Elijah Shaw, Milwaukee, Wis.

113,212.—FORK, HOE, ETC.—Samuel Sheble, Philadelphia, Pa.

113,213.—MACHINE FOR REPAIRING HOSE, ETC.—Alfred Shedlock, New York city. Antedated March 22, 1871.

113,214.—STAVE JOINTER.—John Sherman and Wm. Marriott, Cleveland, Ohio.

113,215.—FASTENER FOR CARRIAGE CURTAINS, ETC.—Samuel Shute, Jr., Richmond, Va.

113,216.—LOCOMOTIVE.—Albert S. Smith, Boston, Mass.

113,217.—SAW MILL.—W. Dean Smith and Andrew J. Chase Union, N. Y.

113,218.—WINDMILL.—Bradley W. Stanton, Almena, Mich.

113,219.—GRAIN DRYER.—William Stark and J. G. Fisher, Toledo, Ohio.

113,220.—HEATING STOVE.—William Stark and J. G. Fisher, Toledo, Ohio.

113,221.—EXCAVATOR.—Barna T. Stowell, Quincy, Ill.

113,222.—FARMER'S BOILER.—R. W. Thickins and David R. Sperry, Batavia, Ill.

113,223.—EXCAVATOR.—Jacob S. Thomas, Mifflintown, Pa.

113,224.—COMPOSITION FOR PRINTERS' INKING ROLLERS.—Andrew Van Bibber, Cincinnati, Ohio.

113,225.—HARVESTER.—Joseph Van de Water (assignor to himself, George Esterly, and George W. Esterly), Whitewater, Wis.

113,226.—FLOUR BOLT.—Thomas M. Walker, Bellefontaine, Ohio.

113,227.—WASHER AND WRINGER.—Paul Weatherbee, Port Washington, Ohio.

113,228.—COMPOSITION FOR TREATING IRON.—Samuel Weaver, Pottstown, Pa.

113,229.—BLOWER.—Wm. W Webb, Indianapolis, Ind.

113,230.—GLOVE.—William W. Whitaker, Gloversville N. Y.

113,231.—FOLDING BED.—Lewis Whitehead, Sr., Brooklyn, N. Y.

113,232.—CUT-OFF VALVE GEAR.—S. H. Whitmore, Decatur, Ill.

113,223.—CORN PLANTER.—Uriah T. Wilson, De Soto City, Miss.

113,234.—SULKY ATTACHMENT FOR PLOWS.—John Worrell and James H. Rynerson, Clayton, Ind.

113,235.—SULKY ATTACHMENT FOR PLOWS.—John Worrell and James H. Rynerson, Clayton, Ind.

113,236.—LIGHTING ATTACHMENT FOR ALARM CLOCKS.—H X. Wright, Memphis, Tenn.

113,237.—LIQUID MEASURE.—William M. Wright, Chambersburg, Pa., assignor to himself and Harrison Phoebus, Fortress Monroe, Va.

REISSUES.

4,308.—BREECH-LOADING FIREARM.—Kiel V. Barnekov, Cornwall, assignor to himself and George W. Greene, New York city.—Patent No. 106,100, dated June 14, 1870.

4,309.—CULTIVATOR.—Theopolis Bertrand and Peter Sames Rockford, Ill.—Patent No. 60,918, dated January 1, 1867.

4,310.—GRINDSTONE JOURNAL BOX.—Thomas W. Brown, Boston, Mass., assignor, by mesne assignments, to Harbster Brothers & Co., Reading, Pa.—Patent No. 58,678, dated October 16, 1866.

4,311.—STEAM ROAD WAGON.—C. W. Hermance, Schuylersville, N. Y.—Patent No. 111,644, dated February 7, 1871.

4,312.—MACHINE FOR OPENING COTTON.—Wm. C. Jillson and Amos B. Palmer., Willimantic, Conn.—Patent 110,368, dated Dec. 20, 1870.

4,313.—MUFF AND COLLAR BOX.—James P. Jones (assignor to Jason Crane) Bloomfield, N. J.—Patent No. 96,118, dated October 26, 1869.

4,314.—MANUFACTURE OF STEEL.—S. W. Kirk (assignor of part interest to Henry Thomas), Philadelphia, Pa.—Patent No. 53,307, dated March 20, 1866.

4,315.—MACHINE FOR MAKING HORSESHOES.—The Howe Horseshoe and Machine Company, New York city, assignee of Ozial A. Howe.—Patent No. 82,409, dated September 22, 1868.

4,316.—HOOP SKIRT.—William H. Towers (assignor to the Vertical Hoop Skirt Company), Boston, Mass.—Patent No. 84,149, dated November 17, 1868.

DESIGNS.

4,732.—STONE DRAG.—Joseph P. Adams and George Hyde, Whitney's Point, N. Y.

4,733.—TOY STEAM ENGINE.—Alexander Buckman and John W. Huffington, Brooklyn, N. Y.

4,734.—CARPET PATTERN.—George Holdsworth, Halifax, England, assignor to W. & I. Sloane, New York city.

4,735.—BED QUILT.—Louis Kreuzberger (assignor to Braner & Co.), Philadelphia, Pa.

4,736.—SALT CELLAR.—John B. Larner, Washington, D. C.

4,737.—CARPET PATTERN.—Wm. Mallinson, Halifax, England, assignor to W. & I. Sloane, New York city.

4,738 to 4,740.—CARPET PATTERN.—Archibald McCallum, Halifax, England, assignor to W. & I. Sloane, New York city. Three patents.

4,741 and 4,742.—CHAIR.—Henry Ocorr, Sheboygan, Wis. Two patents.

4,743.—TYPE.—Richard Smith (assignor to Mackellar, Smiths & Jordan), Philadelphia, Pa.

4,744.—STATUARY.—Ames Van Wart, New York city.

4,745.—GLASS BOTTLE.—Wm. R. Warner (assignor to Wm R. Warner & Co.), Philadelphia, Pa.

TRADE MARKS.

207.—WHISKY.—John L. Bernecker, St. Louis, Mo.

208.—MEDICINE.—Henry H. Hay, Portland, Me.

209.—WHISKY.—Daniel V. B. Henarie, San Francisco, Cal.

210.—WHISKY.—E. Martin & Co., San Francisco, Cal.

211.—BITTERS.—Adam Orth, Milwaukee, Wis.

212.—SALVE.—O. M. Palmer, New York city.

213.—MINERAL WATER.—Saratoga Seltzer-Spring Company, Saratoga Springs, N. Y.

214.—TEA.—Williams, Blanchard & Co., San Francisco, Cal.

EXTENSIONS.

MACHINE FOR PARING APPLES.—David H. Whittemore, of Worcester, Mass.—Letters Patent No. 16,666, dated February 17, 1857.

ENEMA SYRINGE.—Herman E. Davidson, of Gloucester, Mass., for himself and Charles H. Davidson, deceased.—Letters Patent No. 16,956, dated March 31, 1857; reissue No. 1,940, dated April 25, 1865.

GAS GENERATOR.—Alonzo M. Giles, Boston, Mass.—Letters Patent No. 16,830, dated March 17, 1857.

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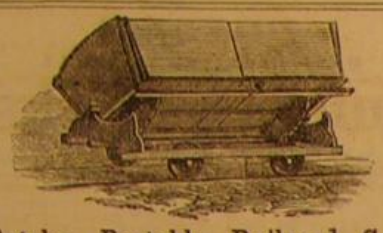
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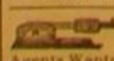
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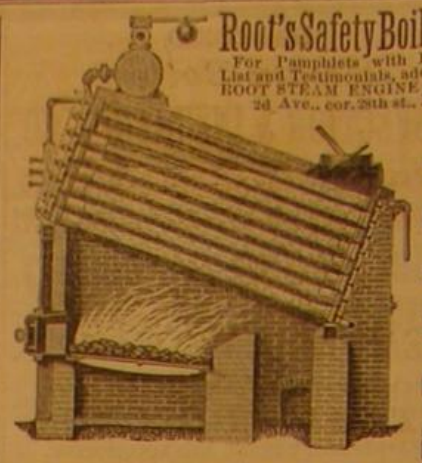


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THE CAISSON FOR THE EAST PIER OF THE ST. LOUIS BRIDGE.

This celebrated structure, remarkable for the great depth to which it has been sunk, was completed Sept. 1, 1869, launched Oct. 18, 1869, was towed to its place, and had the first stone laid upon it, on the 25th Oct., 1869, and was finally sunk to bed rock, 128 feet below high water mark, on the 28th of February, 1870.

The caisson for the east abutment pier, the successful sinking of which, to a depth of 136 feet below high water mark, was announced in our last issue, has some points of difference, which will be pointed out below.

The construction of the caisson for the east pier is shown in the engraving, the letters referring to different parts as follows: A, air locks; B, air chamber; C, timber girder; D, discharge of sand pump; E, sand pumps; F, main entrance shaft; G, side shaft; H, iron envelope; I, bracing for the shell.

The workmen, descending the main shaft, entered the air lock, which then being closed from above, so as to prevent the escape of air from the interior of the caisson, was opened at the side for their admission to the air chamber.

The caisson is shown with the superstructure of masonry upon it, and sunk about three fourths of the way down to bed rock. The excavations of sand were ejected through the sand pumps, a mixed column of air, water, and sand being continually kept ascending from wells maintained at the bottoms of the pumps.

For particulars of the difficulties encountered, the reader is referred to pages 151, 376, 391, Vol. XIII., of this journal.

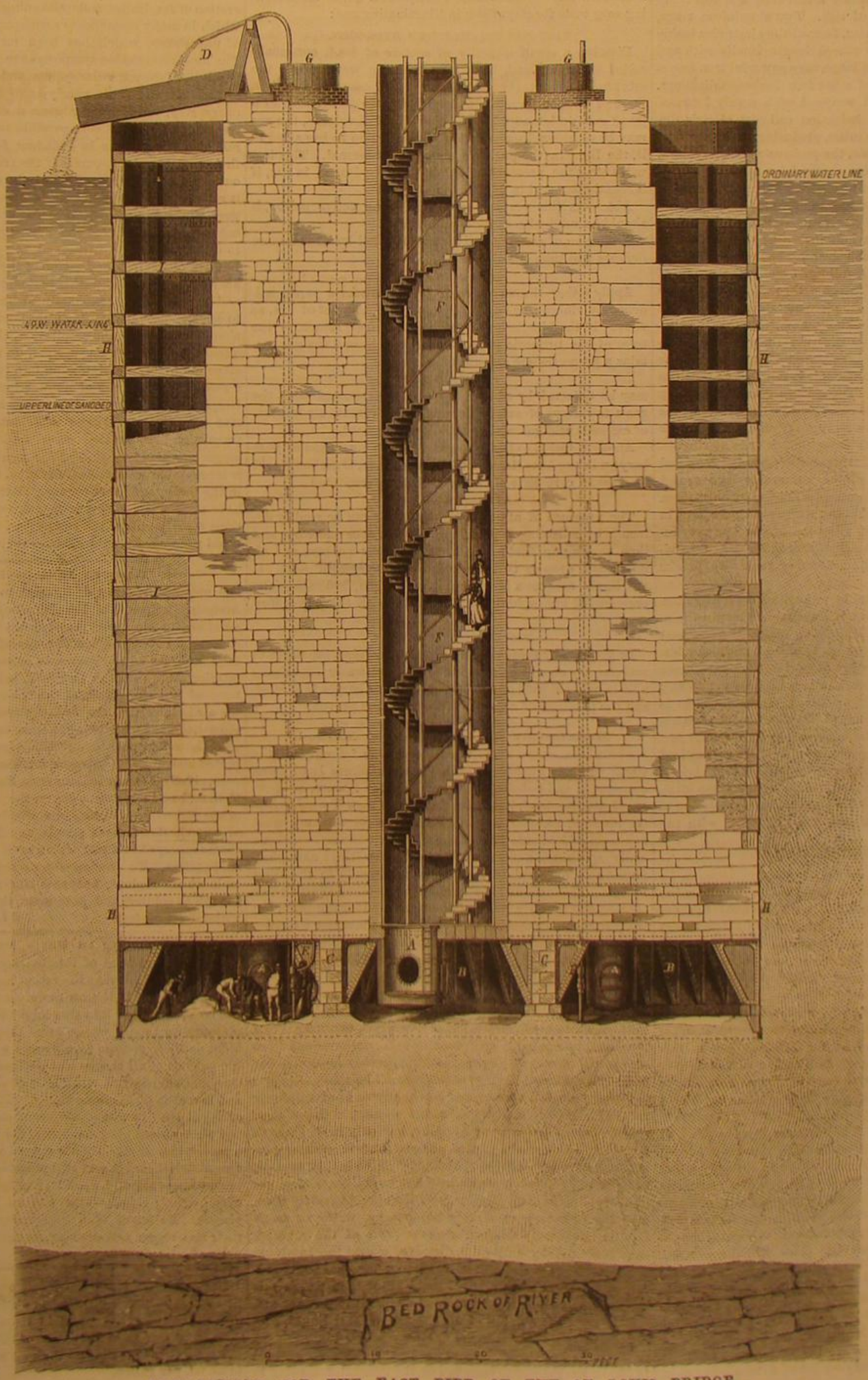
The width of cross section, shown in the engraving, is fifty feet, and the depth to which the caisson is sunk, as shown, is about sixty feet below the ordinary water line.

The east abutment caisson, as we have said, has some features differing from that of the east pier. The main shaft has two air locks at the bottom, instead of one, and their diameters are 8 ft., instead of 6 ft. as in that of the east pier. The east pier caisson had six other shafts of 4 ft. 9 in. in diameter, with air locks of the same diameter at the bottom of each. The east abutment caisson has only two other shafts, 4 ft. in diameter, with air locks 8 ft. in diameter. The shafts, other than the center shafts, were intended for use in case any embarrassment to free exit and entrance should occur, from accidental causes, in the main shafts. To avoid the labor of ascent over so long a stairway, the east abutment caisson was provided with an elevator, or lift, to raise the men to the surface.

These simple changes were found to add greatly to the health, comfort, and convenience of the men employed upon the work.

Changes in lighting this caisson were also adopted, considerable discomfort having been experienced through the generation of carbonic acid from the lamps used in the previous caisson. The calcium light was not used, on account of its great cost. A system of lighting by candles, inclosed in glass globes of strength sufficient to withstand the pressure, was adopted. The chimneys of these lamps are pipes leading to the external atmosphere, the air necessary to support the combustion being admitted through a small regulating valve. Stop cocks in the chimneys prevent the escape of air when the globes are opened to put in candles.

The timber roof of the chamber is 4 ft. 10 in. thick, and is strengthened by two horizontal timber girders, each 10 ft. thick at the top and 3½ ft thick at the bottom, and 9 ft. in hight. These divide the caisson into three nearly equal compartments, in the direction of the length of the bridge. Communication between these apartments is had through openings provided for the purpose.



THE CAISSON FOR THE EAST PIER OF THE ST. LOUIS BRIDGE.

Trouble and Reward of Inventors in England.

The *Mechanics' Magazine*, in alluding to the complaints of an inventor who had placed, some four years ago, models and drawings of a ram for naval service, at the disposal of the British Admiralty, says: the inventor states that his designs were approved by Mr. E. J. Reed, then Chief Constructor of the Navy, but he, the inventor, has neither received, nor can he obtain, his model and drawings, or any straightforward answer as to the use that may be made of them. The editor alludes, also, to others who have like good grounds of complaint against Government for the manner in which they are treated; but there are others who are more fortunate, whether from the intrinsic merit of their inventions, or other influence, it is not for us to say. Government is very liberal to some inventors. We do not say that they will reward in turn the inventors of a rifle projectile with a hollow base, of a clay plug to fill the base, of an iron cup instead of the clay plug, and of a third, whose invention is simply "as you were," and abolishes cup and plug, restoring the projectile to its original form. If such a series of rewards have not been really paid, other awards not much more sensible have been made by the public departments.

Some of the inventors who have applied to the Ordnance departments have certainly been dealt with very liberally. Messrs. Henry & Martini can have no reason to complain. Mr. Snider and two others have taken no less than £16,000 for their plan of converting muzzle-load-

ing into breech-loading rifles. Major Palliser had £15,000 for his chilled projectiles, although the chill process was neither an invention nor a discovery, but simply the adaptation of a process employed many years previously at Ransome's Works, Ipswich (in casting chilled crossings), and others. The same gallant gentleman had £7,500 for his plan of converting cast-iron guns. Captain Moncrieff has had £10,000 for his gun carriage, has £1,000 a year salary, and will have £5,000 when his services are dispensed with. It cannot be supposed that the Admiralty or Ordnance Depart can award £15,000 or £20,000 each to all the inventors that apply to them, but they may surely, in accordance with fairness and common sense, deal with an inventor in a more honorable manner, than by official evasion and the retention of the details of his designs for four years, and by causing the public scandal of driving a respectable man to such a course for redress as we have been referring to.

It will be seen from the above that some of our American inventors have received handsome fortunes for their inventions in England.

New Electrical and Other Experiments.

At a recent soirée of the Royal Society, London, three experiments by Mr. Cromwell F. Varley were exhibited for the first time in public. In a Geissler's tube, containing highly rarefied hydrogen, a small filament of talc was hung by a single horizontal fiber of silk. Two aluminium rings, separated an inch and a quarter, formed the electrodes inside the vacuum. This tube was placed longitudinally with and over the horizontal poles of a large, very powerful iron horse-shoe electro magnet, made of a bar four inches in diameter, and four feet in length, and wrapped with nearly 2 cwt. of thick copper wire. A small induction coil sent electric discharges from one ring to the other, producing a brilliant blue light around the negative pole, the positive pole being dark. The moment the magnet was charged, by means of thirty cells of Grove's nitric acid battery, each cell containing twenty square inches of platinum foil, the electric luminosity in the tube, which beforehand was diffused, gathered up into an arch extending one and a half inches beyond each ring, forming altogether a well defined arch about four inches in length. This luminous arch follows exactly the course of those magnetic rays which traverse through the negative pole. By shifting the tube, the piece of talc can be brought at pleasure in or out of this luminous arch. Neither the electric action, nor the magnet *per se*, produce any motion upon the talc; but when the tube is so placed that the luminous arch strikes against the talc, the talc is repelled as much as 30° from the perpendicular. The electric current is passing simply from one ring to the other, inside the tube, but the luminous arch in question, where it strikes the talc, is on the other side of the ring, and where no electricity is flowing.

Mr. Spottiswoode's musical vibration experiment consisted of the visible representation of the forms actually assumed by a musical string when producing a note or its harmonies. To show this, it is required that the string should be kept in a perfectly uniform state of vibration. This was very ingeniously accomplished by means of tuning forks kept in vibration by electro magnets, these forming their own breaks in cups of mercury.

The singular action of nuclei in promoting crystallization has long been known; but recent experiments by Mr. Chandler Roberts, chemist of the Mint, have imparted additional interest to the subject. Minute traces of lead, antimony, bismuth, or arsenic, render the alloy of gold and copper known as "standard gold" crystalline, intensely brittle, and totally unfit for the purpose of coining. This remarkable effect is produced even when the amount of obnoxious metal does not exceed the $\frac{1}{1900}$ part of the mass of standard gold. Mr. Roberts exhibited beautiful specimens of crystalline standard gold, and illustrations of the process of toughening brittle gold by means of chlorine, recently introduced in the Mint, the adoption of which has afforded a satisfactory solution to a question of considerable importance, connected with the manufacture of coins.

A Wonder in Weaving.

We hope our able cotemporary, the *Bureau*, is in its sober senses, and that much learning (or enthusiasm) has not driven its editor mad. It treats its readers, in its April number, to a loom story, which, if published on the first day of the month, would lead us to believe it was trying to "get even" with the public for sundry "sells," perpetrated upon it by mischievous correspondents. It says:

"The genius of invention, which has so ennobled the American name by important discoveries in other mechanical arts, has inspired the brain of a New England boy in this direction; and the ancient forms and usages of the weaver must now give way to a loom, in construction as remarkable for its progress and achievements in the manufacture of cloths as, in their several departments, were the inventions of Howe, Morse or Bigelow. The inventor is a Mr. Abel, of Vermont, and he calls his new machine the Weft-Thread Loom. We have studied its construction and operations, and can say to the more thanseven hundred woolen manufacturers whom we address by our journal, that it is a most remarkable invention, and has imperative claims upon their attention; for it will, of necessity, revolutionize the main department of their industries. One fact alone will demonstrate this. A first-class Crompton loom will weave thirty yards of cloth a day. A machine of the weft-thread pattern of the same class, will produce, of equally good fabric, *three hundred yards daily!* The Abel loom is simple in construction, and can be made of any size required. For cloth of ordinary width, the extreme dimensions are five feet by six, or thereabouts. The movement is easy—a lad of fifteen being able, by a crank attachment, to supply power for several machines. It makes no more noise than a Wheeler & Wilson sewing machine, and runs as easily. Its motion is that of knitting and weaving combined. The yarn is taken direct from the bobbins, which are placed in a semi-circular form, close up to and forming part of the frame of the loom. On these bobbins the yarn is wound with ease and speed, on a machine invented for the purpose by Mr. Abel. There is no dressing, beaming, spooling, or warping; no use for harness, reed, or or shuttle. The warp or filling runs in from the same bobbin as the weft-threads, and the product of thirty yards per hour is so firm, strong and stocky, that it is almost impossible to rend it, and it cannot ravel; while in smooth, even surface it is the equal of any cloth we have seen made. To these advantages it adds that of economy in the saving of waste, to the extent of at least fifty per cent over any other loom in use. Its simplicity of construction will make its repairs easy and of slight cost. With these advantages, the machine weaves, also every variety of pattern in plain, fancy, ribbed and striped goods, and uses any material in silk, cotton, flax, or jute, as well of wool. In fact, the range of its production is from the coarse gunny cloth for cotton bales, to the most elegant cloths of our mills, East or West."

Tests for Impurities in Gas.

Harris's *Gas Superintendent's Companion* gives the following easy tests for impurities in illuminating gas:

TEST FOR SULPHURETED HYDROGEN.

Dissolve a small quantity of acetate of lead, commonly called sugar of lead, in distilled or rain water, until the mixture is about the consistency of cream; dip into it a piece of writing paper, which hold a minute or two over a jet of gas (unlighted); if the paper be not discolored, the gas may be considered pure; but if a brown stain be imparted to it, the lime in the purifiers should be renewed. This test will detect the presence of sulphureted hydrogen in gas, if it contain one part in 20,000.

Note.—As this preparation of lead is an active poison, it should be used with caution, and labeled.

A solution of nitrate of silver and distilled water is a more delicate test than the above.

FOR AMMONIA.

Apply either litmus paper or yellow turmeric paper, reddened by vinegar, or any other weak acid, to a jet of gas, as above; if the blue color of the litmus paper return, or the color of the turmeric paper deepen to a brown, the gas contains a proportionate amount of ammonia.

CARBONIC ACID

may be detected by adding to water impregnated with the gas a few drops of sulphuric acid, when minute air bubbles of carbonic acid gas will be rapidly disengaged.

Another test is to pass the gas through a solution of pure barytes in the blue tincture of litmus, when, if carbonic acid be present, carbonate of barytes will be precipitated.

ATMOSPHERIC AIR.

The presence of atmospheric air in gas can be readily detected by collecting a portion of the gas over mercury, and then passing up, first a few drops of caustic potassa, and afterwards a drop or two of a solution of pyrogallic acid. If the liquid assume a blood red hue, oxygen, indicating the presence of atmospheric air, is mixed with the gas.—*Muspratt.*

BISULPHIDE OF CARBON.

By forcing, by means of an ordinary blowpipe, the flame of coal gas, for about a minute, on to distilled-water containing a little acid chloride of barium, sulphate of baryta is formed, and the presence of sulphur in the gas thus proved.

Manufacture of Alum--A New Method.

Alum is such an important salt in the industry of the world that any improvement in its manufacture is of great commercial and industrial interest. Mr. P. Spence, of Newton Heath, England, has, according to the New York *Mercantile Journal*, recently patented a process for utilizing what is known as Rodondo phosphate, a phosphatic clay, or, chemically speaking, a compound of alumina (clay) and phosphoric acid, obtained in the island of Rodondo, in the West Indies. This mineral is also obtained in other West Indian islands, and in other parts of the world. It is not pure, but the process under consideration enables the inventor to utilize the iron and other minerals it contains in combination with the phosphatic clay. The byproducts are chiefly compounds of phosphoric acid, useful as fertilizers.

The following process is substantially the one described in the specification: The inventor takes the mineral in pieces as it comes to hand, and calcines it in kilns, exposing it to a red heat, by mixing it with coal or coke, or he grinds it so that it will pass through a sieve of, say, twenty meshes to the inch. The mineral having been prepared by these means, it is placed in leaden vessels, and an equal weight of sulphuric acid, of specific gravity 1-6, added thereto, if the mineral contain twenty per cent of alumina, but only three fifths of its weight if it contain twelve per cent, and in similar proportions for other degrees of richness. Heat is then applied, preferably by blowing steam into the vessel containing the mixture; the mineral dissolves and the specific gravity rises. The inventor now cautiously reduces by water or weak liquors (obtained during subsequent parts of the process), constantly boiling until all is dissolved except the insoluble sediment, and the strength of the liquor becomes 90° Twaddle, or 1·45 specific gravity. The inventor then passes this liquor into a close leaden vessel, and distills it into vapor containing ammonia obtained from gas ammoniacal liquor, subjected to boiling by either fire or steam injected into the gas liquor, the quantity of the said gas liquor used being equal to 600 or 900 gallons to each tun of the mineral, according to its richness. When all the ammonia has been distilled into the mineral liquor, it is allowed to settle for a few hours, and then the clear solution (now at a strength or specific gravity of 1·4 or 80° Twaddle) is run off into lead coolers to crystallize the alum. It remains in these coolers for some days, with frequent stirring, in order to obtain all the alum possible, which may be purified by crystallization. When the mineral contains twenty per cent of alumina, about one and a half tuns of alum is said to be obtained from one tun of the mineral. The mother liquor, having deposited all the alum that can be obtained, is now chiefly a solution of phosphoric acid, with a small quantity of sulphate of alumina iron, and sulphate or phosphate of ammonia.

Mountain Sickness.

M. A. Le Pileur, M. D., in his "Wonders of the Human Body," describes the effects produced upon the human system by ascension to high altitudes.

"Gay-Lussac, who in his balloon ascension rose to a hight of 22,956 feet in six hours, found his respiration disturbed and greatly accelerated, and having made no movement requiring exertion, he could only attribute this condition to the diminution of the pressure of the atmosphere. But in climbing mountains, the movement and efforts of walking are added to the influence of the hight; and when the difference in altitude in one day amounts to 6,560 feet, a notable acceleration of respiration and quickening of the pulse is observed, which in many instances is accompanied by a peculiar sense of uneasiness, which has been termed *mountain sickness.* The most remarkable symptoms are fatigue, or rather partial paralysis of the muscular system, and especially of the muscles of locomotion. This paralysis of the legs increases with every step, until, having gone a certain distance with increasing difficulty, it is impossible to take another step. A rest of a few seconds is sufficient for the muscles to regain their power, and it seems as if the traveller could go on without the fear of a recurrence of the difficulty; but very soon it returns, and a fresh halt is necessary. The higher one goes, the shorter the distance that can be passed without resting—from one hundred and fifty steps the distance falls off to one hundred—to fifty—and at last to twenty or thirty. Inclination to sleep, oppression of the heart, and loss of spirit, are sometimes added to this periodic exhaustion of strength, and in some persons mountain sickness is closely analogous to sea sickness. In others the symptoms are such as are always induced by the respiration, circulation, and, in consequence, in the muscular system, by violent exercise. Thirty steps in climbing a high mountain cause as much fatigue as a forced march or run of a much longer distance, on a plain. Respiration, quickened by motion and disturbed by successive efforts, is no longer sufficient for sanguification; the proportion between the venous and the arterial blood is no longer normal; and, above all, sanguineous congestion, which is inseparable from violent exertion, takes place in the lungs, in the brain, and other organs. But as soon as the muscles have relaxed for a few moments, two or three full inspirations rapidly relieve the congestion, while a flood of arterial blood proceeds from the heart to revive the whole organism."

Aymara Indians in Peru.

A new undertaking of interest to the philosopher, is the Arequipa Railway, in Peru, just opened for traffic. It is a great engineering work, carried out with English capital by American enterprise, and it penetrates the western chain of the Cordillera of the Andes, to reach the table lands of the interior, Arequipa, the terminus, being 7,800 feet above the level of the sea. Now, at this elevation, the rarefaction of the air is such that the ordinary workmen could not be employed, the suffering being in some cases intense. The works were, however, pushed on with vigor, and Mr. Meiggs imported above 16,000 laborers for his works, and for this purpose, chiefly Aymara Indians from Bolivia. Mr. David Forbes, F. R. S., has, in his memoirs on the Aymaras, in the *Journal of the Ethnological Society*, described the abnormal structure of the chests of these people, and it is astonishing to see them employed in a task which most effectually insures their subjugation. To foreign troops it was always difficult to scale these regions, but now the railway does the work, though to soldiers and passengers the journey is not always without discomfort.

Pawnbroking in Paris During the Siege.

Many curious facts of interest are coming to light, as to matters in Paris during the recent siege. For example: No one was allowed to borrow more than 50 francs on any article, no matter what its value might be. In spite of this, the pressure for money was so great that the store rooms of the Mont de Piété became encumbered with articles, which 150,000 persons of all classes had pledged. There were no fewer than 100,000 watches, and 25,000 clocks, diamond necklaces, and bracelets of fabulous values. There were also evidences of the distress to which persons of rank had been reduced—one piece of lace after the other, the last cashmere shawl, or a pocket handkerchief embroidered with a coronet, of such fine material that it was still possible to raise 3 francs, the lowest figure allowed, upon it; gentlemen's gold-headed canes, even ordinary riding whips, and no fewer than 2,000 opera glasses. No fewer than 2,300 poor wretches had pawned their mattresses, and starving seamstresses had pawned 1,500 pairs of scissors.

EXPERIMENTS recently carried on in India have proved that coffee pulp will yield, upon distillation, 9 per cent of its own weight of spirit, equal in strength to Scotch whisky Nothing is said as to the flavor of this spirit in its raw state, but it appears to realize on the spot a price nearly equivalent to 4s. 6d. per gallon.

THE PATENT LAWS.

Not fewer than three Bills are before the British Parliament, proposing to modify or abolish the Patent Laws. The cry for repeal, says the (London) *Building News*, has, for many years, come from the same quarter, and it is still contended that the abolition of patents would conduce to the advancement of arts and sciences. On the other hand, it is urged that this would put a dead lock upon the genius of invention. Now, between these two extremes, may we not find a middle term, as in logic? And if not a middle term, then we are forced back upon the principle of patents. There are economists who protest against "property in ideas;" who would disendow the human mind; who would treat the contriver of a new machine as the Americans treat the author of an English book—thank him for his production—and steal it. A patent is granted for the mode, easier and cheaper than other modes, of achieving a particular result. It is as much the individual's property as an artist's picture, or a scholar's book. Take the method of boiling; you cannot patent heat, but you can patent the means of applying it. It is to the parts employed in working out the discovery that the Act of Parliament affords protection. When Mr. Smith patented the screw propeller he did not become possessed of the sole right to the idea of propulsion by means of a screw; other inventors obtained patents for varying patterns. So with the paddle-wheel. The feathering superseded the fixed float, and no legal privilege was infringed. But the extinguishment of this privilege would be the deadening of independent ingenuity. Who cares to work without a reward?—Who, especially among the poor, whose dreams, while they ply at their striving labor, are of reputation and success? As well might men publish books without copyright. An invention is not a commodity which can be produced at will. If we wish to have bread to eat we must till the ground; if we have corn to grind we must send it to the miller; we must sow the seed, reap the harvest, separate the wheat from the chaff, convert the grain into flour, and the flour into dough, and the dough into rolls and loaves; and we have the needful substance on our tables. But we are bound to think of the miller and his men. For centuries, dating from beyond Chaucer, they toiled in an atmosphere made unwholesome by the cloud from the grinding grain. Then stepped in the inventor, Bovill. He had devised a plan for increasing the efficiency of the millstones, while subduing the mealy dust. He patented it. But what the outcry? Exactly that which greeted Christopher Columbus when he had found out a new world. Anybody might have done it. Each miller could have made the discovery for himself "in process of time." But the process of time is a long one, occasionally. Three-fourths of the millers in England, for many years, neglected Bovill's improvements, as three-fourths of the engineers despised Watt's modifications of the steam engine. An eminent lawyer recently said—and it was a surprising thing for him to say—that all inventions will be made, some day or another, even if the patent laws be abolished. This we can neither disprove, nor accept without qualification. The qualification is that patent laws are good, not merely because the direct influence they have in the stimulating of invention, nor even that they act, in a manner, as premiums upon ingenuity, but because when the state has to deal with the demands of inventors, and has to take into account the interests of every section of the community, patent laws offer the most equitable arrangement for satisfying rival claims, while protecting the meritorious from pillage and ruin. It is urged that the laws of nature are common property? But is a peculiar unsight into these laws, common property. We do not suppose that Newton ever thought of patenting his law of gravity, or that a mathematician who squared the circle would register his triumph at the South Kensington Museum. Still, in our day, thousands upon thousands of discoveries, useful in their way, are the productions of poor men's thought, who cannot afford to give their time to enrich "the general fund of the world's wisdom." They do not ask for a perpetual prerogative of royalty in a screw propeller, a hydraulic press, a steam engine, or an electric telegraph; their want, in plain language, to gather in the first fruits of they intellectual industry; and they have a right to it. Why should the dull and indolent profit freely by the exertions of the acute and pertinacious? Where, under those circumstances, would be the natural human motive for exceptional effort? It is very easy to talk about the sacrifice of a few to the general good; yet where would the few be found unless they felt an incentive? It has been wisely written that there is really no great and continuous labor undertaken without some stimulus of a more special and personal kind than the self-satisfaction of contributing to the enjoyment or profit of our mortal race. We all denounce when a great inventor dies unrewarded. He has been looking keenly into the laws of nature; he has learned something of which we, hitherto, have been ignorant; he has won in a race for which many have started; and, forsooth, he is to be denied the prize because others might equally easily have won it! For our own part, we can perceive no tangible distinction between copyright in a book and copyright in a mechanical or scientific invention—setting aside the discoveries in surgery and medicine, the disclosure of which is immediately due to all mankind. We cannot distinguish between the author of a work on the screw-propeller and the author of the screw-propeller itself. The book is a creation, and the novelty it treats of is an invention also; and why should not be protected? The history of discovery is a history of surprises. We do not say that patent laws are never abused. They are put in force for unmeritorious quackeries, and for copies of old specifications. But these abuses, upon the whole, correct themselves. There is no virtue in the words "by royal letters patent" which can permanently mislead the public. If these words were legally affixed to machines constructed to produce perpetual motion, they would hardly suffice to overcome those drawbacks due to friction and gravitation which have always hindered such engines from working so well in practice as they do on paper. Patents, justly understood, are the finger posts of progress. They are granted upon exactly the same principle as that which created our Indian and North American Empires. They are related to the spirit of monopoly, no doubt; but is not every man's private estate a monopoly? Is not every man's personal genius a monopoly? Was not Sir Walter Scott—was not our Charles Dickens a monopolist, in the most exclusive sense of the term? There is nothing in common between these particular prerogatives and, for example, the infamous monopolies created by Queen Elizabeth. The sovereign has no longer any power to bestow these rights. If they are falsely claimed, they can be cancelled; if they are grossly absurd, so as to include, at once, the propelling of ships, the making of shoes, and the cutting of turnips, they are, no matter what fees are paid, null and void. Still, we admit an injustice and a difficulty. Men who can really invent nothing, may be able to suggest a slight improvement actually suggested by some other man's work, the work of an original and fertile brain. Here the patentees compete unfairly: the greater gives way to the less. If a man discover the effect of the actinic rays of light on nitrate of silver, he becomes master of a new idea, and may, by publishing his discovery, make the public share in his knowledge. Another individual takes advantage of it, and produces a picture on a piece of glass or a sheet of paper. Or the one finds a bed of ironstone or a seam of coal, while the other contrives an apparatus for smelting. Which should be the patentee? Which should possess property in the idea? Clearly the one who can practically apply it. The discoverer enlarges our knowledge; the inventor increases our power; and the whole case stands this way: some manufacturers complain that they are hampered by patents, that they know not what to do lest they should infringe the rights of some monopolists whom they cannot compel, under any royalty, to grant a licence for making their apparatus or employing their processes. Against all this we have only to plead again, that industry and ingenuity must have their inducements and their rewards.

Interesting Coal History.

The year 1820 marked the beginning of anthracite coal mining in this country. The population of the single county of Schuylkill and the tuns mined were as follows at the beginning of each decade since 1820:

Years.	Population.	Tuns mined.
1820	11,339	865
1830	20,784	89,984
1840	29,081	452,291
1850	63,205	1,712,007
1860	90,173	3,270,516
1870	133,000	4,748,969

The population and production of the same period, in the entire 170 square miles of anthracite coal lands, were as follows:

Years.	Population.	Tuns mined.
1820	20,000	865
1830	45,000	174,434
1840	70,000	864,384
1850	130,000	3,358,899
1860	220,000	8,412,946
1870	350,000	15,723,030

The amount of anthracite coal yet in the earth is as follows, the area and thickness of the veins being accurately known:

	Square miles.	Depth of coal, yards.	Tuns.
Central coal fields	126	15	5,854,961,000
Southern coal fields	146	25	11,308,842,000
Northern coal fields	198	15	9,179,872,000
Total	470	..	26,343,675,000
Deduct one half waste in mining		..	13,171,837,500

Which leaves, of marketable coal, 13,171,837,500 tuns, or a deposit equal to an annual supply of 20,000,000 tuns for 600 years.

Within a circle of one hundred miles, of which Pittsburgh, in the western extremity, is the center, there is enough bituminous coal in the earth to pay off the national debts of all the governments of the world many times over. And it has been estimated, from geological surveys, that this coal would pay our national debt fifty-four times, if its stupendous value could be realized at once.

Far down in the mines (in some instances as much as 1,500 feet below the level of the rivers), we have, in the small anthracite region, more than 400 miles of railroad, not included in the aggregate of railways in the State. These subterranean railways would, if formed into one continuous line, reach from Boston to Washington, or they would form a double track from Philadelphia to New York, and back again. These facts are all the more remarkable, as the production of grain and gold was $6,000,000 less in 1870 than in 1869.

Wooden Railways.

A correspondent recently wrote us condemning wooden railways, as difficult to keep in repair, and unprofitable unless the rails be protected by iron straps. The *Railroad Gazette*, however, gives the views of the President of the Clifton road (a description of which was published on page 104, Vol. XXI., of the SCIENTIFIC AMERICAN), regarding the working of that road, which presents the subject in a different aspect. He says that the company expect to move from 50,000 to 100,000 tuns of freight yearly, and that the rails will last five or six years. He also says that light trains have been run on that road at twenty miles an hour. It does not appear that any of the new wooden rails are mounted with iron straps, after the fashion of the old wooden roads, and it is doubtful whether that was any advantage. The writer had some experience, years ago, on a "strap road," and it then seemed that the strap was a damage, rather than a benefit.

Those who are about to build wooden roads will, no doubt, be interested to know in what way a bar of iron, two inches by one half inch, spiked to the top of a wooden rail, would be a damage. Firstly, there is the cost of the iron and spikes, and the expense of laying it, whatever that may be. After this is done, the first injury noticeable is the injury to the rails, caused by the spikes. The rails are frequently split, and the spikes soon work loose, leaving a space for water to enter, which causes the rails to decay rapidly; and, as the iron will not fit the wooden rail so snugly as to exclude water, the wood under the iron is constantly wet or moist, which causes the iron to force its way into the wood; and then in a very short time the bar will have settled its thickness into the rail, so that the portion of the tread of the wheel outside of the iron would run on the wood. We have noticed that, after a new rail had been in the track a few weeks, there would be a layer of pulp one eighth of an inch thick (or perhaps one sixteenth would be nearer the truth), between the strap and the rail, while that portion of the wood outside the strap remained sound. Of course this pulp was formed from the fibers of the wood, which had become separated by the action of the moisture, assisted by the vibration of the strap, while trains were passing, and was nothing more nor less than decay. We also noticed that the portions of the rails, outside the straps, that were acted upon by the tread of the wheels grew hard, instead of "pulping," like the portion under the iron. The rolling of the wheels on the wood had the effect to expel the moisture (on the principle of a clothes wringer), and to compress the fibers of the wood, and in a great measure prevent decay. It is doubtful about the straps strengthening the rail to such an extent as is generally supposed. A bar of iron one half inch, or five eighths inch, thick, laid flatwise, would of itself sustain only a light load; but, by reason of its continuous support by the wooden rail, would add considerably to the strength of the wood. But it is safe to say that the strap will not strengthen the rail sufficiently to warrant the expense of using it.

Another serious objection to the strap is contraction and expansion, which frequently renders it difficult to keep the track in a safe condition. We have seen these strap rails buckled and twisted by the force of expansion until they were torn from the track, resembling, in fact, a quantity of old harness strewn along the track.

Another trouble arising from the use of iron on a wooden rail, is what are usually called "snake heads." The action of heavy loads rolling over these flat bars is similar to that of the machines used for bending wagon tires, giving the ends of the bars a tendency to rise, drawing the spikes with them. It is exceedingly difficult, we may say impossible, to prevent this; and when the bar has once commenced bending, it seems to bend more rapidly, or the more it is bent the easier it bends, and pretty soon the bar is curled up in the form of a section of wagon tire. These are the "snake heads," and so long as they did not reach above the center of the wheels they were not regarded as dangerous; but as soon as a wheel struck one that had curved a little too much, there was mischief. Those who have never witnessed a wheel running under a snake head can scarcely imagine its effect. A twenty-foot bar of iron, wriggling its way through a well-filled passenger car, has, on more than one occasion, resulted in the mangling of as many human forms as in some of our first-class "smash ups."

To all these charges, against the strap rail, may be added the expense of track repairs, which will obviously be much greater with than without the iron. From the nature of the combination of the wood and strap rail, it is necessary that it be kept in good repair. Of course, this is important on any railroad, but a slight derangement of the strap road would be dangerous, and such a road would need constant watching, and would require a larger number of men to keep it safe than a well built wooden track without the straps.

And, finally, if cheapness be the main reason for building a wooden railroad instead of an iron one, the less iron used within reason, the better.

Snakes.

Dr. Fayrer, in India, has been experimenting to correct the popular error that a snake cannot kill a snake. He took a young and very lively cobra, fourteen inches long, and which was bitten in the muscular part of the body by a krait forty-eight inches long. The krait had not bitten for some days before. From a detailed report by Dr. Fayrer, it appears that the cobra was bitten at 12.50 P. M., at 1 P. M. it was very sluggish, and 1.3 P. M. so sluggish that it moved with difficulty, could be easily handled, and made no effort at resistance. At 1.20 it was apparently dying, and its movements were scarcely perceptible, and at 1.22 it died, thirty-two minutes after the attack. Dr. Fayrer has found that the water snakes of India are deadly poisonous. In the Bay of Bengal they swarm, and it is noted as ominous that lately it was proposed to erect a sea bathing establishment at Calcutta, under the assurance there were no sharks. It is remarked that sharks need not be noticed when a bather may have deadly water snakes swimming after him.

PROF. NAUCH, of Riga, has discovered that thin glass tubes, when they have a ball blown at their ends, give out a distinctly audible and clear note on cooling, so long as the relation of the size of the ball to the length of the tube does not pass a certain limit. The sound is ascribed to vibrations set up by the inrush of air consequent upon cooling.

THE IVORY PLANT.

So different are the products of the animal from those of the vegetable kingdom, that even the most careless observer may be expected at once to distinguish them. Yet multitudes are in the daily use of ivory buttons, boxes, and small ornaments, who never doubt that they are made from the tusks of the elephant, while they are really the product of a plant.

The ivory plant is a native of the northern regions of South America, extending northwards just across the Isthmus of Panama, large groves of it having been recently discovered in the province of that name. It is found in extensive groves—in which it banishes all other vegetation from the soil it has taken possession of—or scattered among the large trees of the virgin forests.

It has the appearance of a stemless palm, and consists of a graceful crown of leaves twenty feet long of a delicate pale green color, and divided like the plume of a feather into from thirty to fifty pairs of long narrow leaflets. It is not, however, really stemless, but the weight of the foliage and the fruit is too much for the comparatively slender trunk, and consequently pulls it down to the ground, where it is seen like a large exposed root, stretching for a length of nearly twenty feet in old plants. The long leaves are employed by the Indians to cover the roofs of their cottages.



THE IVORY PLANT.

Each flower of the ivory plant does not contain stamens and pistils, as in most of the British plants, but, like our willows, one tree produces only staminal flowers, while another has only pistillate ones. Such plants are said by botanists to be dioecious. Both kinds of the plants of the vegetable ivory have the same general appearance, and differ only in the form and arrangement of the flowers. In the one kind an innumerable quantity of staminal flowers is borne on a cylindrical fleshy axis, four feet long, while in the other a few pistillate flowers spring from the end of the flower-stalk. Each plant bears several heads of flowers. Purdie, who visited the plants in their native locality in 1846, says: "the fragrance of the flowers is most powerful, and delicious beyond that of any other plant; and so diffuse, that the air for many yards around was alive with myriads of annoying insects, which first attracted my notice. I had afterwards to carry the flowers in my hands for twelve miles, and though I killed a number of insects that followed me, the next day a great many still hovered about them, which had come along with us from the wood where the plants grew."

The group of pistillate flowers produces a large roundish fruit, from eight to twelve inches in diameter, and weighing when ripe about twenty-five pounds. It is covered by a hard woody coat, everywhere embossed with conical angular tubercles, and is composed of six or seven portions, each containing from six to nine seeds. These seeds, when ripe, are pure white, free from veins, dots, or vessels of any kind, presenting a perfect uniformity of texture surpassing the finest animal ivory; and its substance is throughout so hard, that the slightest streaks from the turning-lathe are observable. Indeed, it looks much more like an animal than a vegetable product; but a close comparison will enable one to distinguish it from the ivory of the elephant, by its brightness and its fatty appearance, but chiefly by its minute cellular structure.

This curious hard material is the store of food laid up by the plant for the nourishment of the embryo, or young plant contained in the seed. It corresponds to the white in the egg of the hen, and has been consequently called the albumen of the seed. In its early condition this ivory exists as a clear insipid fluid, with which travellers allay their thirst; afterwards the liquor becomes sweet and milky, and in this state it is greedily devoured by bears, hogs, and turkeys; it then gradually becomes hard. It is very curious that this hard mass again returns to its former soft state in the process of germination. The young plant for some time is dependent upon it for its food, and if the seed be taken out of the ground after the plant has appeared, it will be found to be filled with a substance half pulp and half milk, on which the plant lives until it is old enough to obtain its food on its own account.

From the small size of the seed, the largest not being more than two inches across its greatest diameter, the vegetable ivory can be employed in the manufacture of only small articles, such as beads, buttons, toys, etc. What is wanting in size is, however, often made up by the skill and ingenuity of the workman, who joins together several pieces so as to make a long object (especially when such articles are made by the turning-lathe, when it is easy to hide the joints from view), or makes a lid from one seed, and the box from another. In some years as many as 150 tuns of seeds have been imported into England, and they have been sold in the market at the rate of a thousand nuts for seven shillings and six pence.

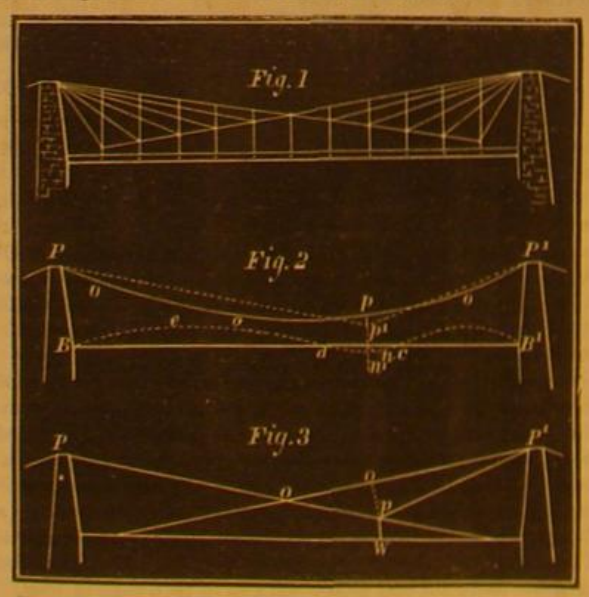
American Supply of Arms to France.

Since the commencement of the Franco-German war, France has been the principal purchaser of arms in the markets of the United States. Since the capitulation of Marshal MacMahon, at Sedan on September 3, and the proclamation of the French Republic on September 5, 1870, the shipments of small arms have been very large, amounting in value, between September 3, 1870, and January 4, 1871, to $9,717,606. The *Pereire*, in three trips to Havre, tooks guns worth $1,432,904; the *Lafayette*, in three trips, took guns worth $2,171,395; and the *Ville de Paris*, in two trips, took guns worth $1,927,263. The steamers *Erie*, *Ontario*, and *Avon*, sailing to Cowes for orders, each carried a cargo of arms valued in the aggregate at $4,216,008. A manufacturing firm in New York, it is stated, has been turning out daily 1,000 muskets of an improved pattern for the French Government. Of the guns shipped, 75,000 were Enfield rifles, originally imported from England, and disposed of last autumn by the United States Government at the public sales by proposals. A large surplus of arms sold on that occasion are not yet delivered, the purchasers being agents of the German Government, and having forfeited the deposit of $10,000 for non-compliance with the conditions of sale.

The shipments of artillery to France were small, the value amounting in the aggregate to $150,000. Harness in considerable quantities appears on the manifests of vessels sailing for Havre, and over 50,000 knapsacks have also been shipped to that port. In September, the *Lafayette* took out a shipment of arms. Early in the second week of January, a cargo reached Bordeaux in the *Lafayette*, from New York, consisting, among other warlike items for the French Government, of 43 field guns; 150,000 stand of arms, being Remington and Springfield rifles; 217 chests of artillery harness, 3,318 chests of rifle ammunition, 4,671 chests of the same of a different make, 6,993 barrels of gunpowder, 56 chests of revolvers, 76 chests of cavalry sabers, and a large quantity of lead and copper.

TRIANGULAR SUSPENSION BRIDGE.

The *Journal of the Franklin Institute*, for February, contains diagrams of a method for the construction of suspension bridges, which appears to us a decided improvement upon methods hitherto used. We have therefore reproduced these diagrams upon a small scale for the benefit of our readers. Fig. 1 illustrates the general method proposed, that is, the construction of a bridge in which the cables shall follow straight lines instead of curves, as hitherto.



Figs. 2 and 3 will illustrate the principle more fully. In Fig. 2, P o o P' represents the cable of the usual suspension bridge, and B B' the roadway. When any extra weight is brought upon the bridge at any point, as n, the roadway at that point is depressed, say to n', the point p descending to p'; from the points e and d to each end, the roadway is elevated; between the points it is depressed. The cables tend to the lines P p' and P' p', while the roadway tends to assume the form B e d n' c B'. This variation, in the forms of the cable and roadway lines, moves from point to point along with the extra weight. To obviate this, a heavy truss is generally used. Now, in Fig. 3, if the weight be transmitted in a vertical line to p, thence in straight lines to P and P', there can be no depression. The roadway will remain firm. This principle, of transmitting the weight directly, and in straight lines to the points of support, is the main feature of the bridge.

It will be seen on examination of Fig. 1, that the weight at any point of the bridge will be transmitted by the vertical cables or rods directly to their points of junction with the obliquely descending rectilinear cables or rods, and from the points of junction in right lines to the towers. Whatever deflection occurs, must therefore arise only from the stretching the cables, all the undulatory effect of heavy strains being entirely eliminated.

Railroading in the Olden Times.

William Hambright, an old conductor on the Pennsylvania Central road, who, we are told, is familiarly known throughout the State as "Cap," "Cappie," "Pap," or "Conductor Hambright," has given to the Columbia (Pa.) *Courant* some account of his experience.

Mr. Hambright commenced his career as conductor by taking the first train (horse cars) out of Lancaster, in 1833, after which time he ran regularly, and has been employed nearly all the time since as passenger conductor on the Pennsylvania Central Railroad. He then acted as conductor, brakeman, and greaser; his compensation was eighteen dollars per month—which was considered good wages at that time. His train of horse cars would leave Lancaster at five o'clock, P. M., and arrive at Philadelphia at five o'clock the next morning, making twelve hours for the journey; and the fare charged was $3·50. Stoppages were frequent, fresh horses being employed every fifteen or twenty miles. At times they would be greatly detained by the severity of the weather, the winters in those times being much colder than at the present day.

There was no fire in the cars, and when a stop was made to change horses, the conductor would make for the nearest haystack or barn for the purpose of procuring straw or hay to strew upon the floors of the cars in order to make his passengers more comfortable; he riding outside, the cars generally being packed so full that he could scarcely gain admission. Down grade the horses were always kept at a full run. Horseflesh was very cheap then—sometimes five good animals could be purchased for $100. In the year 1835 a locomotive, built by Norris, was brought from Philadelphia to Lancaster, in wagons (why it was not brought by rail we did not learn); however, the wonderful machine was put upon the track and fired up in presence of an immense assemblage of spectators. It appears the enterprise was not very successful, as it would run a short distance and then halt; then a number of muscular men would lend their assistance by pushing. Every device was resorted to, to make the "critter" go, but to no purpose. Some time after this, three small engines were purchased in England and sent over, which answered all the purposes for which they were intended, one of which is in use at the present time in York, Pa., sawing wood.

The Harrisburg and Portsmouth Railroad, as it was then called, being laid upon strong pieces of wood, using flat bar iron fastened down with spikes—it was necessary to carry hammer and spikes on the engine. Very often spikes would come out from the end of the bar, causing the end of the same to stick up, which were termed "snake heads," and the engineer would be obliged to stop and spike down before attempting to pass over. Information had to be given the engineer, before starting, where stops were to be made.

Here we may state that to Mr. Hambright belongs the credit of inventing the bell and rope system for signalling engineers. He got permission from his "boss" to put his idea of the thing into practicable shape. Procuring a rope and common door bell, he attached the latter near the engineer—no house being over the locomotive at that time—and then stretched the rope over the top of the cars. Ever after that, and up to the present time, bell ropes have been in vogue, though in a more approved style than the one just described.

Conductors were not required to make reports at the end of each trip, as is now practiced; they would hand over the gold and silver—perhaps two or three hundred dollars or more—to the clerk, who would enter it in a book provided for the purpose, somewhat in this wise: "Conductor Hambright, so many dollars," and that was all the formality about it. Checks for the baggage were not used, but when the cars arrived in Columbia or Philadelphia, the conductor would open the car door for the delivery of baggage, etc., to the passengers, who crowded around and secured their parcels by answering, "mine," to the conductor's interrogatory, "whose trunk is this?" which was kept up until all disappeared. If a trunk was marked "B" it was to go by boat; if "S," it was to go by stage line. Strange to say, there was not as much baggage lost then as now.

Very often the conductors would help the proprietors of the lines during harvest, and assist at other labor when off duty.

SHILLINGS were first coined, in England, in the year 1507.

The Water Works of Philadelphia, Pa.

We are indebted to Frederic Graff, Esq., Chief Engineer of the Water Department of Philadelphia, for a copy of his annual report for 1871, which contains interesting information.

"The supply of water distributed during the past year has been much greater than any previous year. The average daily supply from all the works, for the whole year, has reached 37,149,385 gallons. The average supply for the month of July was 46,008,735 gallons per day—and the maximum supply of any one day was on July 20, 1870, when 54,655,509 gallons were delivered. This was equal to 81 gallons per day for each one of the population of the city per last census; but our citizens do not all get a supply from the works, many in the rural wards obtaining water from springs and wells. The water supplied on that day was equal to 92 $\frac{3}{10}$ gallons for each of the population who actually receive water from the works, and 540 gallons for each of the water tenants now upon our books; of course, no one can believe that each man, woman, and child of the population supplied, consumed for their actual wants 92 $\frac{3}{10}$ gallons a day; therefore, the immense amount wasted must be evident.

"The increase in the water supply is in much greater ratio than the increase of population. This occurs, probably, on account of the multiplication of modern conveniences for using water; such as water closets, wash basins, stationary wash tubs, wash pavements, and the increased number of each now considered necessary or desirable in our dwellings; besides the moer lavish discharge of waste water into drains and sewers than formerly—whereby it can be wasted without fear of detection.

"Whilst the supply of water delivered in our city is as copious as that of any other in the United States, the price charged for it is very much lower; a very trifling increase in some of our charges, for what may be considered as the "luxuries of water supply," and which would scarcely be felt as onerous, would enable us to make a marked increase in our revenue, and a corresponding decrease in direct taxation.

"Over 26 miles of distributing pipe have been laid, including mains of 30 and 36-inch diameter, making the aggregate amount of mains and pipes used in distributing the water 488¼ miles, a greater amount, by nearly 150 miles, than any other city in the United States, and only exceeded in the world by the city of London.

"A LARGE SUBMERGED WATER MAIN.—It was decided to use the Belmont Reservoir for the supply of the high wards on the east side of the river, particularly the 20th and 28th Wards; to do this, it became necessary to cross the river Schuylkill with the main, and it was decided to use a submerged pipe, designed and patented by John F. Ward, of Jersey City, N J.; a contract was accordingly made with that gentleman, and the main has been successfully laid.

"It is 36 inches in diameter, has a movable joint of simple and peculiar construction which admits its being sunk length after length, from scows, by suitable skids and derricks.

"The inside of the bell of the pipe is turned smooth to a spherical form, the small end of the pipe having grooves in it to retain the lead; when two pipes are put together, a lead joint is cast and caulked in the ordinary way. The smoothness and form of the inside of the bell permit the requisite motion, the lead joint slipping upon that, whilst it is retained firmly by the grooves in the small end of the pipe.

"The total length of the pipe is 963 feet, and the deepest water 25 feet; at each side of the river, at the shore ends, a suitable channel was dredged to receive it."

Progress of Ignorance.

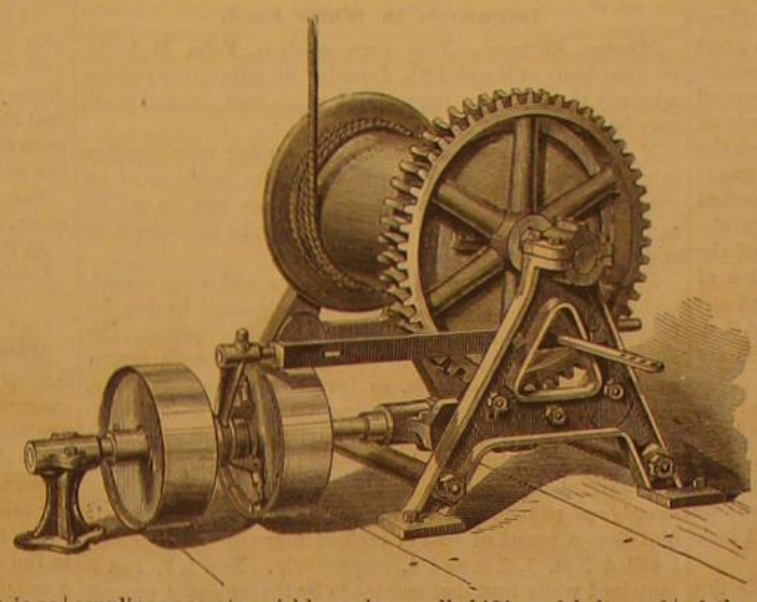
We read in the London *Builder* that a "civil engineer" recently wrote to an English government department, on the subject of the ill-fated ship *Captain*, and in his letter remarked "that a good deal had been said about the center of gravity of the vessel, but the fact was that no hollow bodies could have any center of gravity."

This will disturb the gravity of our readers, and afterwards, in their serious moments, they will agree with us that some examination ought to be made of persons intending to practise engineering, as it is of candidates for the admission to the ranks of medicine, law, and divinity. The term "civil engineer" would then present some definite idea to our minds; at present, it may mean anybody, from Robert Stephenson or I K. Brunel, down to the abovementioned theorist, who seems unconscious of the existence of a center of gravity in his own head.

AMERICAN INSTITUTE OF ARCHITECTS.—LECTURES.—An experimental course of lectures is in progress, before the New York Chapter of the American Institute of Architects, on Mondays and Wednesdays of each week, the course to end on May 31, 1871. The lectures are given by Mr. P. B. Wight and Mr. R. G. Hatfield alternately, the former discussing the History and Æsthetics of Architecture, and the latter, Architectural Construction. Tickets for the course are sold at $10. The lectures commence at 8 P.M., at 925 Broadway (near Twenty-first street).

IMPROVED POWER HOISTING MACHINE.

This machine is designed for elevators and other hoisting purposes, where it is desirable to hoist, and also lower, loads at a regular uniform speed. In the machine illustrated in the accompanying engraving, the desired result is accomplished by the worm and worm gear on the drum shaft. The worm is driven in opposite directions, by means of two friction couplings, with cross and open belts, which operate smoothly in connection with the worm and gear, and are almost entirely noiseless in working, raising or lowering loads with great steadiness. By means of the worm and gear, great power with minimum gearing is secured. The friction



couplings operate quickly, and save all shifting of belts, and also always have the full width and power of the belts on the pulleys. The two main bearings of the worm shaft, on each side of the worm, are made of extra length so as to be durable, and are also both connected or cast in one piece, so that they cannot get out of line. They are also bolted to the main frame, which keeps both shafts in the proper relative position, without danger or liability of loosening, as frequently occurs where the main bearings are separately bolted to the wood framework of elevators. The iron frame is compact and stiff in form and easily set up.

The friction clutch pulleys, as used in connection with the worm and gear, constituting the driving and reversing mechanism of the machine, were patented February 25, 1869. These machines are manufactured by Volney W. Mason & Co., Providence, R. I.

BORING FOR OIL.

The following description of tools and methods employed in boring for oil in Pennsylvania is extracted from Blake's "Notices of Mining Machinery":

The discovery of petroleum in quantities in Western Pennsylvania, West Virginia, Ohio, Canada, and other localities, has given a great development to the art of well boring in the United States. The cumbrous pole tools have been rejected, and the cable, upon the ancient Chinese system, substituted.

The great advance has been in the construction of the tools, and in the adoption of simple apparatus for giving motion to the drill by means of steam power. For prospecting and for sinking to moderate depths of 50 to 150 feet, the spring pole, worked by hand, is frequently employed. This was the apparatus chiefly used in California a few years since, when the oil regions were prospected.

The constructions in common use in Pennsylvania at the oil wells, and used for a time during the oil excitement in California, consist of a derrick, bull wheel, band wheel, sansom post, and walking beam, and a portable steam engine. The descriptions and dimensions given below represent the average as determined by experience.

The derricks are usually constructed of plank and boards, when they can be obtained, or of unhewn poles. They rise to a hight of 50 or 60 feet, and taper upwards from a base about 15 feet square. The standards are of 2-inch plank, 8 inches wide, and the cross braces 8 inches wide and 1 inch thick. The tools are suspended by the cable, which, passing over the pulley at the top, descends at the side, and is wound upon the drum of the bull wheel, the shaft of which rests on bearings in the standards. The drum of the bull wheel is about 10 inches in diameter.

The walking beam, of wood, 26 feet long, is supported at the center, upon the top of the sansom post. One end is connected, by a pitman, with a crank of 22 inches radius upon the end of a shaft, receiving motion by a belt from the engine; the other end, projecting within the derrick, and directly over the well, carries suspended, the temper screw to which is attached a clamp for seizing upon the rope. The rotation of the crank shaft gives a reciprocating motion to the end of the beam, and this is imparted to the rope, carrying the tools at its lower end.

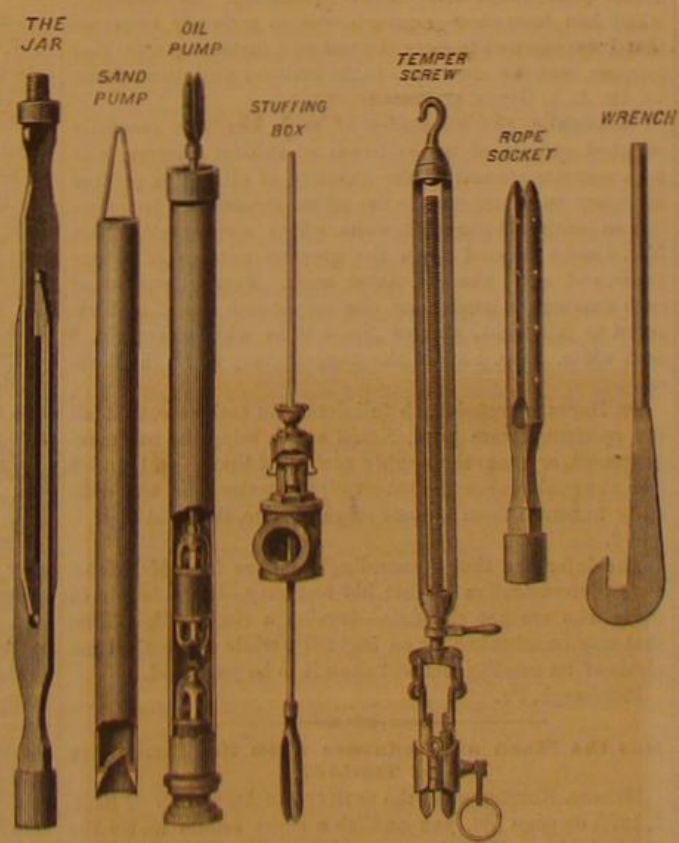
The form of the temper screw is shown by the gure. By this, the drill may be lowered or "fed out" to a certain extent during the progress of boring. The rope is seized and held fast by the clamp, and when the whole length of the screw is fed out, the position of the clamp is changed.

The drilling tools consist of center bits, reamers, an auger stem, sinker bar, and the "jar," besides a socket for attaching them to the lower end of the rope, and wrenches and other accessories to aid in attaching and unscrewing the bits. There are, besides, a variety of tools for recovering broken bits or other parts of the apparatus lost in the well, and sand pumps for removing the *débris*.

BITS AND REAMER FOR DRILLING



The bits are represented by the annexed cuts. They are 3½ inches broad on the face, and the reamers are 4½ inches. They are made, however, of various sizes, and all have strong, square shanks, so that they may be firmly screwed into the auger stem, made of 2½ inch iron and 20 feet long.



The "jar" is a contrivance by which the auger stem and bit are, in a measure, detached from the rope. By it a blow or sudden jerk may be given upwards, so as to loosen the bit, in case it becomes wedged in the hole, while the same device serves to give a blow downwards upon the auger, after the bit strikes the bottom, thus doubling the efficiency of each stroke. It serves, also, to maintain the tension of the rope during the stroke. These jars are made of 1½ inch iron on the sides, with 12 inch heads and 18 inch stroke.

The sinker bar, 10 feet long, is attached by a screw to the upper end of the jar, and above this is the rope socket, securely united, by means of rivets, to the end of the rope.

The bits and other parts of the drilling tools are connected and disconnected by means of two large wrenches, 3 feet 9 inches long, with broad flat heads, shaped as shown in the figures.

The drilling ropes or cables vary from 1¼ inch to 1¾ inch diameter, and weigh from 48 pounds to 86 pounds per 100 feet.

The sand pumps, made of heavy sheet iron or galvanized iron, sometimes of copper, are about 5 feet long, and from 3 to 4 inches in diameter, and are fitted with leather valves resting upon iron seats, as indicated at the lower end of the figure.

These tools, and the iron fittings for the walking beam wheels, and other parts of the apparatus for well boring, are manufactured by Messrs. Hart, Ball & Hart, of Buffalo, N. Y. The steam engines in use are portable, and generally 8 or 10 horse power. A 900 feet well can be drilled with an 8 horse power engine. Rope for a well 900 feet deep, with the tools, will weigh about 800 pounds.

Before commencing to drill, it is usual to drive down a cast-iron pipe through the loose soil and alluvial deposits until the firm bed rock is reached. These pipes are made in lengths of 8 feet, and are from 5 to 6 inches in diameter. They are joined together, end to end, by means of wrought iron bands carefully welded, and sized to shrink on to a shoulder turned upon each end of the pipe in a lathe, so that a flush joint is formed by the band. The lower end is made sharp, and the band is edged with steel. This form of joint has been patented by Mr. Bolles, whose name it bears, and it gives great satisfaction. The 5 inch lengths weigh 55 pounds per foot, or 440 pounds in all; and the 6 inch, 69

pounds per foot, or 552 pounds per length. For lining the wells, wrought iron tubing is used, made with screws and sockets, or with flush joints, but always smooth finished inside. The sizes vary. For the light kinds, from 1½ to 4 inches for the inside diameter, and from 1·66 pounds to 6 pounds per foot. The heavier tubing ranges from 1¼ inches in diameter, and 2·70 pounds per foot, to 6 inches, weighing 18·7 pounds per foot. These large sizes are seldom used for oil wells.

Pumps are made of wrought iron pipe, lined with heavy seamless brass tubes bored perfectly true, or of heavy brass tube alone. One of the last-mentioned construction, 5 feet long, is shown by the annexed figure, in which a portion of the interior is seen with the two valves and boxes. These valves are made of gun metal, and are fitted with great care. The packing is made of the best oak-tanned leather. Ball valves are generally used. The pump here represented is manufactured by the Messrs. Hart, and they have made an improvement upon the ordinary construction, by which the lower ball valve may be loosened from the top of the guard over the valve seat, to which it sometimes becomes attached by the accumulation of a deposit. A projecting point at the bottom of the upper box enters the hole in the top of the lower box, and thus forces down the ball. The portion of this projection nearest to the box has a screw thread cut upon it, and may be screwed into the box below, so that they may both be drawn out together. The pump barrels are usually 5 feet in length.

At the top of the well a stuffing box and elbow pipe is fitted. The construction of this box and the form of the joint for attaching to the sucker rods is shown in the figure. The stuffing is kept in place, and is pressed firmly upon the plunger rod or piston by means of the follower, made of brass. The plunger rods are 5 feet long, are made of 1 inch diameter cold-rolled iron, and are perfectly polished.

One other important adjunct of a complete oil well is the seed bag, the use of which is to form a water-tight joint or packing around the tube or lining of the well, and thus shut off all communication between the water of the upper strata and the oil-bearing crevices or chambers below.

This bag is made of leather, and is filled with flax seed. It is put around the tube, and is pushed down to the proper place, and soon becomes so much swollen by the absorption of water that it fills the space between the tube and the walls perfectly, and thus shuts off all communication around the tubing, for either water or oil from above or below.

Useful Recipes.

TO MAKE FURNITURE OIL.—Take linseed oil, put it into a glazed pipkin with as much alkanet root as it will cover. Let it boil gently, and it will become of a strong red color; when cool, it will be fit for use.

TO GET OIL OUT OF BOARDS.—Mix together fuller's earth and soap lees, and rub it into the boards. Let it dry, and then scour it off with some strong soft soap and sand, or use lees to scour it with. It should be put on hot, which may easily be done by heating the lees.

TO PREVENT THE SPLITTING OF LOGS AND PLANKS.—Logs and planks split at the ends because the exposed surface dries faster than the inside. Saturate muriatic acid with with lime, and apply like whitewash to the ends. The chloride of calcium formed attracts moisture from the air, and prevents the splitting.

SILVERING IVORY.—Immerse a small slip of ivory in a weak solution of nitrate of silver, and let it remain till the solution has given it a deep yellow color; then take it out and immerse it in a tumbler of clear water, and expose it in the water to the rays of the sun. In about 3 hours the ivory acquires a black color; but the black surface on being rubbed soon becomes changed to a brilliant silver.

TRANSPARENT CEMENT.—Dissolve 75 parts India-rubber in 60 parts of chloroform or benzine, and add, to the solution, 15 parts of mastic.

Another.—Balsam of fir is a strong cement when not exposed to heat. It is to be warmed and applied to the glass, itself previously warmed. It is used for cementing lenses, mounting microscopic objects, etc., and does very well for broken glass which is not to be washed in warm water. The thicker the balsam, the stronger; when too thin, it may be thickened by gentle evaporation.

NEW GUTTA-PERCHA CEMENTS.—For uniting sheet gutta-percha to silk or other fabrics; Gutta-percha, 40 lbs; caoutchouc, 3 lbs; shellac, 3 lbs; Canada balsam, or Venice turpentine, 14 lbs; liquid styrax, 35 lbs; gum mastic, 4 lbs; oxide of lead, 1 lb.

For uniting sheet gutta-percha to leather, as soles of shoes, etc.; Gutta-percha, 50 lbs; Venice turpentine, 40 lbs; shellac 4 lbs; caoutchouc, 1 lb; liquid styrax, 5 lbs.

In making the cements the Venice turpentine should be first heated; then the gutta-percha and the shellac should be added; the order in which the other materials are added is not important. Care should be taken to thoroughly incorporate them, and the heat should be cautiously regulated, so as not to burn the mixture.

Instruction in Industrial Drawing Free of Charge.

The state of Massachusetts last winter enacted a law which requires all cities and large towns to furnish free instruction in industrial drawing. The city of Worcester has perhaps made the best beginning. Upon opening the class, more than two hundred made application, and one hundred and forty-five were admitted, of whom nine were women. The lessons are an hour and a half long, and are given semi-weekly by Professor Gladwin, Professor Alden, of the Free Institute, and Mr. Higgins, superintendent of the Washburn Machine Shop, with some assistants.

In respect of occupation, there were of machinists, 42; carpenters, 26; pattern-makers, 7; teachers, 9; masons, 3; farmers, boot and shoe makers, clerks and architects, 4 each; organ builders, book-keepers, painters, armorers, and engravers 2 each; insurance agents, civil engineers, upholsterers, moulders, wire-drawers, blacksmiths, 1 each; miscellaneous, 24.

Correspondence.

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

Impurities in White Lead.

MESSRS. EDITORS:—Your correspondent, Felix McArdle, in your issue of March 18th, describes an interesting process whereby the purity or impurity of white lead, ground in oil, may be determined.

If you think the subject worthy of further consideration in your columns, I beg leave to narrate the incidents of an extended trial test, made about twelve years ago, in which certain results were obtained, which may be of interest to white lead manufacturers and consumers.

Being, then, in the habit of purchasing and using considerable quantities of white lead, I was desirous of having the best that could be procured; but the conflicting opinions, the vilification, and the detraction indulged in by manufacturers, painters, and other experts, so involved me in perplexity, that I resolved to make an experimental test myself. Without my purpose being known to anybody, I obtained from each of four highly reputable firms, a twenty-five pound keg of "warranted pure white lead," from each of which I took exactly one pound and placed it in a crucible of about a half pint size—a pound of lead in each of four crucibles. These I called Nos. 1, 2, 3, and 4, respectively. Nos. 1, 2, and 3 contained white lead that was made by the ordinary process then commonly in use. No. 4 was made by a new process in which a high degree of artificial heat was employed. I placed the crucibles in a bituminous coal stove, first making a strong fire, and allowing it to burn to a mass of glowing embers, in which the crucibles were embedded to prevent their upsetting; and allowed them to remain, uncovered, until heated to nearly a white heat. They were then taken out, the lead found to be melted, or supposed to be melted. When cooled they were broken to pieces to obtain the contents, which could not otherwise be removed.

Nos. 1 and 2 had nuggets of pure pig lead. No. 3 was a mass of irregular and jagged particles, matted together, and much resembling the small cinder seen under a bituminous coal fire. No. 4 was much like it.

Of course, much excitement ensued among the manufacturers when informed of the result. No. 3 was claimed to be a superior lead to any other made in this country. No. 4 maintained that the new process was every way superior to the old. As the specimens laid, side by side, exposed to view, argument seemed out of the question. The conviction of the great firm, No. 3, was overwhelming. Its character, which had been above reproach, was so seriously impaired that I was induced to carry the test still further, and for that purpose, sent the specimens to the eminent analytical chemist, Dr. A. A. Hayes, of Boston.

Meanwhile, the remainder of each keg was carefully weighed and placed in the hands of skillful painters, who kept accurate account of the quantity of oil and turpentine necessary to reduce each to the proper consistency for painting on inside old plastered walls, which were exactly alike. Nos. 3 and 4 covered much the greatest number of square yards, and made the smoothest work. Parallel streaks of each number, painted same size on smooth board, and exposed to fair light, showed No. 4 to be whitest, and No. 3 next white. Nos. 1 and 2 (the nuggets) very much the darkest.

Dr. Hayes reported, with full details in each case, that all the specimens were pure, Nos. 3 and 4, being the best manufactured, or, more thoroughly converted than Nos. 1 and 2 (the nuggets), and in my test required greater heat and difficulty to return them to their original state, than did Nos. 1 and 2.

The inference that I accordingly deduce from Mr. McArdle's communication is, that his test may—in the hands of those who are not chemists—develop a cinder like mine, that may be mistaken for an impurity, while a chemical analysis of its constituents will show it to be pure lead.

Pittsburgh, Pa. X.

Has the Moon any Influence upon the Durability of Timber?

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of Sept. 3, 1870, on page 148, you publish a short article under the head of "Moon Fallacies," signed D. A. M., Cincinnati, Ohio. He says: "I am quite certain if hickory timber, for instance, be cut between the full and new moon, the worms will devour it; but if cut, say three days after full moon, the worms will not touch it. Let some of your country correspondents give this matter a trial. Cut a stick of hickory, say three or four days after the full of the moon, and then cut another stick of the same kind of wood, say three or four days after the new of the moon, and set these sticks up side by side for a few months, and then let us hear the result. I venture to say, the former of these two will become worm-eaten, and the latter will show no signs of worms or wood borers."

On reading the above quotation last September, I determined to give the thing an impartial trial; as I had considerable curiosity to know the truth in the matter, having heard it discussed, *pro* and *con*, for many years. At that time, I was living at Wallingford, Conn. On September 9th, there was a full moon. September 12th I cut two hickory sticks, several inches in diameter, and four feet long. I marked these sticks with an iron band, and placed one of them in a garret, over an engine room; the other I stuck in the ground by a fence post.

New moon September 25th. On September 28th, two similar sticks were obtained from within a few feet of the first cutting, and placed each beside one of the two first specimens. Shortly after, I came to Oneida, but left the sticks in charge of a faithful man. A few days ago I wrote to this man, asking him to saw off a section of each piece, and report to me which showed the greater signs of being bored, or worm eaten. His reply is as follows:

"I have made an examination of the sticks—both of those over the engine room, and those out of doors. As for those over the engine room, they are seasoned a little, but I can discover no signs of powderpost about either of them. Those that stand out of doors are nearly as green as on the day they were cut, and show no difference. I inclose a section of the one with the iron mark."

The piece he sent me, from the stick cut in the full of the moon, shows no sign of being worm eaten.

At the end of another six months, I will again report.

Oneida, N. Y. D. E. S.

Lunar Rainbow---Haloes.

MESSRS. EDITORS:—On page 164, current volume of the SCIENTIFIC AMERICAN, is a communication from A. O. Grube, concerning what he calls a lunar rainbow. He asks for an explanation, and if it were really a rainbow.

To this last, I answer, no. His description justifies this answer. Professor Loomis says ("Meteorology," p. 210) that the rainbow "is situated in that part of the sky which is opposite to the sun;" and, of course, with the moon it must be in the same situation. As the phenomenon he describes was a complete circle, it is certain it was not a rainbow for the above reason, and that the lower half of the rainbow is not visible unless the observer is considerably elevated above the surface of the earth.

Again, he says, "The play of the prismatic colors . . . was beautiful." Loomis says ("Meteorology," p. 211) that the colors of lunar rainbows "are faint, and generally only a white or yellowish arc is distinguishable." One more proof: the altitude of the moon was too great for a rainbow to be visible.

Now, for what it was, and the explanation. It was only a common lunar halo. The circle inside was a corona, and the belt of light immediately around the moon was such as is often seen when the sky is slightly hazy. In proof that it was a halo, I will give: 1st. It was a complete circle; 2d. It was around the moon; 3d. The clouds were right to form a halo and not right for rain; 4th. The corona, or circle between it and the moon; 5th. The light colors. Its peculiar appearance—the lower half of a circle—was caused by the clouds passing from over the moon.

I have no doubt it was a beautiful sight, but I have seen some as beautiful and remarkable. A description of one or two may not be unacceptable. On the evening of January 19, 1867, there was a double lunar halo, so bright that all the colors were quite distinct, and it lasted about three hours.

There was a solar halo August 6, 1866, which was composed of five complete circles besides the corona. It was visible for about half an hour from 11 A.M., and some of the circles were as bright as rainbows. Immediately around the sun there was the belt of light, and around this the corona; around these a double circle of 22°, crossing above and below the sun; next outside, a circle of 46°; then the parhelic circle (which was complete and distinct) passing through the sun; and last, a circle, extending from the upper part of the double circle to the opposite point in the parhelic circle. There were six parhelia, the anthelion, and the crossings of the double circle; and these, confined with the complete circles, made up one of the most beautiful sights it has ever been my lot to witness. T. MIKESELL, JR.

Wauseon, Ohio.

Cleaning Steam Fire Engine Boiler.

MESSRS. EDITORS:—A short time ago, I asked through your paper for some method of cleaning a steam fire engine boiler. I was recommended to use five or six pounds of common soda. I will give my experience, as it may benefit others.

The boiler holds thirty gallons of water. I put in four pounds of soda, and let it remain three days. In the mean time we had two alarms of fire, but did not work. The fourth day I worked the engine, and worked nearly all the water out of the boiler through the cylinders, and drowned out the fire in the furnace. The engine was working very slowly all the time.

I have since experimented, and find the quantity that will clean and not foam, is from ¼ to ½ ounce to the gallon of water; this may vary with the quality of water used. The water I used, is from our wells, and it is impregnated with magnesia. H. CHOATE.

Shelbyville, Ky.

Birds' Tails not for Ornament Only.

MESSRS. EDITORS:—Your correspondent, on page 194, Vol. XXIV. SCIENTIFIC AMERICAN, is sadly mistaken in his attempted explanation of the flight of birds. I would remind him that birds have tails; and that these tails act as rudders, I need not affirm. Many of your readers have, no doubt, observed that those birds which vary most in the speed of their flight, have the longest tails in proportion to their size. Now I state, without fear of successful contradiction, that if a bird, flying on a plane with the earth's surface, with tail in

same plane, and making three strokes of wing per second should elevate his tail to an angle of 45°, he would rise above that plane; and if the tail be depressed to an angle of 45° below the plane, he would inevitably come to the ground. In regard to the stroke of the wing, I will state that if the bird stand still while the stroke is being made, it can be made perpendicular to line of flight. If the bird be moving ahead, it must be diagonal.

Nebraska, Ohio. A. K. SMITH.

Deep Sea Soundings and Analysis of the Waters of the Ocean.

MESSRS. EDITORS:—At a time when science is doing so much to enlighten us as to the operations of nature in domains heretofore veiled from the curious eye, and a new field is being opened, by deep sea soundings, from which we may gather materials to confirm or disprove theories built upon former scientific research, it is frequently said with regret, that no means have yet been devised to obtain water from great depths of the ocean, in a manner to preserve the gases it contains until analysis can be made; and believing that all should be willing to contribute what they can, to aid the researches thus begun, and that this difficulty can be overcome, a few suggestions are here offered, which, if they do not obviate the difficulty, may at least open the door to further inquiry, and furnish the groundwork for successful invention.

The difficulty seems to be one of force, both in the compression of water, and the dilation of gases, and the question has been how to overcome it, instead of adapting ourselves to circumstances, and seeking to evade the one, and accommodate the other.

The experiment of sinking a closed empty vessel of great strength, to be opened at the proper depth, has been tried, and it is said that on account of the great weight above, the water either crushes or filters through it before it can perform its duty; and when secured, on approaching the surface, any gases that had been subject to the enormous compression of the superincumbent water, would, on being thus relieved, dilate to such an extent as no ordinary closed vessel could be expected to resist.

This can be remedied best, not by constructing vessels of greater strength, so as to keep the gases compressed, but by providing for the gases a chamber in which they may dilate to the utmost without escaping, and thus be brought to the surface, and analyzed at leisure.



The plan is this: Use a cylindrical vessel, A C, of any size desired (see diagram), provided with two valves, B B', so adjusted that when open, they shall present the least possible resistance to the upward flow of the water, as the cylinder is sunk to the required depth; the vessel between the valves, A, to be smaller in diameter than below, and extend some distance below the lower valve, as shown at C.

The upper valve should be arranged to shut upon an air-tight rubber cushion, and be provided with a spring lock, to fasten it there when closed.

The lower valve should shut, and rest upon a movable rim, D, fitted with rubber to fill and entirely close the large portion of the vessel below, but so that it can slide without much difficulty.

The vessel can be sunk by a weight similar to that used in Brooke's deep-sea sounding apparatus, or by making the vessel heavy enough to sink rapidly by its own weight. The water would pass freely up through it until it reaches the required depth. Then, on raising it, the valves would immediately close, and, as it gradually approaches the surface, the gases must as gradually dilate, as the superincumbent pressure is removed, and, finding resistance in their upward tendency, would force down the movable lower valve, and make room for themselves as they expand.

If difficulty be experienced in closing and locking the upper valve, it can be overcome by a cord or wire attached so as to lock it at the required depth.

There could be no danger from the pressure of the water, for the vessel, being filled with water of the same density as that surrounding it, has the same pressure within as without, and the dilating gases, having room to expand, would not affect the vessel by their expansion, nor could they escape; and thus the water would reach the surface from any depth, without disturbance or loss of its component parts.

Fort Wayne, Ind. R. S. ROBERTSON.

Domestic use of Aqua Ammonia.

A "housekeeper" in the *Michigan Farmer*, says: For washing paint, put a tablespoonful in a quart of moderately hot water, dip in a flannel cloth, and with this merely wipe over the wood-work; no scrubbing will be necessary. For taking grease spots from any fabric, use the ammonia nearly pure, and then lay white blotting-paper over the spot and iron it lightly. In washing laces, put 12 drops in warm suds. To clean silver, mix two teaspoonfuls of ammonia in a quart of hot soap suds, put in your silver and wash it, using an old nail brush or tooth brush for the purpose. For cleaning hair brushes, etc., simply shake the brushes up and down in a mixture of one teaspoonful of ammonia to one pint of hot water; when they are cleaned, rinse them in cold water and stand them in the wind or in a hot place to dry. For washing finger marks from looking glasses or windows, put a few drops of ammonia on a moist rag and make quick work of it. If you wish your house plants to flourish, put a few drops of the spirits in every pint of water used in watering. A teaspoonful in a basin of cold water will add much to the refreshing effects of a bath. Nothing is better than ammonia water for cleansing the hair. In every case, rinse off the ammonia with pure water. Aqua ammonia should be purchased by the pound or half pound, as druggists ask an extortionate price per ounce.

[For the Scientific American.]

INSTRUMENTS USED IN STORM SIGNAL SERVICE.

The incalculable benefit to be derived from an efficient and active storm signal service has been thoroughly demonstrated, by practical experience, both in this country and Europe. The protection it gives to commerce and agriculture, not to mention other industries, is invaluable. Its premonition causes the mariner to seek a harbor in which his bark can weather the coming storm. The farmer watches carefully the column in his daily paper containing the reports of the signal service, and heeds the "probabilities."

To accomplish its end, the United States Signal Service uses several simple and ingenious instruments. Besides the common mercurial thermometer, the Signal Service makes use of two others, namely, the maximum and the minimum thermometer. The maximum thermometer consists of a common mercurial thermometer, stationed in a horizontal position, inside the tube of which is placed a steel index; this index is pushed forward by the mercury, as the temperature rises; but when the temperature falls, and the mercury recedes, the index remains stationary, thus registering the highest temperature. The minimum theremometer is a common thermometer in which spirit is substituted for mercury; a steel index is inserted; when the temperature falls the index is dragged with the spirit; increase of temperature and the consequent rising of the spirit does not affect the index, which still remains at the lowest point, thus registering the lowest temperature.

To measure the velocity of the wind an hemispherical cup anemometer is used. It consists of four hemispherical cups placed at the extremities of two horizontal rods which cross each other at right angles. The cups revolve with the wind, and the rods, or arms, are of such a length that five hundred revolutions is equivalent to a mile of wind. These revolutions are registered by a system of index wheels, set in motion by an endless screw on the upright which supports the rods. The force of the wind is ascertained by a tube, bent like a syphon, called a wind gage. It is one half filled with water, and its open end always faces the wind, the instrument being adjusted on a pivot. The force of the wind drives the water up the opposite leg of the instrument, which is graduated.

By putting a chemical solution in the water and pieces of prepared paper along the side of the graduated leg, it may be made to register the greatest force which the wind attains.

The rain gage consists of a copper cylinder, its upper end closed by a funnel to prevent evaporation. The rain is collected in a second vessel placed inside the cylinder, and thence measured. The relative amount of vapor in the air is measured by the hygrometer. Two mercurial thermometers are placed side by side; one, a common thermometer, is called the dry bulb thermometer, the other has its bulb covered with muslin, from which pass threads of darning cotton into a small vessel containing rain water; this is called the wet bulb thermometer. The water rising by capillary attraction keeps the bulb constantly wet. When the air is dry, evaporation from the muslin is rapid; and, on account of heat lost by evaporation, the wet bulb thermometer indicates a lower temperature than the dry one. When the air is damp, the evaporation is slower, and the difference between the two thermometers is smaller. When the air is completely saturated with moisture, the evaporation ceases entirely, and the two thermometers are equal.

Though these instruments are so simple, they are some of the most important ones in use; not the most important, however, for, to that honor, is reserved the barometer, an instrument too well known to need description here. WARREN.

Crawling and Gathering up of Varnishes.

Says Arlot's "Manual for the Coach Painter:" A varnish has crawled, when, after being spread, its surface presents portions which have contracted. This is sometimes due to the inferior quality of the varnish, but more generally to coolness in the temperature. In winter this accident happens where there are unequal thicknesses of varnish.

Therefore, we must avoid: too thin coats in cold weather; the exposure to the air, of a body, before the varnish has had time to become somewhat hard; the direct action of the sun.

A slight crawling may be remedied by an increase of heat, in the drying room for instance. But when the defect has disappeared, we must avoid any chilling by cold, because there would be no further remedy. Therefore, the proper temperature must be kept up till the varnish is hard. It is then polished, and after further hardening, it must receive a fixing coat, and be rubbed and varnished for the last time.

If it be not possible to remedy the crawling by the above process, the defective parts must be removed with a knife, washed with a rag without lint, and varnished again with a small brush. When these parts are dry, they are smoothed with a pumice stone, and rubbed with a rag and pumice-dust before striping.

In the case of a general crawling, there is no other remedy but to wash off all the varnish with turpentine and a linen rag, providing the varnish has not hardened too much. Then, allow the panels to dry, and polish.

But when the varnish has set so that it cannot be dissolved, let it dry, then scrape it, pumice, and paint again.

Of all the accidents which may happen to the coach painter, crawling is the most troublesome.

Jarrah Timber.

There are on view at Melbourne, Australia, three logs of Jarrah timber, sent there by the government with a view of exhibiting the capabilities of this remarkable wood. A Melbourne paper states: the logs are about twenty feet in length with a diameter of about twelve inches, and, having been sawn down the full length and polished, exhibit the splendid grain of the wood to great advantage. Any person glancing at these piles would never believe that for more than a quarter of a century they had been submitted to the continued action of salt and fresh water, in which the dreaded *teredo navalis* abounded, as there is not the slightest sign of any deterioration having taken place. The wood is as firm and solid as when first hewn. The grain is close, of a fine dark color and taking a rich polish. There can be no doubt that these piles have been in use as long as stated, as each pile bears a written certificate from an officer of the Western Australian Government to that effect. They were driven in the year 1840 and taken up in 1870, having been thirty years in use, subject to the influence of wet and dry, air between wind and water, in salt water and fresh. They are polished on one side to show the small effects of thirty years' wear and tear. The point has not been altered in any way, but is as it was driven in 1840. The head is also in its original state, it having been used as a fender pile. It is stated that not only does this timber withstand the attacks of the *teredo navalis*, but it is also impervious to white ants. In Western Australia, if deal be used for building purposes, it is totally destroyed within twelve months by the white ants which abound, and consequently jarrah is principally used for building purposes and is found to answer admirably. The valuable properties of this wood are attributed to its containing a powerful astringent gum, which acts as an insect poison; and in order that this might be fully ascertained, a chemical analysis was supplied to the Western Australia Timber Co. by the Hon. F. P. Barlee, Chief Secretary of that colony. It was as follows: "In accordance with instructions received, I have made a qualitative analysis of sundry specimens of the jarrah, with a view of obtaining, from its chemical composition, actual proof of the existence of the principle which renders the timber impervious to the action of dry rot, and proof against the attacks of the *teredo navalis* and the white ant. I find that the duramen contains from 16 to 20 per cent of an astringent gum, sparingly soluble in alcohol, but completely so in boiling distilled water. Upon further analysis, this gum was found to consist almost entirely of coloring matter and a highly astringent vegetable acid, which may be termed jarrah tannic acid, inasmuch as it possesses some of the characteristics of tannic acid, together with other reactions peculiar to itself. I have failed to discover an alkaloid or organic base (although several different processes have been adopted), since, after the separation of the gum albumen, and coloring matter, I obtain nothing more than traces of saccharose and glucose, with fatty matter, which in the present inquiry are of little or no importance. It is therefore evident that the active principle of the jarrah is the powerfully astringent acid, which, uncombined with any base, is suspended in the gum, and thereby uniformly diffused throughout the tissues of the wood, in a thin section of which innumerable translucent particles of the gum may be seen by the aid of a small convex lens."

Manufacture of French Nails.

French nails, says the *Mechanics' Magazine*, are manufactured at Charleville, partly in large factories by machinery, partly in a multitude of small factories, or rather *atêliers* scattered about the densely-peopled villages. These villages, and especially one of them, Neufmanil, are not only inhabited by people, but by an *ouvrier* class of dogs. The labor of these dogs, whose hours are as exactly regulated as those of their human fellow laborers, consists in furnishing motive power to the bellows, which fan the furnaces of the *atêliers*. They get inside a wheel, and turn it, just like squirrels in a cage.

There are four stages of each day's labor. The first lasts from 5 to 8 A.M.; the second, from 8:30 to 12 P.M.; the third, from 1 to 4 P.M.; the fourth, from 4:30 to 7 P.M. Each dog works during two stages only. The early dog, who works from 5 to 8 A.M., misses the second stage, and is not employed again till 1 P.M. The dog who begins his day's work at 8:30 misses the third stage, being reserved for the fourth.

Another peculiar feature of the nailmaking industry is, that each workman or woman belonging to a particular *atêlier* has to furnish a fixed and equal daily supply of fuel to keep the furnace going, which is consumed, whether the individual contributor works or not on any particular day. As the workpeople are paid by the quantity of nails each produces, the burning of their fuel, whether they work or not, acts as a strong stimulant to continuous labor.

WONDERS OF THE HEAVENS.—There may be seen at present, soon after sunset, the planets Jupiter, Mars, and Venus, and the Moon, all careering magnificently in their orbits, Mars in the east, Venus in the west, and Jupiter about in his zenith, with the moon rising toward her meridian. They all seem nearly in a direct line in the heavens, and are, when unclouded, remarkably brilliant, affording a rare and beautiful sight, such as we are not often favored with. This attractive display may be observed for several evenings to come. Saturn does not rise until toward morning, and Mercury rarely appears to the naked eye.

THE drying of grapes, for making raisins, is becoming a large industry in California, the highly saccharated juice of the American grapes peculiarly fitting them for the purpose.

Improved Self-centering Saw Arbor.

The saw arbor, illustrated in our engraving, has a self centering device which, we think, will commend itself to mechanics, as a neat, durable, and exceedingly convenient attachment, calculated to obviate the trouble, time, and expense of centering saws by bushing in the old method; and, being entirely confined to the loose collar which holds the saw, capable of universal application without change of arbors.

Figs. 1 and 2 are, respectively, a perspective view and a section, showing the form and application of the improvement.

The arbor, A, is turned off at the end, to form a shoulder against which the back of the inside half, B, of the collar rests, as indicated in the engraving. The outer half of the collar is formed hollow, and in its interior is arranged a series of steel points, C, supported in a movable inside collar or ring, D, from which their ends project, the ends being beveled off as shown in the engraving. A thin steel washer is riveted to the back side of the ring, D, to support the points in position, and still to allow them to spring slightly inward with any pressure upon their outer beveled ends, so that they will press closely down upon the arbor, A, when in use.

A coiled spring, E, is arranged within the opening at the rear of the ring, D, which presses the ring out even with the face of the collar, F; while guide screws, G, are set at the side of the opening, on which the ring can slide back and forth, and by means of which it is retained within the opening, and also prevented from turning round. The saw is arranged upon the arbor between the two halves of the collar. The bevel points enter the eye of the saw should the eye be of greater diameter than the arbor, and the saw will be properly centered and supported by the bevel points.

As the nut, H, is screwed on, the two parts of the collar clamp and hold the screw, I, in the usual manner. The points and ring recede into the opening, so that the former project only just far enough to retain the saw at its proper center.

Patented, Dec. 6, 1870, by James B. Heald, of Milford, N.H., whom address for further information.

Fig. 1

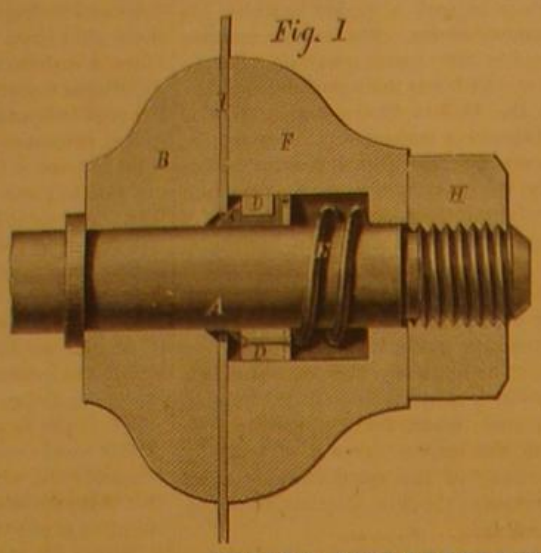
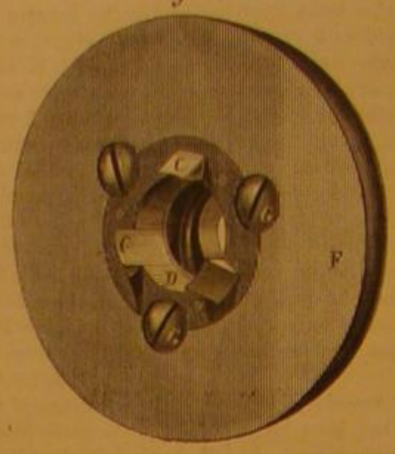


Fig. 2



HEALD'S SELF-CENTERING SAW ARBOR.

Improved Flower and Tree Tub.

This is a very neat device, and one which obviates several difficulties which florists experience in the management of wooden tubs. Among these may be mentioned the dropping of hoops, the decay of the upper ends of the staves, and the difficulty of removing a large plant without too great disturbance of its roots.

The construction of this tub will be readily understood by reference to Figs. 1 and 2—Fig. 2 being a section showing the method of holding the parts of the tub together.

These parts are the bottom, the staves, the top rim, the bottom rim, and vertical rods, with nuts which hold the whole structure firmly bound together.

The bottom plate or rim is of galvanic or tinned cast iron, and provided with legs, as shown. Upon its upper surface is cast a groove, into which the lower ends of the staves fit. Within the staves, the bottom plate presents a ledge upon which a perforated wooden bottom rests when in use.

The upper rim is also made of galvanized or tinned iron, and has, cast upon its under side, a rim suited to receive the upper ends of the staves, the whole being held together by vertical rods and nuts under the bottom plate, as shown in Fig. 2. The upper plate is also provided with convenient handles cast upon it, as shown.

The bottom, being movable, can be raised when it is desired to take out a plant, raising with it the ball of earth, without breaking it.

The upper ends of the staves are measurably protected from the action of weather by the iron rim, and their decay is thus retarded. The top and bottom rims being supplied, any ordinary carpenter can furnish the staves, or replaces such as may give out before the others.

Patented, March 12, 1867, by Jesse Booher. For rights to manufacture and sell on royalty, for territorial rights, or for further information, address Hoglen & Houck, 28 Wyandotte street, Dayton, Ohio.

Fig. 1



Fig. 2



BOOHER'S FLOWER POT AND TREE TUB.

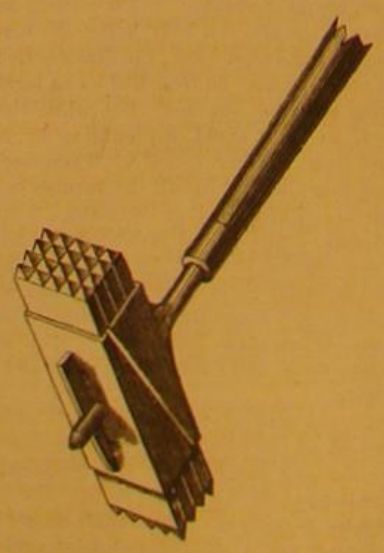
Imagination in Science.

Professor Tyndall will eventually have much to answer for. He has lent his authority to the admission of imagination in the pursuit of science, and there is every prospect that people whose imaginative faculty is stronger than their habit of observation, will give us all plenty to do. We shall not only have to question nature, but we shall have to eliminate imagination, and thus have two battles to fight for truth. Our medical friends have not always walked in the ways of rigid observation and induction, but if any one desires to see how easy it is for the imaginative faculty alone to tell us all we require to know, we commend to his perusal a communication in the *Mobile Daily Register*, from Dr. Cochrane, on the subject of yellow fever, well written and interesting, and giving what may be called an account of yellow fever from the imaginative side. The author justifies his position by the example of European names; tells us candidly that he states only "what he believes but does not know," and then takes his flight into the unknown. He imagines "the yellow fever poison to be composed of living germs in innumerable number, living organisms of inconceivable minuteness, which eat, and drink, and multiply their generations under the sun, just as other living creatures do with which we happen to be familiar." He connects his speculations in these matters with similar speculations about "contagia" and disease "germs," which are well known on this side of the Atlantic, and without paying any attention to facts regarding yellow fever, and other diseases which are left untouched by any extant doctrine, he tells us truly that "the visions of modern science are more wonderful than the visions of Eastern fable." This may be true, and the visions themselves may be true; but, for people who feel that they must walk over the earth in search of truth, nutriment of this kind is by no means sufficient for mental sustenance.

We have no desire to undervalue the importance of the imaginative faculty in scientific pursuits; but papers such as the one before us raise some very important primary questions. Are we to live, scientifically, in the same way as alchemists and astrologers did in the middle ages? and are we to ignore all that Bacon and Newton have done for us? If it be true that there is no royal road to knowledge on the firm earth, it is certain there is no such road through the air. Let us use the imaginative faculty, by all means; but, in doing so, let us take our stand on the firm ground of the known before we venture ourselves into the unknown.—*Nature.*

Furrowing Hammer for Stone Dressing.

This tool consists of a handle and two clamps, brought forcibly together by a key driven into a slot, cut through the end of the handle, which projects through the clamp. The handle passes through four four-pointed chisels, as shown, the holes being formed in the centers of the chisels, so as to bring their points into a common plane. The use of the tool is apparent from its construction. It is the invention of Lewis Sauers, of Mount Joy, Pa.



Facts about Copper.

Prof. Dembrinsky contributes to the *Mechanics' Magazine*, the following facts about copper:

Copper is malleable, flexible, and ductile, though inferior in these respects to silver. It is of specific gravity 7.780 to 8.534.

A wire of 1-10in. will support a weight of 299¼ lb. It melts at 27 deg. Wedgewood.

Exposed to fire it becomes bluish, yellow, and at last violet. When in contact with coals, it gives a greenish blue tinge to the flame, and if kept long in fusion, a part is volatilised. Heated in contact with air, it burns at its surface and becomes changed into an imperfect blackish red oxide, which by a more violent heat is converted into a brown glass or more perfect oxide.

If melted and cooled slowly, it forms in quadrilateral pyramids. It has no action on water, yields oxygen to many of the other metals, but takes it from mercury and silver. It combines readily with sulphur, forming a very fusible mass termed sulphuret of copper; it also readily unites with phosphorus, forming a gray, brilliant phosphoret of copper.

It is acted on by sulphuric acid only when concentrated and very hot, when it is oxidised by it, and affords blue crystals, being the sulphate of copper, blue vitriol, Cyprian vitriol, or blue copper, which is largely used for medical purposes and by metal workers.

It is attacked by diluted nitric acid with effervescence, abundance of nitrous gas being emitted; and a blue solution is thus obtained, yielding crystals of nitrate of copper of a grass green color.

Ammonia does not dissolve the oxide of this muriate with the same facility as that of other cupreous salts.

When acted on by the acetic acid, it is corroded, and yields the substance known as verdigris. Being combined with oxygen it becomes more readily soluble in vinegar. The oxide of copper dissolved in vinegar forms the acetate of copper, distilled verdigris, or crystals of Venus. The blue solution of copper indicates the less, and the green the greater degree of oxygenation.

The fixed alkalies and even many neutral salts act on it, and, it is said, act most powerfully in the cold and when it is exposed to the atmosphere. It is also readily acted on by rancid fats and oils, forming powerful poisons. It is precipitated, from the solutions, in its metallic form by a clean plate of iron, the iron, covered by copper, being known by the name of copper of cementation.

With the earths it unites only by vitrification. It mixes with most of the metals, forming with arsenic or zinc, the white tombac; with bismuth, an alloy of a reddish white color with cubic facets; with zinc, by fusion, brass; with a solution of quicksilver, it acquires a white surface. On the precipitation of the quicksilver, it easily unites with tin, and on this depends the art of tinning. Fused with tin it forms bronze or bell metal; alloyed with silver it is rendered more fusible.

When copper is added to gold, the gold is hardened and its color hightened.

Copper precipitates silver from the solution in nitric acid. This method is used to separate the silver after the operation of parting.

Copper filings being added to caustic spirit of ammonia, no solution takes place except air be admitted; and if this be admitted only for a short time, and though the solution takes place, it remains colorless, but if air be admitted, it becomes a color varying from blue to the deepest red.

Animal substances contain it, and it exists in the vegetable kingdom, even in vegetables supported merely by air and moisture.

If, to the solution of copper filings, fresh filings be added before it has been too long exposed, it will lose its color and only regain it by admission of air. Copper is used and applied for various domestic uses, medical purposes, and generally in the arts.

Value of Scientific Knowledge to the Clergy.

The Rev. William F. Morgan, D.D., Rector of St. Thomas Church, Fifth avenue, in this city, one of the very largest churches in New York, in a recent letter renewing his subscription to the Scientific American, pays the following graceful tribute to the value of science to the clerical profession:

"In my opinion the best investment that any clergyman could make would be to subscribe for the Scientific American, and gather from its ample pages, the actual advancement of mind, and the development of the inventive faculty, and the amazing combinations of power, skill, adaptation, and practical usefulness, which almost any recent discovery, or even improvement, would disclose. Except in the Bible, the doctrine of man's immortality is nowhere better taught than in those imperishable institutions and careful, beneficent studies, which result in honor to the man and good to the race."

Scientific American.

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PISCICULTURE IN NEW YORK AND NEW JERSEY.

It has long been seen by naturalists that the propagation and cultivation of fish is as much within the limits of possibility as poultry or pork growing. It has, however, taken much experience, and long study of the habits of the various kinds of fish desirable for human food, to bring the art of pisciculture to a point where it may be said to be uniformly successful, as the growing of pigs or chickens. If this point be not already reached, it evidently will be ere long. Already the advances made are very great, and every year adds to the general stock of knowledge upon this important subject.

It seems odd to speak of domestic cod fish or tame pikes, yet these things are realities, and, if we are to believe statements made by those who ought to know, the quality of the cod is greatly improved by selecting his diet for him instead of leaving him to the full gratification of his natural tastes.

The oyster has long been systematically raised, and it is a well known practice, in some parts of the country, to fatten these delicious bivalves with Indian corn meal, sprinkled upon heaps of them in a cool cellar. We do not believe the story told us by an Eastern knight of the quill, about a tame clam that has been taught to stand on its head, and to count any number up to fourteen at word of command; but we see no reason to discredit the statement that codfish may be rendered so tame, that they may be picked out of the water by hand when wanted for the table. We have seen fish in ponds so tame that they would take food from the hand, and might have been seized, if it had been desired to do so.

Fish are not only wholesome but very cheap food, and those now engaged in preserving the fish in our waters, from wanton waste, and stocking our rivers with valuable food varieties, are doing a public service, which, in a few years, will result in immense benefit to rich and poor alike.

We are led to these observations by a glance through the reports of the Commissioners of Fisheries of the States of New York and of New Jersey. In both these States, the most reckless prodigality in fishing formerly prevailed. Fish were taken in the spawning season, and their eggs thrown away to fertilize land. Large and small fish were indiscriminately seized, in season and out of season. Dams were built across streams, for private benefit, without regard to obstructing the passage of fish ascending to upper waters to deposit their spawn.

The Commissioners are changing this state of affairs, and inaugurating a new and more provident system. Their labors have been severe in combatting old prejudices and obstinate resistance on the part of ignorant fishermen, who could at first see in the action of the Commissioners only an arbitrary encroachment upon their rights, instead of a wise protection of the natural store upon which their business depends.

We think no one can read the reports alluded to, without being convinced that the two commissions named are doing a great public service.

Of all the edible fishes which ascend from the sea into our fresh-water streams, the shad is the most valuable, and, perhaps, as yet, the greatest mystery to naturalists. Whatever unknown substances constitute his bill of fare, they are certainly of a kind to impart to his flesh a flavor gratefully acceptable to the human palate. It would seem strange that the principal food of this fish has never yet been determined. Rarely one rises to the fly of the fisherman, or seizes upon the minnow, designed to entrap some other member of the finny tribe, but this is evidently when, for want of his favorite diet, the keen demands of appetite have driven him to extremity.

Much speculation and study have as yet thrown but little light upon the food of the shad. The report of the New Jersey commissioners states that "stomachs of shad captured in the Delaware river, one hundred miles from the sea, are frequently found filled with a green slimy mass, which is proved, by microscopic examination, to be composed of half digested fragments of the *ulva latissima*, a well known marine aquatic plant, common on our coasts. In one examined by the commissioners, May 16, 1870, at Howell's Fisheries, located at Fancy Hill, six miles below Philadelphia, the entire stomach was filled with a soft, pultaceous, salmon-colored, unknown substance."

Whatever it is, their food evidently exists in large quantities. The prolific character of the shad is also noteworthy. There is no doubt whatever that the annual catch may be doubled or quadrupled, in all our Atlantic streams, by efforts such as the Commissioners are now making. The character of these efforts has been heretofore explained at length in this journal, and hence need not be dwelt upon here. Their importance will, however, be better appreciated when we state, on the authority of the Commissioners, that the price of shad has risen from six to sixteen dollars per hundred in the lower waters of the Delaware river, and to thirty-five dollars in the upper portion. Similar advances in price have been made in shad caught in the Hudson. These advances are chiefly attributable to the reduction of the supply, though of course, partly to increased demand.

The system of gilling seines is notoriously destructive and obstructive, and the Commissioners are laboring to correct its abuses, in which labor they should have the countenance and support of all good citizens.

IRON RAILS FOR COMMON ROADWAYS.

There exists a growing belief that iron rails might be advantageously applied to country roads, making tramways whereon heavy loads could be drawn by horses, at all seasons of the year. The condition of the majority of American roads in rural districts during the spring and fall rains, and subsequent to the fall rains, before the snow fills up the ruts, is almost indescribably bad. At their best, these roads exact very much from teams and vehicles, but at the seasons mentioned, they are in many cases wholly impassable to loaded wagons; and nearly all of them are in such a state as to render traveling upon them most disagreeable and tedious.

If it can be demonstrated that iron ways will wholly remedy, or greatly mitigate, this evil, such roads would doubtless meet great favor, as substitutes for the now discarded plank roads, provided their cost could be brought within due limits.

Mr. J. R. Garretsee contributes to the American *Rural Home* (Rochester, N. Y.), an article in which some statistics, bearing upon this subject, are given. In the article referred to it is stated, on the authority of a committee of the Farmers Club, that the cost of hauling produce to market, in the county of Monroe, N. Y., is $150,000 per annum more than it ought to be, were the roads such as they should be. This extra cost would, according to the report of the committee, construct over forty miles of macadamized road each year, at a cost of $3,500 per mile, or one hundred miles of gravel road.

Mr. Garretsee has made a computation relative to the marketing of the produce in a single town (Parma), in Monroe Co. This town has a road running through its center, from Lake Ontario, on the north, to the Erie Canal and New York Central Railroad on the south, with a gradual rise of 160 feet in the entire distance. Cross roads connect with it, and the road is considered as a fair average sample of earth roads throughout the country. "This road," says Mr. Garretsee, "is, when needed most, simply—*awful*."

Over this road are transported, annually, twenty thousand tuns of produce, at a cost of $30,000, estimated on the low basis of $1·50 per tun. This is considered to be at least double what the same transportation would cost on a good macadam road.

But Mr. Garretsee goes further, and advocates an iron road, as cheaper and better, and more easily kept in repair than any other road of equal efficiency. The road proposed should, he thinks, take the center of the highway, and should resemble in its main features the tramways now used by city horse-railroad companies, except that the rails should be made a trifle lighter, and about one inch wider. The track between the rails should be of broken stone covered with gravel, the whole to be one foot in depth. The estimate made of the cost of such a road is $7,000 per mile.

The article closes with an extract from a letter written by a correspondent of this journal, demanding the invention of a rail suitable for such roads. Mr. Garretsee will find, also, an editorial article calling attention to the improvement of country roads, by this means, on page 169, Vol. XIX., of the SCIENTIFIC AMERICAN.

While we concur in the opinion that iron rails, of some kind yet to be devised, properly laid, would make an excellent road for farmers' use, it is evident to us that many of the advocates of the system do not appreciate all the difficulties in making such roads. These difficulties are none of them insurmountable, yet they should be thoroughly considered. To omit their consideration will be to insure failures, in the first attempt at the introduction of such a road system, which we hope will be avoided.

It is true that on country roads the bulk of freight is carried in a single direction, but to neglect provision for loads in the opposite direction, would be excusable only after careful consideration of the subject had demonstrated the disadvantages of such a provision to be greater than the advantages. Turn-outs, at reasonable distances, or other contrivances, calculated to subserve this end without the cost of double track all the way, will doubtless be forthcoming when inventors see there is a demand for them.

Again, country roads are much more affected by frost than the more thoroughly drained city roads, and are also liable to become covered with ice and frozen mud—a difficulty experienced on city tramways in winter, and one which often entails large expense and trouble. Concave rails, which have been suggested by some, would be particularly liable to fill and clog. Convex rails require grooved or flanged wheels, not to be thought of for ordinary vehicles; and the flat rail, with vertical flange at the outside, is probably the best form that could be employed.

The preparation of the road bed is also a work which must not be underrated. This should be done to such a depth, and with such materials, as to secure permanency. Thoroughness at the outset will save much cost and trouble in subsequent repairs.

If roads of this kind be properly constructed, they would, in our opinion, prove useful and economical in thoroughfares subjected to considerable travel. At any rate, we should be glad to see the experiment tried in some enterprising locality, and we hope Mr. Garretsee, will succeed in his attempts in Monroe Co. In this matter, as in others, actual experience is better than all theorizing, as establishing the value or worthlessness of a system.

FIRING OF STEAM BOILERS.

Of the firing under steam boilers, much has been said and written in works upon steam engineering, and plain, practical directions for the proper performance of this work have, in various forms and connections, been given in this journal. This is one of the things, however, upon which a paper like the SCIENTIFIC AMERICAN, which aims to instruct all classes of mechanics and workmen, must perforce repeat its precepts. Every year brings forth a new crop of boiler tenders who have to be instructed in regard to their duties from some source. Many of them are ignorant as horses, of the laws of combustion, or the la s of steam; and bad firing must be said to be the rule rather than good firing, so far as this country is concerned. Judging also from complaints on this score in English journals, that nation of steam users is not much better off than ourselves. We shall endeavor to make our remarks on this subject as practical as possible, only referring to theory when necessary to give point to practical directions.

Passing by the kindling of the fire, which requires no particular skill, the regulation of the thickness of the stratum of fuel on the grate, and the supply of fuel to the furnace, next claims attention. The additions of fuel should be made to that portion which lies at the front of the grate, especially when draft holes, at back of the grate, are not used. The fuel thus placed on the front of the grate becomes coked, as it were, before being spread over the grate. In the coking process, the products, first driven off from the coal by the effects of heat, which would otherwise pass out of the chimney as waste fuel, commonly called smoke, will get a supply of air from the apertures in the furnace door sufficient to nearly, or quite, consume them.

When the fuel is of such a character that coking cannot be done in the manner described, it should be spread evenly all over the grate, and maintained at as uniform a thickness as possible. We are believers in pretty thick firing, and would hardly recommend a thickness of less than eight inches in moderately large grates, unless under exceptional circumstances; and in no case should fuel be carried more than a foot in thickness in the furnace of any land boiler.

The next thing is the adjustment of the dampers to supply the proper amount of air to the fuel, and here is where most inexpert boiler tenders fail lamentably. Every pound of air allowed to enter the furnace more than is practically found necessary to consume the fuel at the required rate of consumption carries off with it heat, which should be applied to making steam. But while boiler tenders are to blame in this matter, it must be confessed that the construction of some furnaces is such as to render the proper regulation of air admission a thing of much difficulty. Grates are often too long in proportion to their width, and in this case, when air is admitted only at the front, more air than would be necessary on a short grate is required in order to keep the combustion perfect at the rear of the furnace. The loss of heat from the improper regulation of the draft is often enormous. The dampers in front should be kept as nearly closed as possible, consistently with the maintenance of a clear uniform bright fire on all parts of the grate.

Another great fault in firing arises frequently in the use of a boiler too small to generate the steam required with economy. The boiler tender finds that he cannot keep the steam up to the required pressure without forcing the firing beyond the point of highest economy, and, we may also add, the limit of safety, for there is no doubt that the forcing of boilers beyond their capacity is a fruitful cause of explosions. When firing is forced, the gases of combustion pass with excessive rapidity through the uptake, and do not so nearly impart their full measure of heat to the surfaces over which they pass. This can be easily proved by examining their temperature with a thermometer inserted in the uptake. It will be found that the more the firing is forced beyond a certain point, the greater will be the volume, and the higher will be the temperature, of the gaseous products escaping in a given time.

Loss of heat is sustained in slicing the fire, etc., and this loss is lessened in proportion to the rapidity with which the

operation is performed. It is of the utmost importance that the flow of air through the grate should be free as possible, and, therefore, the slicing should be done thoroughly, but as quickly as practicable. This is a point, however, which is more generally complied with than the more important ones above insisted upon.

A difference of twenty-five per cent in economy between good and bad firing might undoubtedly be often discovered; and, we believe, that with the greater proportion of large-sized boilers used in this country, the wages of skillful firemen might be doubled or trebled with profit, rather than substitute for such men those who are either ignorant of their duties or unfaithful.

ARTIFICIAL STONE.

The future material for houses and engineering structures in this country is evidently artificial stone. The wages of stone cutters and the high price of labor generally must determine this question. It may be well, therefore, to consider some of the inventions, that have been made within the last few years, looking to a solution of the important problem. Artificial stone can now be made in Europe of undoubted strength and durability, and cheaper and better than hewn stone. We understand that in this country satisfactory experiments have been made, and there is every probability of a general acceptance of this material as soon as the public are made aware of all the facts of the case.

We do not propose to enter into a history of all of the mortars, cements, concretes, and the like, that have been made since the time of the Romans, but to speak of some of the modern experiments that have attracted the most attention from engineers. Perhaps the best known cement or artificial stone is the *Béton-Coignet*. We have had occasion to witness the preparation of this celebrated building material in Paris, and have examined some of the constructions in that city and elsewhere, and can therefore speak from personal observation. *Béton* was introduced into France about thirteen years ago, by M. Coignet. There was much opposition to it at first, and it was only cautiously tried on constructions of little importance.

This caution was well founded, as the first mixture was unsatisfactory, because it was made of coal cinder with lime, and was not found to work well. By progressive experiments and changes of constituents, M. Coignet finally hit upon a mixture that was able to resist all extremes of weather, and to withstand the severest tests that could be applied to it. It is of this invention that we propose to speak. *Béton-Coignet* is a mixture of a large proportion of sand with a small percentage of lime, to which is added a little cement, the quantity of the latter varying with the amount of hardness or the rapidity of setting required; it may be said to be an artificial stone, formed of sand, lime, and water, capable of being used in blocks or in continuous masses, for foundations, walls above and below ground, sewers, water pipes, floors, pillars, arches, embankments, aqueducts, reservoirs, cisterns, and the entire walls of buildings, bridges, tunnels, flagging, and, in fact, all structures ordinarily made of brick or stone. It is a mortar in which only a very small quantity of water is employed to moisten the lime and sand, and in which the materials are ground in a mill to a stiff paste, and compacted into forms by heavy blows of a peculiarly constructed mallet. As we witnessed the operation in Paris, it did not appear any more difficult than ordinary mortar making, only that there was more machinery used in the *béton*.

On the average, 1·31 bushels of the mixture of sand, lime, and cement, make a cubic foot of *béton*, which will weigh about 140 pounds, and offer a resistance of 2½ tuns per square inch; while ordinary mortar, formed of the same constituents, will exhibit very insignificant powers of resistance. It will be seen that the weight of a cubic foot is less than that of ordinary building stone, while its resistance to pressure is greater. In mortar, a large quantity of water is employed, and this, on drying, leaves a porous mass, which possesses very slight resisting power. The cost of *béton* in Paris, two years ago, was from $5 to $8 per cubic yard. We have in former numbers of this journal given some account of the manner in which artificial stone is made, but the revival of interest in the subject will warrant us in refreshing the knowledge of our readers on the subject. Great care should be taken in selecting the ingredients. The lime should be hydraulic, in fine powder, well screened to preserve it from lumps; and river sand should be used when feasible. The grinding mill employed in France is not unlike the one used in porcelain manufactures. It consists of an iron cistern, the bottom of which is perforated, and in the center of which revolves a vertical shaft, armed with knives, and a board, which in each revolution discharges a part of the paste. There is a penstock covering the outlet, to regulate the discharge of the *béton*. The ingredients are measured into the mixing mill in barrows, and during this process, small quantities of water are gradually added. Very much depends upon the care bestowed upon this part of the work, as it is essential that every particle should be moistened, in order that the setting may be more rapid and the stone become harder. As good or bad bread can be obtained from the same flour, according as the kneading is well or imperfectly done, so a hard or a crumbling cement can be made by entirely or partially moistening and mixing the ingredients. The plastic material from the mill is thrown into a mold in thin layers, and each layer, as it is laid on, is beaten and compressed by the regular and even blows of a sixteen pound hammer. The successive layers are cross cut, as in plastering, in order to insure their firm adhesion. The form of the mold must depend upon the proposed use of the stone. In buildings it may consist of close boarding, kept in place by cross bracing, and may be made to carry complicated ornaments, cornices, and tracings, that would be very expensive if they were to be wrought out of solid stone. Fine specimens of statuary have been made of the well mixed material. The arches of the basement to the Paris Exhibition of 1867, which constituted a perfect labyrinth, and were of great extent, were formed of five parts sand, one of lime, and one fourth cement. In no other way could these vast constructions have been completed in time for the exhibition. They were visited by thousands of persons interested in the subject, and did more to dispel doubts and satisfy engineers than any previous works constructed of this material. The work was done with amazing rapidity, as the centering was often struck within ten hours after the *béton* was got in place, and the passages were ready for service in four or five days after their completion. The embankment at the Trocadero in Paris, for a quarter of a mile, is supported by a wall of *béton* forty feet high, and one of the bridges over the Seine is built entirely of the same material. In Egypt, the very sands which threatened to destroy the Suez Canal have been appropriated to the manufacture of sea walls, embankments, lighthouses, and vast constructions, by this system of Coignet.

In view of all these facts, it is not surprising that so much attention should be bestowed upon artificial stone in this country. It cannot be long before we shall discover a cement equal to the best Portland, and the ingenuity of our inventors will soon supply improved machinery for working up the ingredients. In the construction of the sewers, boulevards, and heavy embankments of the upper part of the island of New York, it is worth while to consider whether the artificial stone is not the best material that could be employed. In the far West, where stone is scarce, there can hardly be a doubt as to the value of *béton* for building purposes. We have chiefly confined our remarks to the *béton*, because that is most familiar to us, but we do not intend to disparage other inventions, which are making their way to popular favor, and appear to be worthy of all that has been said in their praise. The subject of artificial stone is well worthy the attention of our engineers.

SUGGESTIONS FOR THE IMPROVEMENT OF RAILWAYS.

As usual after the occurrence of any severe railway accident, the recent disaster on the Hudson River Railway has showered upon us a large number of suggestions relative to the improvement of railways and their management, so as to obviate such disasters in the future. A great many of these suggestions emanate from men who have no practical knowledge of railroading, and so little theoretical knowledge as to render their suggestions of no value.

There are others, however, worth consideration. A Boston correspondent, referring to the numerous accidents which have lately occurred in depots, by passengers stepping into or off from cars in motion, thinks railroad companies are morally responsible, if not legally so, for accidents of this kind, since such accidents, resulting from carelessness or imprudence of passengers, might be prevented by a change in the construction and arrangement of platforms in the depots.

He points out the fact that the platforms are now placed so as to leave a space of about two feet between them and the cars. Persons walking along the edge of these platforms are liable to slip and fall off under the cars, and be injured, and are sometimes crowded off in the rush for seats in trains.

He suggests that a uniform height for platforms in depots should be adopted, at least on the same road, and that perforated shield plates be attached to both sides of cars, extending laterally so as to reach over and a little beyond the edges of the platforms, and joining the steps of the cars in a proper manner. Also, that shield plates be placed between connected cars, to prevent passengers from falling between them; and that, also, a bridge with side railings should be placed between connected cars.

He further suggests that cars should always be coupled and uncoupled from above, instead of from the side as is usually the case, and thinks the details of these improvements will offer little difficulty to engineering skill, and entail very little additional cost upon railway companies.

THE BATTLE OF THE TIRES.

The question of rubber tires for traction engines is one now hotly disputed on the other side of the Atlantic. This is about how the matter now stands.

First, the advocates of the soft rubber tires claim that the experiments performed at Rochester, described in one of our late issues, were made in the interest of Aveling and Porter, and that they were not fair, as the proper proportions of the tires were not observed, as they are on the Thompson road steamer. Further, it is claimed, as proof that the manufacturers of the rigid tired wheels are really convinced of the value of the rubber tires, that Messrs. Aveling and Porter have purchased a license to use such tires from Mr. Thompson, the patentee. The first of these statements is replied to by a denial; and the second is answered by a statement of Messrs. Aveling and Porter that they do not avail themselves of their license to use rubber tires, because they are not yet convinced of their durability and efficiency.

A correspondent of the *Engineer*, writing from Glasgow, over the signature of "Old Traction Engine Driver," asks a series of questions, which, by implication, may be fairly translated into statements in regard to rubber tires, as follows:—A 6-foot Thompson's tire weighs 6 cwt., and costs 2*s.* a pound, or thereabouts. The tires of the Thomson engine, with their armor, cost £200—that is, about $1,050 in gold. He further states, by implication, that the rubber tires, when left to rest in a damp and warm atmosphere, spontaneously evolve the sulphur they contain, and decay, and that the use of the armor reduces the tractile power of the wheels, while to omit the armor insures the speedy destruction of the rubber tires. He adds that, in his opinion, Mr. Thomson's tire possesses certain advantages over ordinary iron tires, which, under most circumstances, are not worth the first cost of the rubber, even if the rubber could be got to last, say for three years, and under no circumstances are worth the first cost, seeing that the performance of the costly tires cannot be depended on for even a few months. He thinks that, in about a year, the present purchasers of Thomson's tires will be less pleased with them than they are now. The replacement of a new set of tires will be found a rather costly item in repairs.

We give these statements for what they are worth. They are not made in that spirit of candor which appeals to the inborn sense of truth; and yet they certainly represent an existing doubt whether the rubber tires do not cost more than they repay in practice.

There are so few of these engines in use in this country that we must rely, for the present at least, upon the facts received from foreign sources, in making up our judgment. The correspondent referred to assumes to speak from the card, and yet we feel that it would not be safe to found a judgment upon the statements he makes.

Per contra, we find a letter in *The Engineer*, in which the writer gives his experience as entirely favorable to the durability of the rubber tires, both with and without armor. He has found the breakages to be confined chiefly to shoe-plates and rivet links. He has worked the tire continuously from Sept. 20th to the date of his letter (March), without material reduction in its thickness through wear, and he ascribes the trouble hitherto met with in the use of these tires to the fact that, their proper consistency not being fully ascertained, some blunders were necessarily made in this particular. The tires described by this correspondent have, he says, drawn a load of from 13 to 14 tuns, gross; 260 journeys of 7 miles each (1,820 miles, up a gradient of 1 in 10, most of the way), with a consumption of coal averaging 700 lbs. per day, from 5 A. M. to 2:30 P. M. The external surfaces of the tires are, he states, only slightly marked, while the surface next the rim of the wheel is as smooth as when first put on.

The *Irish Farmers' Gazette*, of March 18th, contains an extract from the *Scotsman*, describing a very successful experiment with a Thompson road steamer made in Dunmore Park, on the estate of the Earl of Dunmore—this gentleman having invented an improvement on the shoes heretofore employed to prevent their slipping on wet grass. Lord Dunmore's invention consists in an addition of "clams" to the shoes surrounding the india-rubber tires, converting them, as it were, when the steamer is used in plowing, into hob-nailed shoes.

The journal quoted, says:—"The field to be broken up had lain in pasture for 40 years, and had not been plowed since 1831. It was therefore extremely tough to work, and the ordeal was great both to the road steamer and the plow.. It had also rained heavily all the morning and all the previous night and day; and as the field had never been drained, it afforded ample opportunity for the verification of the evil prophecies of those who had declared that no traction engine could drag itself, much less a plow, over such land. The engine, however, steamed down the field in the easiest and smoothest manner imaginable, and its work was admirable. The furrows, 6 inches by 10, were beautifully turned over, closely packed, giving a nice shoulder and a capital seed bed. Notwithstanding all the adverse circumstances, there was not a hitch but what would have occurred to an ordinary swing or double-furrow plow. Horses brought into the field in the morning sunk into the soil three inches."

The rapidity with which the work was performed, and the number of furrows simultaneously turned, are items not mentioned in the extract alluded to, so we can form no opinion upon the results of the experiments in these particulars.

The old proverb, "that there are two sides to every story," is singularly illustrated in this controversy. Time will be the arbiter of this, as of other questions of importance. The evidence is not all in yet.

EMPLOYMENT OF FEMALES IN NEW YORK.

The labor of women is largely employed in this city, the constant immigration keeping the market overstocked, and preventing anything like a rise in wages. Of 24,000 hands, distributed among the trades of bonnet-frame making, paper-box making, bookbinding, paper-collar making, shoe fitting, cap making, hotel and restaurant attending, artificial flower making, hair weaving, and lace sewing, we find that the earnings generally average about seven dollars per week, for work of ten hours per day. Putting such peculiar and limited trades as satchel sewing and type setting out of consideration, it must be admitted that the average wages paid to women are small, and that employers get full value for their money. A good shoe-fitter will earn $20 or $22 a week; a lace sewer almost as much; while the run of wages to women compositors is about 20 per cent below men's. A great many females are employed in tobacco stripping—work so simple that mere children can do it, and the pay is from $3 to $5 per week. The wages of paper-collar makers are no higher, and this large trade employs 4,000 hands in the city of New York.

The *Star*, to which we are indebted for some of the above figures, states that "no girl, who values her health, should work at folding and stitching."

The condition of many of these working girls is one of extreme hardship. Many are constantly out of employment, and when employed, their wages scarcely suffice to supply

them with food, clothing, and lodging, even of the plainest kind. The benevolent and philanthropic are, however, endeavoring to ameliorate their condition, and it is to be hoped that a better day is dawning for women and girls obliged to support themselves by the labor of their hands.

SCIENTIFIC INTELLIGENCE.

FIVE MILLIARDS OF FRANCS.

The indemnity to be paid to Germany by France is said to be five milliards of francs, and as this sum exceeds the ordinary transactions of life so greatly as to be unintelligible, a German scholar has founded some calculations upon it for the edification of his countrymen. We give it for what it is worth. The weight of five milliards of francs, in gold twenty franc pieces, is 3,548,380 pounds, and it would require a train of 322 average freight cars to transport it. The same sum in silver five franc pieces would weigh 55,000,000 pounds. A practised teller can count out 40,000 francs an hour in five franc pieces; assuming that he were to begin his counting at 25 years of age, and to work steadily eight hours for 300 days in the year, he would not complete his task until he had passed his 77th birthday. If laid down in one franc pieces, so as to touch each other, the line would extend 71,461 miles, nearly one third of the distance from the earth to the moon. In gold twenty franc pieces, the line would be 3,262 miles long. Finally, if we call to mind that since the birth of Christ not one milliard of minutes has passed away, we can understand that, if for every minute, day and night, since the commencement of the Christian era, a five franc piece had been laid aside, we should not yet have extinguished the debt of France."

MANGANESE IN VEGETABLES.

It has generally been stated that manganese does not occur in vegetables, but recent researches go to show the error of this assertion. In examining beech wood which was grown on soil containing manganese, near the University of Göttingen, also near Geissen, too much manganese was found to be considered accidental. Finally, beech nuts from the famous park of Blenheim, in England, have been shown to contain manganese as a regular, fixed constituent. From these observations, it would appear that this metal is a constituent of a certain species of tree, and it is probable that it will be found in other varieties, if search be made for it. The question is interesting, from an agricultural point of view, and may lead to ingenious experiments.

EXAMINATION OF PHARMACEUTISTS.

We have been shown the examination papers of the recent graduates of the College of Pharmacy, in New York, and must say that we find the questions thorough and searching. Any student who could answer all of these questions must be regarded as fully entitled to a diploma from the trustees, and the compounding of medicines may be safely intrusted to his charge. We give below some of the questions, for our readers to try their hands at answering, selected at random from a long printed list:

What is glycerin, and how is it prepared?

How much iodine is required to prepare 2 drachms of iodide of iron?

What are the different kinds of fermentation and their products?

What is the best antidote in poisoning by arsenic, and how is it prepared extemporaneously?

Digitalis: Definition, natural order, habitat, medical properties, officinal preparation, doses.

Opium: Definition, natural order, commercial sorts, alkaloids, tests, symptoms of poisoning, antidotes, incompatibles, medical properties, names and strength of official preparations, and their doses.

What is the officinal name for calomel? preparation? common impurity? how detected?

What is the characteristic difference between decoctions and infusions?

What is pyroxylin? how prepared? properties and uses?

What are the equivalents of the kilogramme and gramme in grains, and what are the equivalents of the liter and cubic centimeter in grammes?

GAS FROM THE RESIDUUM OF PETROLEUM.

What to do with the heavy tar left in the retorts after the naphtha, kerosene, and other products have been distilled off, has occupied oil dealers ever since the introduction of petroleum as a burning fluid. A number of patents have been taken out, covering various uses, but the most valuable is probably the conversion of the residuum into illuminating gas. This is a vey simple and neat operation. It is only necessary to heat the oil in a suitable retort, pass it through a scrubber, and thence directly to a gas holder. As it has already been distilled at a high temperature, the lighter and more inflammable oils have been removed; and there is no sulphur or ammonia requiring expensive purifiers. The whole operation can be conducted as readily as the distillation of resin, and affords a gas so rich that ordinary burners cannot be used; but in their places, tips, consuming only one foot per hour are substituted. Gas from coal requires a five feet burner to produce the same illuminating effect as can be obtained from one foot of the gas from petroleum. A number of towns, large factories, schools, and private dwellings are lighted with this gas, and as the explosive mixtures are previously removed in the original refining of the crude petroleum, there is not the same danger as we have pointed out in the case of naphtha, gasoline, and air light. Where a sufficient supply of this residuum of stills can be had, it ought to afford a pure and cheap light.

A New Water Meter.

One of the most comprehensive and interesting papers on mechanical subjects which we have met with, is that of Mr. Fred. E. Bodkin, on "Water Meters," read before the Society of Arts, in London, Feb. 12th. It shows very thorough knowledge of the various principles employed in Europe to solve the very knotty problem of measuring, under pressure, the flow of water through pipes. In this paper the uses of water meters are succinctly set forth, and then the leading principles of construction of all the principal meters is described, their deficiencies and defects explained. The merits of a new invention in this line are emphatically extolled by Mr. Bodkin, who says:

A great step in the removal of the defects, both in this and every other meter yet introduced, is exemplified in an invention by Messrs. Cook and Watson, a meter which has only lately come before the public notice. It consists of an upper plate, indented on the under side with a ring of thumb holes, and riding loosely in a chamber over a lower plate, through which inclined inlet holes are bored. The water rises through these holes, raises the upper disc, and, acting against the square ends of the thumb holes, causes it to rotate at the same time. This action, of course, requires some small power to commence, but as soon as the upper plate is lifted it must also necessarily rotate. When the supply ceases the upper plate falls, and forms a tight valve against the return of the water; and since, during its period of revolution, this plate floats in a film of incoming water, there are no wearing surfaces involved in the machine. Small stays are placed on the upper surface of the revolving plate, in order to produce regularity of motion under varying pressures, and appear, from the specimens I have at different times been enabled to test, to do so with complete success.

These machines are not expensive, and offer but small opposition to the flow of liquid, and certainly appear to be the simplest and most practicable form of high-pressure meter yet invented.

The Chronopher.

"Greenwich time" is kept all over England and Scotland by all the railway, postoffice, church, and watchmakers' clocks. The time is sent daily, at 10 o'clock, from Greenwich Observatory, all traffic over telegraph wires used for the purpose being suspended at 9·58. Sixteen of the most important cities are in direct communication with Greenwich, and places through which the wires pass are aware of the completion of the circuit which announces 10·0 o'clock. The principal London watch and chronometer makers, such as Dent, Vulliamy, Barraud, Walker, Frodsham, and others, are communicated with even more frequently. Guns are fired at the ports of Newcastle and Shields at one o'clock daily by the same means. The clock at Greenwich, which automatically sends the time, is called a chronopher, and is corrected to a variation of a twentieth part of a second in a week.

This is an useful arrangement in England, where the country is so small that one uniform time can be kept without varying more than a few minutes from solar time, even in the most distant cities. But it could not be practiced in the United States. No assimilation over a part of the country would do anything but confuse and perplex the public; and if the clocks of San Francisco kept New York time, they would vary from solar time, by a difference of more than three hours.

A State Reward for Inventions.

The Legislature of New York has now before it a bill to encourage the invention or discovery of new and better methods of propelling canal boats. The bill offers *fifty thousand dollars reward* for the best plan, and has passed to its third reading in the Assembly. During the discussion, one of the most experienced and intelligent members spoke of the importance of this proposition to inventors. He knew the $50,000 would be a mere bagatelle to the real value of such an invention, but he was frank to say that he did not believe the State would soon be called upon to pay that $50,000. Such an invention would be worth millions of dollars, and whoever could produce what was wanted, ought to be paid $1,000,000, instead of $50,000.

Another member announced his willingness to vote for the bill, but at the same time, from what he had seen in the days of his youth, when passenger packets were on the canals, he did not believe the speed looked for could be secured without washing the banks of the canals.

We believe that some of our ingenious readers are competent to study out the solution of this problem, and we advise them to try. Unless an attempt is made, nothing will be accomplished. One of the good effects of the offering of specific rewards for special inventions is that careful study is induced, which leads to useful results, in some direction or other. Many unexpected and useful discoveries have thus been made.

Cutting Glass by the Blowpipe Flame.

At a recent meeting of the Albany Institute, a member exhibited specimens of glass cutting by the use of the blowpipe, which is specially adapted to cutting tubes of all sizes, thick or thin. A sample of a tube cut spirally in this manner has been sent us. The tube is about 1¼ inches in diameter, and is cut from end to end in a spiral, the cuttings not averaging more than ¼ inch in distance from each other. The cutting is done by directing the point of the blue flame against the side of the tube. Instantly, a small check or crack is formed, which may then be led in any direction by directing the point of flame to the part to be cut. In dividing thick and large tubes, it is advised to begin by separating them into large sections, and afterward subdividing these sections, till the required length is reached.

The Lenox Library.

The munificence of private citizens of the United States in their gifts for public purposes has often brought forth expressions of astonishment and admiration from European and other travelers who have paid us visits; and certainly the liberality of the donors, and their more rare and good judgment are matters of which we have right, as a nation, to be proud. Mr. James Lenox, a very worthy and wealthy citizen of New York, purchased a block of ground fronting on Fifth avenue, between Seventy-first and Seventy-second streets, and facing the Central Park; and arrangements have been consummated, and plans drawn, for the immediate erection of a library building, massive and solid in construction, and of grand and imposing proportions. Lockport limestone will be the material used, and the building will be fire-proof. The ground and building will cost, in all, about $1,000,000, and the work will be commenced at once.

TENNESSEE INDUSTRIAL EXPOSITION.—A grand industrial exposition of the mechanical, mineral, and manufactured productions and arts of Tennessee will be held at Nashville, May 8 to 27, 1871. Circulars containing rules and instructions, with full information, may be obtained by addressing Tennessee Industrial Exposition, Nashville, Tenn.

THE importance of cotton seed for oil manufacture is appreciated in England, the annual production of oil having reached 20,000 tuns.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

671.—HANDCUFF AND SHACKLE.—J. J. Tower, Brooklyn, N. Y. March 14, 1871.

675.—PRINTING MACHINE.—C. T. Bainbridge and R. P. Yorkston, New York city. March 14, 1871.

688.—REFINING AND PURIFYING CAST IRON.—James Henderson, New York city. March 15, 1871.

689.—PRINTER'S COPYING INK.—C. McIlvaine, Wm. McLloyd, and F. J. Firth, Philadelphia, Pa. March 15, 1871.

699.—FORMING ELBOWS AND BENDS IN METAL PIPE.—Charles Hoeller, Cincinnati, Ohio. March 16, 1871.

704.—COUPLINGS FOR HOSE AND OTHER PIPES.—P. Barnes, Jr., Troy, N. Y., now residing at 8 Southampton Buildings, in the county of Middlesex, Eng. March 16, 1871.

727.—DRIVING MECHANISM FOR SEWING MACHINE.—A. W. Harris, Providence, R. I. March 17, 1871.

737.—MACHINE FOR SPINNING, WINDING, AND DOUBLING FIBROUS MATERIAL.—George Draper and W. F. Draper, Hopedale, Mass. March 18, 1871.

740.—MANUFACTURE OF TEXTILE FABRICS.—George Merrill, New York city. March 18, 1871.

747.—NAIL-CUTTING MACHINE.—Oscar Mussman, New York city. March 20, 1871.

749.—FASTENING AND SUSPENDING WINDOW SASH.—P. W. Gates, Chicago, Ill. March 20, 1871.

755.—BREECH-LOADING FIREARM.—W. C. Dodge and P. T. Dodge, Washington, D.C. March 20, 1871.

Foreign Patents.

The population of Great Britain, is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars, with full information on foreign patents, furnished free.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.]

1.—TURNING CURVED PLUNGER.—Will Mr. Patten tell us how he would finish the plunger, where the flange plate is attached to it?—S. G. S.

2.—ELECTRIC CURRENTS.—If, as is claimed by some, electricity does not consist of two currents in opposite directions, how is it that a card punctured by the passage of a discharge from a Leyden jar is equally burned upon both sides?—F. I.

3.—CEMENT FOR LEAKS IN GAS HOLDERS.—I wish a good cement for the above purpose. I have tried many recipes, but the oil from the gas either softens everything I have used, or the cements crack, when hard, from the working of the holder.—F.C.

4.—DIAMETER AND PITCH OF TOOTHED WHEELS.—Will some one give me a short and accurate way of determining the diameter of cog wheels, pitch and number of teeth being given; and, *vice versa*, to get the pitch, the diameter and number of teeth being given? I have the tables of given numbers, but these I do not happen to have with me at times—probably when most wanted. I know the rule: Set off 7 times the pitch on a straight line; divide same length into 11; each division equals 4 teeth on the radius; but this is incorrect in small wheels or pinions. Is there not some short and accurate rule that a man may think of at any moment, without tables, etc?—J. W.

5.—SHELLAC POLISHING.—How ought I to prepare shellac for polishing on a wheel?—J. L.

6.—ANNEALING STEEL.—What is the best way to anneal cast steel for filing or drilling, so as to remove the little "pins" appearing usually in steel, which a file will hardly touch?—F. A. K.

7.—PLASTER MOLDS.—What can I add to plaster of Paris, when mixing it for molds, that will enable it to withstand the action of water at 212° Fah?—G. M.

8.—POLISH FOR WOOD IN THE LATHE.—I wish a recipe for a transparent polish to be applied to wood, while in the lathe, after it is turned, and which requires a nice finish.—W. H. B.

9.—CASE-HARDENING IRON.—Will some expert in processes of this kind favor me with instructions how to harden iron in the various ways found valuable?—E. B. T.

10.—WHITE GLUE.—How is white glue made? Full details of the process are requested.—J. F. H.

11.—WANTED.—By that large class who are under the sad necessity of using crutches, some device to protect the clothing, around the arm, from the wear and tear consequent upon their friction.—CONSTANT READER.

The Philadelphia "Sunday School Times" says Of Geo. P. Rowell & Co., of New York: "They are the most enterprising, prompt, systematic, and reliable advertising agents with whom we are acquainted. We have had some most satisfactory dealings with them, in some extensive advertising plans in our own business."

Business and Personal.

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Only $1,500 for a Patent of a Valuable Tool. Can be cast, or will be sold in State Rights. J. F. Ronan, Station A, Boston, Mass.

A. G. Bissell & Co., East Saginaw, Mich., manufacture Packing Boxes in shooks.

Wanted.—A first-class Draftsman and Calculator. One acquainted with drafting iron hulls, etc. None other need apply. Address, AT ONCE, with best references, W. S. Nelson, No. 618 N. Main st., St. Louis, Mo.

Parties manufacturing machines adapted to boring small cylinders, are requested to send illustrated circulars to J. E., Drawer 116, Bridgeport, Conn.

Wanted.—A situation as Analytical Chemist. Good references furnished. Address "Chemist," P. O. Box 60, Haverhill, Mass.

Commercial Travelers, Carpenters, Hardware Dealers, and others, address for sample of the best Sash Lock and Catch yet made Charleton & Woodbury, New Britain, Conn., or Madison, Wis. Contains no spring, and but one movable piece. Can be applied to any window in five minutes.

Wishing to increase my business, I desire to make arrangements with some responsible Sewing Machine Manufacturers, to furnish them with needles. All work warranted. Address E. S. Hill, S. Abington, Mass.

Bok & Bennett are dealers in Patents, and introducers of patented articles, 238 Broadway, New York.

Models in Miniature.—Wanted, working models of Steam Engines, Agricultural Implements, or any machine directly applied to agricultural purposes. Inventors and Patentees will please address circulars to Senor de Moncada, Grand Hotel, Broadway and 31st st., New York.

Manufacturers of Corn, Cotton, and Seed Planters (everywhere) send address and circular to Levi Scofield, Watertown, Wis.

Newton's Principia.—Wanted, a copy of this work. Address Publisher SCIENTIFIC AMERICAN, 37 Park Row, stating price.

Mechanical Draftsman wanted.—One experienced and expert in getting up machinery will find permanent employment, with liberal weekly pay. Address E. H. Stearns, Erie, Pa.

To Club Agents.—Those who have raised Clubs for the SCIENTIFIC AMERICAN, and others, can make it pay to take a Local Agency for the publications of S. R. Wells, 389 Broadway, New York. They are popular, practical and useful. Inclose stamp for terms.

A person with a knowledge of Chemistry, and 30 years' experience in Electro Plating (with some practice in Nickel Plating), is open to an engagement on reasonable terms. Address "Chemist," New Haven, Ct.

Superintendent Wanted.—An energetic man, capable of superintending a factory. Must have a general knowledge of mechanics. One familiar with the manufacture of horn, shell, or vulcanite preferred. The very best reference required. Address "Horn," P. O. Box 2674, New York.

Machinery for the manufacturing of all of kinds of Rubber Goods, made by W. E. Kelly, New Brunswick, N. J.

See advertisement of L. & J. W. Feuchtwanger, Chemists, N.Y.

Carpenters wanted—$10 per day—to sell the Burglar Proof Sash Lock. Address G. S. Lacey, 27 Park Row, New York.

Manufacturers' and Patentees' Agencies, for the sale of manufactured goods on the Pacific coast, wanted by Nathan Joseph & Co., 619 Washington street, San Francisco, who are already acting for several firms in the United States and Europe, to whom they can give references.

Pattern Letters for Machinists, Molders, and Inventors, to letter patterns of castings, all sizes. Address H. W. Knight, Seneca Falls, N. Y.

Improved mode of Graining Wood, pat. July 5, '70, by J. J. Callow, Cleveland, O. See illustrated S. A., Dec. 17, '70. Send stamp for circular.

All parties wanting a water wheel will learn something of interest by addressing P. H. Walt, Sandy Hill, N. Y., for a free circular of his Hudson River Champion Turbine.

Self-testing Steam Gage. There's a difference between a chronometer watch and a "bull's eye." Same difference between a self-tester and common steam gage. Send for Circular. E. H. Ashcroft, Boston, Mass.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

E. Howard & Co., Boston, make the best Stem-winding Watch in the country. Ask for it at all the dealers. Office 15 Maiden Lane, N. Y.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

Walrus Leather, for Polishing Steel and Plated Ware, at reduced rates. Greene, Tweed & Co., 19 Park Place.

Oak-Tanned Leather Belting.—We make an extra quality, cheapest for the consumer. Greene, Tweed & Co., 19 Park Place.

Gage Lathes for Broom and other handles, Chair Rounds, etc. Price $20. With attachment for Nail work, price $30. Also, Wood-turning Lathes. A. L. Henderer & Co., Binghamton, N. Y.

E. P. Peacock, Manufacturer of Cutting Dies, Press Work, Patent Articles in Metals, etc. 55 Franklin st., Chicago.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

Dr. E. F. Garvin's Tar Remedies cure Gout and Rheumatism. Sold by Druggists.

Inventors' Coöperative M'f'g Co, 258 Broad'y. Send for circular.

H. S. Redgrave, Norfolk, Va., would like information as to the most improved process or apparatus for drying fruits, either by steam, hot air, or other means.

Wanted, a man, fully up to the times, who has acted as Superintendent of a Gun or Sewing Machine Factory, to take charge of a shop. One fully competent to set up the machinery and break in the help. Address H. H., 35 Bond st., N. Y.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro., 414 Water st., N. Y.

Improved Foot Lathes. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Cold Rolled-Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

Keuffel & Esser 116 Fulton st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., 25 Whitney ave., New Haven, Conn.

Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N.Y. (Send for Circular.)

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N.Y. Send for catalogue.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

2d hand Worthington, Woodward and Novelty Pumps, Engines 25 to 100 H.P., 60 Horse Loc. Boiler. W. D. Andrews & Bro., 414 Water st., N.Y.

English and American Cotton Machinery and Yarns, Beam Warps and Machine Tools. Thos. Pray, Jr., 57 Weybosset st., Providence, R.I

Winans' Boiler Bowder.—15 years' practical use proves this a cheap, efficient, safe prevention of Incrustations. 11 Wall st., New York.

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year

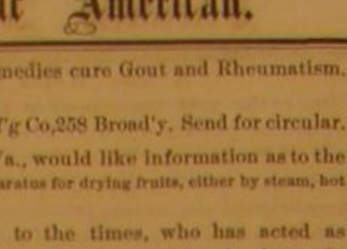
Answers to Correspondents.

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.

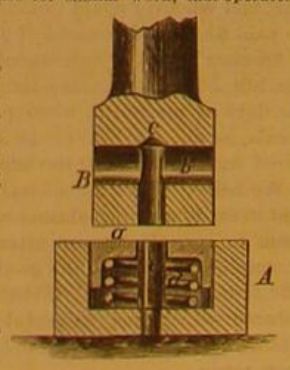
SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

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

CUTTING SMALL BRASS SCREWS.—L. C. D. asks for a plan to cut small brass screws, fine thread and true, in a quick and reliable way. I submit drawing of tool that is simple, and that will do good work if given half a chance. On the threaded end of the spindle of hand lathe, A A, a hub, *a*, is screwed; said hub is threaded on its outer surface, the same pitch being given as is required on the bolts to be cut. The hub has a square, tapered socket formed in its free end, for the retention and driving of the bolt, *b*; the bolts to be turned and chased should have one end squared to fit the socket in *a*. The chaser holder, B, is constructed, as shown, with two boxes, one of which carries the guiding chaser, the other the cutting chaser. The guiding chaser, *c*, meshes into the hub, *a*; the cutting chaser, *d*, cuts the bolt, *b*. A proper rest, or support, for the holder should be provided. The great difficulty which amateurs experience, in using a chaser, is to properly start the thread. This tool overcomes the trouble, and, with a little practice, by its use a true thread can be cut without failure.—W. P. P., of Pa.



CUTTING BLANKS FOR TOOTHED WHEELS.—In the SCIENTIFIC AMERICAN of March 25, B. B. S. desires a plan to cut blanks of small toothed wheels and to punch the center hole at one operation. I send a drawing of a method, now in use for similar work, that operates well. The lower die, A, cuts the outside of blank; the small punch, *i*, is rigidly adjusted in the center of die, A. A flanged disk, *a*, is provided of proper size to slide in die, A, and and over punch, *i*. A stout spiral spring, preferably of steel, supports the disk, *a*, level with the upper face of the die, A. The upper punch, B, has a longitudinal hole of the size of punch, *i*, drilled in its center; a transverse hole or opening, *b*, is cut to intersect hole, *c*, and should be of sufficient size to permit the waste cut by punch, *i*, to pass out. The spring, *d*, should be of sufficient strength to remove the punched blank from die, A, by forcing up disk, *a*.—W. P. P., of Pa.



TEMPERING CHISELS MADE FROM OLD FILES.—Tempering cold chisels made from old files, would, to a very great degree, depend upon the quality and temper of steel from which the files are made. If the chisels are made from saw files, draw your steel down, at a very low heat, to the shape or form required, and let them get cold. Then grind, or rub with sandstone, at least two inches up from the cutting edge, till bright, which enables you to see distinctly the change in color as it advances to the end. Heat them slowly, at least three inches from the point upwards, in a clean, low fire, till you get a cherry red heat through the body of the metal. Effectually cool them in clean cold water, one inch up from the point. Rub away the dirt from the surface with your sandstone, and the heat above will bring down your white, cool end, gradually and bodily, to a dark blue; cool off, and you have a good tool. If your files be small flats or rounds, run down your temper, by the same process, to a pale blue, and cool off. If your files be large, cool off at a dark straw color. These remarks apply only to files made from good material and on most approved principles. Should the nature of your steel by the foregoing process, require a higher or a lower temper, regulate it by the degrees of color in your tempering, but in no case make your steel too hot. But you may rest satisfied that if your files have been bad as files, they will not make good cold chisels. Want of precaution, ignorance of the nature of steel, and overheating and hurry in the hardening and tempering tools, have wasted thousands of dollars that would otherwise have been moving in the legitimate channels of commerce and trade. If you want a good tool, there must be no undue haste in making it; your steel should never be heated in a quick hot fire, from the fact that the point is hot before you have sufficient heat above to gradually bring down the temper. Besides, in this way, you do not get even the point heated as a mass. A hot, quick fire gives you a skim heat, and, if you adopt this process, do not charge the fault to the steel, but to your individual ignorance, carelessness, or undue haste, when your tools crumble off in bits at the points, and you have to spend more time at the grindstone than at the lathe or vise. All files for cold chisels should be annealed, though this is not necessary for lathe tools.—B. C., of Pa.

CUTTING FINE THREADED SCREWS.—L. C. D., does not give the length of the screws, nor state whether it is necessary that they should be cut sharp up under the head. If they are not to be so cut, a solid die, having three or four cutting edges in it, may be made to do the work by flaring out the three or four first threads, so that it will act like a female taper tap. If necessary to come sharp up under the head, use a second die that is not tapered out. Make the outside of the dies round, and on one side slot them right through to the center; then put them into a holder, having a set screw in it, and set them together, by means of the set screw, if they make the screw too large. Use them in the engine lathe with the screw gearing on, if necessary.—S. G. S., of Conn.

BOILER FURNACE.—N. H., with two boilers, will find that a furnace constructed as follows will answer his purpose: Fire the full width of both boilers with 7 feet grate bars, then let each boiler have its own draft of 2 feet 6 inches by 15 inches deep, a division wall running from the fire back to the end flue. Distance from back wall to boiler, 2 feet—or 3 feet would be better. Use good fire brick for walls.—G. D., of Miss.

J. G., of Miss.—We have no means of judging as to the durability of the cement you name. We certainly should not condemn it upon present information, and we should not praise it over others, even if we knew it to be superior. The proprietors of a good article need no gratuitous advertising from us.

YELLOW RAIN.—The yellow powder, observed by H. H. B., after the storm of March 8, 1871, at New Orleans, was the pollen from the blossoms of the forest trees of the Great Mississippi Valley.

J. L. & Son, of Md.—With the same mean effective pressure, and same amount of radiation, the indicated power of two engines will be in proportion to the steam consumed. A cylinder 7 x 9, making 300 strokes per minute, will, with equal mean effective pressure, give two and one fifth times as much power as a cylinder 5 x 10, making 240 strokes per minute.

W. A., of R. I.—The suggestions made in the article sent us on improved permanent way for railways, contain nothing substantially new. Stone supports for rails have been tried, but have not met with favor. Such a permanent way as you describe would cost more money than railway companies are willing to pay, and would, we think, be accompanied by practical difficulties unforeseen by you.

T. B. K., of Pa.—An inch rope laid upon a level surface, and long enough, so that its friction in moving would be greater than the tensile strength of the rope, would of course break before tension could be transmitted from one end to the other.

W. P., of Md.—Lightning conductors conduct only on their surfaces. A hollow tube slit longitudinally will conduct both on outside and inside surfaces, or if open at both ends will conduct on both sides. The resistances of conductors vary as their cross sections.

N. T. D.—We should prefer Bunsen's carbon battery to Daniell's for the voltaic arc experiment. Forty eight of Bunsen's elements have produced good results. We should not expect much success with fifty Daniell's elements.

H. B., of Pa.—We do not think tea is liable to become tainted with lead from the lead lining of the chests, unless, through leakage water should gain access to the contents.

Recent American and Foreign Patents.

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

DUMPING CART.—William Hand, Plainfield, N. J.—This invention relates to a new and useful improvement in dumping carts, whereby much time and labor is saved, and it consists in attaching the body of the cart to the axle and in connecting the "hind board" of the cart body with the shafts, attaching the shafts to the body, and in fastening the body of the cart down to the shafts by a hook which fastens automatically.

CONSTRUCTING WATER-PROOF CELLARS, CISTERNS, ETC.—Tobias New, Brooklyn, N. Y.—This invention relates to a new and useful improvement in the construction of water-proof cellars, cisterns, vaults, and all underground apartments for whatever purpose, whereby the bottom and walls of such cellars, etc., are made perfectly impervious to water.

ADJUSTABLE SEAT.—Louis Postaroka, East Cambridge, Mass.—This invention relates to a new and useful improvement in seats for pianos and other purposes, and consists in making the seat adjustable as to hight.

SWIVEL PIN FOR TETHERING ANIMALS.—William Lyon Troop, Camp I, Halleck, Nevada.—This invention relates to a new and useful improvement in a pin for tethering horses and other animals.

COMBINED WASHER AND WRINGER.—Cyrus E. Carter, Martinsville, Ohio.—This invention relates to new and useful improvements in machines for washing and wringing clothes, whereby convenience, ease of action, and expedition are secured.

AUTOMATIC CLOSING GATE.—Benoni F. Palmer, Baraboo, Wis.—This invention relates to a new and useful improvement in mode of hanging and operating gates, whereby the gate is made self-closing, and may be opened from either side or in four different directions.

COMB.—Leonce Picot, Hudson City, N. J.—This invention has for its object to avoid the corrosion of the metal strengthening backs applied to horn, bone, and composition combs, to permit warping, which is caused by the acids deposited on the combs in use, and it consists, in one case, in applying the stiffening ribs so as to be wholly covered by the substance of which the comb is made, and in another case, in providing a raised rib between the metal back and the base of the teeth, one on each side, to arrest the said deposit in advance of the metal backs, and prevent contact therewith.

PREPARING SILK AND OTHER TEXTILE FABRICS FOR PRINTING.—Louis Prang, Boston, Mass.—This invention has for its object to facilitate the proper printing of silks, laces, and other textile fabrics of a pliable character, in one or more colors.

ELECTRICAL GAS LIGHTING AND EXTINGUISHING APPARATUS.—John Vansant, San Francisco, Cal.—This invention has for its object to produce an apparatus by means of which gas can be lighted and extinguished on a suitable number of burners in rapid succession, and without requiring the handling of, or personal contact with, each burner or its gas pipe. The invention consists in the application to each gas pipe, or burner, of an electric apparatus, by means of which the valve, for admitting the gas to the burner or withholding it from the same, will be opened or closed whenever the currents are directed in the appropriate manner.

PADLOCK.—George Merkel and Charles H. Meyer, New York city.—This invention relates to a new padlock, and has for its object to make the picking of the same more difficult than in ordinary padlocks, and also to facilitate the operation of the same by the right key.

CLOTHES PIN.—K. H. Goss, Cedar Springs, Mich.—This invention relates to improvements in clothes pins, and it consists in a piece of wire having one or more coils at the center, and a sharp bend in each part below the coils at the termination of which the two parts cross, and beyond these bends the said two parts are bent backward beyond the coils, to form levers for opening the pin, and terminate in finger pieces suited to grasp between the thumb and finger for opening the bent parts below the coil for attaching to the clothes line.

AWNING FRAME FOR ANIMALS.—Simon Moffitt, Minneapolis, Minn.—This invention relates to an awning to be attached to the pole of a two-horse wagon, for the purpose of protecting the animals, when harnessed to the wagon, from the action of sun and rain.

CEILING FOR STAGES.—J. W. Dunne, New York city.—This invention relates to an improvement in ceilings which are to be used on the stages of theatres, opera houses, etc., to complete and perfect the display of scenery.

MATCH SAFE.—William Stine, Elmore, Ohio.—This invention relates to a new match safe, which is so constructed that the matches can successively and singly be removed from the same without requiring the opening of the main lid or cover.

WATER AND WIND WHEEL.—Andrew Folsom, Eastport, Me.—This invention relates to a new water or wind wheel, which is so constructed that it will serve to revolve its shaft whenever it is exposed to a current of liquid or air, whatever the direction from which the same may come.

WIND MILL.—Peter Bailey, Smyrna, Iowa.—This invention relates to a wind-mill constructed with a double wind wheel, the two parts of which are mounted, side by side, on the same shaft, and revolve in opposite directions. The apparatus is supplied with rudders, that have adjustable wings, by regulating which the wind wheels may be kept face to the wind, or inclined to the wind, or side to the wind, at pleasure, the wheels, when in this ast mentioned position, being stopped.

WINDOW-SILL AND FIRE-ESCAPE.—George Laynor and Harry Helmling, Baltimore, Md.—This invention consists in arranging in a window-sill, made as a box, and having a cover that turns back, and a side or sides that turn down, a fire escape ladder, so constructed that it may be folded compactly within the sill, and there stored till wanted for use, when the sill may be opened, and the ladder unfolded and let down the side of the building. The invention also consists in so constructing the ladder that the several sections thereof fold one within another, so as to occupy a minimum of space.

ILLUMINATING APPARATUS.—F. H. Lutkewitte, St. Louis, Mo.—This invention consists of a series of small hydrogen chambers, filled with absorbent, and arranged in a series of sections, which may be shut off from one another, to graduate the amount of oil through which the air passes, and its time of contact therewith, according to the temperature and season of the year.

CIDER OR WINE MILL.—W. B. Farrar, Greensboro, N. C.—This invention relates to a cider or wine mill, in which the unbroken fruit is first placed in a press-box, wherein, by the moving of the platen, it is fed up to the revolving grinding cylinder, and thereby reduced to pomace; and in which the pomace is then replaced in the same box, and, by the operation of the platen, forced again against the grinding cylinder, which now stands still, whereby the juice is expressed from the pomace, the same box thus serving to hold the fruit to both while grinding and pressing.

COTTON PRESS.—C. C. Conner, D.D., Ripley, Tenn.—This invention relates to an improvement in presses, in which the platen is raised and lowered by the action of two complementary sets of cables or ropes operated by one and the same set of vertical shafts, one set of ropes being unwound from the shaft as the other is wound upon them, and *vice versa*.

HAY LOADER.—L. D. Taylor, Granville Center, Pa.—This invention relates to a new hay-loader, which is to follow a wagon for the purpose of transferring the hay to the same. The invention consists in a new arrangement of inclined rake-heads, which receive their motion from two crank shafts, so that they will serve to elevate the hay gradually to the top of the wagon; also in the combination of the same with a fixed inclined platform having detaining teeth.

ROTARY STEAM ENGINE.—T. S. La France, Elmira, N. Y.—This invention relates to a new rotary engine, of the class composed of two toothed drums or wheels within a fixed case, the drums being revolved by the pressure of steam against their teeth.

LOOM.—W. R. Gifford, W. R. Gifford, Jr., and J. A. Gifford, Piscataqua Co., Me.—This invention relates to improvements in hand looms, and consists in certain novel arrangements of apparatus for setting the spring for acting the picket staves by the action of the lathe, the same being accomplished during the backward movement, so that on the forward movement, the whole power may be applied to the reed in beating up. The invention also comprises improvements in the arrangement of the driving shaft and the apparatus for operating the lathe by which the treddles and the yarn beam are operated, and it also comprises improvements in the part of the frame which supports the cam shaft and the yarn beam, calculated to facilitate packing for shipment.

FEEDER FOR NAIL MACHINES.—H. B. Landers, Williamsburgh, N. Y.—The object of this invention is to provide a mechanism whereby plate iron can be fed to the cutting apparatus of a nail machine at such regular intervals that the blanks can be cut therefrom with the desired velocity.

ASH SIFTER.—G. W. Rogers, New York city.—This invention relates to a new ash sifter, in which an oscillating sieve is employed, the same being supported on an U-shaped rock shaft, from which it can be readily detached. A very convenient and reliable ash sifter is thereby produced.

EEL TRAP FOR WATER PIPES.—J. J. Dutcher, New Haven, Conn.—The object of this invention is to provide an eel trap at the extreme end of the water pipe, let into a main or reservoir, so that the eels cannot enter a portion of the pipe.

BOLT.—William C. Coles, Williamsburgh, N. Y.—This invention has for its object to furnish a neat, simple, and convenient bolt for window sashes, doors, etc.

PLATFORM SPRING COUPLING.—Benjamin T. Parsels and John L. Hedges, Hanover, N. J.—This invention has for its object to furnish an improved coupling for platform springs, which shall be simple in construction, strong and durable, and which will allow the springs to lengthen under pressure, without twisting or straining them.

CHURN DASHER.—Stephen Stout, Tremont, Ill.—This invention has for its object to furnish an improved churn dasher, simple in construction and effective in operation, bringing the butter in a very short time, and gathering it, when brought, quickly into a mass.

FOUNTAIN PAINT BRUSH.—Daniel J. Kellogg, Toledo, Ohio.—This invention has for its object to improve the construction of the improved fountain paint brush, patented, by the same inventor, January 17, 1871, and numbered 110,978, so as to make it more convenient in use, and more effective in operation.

COVERING FOR MELTING POTS.—Albert C. Lewis, New York city.—This invention has for its object to furnish an improved covering for melting pots, to protect them from being injured by the intense heat, and by the adhesion of the coals.

ANIMAL TRAP.—C. R. Veronee, Athens, Ga.—This invention relates to a new and useful improvement in traps for catching rats and other animals.

SPINDLE BEARING.—Charles Wilson, Brooklyn, N. Y.—This invention relates to a new and useful improvement in bearings or boxes for upright spindles, in spinning frames in cotton or woolen manufactories, and for other upright journals.

TUBULAR STEAM BOILER.—James Howard and Edward Tenney Bousfield, Bedford, England.—This improved boiler is constructed of sections or a group of tubes, so arranged that the main connecting tube of each section will be in or approach a vertical position, with smaller tubes projecting from one side of it, say at right angles thereto, and secured to it by any approved method. The tubes which stand out at right angles to the main tube, we prefer to connect by water and steam warp with each other at both ends.

WAREHOUSE TRUCKS.—John S. Cochran, New York city.—This invention relates to a new and useful improvement in trucks for warehouses, stores, etc.

MILLSTONE BALANCE.—J. A. Althouse, New Harmony, Ind.—This invention relates to a new and useful device for balancing millstones, and consists in a weight or weights, made adjustable on the side or sides of the stone, by means of slotted bars and plates.

WAGON BRAKE.—Abraham Quinn, Brooklyn, N. Y.—This invention relates to improvements in brakes for wagons, and it consists in a shoe, suspended by bars from the axle eccentrically to the axles, so that when let fall under the wheel it will bind firmly against the rim, which said shoe is held out of action by a chain and hand lever, arranged for readily letting it fall in case the horses attempt to run, and the said shoe is connected by a drag chain to the check rein in such a way that when it falls down under the wheel to its working position, it will check up the horse.

ROTARY STEAM ENGINE.—William Barry, Carthage, N. Y.—This invention relates to improvements in rotary steam engines, and consists in a rotary hub or wheel, with a conical face, in which is a groove or channel for the steam, with taper sides, in which groove fills a tapered stop, for separating the live steam from the exhaust, projecting through a case, having an inner face corresponding to and fitting around the hub, in which are two pistons, on which the steam acts, fitted in grooves traversing the steam groove, and arranged for sliding out to pass the stop and in again by the action of a cam groove or a cam and a spring.

SAWING MACHINE.—Wm. W. Waterbury and Jno. M. Waterbury, New Canaan, Conn.—This invention relates to improvements in foot power circular sawing machines, and it consists in the application to a bench having the saw mounted in the usual way, and multiplying gear for increasing the motion, of a tread wheel on the main driving shaft, for applying the power by treading thereon.

EXTENSION LADDERS.—R. F. Delmot, Flemington, Pa.—This invention relates to improvements in extension ladders, and consists in jointing the sections together by means of trunnions on the one section, arranged in angle plates attached to the other sections, having right-angled slots, and arranged so that one part of the slot is parallel with the bars of the section to which the said plates are attached, and the other parts are perpendicular thereto; and to the rods connecting the bars, so that one section may swing on the other, and slide up and down on it.

MIXED FELTED GOODS.—Theo. Demuth, Danbury, Conn.—The nature of this invention consists in the preparation of woolen or cotton yarn, of different colors, to be applied to the wool in process of manufacture, for imparting the mixed character by a solution of gum shellac, or other suitable resinous or glutinous substance, for the purpose of keeping the same intact and distinct, and preventing the assimilation and entanglement of its fibers with those of the wool with which it is mixed, in the process of carding and fulling, thereby producing a new and distinct mixed felted fabric, which cannot be obtained with the same materials without such preparation of the yarn.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING APRIL 4, 1871.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT FEES

On each Caveat	$10
On each Trade-Mark	$25
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113,238.—MACHINE FOR MAKING BOXES.—E. G. Alden, Cambridge, Mass.

113,239.—MANNER OF PACKING AND CONVEYING ICE CREAMS, WATER ICES, ETC.—Ignazio Allegretti, Philadelphia, Pa. Antedated March 29, 1871.

113,240.—MAGNETIC-ELECTRO DIAL TELEGRAPH.—George L. Anders, Boston, Mass.

113,241.—STEAM COOKING RANGE.—John Ashcroft (assignor to Sarah Jane Ashcroft), Brooklyn, N. Y.

113,242.—FLUTING MACHINE.—S. William Babbitt, West Meriden, Conn.

113,243.—WINDMILL.—Peter Bailey, Smyrna, Iowa.

113,244.—BRUSH, BROOM, AND MOP HOLDER.—Charles L. W. Baker (assignor to C. L. W. Baker & Co.), Hartford, Conn.

113,245.—DAMPER FOR CHIMNEYS.—Peter Baker, Oakland, Md.

113,246.—POWER PRESS.—C. J. Beasley (assignor to Tappey, Lumsden & Co.), Petersburgh, Va.

113,247.—VALVE FOR STEAM PUMPS.—John V. V. Booraem, Jersey City, N. J. Antedated March 23, 1871.

113,248.—VALVE FOR STEAM PUMPS.—John V. V. Booraem, Jersey City, N. J. Antedated March 23, 1871.

113,249.—APPARATUS FOR CASTING.—John P. Broadmeadow, Bridgeport, Conn.

113,250.—MANUFACTURE OF SALT.—J. R. Buchanan, Louisville, Ky. Antedated March 21, 1871.

113,251.—CHURN.—W. E. Budd, Chatham, N. J.

113,252.—STEAM AND HYDRAULIC PACKING.—W. M. Canfield, Philadelphia, Pa.

113,253.—HORSE COLLAR AND HAME.—Otho Cann, Coldwater, Mich.

113,254.—WASHING MACHINE.—C. E. Carter, Martinsville, Ohio.

113,255.—ROLL FOR ROLLING HORSESHOE BARS.—Ebenezer Cate, East Woburn, Mass.

113,256.—PAPER-CUTTING AND FOLDING MACHINE.—Cyrus Chambers, Jr., Philadelphia, Pa.

113,257.—PAPER-CUTTING AND FOLDING MACHINE.—Cyrus Chambers, Jr. (assignor to Edward Chambers and Cyrus Chambers, Jr.), Philadelphia, Pa.

113,258.—RUBBER AND BRUSH.—Augustus Charles, Pittsburgh, Pa.

113,259.—GAITER.—Peter E. Clark, Hartford, Conn.

113,260.—DEVICE FOR PREPARING BEEFSTEAK FOR BROILING.—W. A. Clark, Woodbridge, Conn.

113,261.—SHOEMAKERS' PINCERS.—Alfred Clarke, Philadelphia, Pa.

113,262.—CUTTER HEAD FOR PLANING MACHINES.—Henry Climer and C. E. McBeth, Hamilton, Ohio.

113,263.—WAREHOUSE TRUCK.—John S. Cochran, New York city.

113,264.—BOLT.—W. C. Coles, Williamsburgh, N. Y.

113,265.—COTTON PRESS.—C. C. Conner, Ripley, Tenn.

113,266.—STOOL OR TABLE.—Albert O. Crane, Boston, Mass. Antedated March 24, 1871.

113,267.—CAMERA STAND.—Aylett R. Crihfield, Lincoln, Ill.

113,268.—STAVE JOINTER.—Harry A. Crossley, Cleveland, Ohio.

113,269.—CHEMICALLY-PREPARED LAMPWICK.—Aaron M. Daniels Hartford, Conn.

113,270.—SPRING FOR VEHICLES.—J. N. Decker (assignor to himself and Thomas J. Smith), Covington, Ky. Antedated March 21 1871.

113,271.—FLUTING MACHINE.—E. M. Deey, New York city.

113,272.—MANUFACTURE OF BILLIARD BALLS AND OTHER COMPOSITION ARTICLES.—Lewis Deitz, B. P. Wayne, and Albern Stone Albany, N. Y. Antedated March 23, 1871.

113,273.—EXTENSION LADDER.—R. F. Delmont, Flemington Pa.

113,274.—FELTED FABRIC.—Theodore Demuth, Danbury, Conn.

113,275.—SASH HOLDER.—John F. Dingee, Bedford Station N. Y.

113,276.—LITHOGRAPHIC PRINTING.—Otto Dubois, Fall River Mass.

113,277.—CEILING FOR STAGES.—John W. Dunne, New York city.

113,278.—EEL TRAP FOR WATER PIPES.—J. J. Dutcher (assignor to G. W. Dutcher), New Haven, Conn.

113,279.—PURIFYING ANIMAL CHARCOAL.—Hermann Eissfeldt, Solingen, Duchy of Brunswick, and Camillo Thumb, Magdeburg Prussia.

113,280.—BOLT HEADING DIE.—Philip Eley, New York city, assignor, by mesne assignments, to Charles Wallich, George Hicock, and Alexander Young.

113,281.—WATCH REGULATOR.—Julius Elson, Boston, Mass

113,282.—GATE.—J. B. Erwin, Pittsburgh, Pa.

113,283.—CIDER AND WINE MILL.—W. B. Farrar, Greensborough, N. C.

113,284.—WATER AND WIND WHEEL.—Andrew Folsom Eastport, Me.

113,285.—WAGON JACK.—George Benedict Fowler, Brooklyn, N. Y.

113,286.—HARROW.—William Fox, Beaver Dam, Wis. Antedated March 18, 1871.

113,287.—CHAIR.—George Gardner, Glen Gardner, N. J.

113,288.—LOOM.—W. R. Giffard, W. R. Giffard, Jr., and J. A. Giffard, Milo, Me.

113,289.—CLOTHES PIN.—Keyes J. Goss, Cedar Springs, Mich.

113,290.—RAILROAD CAR BRAKE.—John C. Gove, Cleveland, Ohio.

113,291.—PAPER FEEDER.—John A. Graves, Washington, D. C. Antedated April 1, 1871.

113,292.—FISH TRAP.—Job E. Hammond, New Bedford, Mass. Antedated March 24, 1871.

113,293.—DUMPING CART.—William Hand, Plainfield, N. J.

113,294.—GATE.—U. W. Hardy, Abingdon, Ill.

113,295.—PIN LOCK.—August Hermann and W. H. Taylor (assignors to the Yale Lock Manufacturing Co.), Stamford, Conn.

113,296.—GRAIN SCOURER AND SEPARATOR.—S. H. Hinsdell, H. W. Drake, and C. B. Way, Camillus, N. Y.

113,297.—WOOD PULP MACHINE.—W. M. Howland, Topsham, Me.

113,298.—TUBULAR STEAM BOILER.—James Howard and E. T. Bousfield, Bedford, England.

113,299.—AUTOMATIC APPARATUS FOR OPERATING THE VALVE OF THE EXHAUST PIPE OF LOCOMOTIVES.—Ralph C. Huse, Jr. Georgetown, Mass.

113,300.—BRICK AND TILE MACHINE.—William Hutchinson Salford, Great Britain.

113,301.—WINDOW BLIND OPERATOR.—George Jennisen and M. F. Otis, Westborough, Mass.

113,302.—MILK COOLER.—Nelson Johnson and R. E. Johnson, Jasper, N. Y. Antedated March 21, 1871.

113,303.—SASH HOLDER.—Wm. G. Jones and S. M. Rankin, Long Green, Md.

113,304.—COMBINED CHAIR AND STEP LADDER.—Ib Jörgensen and Rasmus Olson, Racine, Wis.

113,305.—FOUNTAIN PAINT BRUSH.—D. J. Kellogg, Toledo Ohio.

113,306.—CULTIVATOR.—A. H. Kennedy, Oberlin, Ohio.

113,307.—ROLLING BED.—Julius Krisch and Charles Thoener, New York city.

113,308.—POTATO DIGGER.—J. P. Lafreta, Shrewsbury, N. J

113,309.—ROTARY STEAM ENGINE.—J. S. La France, Elmira N. Y.

113,310.—FEEDER FOR NAIL MACHINE.—H. B. Landers, Williamsburgh, N. Y.

113,311.—FIRE ESCAPE.—George Laynor and Harry Helmling, Baltimore, Md.

113,312.—COVERING FOR MELTING POTS.—A. C. Lewis (assignor to himself, H. A. Richardson, and N. A. Boynton), New York city.

113,313.—CLOTHES PIN.—A. B. Lipsey, West Hoboken, N. J.

113,314.—MACHINE FOR TAPPING GAS AND WATER FITTINGS.—C. B. Long, Worcester, Mass.

113,315.—COVER AND DESK FOR SEWING MACHINES.—B. T. Loomis and J. A. Carey, New York city.

113,316.—COMBINATION LOCK.—Samuel Loyd, New York city.

113,317.—APPARATUS FOR CARBURETING AIR AND GAS.—F. H. Lutkewitte, St. Louis, Mo.

113,318.—SWIVEL PIN FOR TETHERING ANIMALS.—William Lyon, Camp Halleck, Nevada.

113,319.—PAPER BOX.—B. J. Magee and J. F. Wall, Watertown, Mass.

113,320.—COTTON SCRAPER, HILLER AND CULTIVATOR.—Cyrus Marsh, 2d, Natchez, Miss.

113,321.—HARVESTER RAKE.—Alexander McArthur, Booneville, Mo.

113,333.—PADLOCK.—George Merkel and C. H. Meyer, New York city.

113,323.—AWNING FOR ANIMALS.—Simon Moffitt, Minneapolis, Minn.

113,324.—FURNACE GRATE.—G. R. Moore, Philadelphia, Pa.

113,325.—MACHINE FOR WINDING BOBBINS.—F. H. Morrill, Philadelphia, Pa.

113,326.—MACHINE FOR CORKING BOTTLES.—David Mueller (assignor to himself and Franz Wagner), New York city.

113,327.—MODE OF PREPARING PAPER FOR PHOTOGRAPHIC PURPOSES.—P. H. Murray, Portsmouth, Ohio.

113,328.—WATER-PROOF CELLAR.—Tobias New, Brooklyn, N. Y.

113,329.—FIRE ESCAPE.—G. H. Nichols, Richmond, Va.

113,330.—COMB.—C. H. Noyes, Brooklyn, N. Y.

113,331.—ORNAMENTING THE SURFACE OF METAL BY ELECTRO-DEPOSITION FROM SOLUTIONS.—Richard O'Neil, New York city.

113,332.—MACHINE FOR ROLLING HOLLOW BARS FOR NUTS.—Jonathan Ostrander, Manchester, Va.

113,333.—EXTENSION LOUNGE.—J. S. Paine, Cambridge, Mass.

113,334.—GATE.—B. F. Palmer, Baraboo, Wis.

113,335.—PLATFORM SPRING COUPLING.—B. T. Parsels and J. L. Hedges, Hanover, N. J.

113,336.—LAWN MOWER.—E. G. Passmore, Philadelphia, Pa.

113,337.—STOP VALVE.—J. L. Peake, New York city.

113,338.—PORTABLE APPARATUS FOR PRESERVING WOOD.—W. T. Pelton, New York city.

113,339.—APPARATUS FOR STRIPPING THE TOP FLATS OF CARDING MACHINES.—E. C. Pfaff, Chemnitz, Saxony, assignor to Dobson & Barlow.

113,340.—COMB.—Leonce Picot, Hudson City, N. J.

113,341.—SHOVEL PLOW.—S. W. Pope, Louisville, Ky.

113,342.—ADJUSTABLE SEAT.—Louis Postawka, East Cambridge, Mass.

113,343.—PRINTING SILKS AND OTHER TEXTILE FABRICS.—Louis Prang, Boston, Mass.

113,344.—DRILL STOCK.—W. H. Rand, Brooklyn, N. Y.

113,345.—FIELD THRASHING MACHINE.—George Rieke, Kairo Township, Minn.

113,346.—PRINTING PRESS.—J. T. Robertson, New York city.

113,347.—CLOTHES-WRINGING PRESS.—Charles Robinson, Boston, Mass.

113,348.—RAILROAD CAR HEATER.—A. M. Rodgers, Brooklyn, N. Y.

113,349.—ASH SIFTER.—G. W. Rogers, New York city.

113,350.—MACHINE FOR CHANNELING AND BEVELING SOLES FOR BOOTS AND SHOES.—J. G. Ross, Philadelphia, Pa.

113,351.—FOOT SCRAPER.—August Sahlstrom, Chicago, Ill.

113,352.—WASHING AND WRINGING MACHINE.—J. S. Sandt St. Joseph, Mo.

113,353.—COAL-DELIVERING SACK.—W. S. Shackleton, Cleveland, Ohio.

113,354.—HOLD-BACK FOR VEHICLES.—N. W. Simons, Williamsfield, Ohio.
113,355.—FEED WATER HEATER.—T. D. Simpson, Mount Vernon, Ohio.
113,356.—CRACKER MACHINE.—G. R. Skillman (assignor to himself and James Beatty), Baltimore, Md.
113,357.—FIRE ESCAPE.—G. C. Smith and F. M. Burrows, Baltimore, Md.
113,358.—WHISK BROOM.—Greenleaf Stackpole, Elizabeth, N. J.
113,359.—MAIL-BAG FASTENER.—H. M. Stephenson and J. B. Tyer, Wabash, Ind.
113,360.—MATCH SAFE.—William Stine, Elmore, Ohio, assignor to himself and H. R. Lyle, Pilatka, Fla.
113,361.—CHURN DASHER.—Stephen Stout, Tremont, Ill.
113,362.—HOISTING APPARATUS.—L. W. Stuart, Narrowsburg, N. Y. Antedated March 23, 1871.
113,363.—HAY LOADER.—L. D. Taylor, Granville Center, Pa.
113,364.—WINDOW-SHADE FIXTURE.—Nathan Thompson, Brooklyn, N. Y.
113,365.—COATING LAMPS.—G. W. Thomson, Buffalo, N. Y.
113,366.—WATER METER.—I. P. Tice, New York city.
113,367.—COTTON SCRAPER.—T. H. Trantham, De Soto county, Miss. Antedated March 29, 1871.
113,368.—RUBBER PAINT.—Samuel Truscott, Cleveland, Ohio.
113,369.—PORTABLE DUMPING HOD FOR EARTH CLOSETS.—E. W. C. Vanderveer, Elizabeth, N. J.
113,370.—ELECTRIC GAS LIGHTING AND EXTINGUISHING APPARATUS.—John Vansant, San Francisco, Cal.
113,371.—ANIMAL TRAP.—C. B. Veronee, Athens, Ga.
113,372.—BED LOUNGE.—Valentine von Dissen, New York city.
113,373.—POTATO DIGGER.—J. A. Wadhams, Blue Island, Ill.
113,374.—COFFER DAM.—J. E. Walsh, New York city.
113,375.—SAWING MACHINE.—W. W. Waterbury, and J. M. Waterbury, New Canaan, Conn.
113,376.—VOTE-RECORDING MACHINE.—Adan Weston, Keeseville, N. Y.
113,377.—COMBINED LOCK AND LATCH.—S. H. Wheeler, Dowagiac, Mich.
113,378.—HINGE.—Shepherd H. Wheeler (assignor to himself, Enos L. Chappell, and Guy E. Chappell), Dowagiac, Mich.
113,379.—FOOT LIFTER FOR BLACKSMITHS.—T. C. Williams, Warrentown, Mo.
113,380.—SPINDLE BEARING.—Charles F. Wilson, Brooklyn, N. Y.
113,381.—LIFTING JACK.—Hiram J. Wilson, Mason, Mich.
113,382.—CRIB ATTACHMENT FOR BEDSTEADS.—J. H. L Wilson, Auburn, Kansas.
113,383.—COMBINED COTTON SEED PLANTER AND CULTIVATOR.—James A. Wright, Marietta, Ga.
113,384.—CHEST EXPANDER.—Samuel L. Barnett, New York city.
113,385.—SPRING BED BOTTOM.—L. M. Bates, Cleveland, Ohio. Antedated March 27, 1871.
113,386.—CHEEK PIECE FOR SHIPS' MASTS.—Joseph Baymore, Philadelphia, Pa.
113,387.—ADJUSTABLE CARRIAGE SEAT.—Sylvester W. Beach, Ypsilanti, Mich.
113,388.—ATTACHING MARBLE TOPS AND BACKS OF WASH-STANDS.—Wm. J. Bender, Cincinnati, Ohio.
113,389.—DOOR MAT.—Norborne Berkeley, Aldie, Va.
113,390.—GANG AND SUBSOIL PLOW.—Joel L. Bond, Marshalltown, Iowa.
113,391.—SEWING MACHINE.—Thomas W. Bracher, New York city.
113,392.—CORSET.—Morris P. Bray, Birmingham, Conn.
113,393.—MODE OF MAKING TELEGRAPH INSULATORS.—Wm. Brookfield, New York city.
113,394.—PACKAGE FOR HYDROCARBON AND OTHER LIQUIDS.—Morgan W. Brown, New York city.
113,395.—PACKAGE FOR OYSTERS, CLAMS, ETC.—Morgan W. Brown, New York city.
113,396.—COVERING FOR SAUSAGES AND OTHER MEATS.—Morgan W. Brown, New York city.
113,397.—PUMP VALVE.—Adam S. Cameron, New York city
113,398.—TOWEL BRACKET AND SPONGE HOLDER.—J. F. Chandler, Boston, Mass.
113,399.—ELECTRIC BATTERY FOR TELEGRAPHING AND OTHER PURPOSES.—Daniel M. Cook, Mansfield, Ohio.
113,400.—WATER WHEEL.—Gardner Cox, Pierpont, N. Y.
113,401.—SMELTING IRON AND OTHER ORES.—R. D. Cox and W. F. Cox, Philadelphia, Pa.
113,402.—CHILD'S CARRIAGE OR PERAMBULATOR.—Benj. P. Crandall, Jr., Williamsburgh, N. Y.
113,403.—SUSPENDING SIGN, ETC.—John H. Crane and Chas. W. Crane, Boston, Mass.
113,404.—STREET-SPRINKLING MACHINE.—S. E. Cursons, Buffalo, N. Y.
113,405.—SEDIMENT COLLECTOR FOR STEAM BOILERS.—C. W. Deane, Philadelphia, Pa.
113,406.—TRACE BUCKLE.—Myron H. Dinsmore (assignor to himself, Milton J. Snyder, and Aaron Briggs), Shickshinny, Pa.
113,407.—SEWING MACHINE.—Alfred S. Dinsmore, Boston, Mass.
113,408.—BREECH-LOADING FIREARM.—William C. Dodge, Washington, D. C.
113,409.—ADVERTISING DEVICE.—James F. Emery, Albany, assignor to himself and James E. Thomson, Buffalo, N. Y.
113,410.—HORSE POWER.—Thomas Addis Emmet Evans, Albany, Ga.
113,411.—EARTH CLOSET.—Benjamin Ferris, Wilmington, Del.
113,412.—SAW MILL.—George Finnegan, Dublin, Ireland.
113,413.—STOVE DRUM.—Charles Fisher (assignor to himself and Henry N. Wilcox), Niles, Mich.
113,414.—TUMBLER FOR PERMUTATION LOCKS.—Charles Flesch, Rochester, N. Y.
113,415.—LET-OFF MECHANISM FOR LOOMS.—William T. Flinn (assignor to himself and Jacob Steinmetz Thorn), Philadelphia, Pa.
113,416.—TREATMENT OF SEWAGE AND THE MANUFACTURE OF FERTILIZERS.—David Forbes, York Place, Portman Square, and A. P. Price, Lincoln's Inn-Fields, England.
113,417.—MOTIVE-POWER APPARATUS.—J. T. Gilbert, Asbury, Ill.
113,418.—SKELETON CORSET.—T. S. Gilbert, Birmingham, Conn.
113,419.—CORSET.—Thomas S. Gilbert, Birmingham, Conn.
113,420.—BOOT AND SHOE SOLES.—Charles Goodyear, Jr., New Rochelle, and Joze De Silva, Williamsburgh, N. Y., assignors to Charles Goodyear, Jr.
113,421.—PLOW COLTER.—Charles M. Gordon, La Porte, Ind.
113,422.—CORN PLANTER.—Lewis Graham, Plymouth, Ill.
113,423.—MANUFACTURE OF PEAT FUEL.—R. A. Griffin, Montreal, Canada.
113,424.—FURNACE FOR STEAM BOILERS.—John C. Gripp, Pittsburgh, Pa.
113,425.—RAILWAY-BRIDGE SIGNAL APPARATUS.—T. S. Hall, New Haven, Conn.
113,426.—COMPOSITION FOR COATING PHOTOGRAPH PICTURES. Happel, New York city.
113,427.—ROLLED METALLIC STRIPS FOR WASHERS.—T. C. Hargrave, Boston, Mass.
113,428.—VALVE AND VALVE GEAR.—William Z. Hatcher (assignor to himself and William L. Lance), Plymouth, Pa.
113,429.—COAL SCUTTLE.—G. H. Hazelton and D. W. Hazelton, Philadelphia, Pa.
113,430.—BOOT CRIMPER.—Henry Henley, Shoals, Ind.
113,431.—BULLET PATCH.—Alfred C. Hobbs, Bridgeport, Conn.
113,432.—MACHINE FOR FORMING HEEL BANDS.—Sumner Holmes, North Brookfield, and Joseph F. Sargent, Melrose, Mass.
113,433.—GRINDING PLATE.—Edmund S. Howland, Batavia, Ill.
113,434.—STEAM TRAP.—J. J. Jordan (assignor to himself and G. T. Carter), Philadelphia, Pa.
113,435.—APPARATUS FOR OPERATING CHURNS.—Preston L. Jordan, Lexington, Miss.
113,436.—PLOW.—John Lane, Jr., Chicago, Ill.
113,437.—COOKING STOVE.—E. C. Little, and D. H. Nation, St. Louis, Mo.
113,438.—APPARATUS FOR COOLING MILK.—John R. McKay, Rockton, Ill.
113,439.—MANUFACTURE OF EMERY WHEELS AND ARTIFICIAL STONE.—Edgar C. Merrill, Charleston, Vt.
113,440.—APPARATUS FOR DRAWING WATER FROM WELLS. Merrick A. Mihills, Lodi, Ohio.
113,441.—WHEEL FOR VEHICLES.—J. R. Mills, Macon City, Mo.
113,442.—CULINARY VESSEL.—William H. Murch, Portland, Me.
113,443.—FLOUR SIFTER.—Oliver D. Myers, Doylestown, Pa.
113,444.—WASHING MACHINE.—John Osmun and John Curl, Rockport, N. J.
113,445.—SELF-ACTING MULE FOR SPINNING.—C. B. Parkinson, Aaron Metcalf, John Metcalf, and Wm. H. Heald, Preston, Great Britain.
113,446.—MACHINE FOR POUNCING HATS.—Augustus Pelisse and George W. Stoute, Newark, N. J.
113,447.—HOT AIR REGISTER.—Hugh M. Phinney, Boston, Mass.
113,448.—SAD IRON.—Mary Florence Potts, Ottumwa, Iowa.
113,449.—POTATO DIGGER.—John P. Radley, Albany, N. Y.
113,450.—ICE CREAM FREEZER.—John Franklin Rote, Reading, Pa.
113,451.—SPRING FOR WHEELED VEHICLES.—Cyrus W. Saladee, St. Catharine's, Canada.
113,452.—TABLE-LEAF SUPPORT.—Daniel Saylor and Lauritz Anderson, Chicago, Ill.
113,453.—APPARATUS FOR SPREADING MEDICAL PLASTERS.—Adolph J. Schafhirt, Washington, D. C.
113,454.—TREATING PAPER AND VEGETABLE FIBROUS SUBSTANCES.—Augustus T. Schmidt, Pittsburgh, Pa.
113,455.—SAFETY VALVE.—Matthew Scrannage and Edward Scrannage, Jr. (assignors to Scrannage, Bate & Co.), Boston, Mass.
113,456.—CORN SALVE.—Anthony Seabold, Florence, Ohio.
113,457.—MOP HEAD.—Samuel Selden and Matthew Griswold, Jr., Erie, Pa.
113,458.—WAGON BOLSTER STAKE.—Lewis Washington Shaeffer, Elizabethtown, Ky.
113,459.—COMPOUND FOR CURE OF FOOT ROT IN SHEEP.—William T. Sherman, Marengo, Ohio.
113,460.—FIRE ALARM.—Horatio N. Shultz, Mechanicstown, Md.
113,461.—BIRD CAGE MAT.—Isaac A. Singer, New York city.
113,462.—CAR COUPLING.—George C. Spangler (assignor to himself and Simpson H. Daft), Allegheny City, Pa.
113,463.—FRICTION CONDENSER FOR ILLUMINATING GAS.—William H. St. John, Brooklyn, N. Y., and Samuel O. Rockwell, Jersey City, N. J.
113,464.—CUTTER HEAD.—Alonzo Louis Sweet, Norwich, Conn.
113,465.—PERMUTATION LOCK.—William Terwilliger, New York city, assignor to himself and Frederick H. North, New Britain, Conn.
113,466.—TUBULAR STEAM BOILER.—Charles A. Thompson, Flushing, N. Y.
113,467.—FASTENING FOR MEETING RAILS OF SASHES.—Nathan Thompson, Brooklyn, N. Y.
113,468.—HALTER.—James Thornton (assignor to himself and E. G. Latta), Wellsville, N. Y.
113,469.—ATTACHMENT TO HAMES.—James Thornton and Emmit G. Latta, Wellsville, N. Y.
113,470.—BREECH-LOADING FIREARMS.—Frank Tiesing and Charles Gerner (assignors to Eli Whitney), New Haven, Conn.
113,471.—SHIP'S TRESTLE TREE.—Henry Townsend, Philadelphia, Pa. Antedated March 22, 1871.
113,472.—LAMP BURNER.—Joseph Trent, Millerton, N. Y.
113,473.—BASE BURNING STOVE.—Jaspar Van Wormer (assignor to himself and Michael McGarvey), Albany, N. Y.
113,474.—HARVESTER RAKE.—Cyrenus Wheeler, Jr., Auburn, N. Y.
113,475.—HARVESTER.—Cyrenus Wheeler, Jr., and Calvin Young, Auburn, N. Y.
113,476.—MOVABLE PARTITION.—Douglas Joseph Williams, Birmingham, England.
113,477.—BLOCK FOR TOP-PROP JOINTS FOR CARRIAGES.—John J. Wilson, New York city.

REISSUES.

4,317.—SLIDE FOR EXTENSION TABLE.—Merrill E. Carter, Syracuse, and Elisha Mets, Rochester, N. Y.; Elisha Mets assignor, by mesne assignments, to Hayden & Hahn.—Patent No. 44,075, dated Sept. 6, 1864.
4,318.—WATER PITCHER AND OTHER VESSELS.—Kingston Goddard, Richmond, N. Y., assignor to himself and John P. Adams.—Patent No 97,390, dated November 30, 1869.
4,319.—PISTON STEAM VALVE.—Robert C. Gray and William B. Brittingham, LaFayette, Ind., assignors to themselves and John Fordyce.—Patent No. 86,067, dated January 19, 1869.
4,320.—Division A.—MANUFACTURE OF ALIZARINE.—Charles Graebe, Frankfort-on-the-Main, and Charles Leibermann, Berlin, Prussia.—Patent No. 95,465, dated October 5, 1869.
4,321.—Division B.—DYES OR COLORING MATTER FROM ANTHRACINE.—Charles Graebe, Frankfort-on the-Main, and Charles Liebermann, Berlin, Prussia.—Patent No. 95,465, dated October 5, 1869.
4,322.—CARRIAGE WHEEL.—Robert W. McClelland, Springfield, Ill.—Patent No. 99,691, dated February 8, 1870.
4,323.—MANUFACTURE OF GERMAN HAND CHEESE.—Francis C. Mende and Theodore F. Mende, Philadelphia, Pa.—Patent No. 95,500, dated October 5, 1869.
4,324.—MACHINE FOR TIGHTENING ROPES, ETC.—Arthur Paget, Loughborough, England.—Patent No. 105,240, dated July 12, 1870; antedated April 21, 1868.
4,325.—HARNESS FOR HORSES.—John Rouse, Palmyra, N. Y.—Patent No. 25,587, dated September 27, 1859.
4,326.—ELECTRO-MAGNETIC REGULATOR FOR TEMPERATURE IN ROOMS, ETC.—George Miller Sternberg, New York city.—Dated No. 100,462, dated March 1, 1870.
4,327.—COTTON PRESS.—Paul Williams, Winona, Miss., assignor to Robert A. Williams and James L. Williams.—Patent No. 73,683, dated January 21, 1868.

DESIGNS.

4,746.—HITCHING POST CAP.—Roger S. Austin, Wallingford, Conn.
4,747.—GANG PRESS.—Wellington Denison (assignor to himself and Joseph H. Knight), Rome, N. Y.
4,748.—TELEGRAPHER'S BADGE PIN.—Orrin C. Dow and Alford C. Harvey, St. Johnsbury, Vt.
4,749.—CHAIN LINK.—Virgil Draper (assignor to Oscar M. Draper), Attleborough, Mass.
4,750.—STATUE.—Angelo Fusary, New York city.
4,751.—ORNAMENT FOR THE BACKS OF LOUNGES.—George Hartzell (assignor to John P. Reifsnieder), Philadelphia, Pa.
4,752.—CASTER BOTTLE.—John Hoare, New York city.
4,753.—ORNAMENTATION OF GLASS WARE.—William C. King (assignor to King, Son & Co.), Pittsburgh, Pa.
4,754 to 4,759.—JELLY GLASS.—William M. Kirchner, Pittsburgh, Pa. Six patents.
4,760 to 4,767.—CARPET PATTERN.—Levi G. Malkin, New York city, assignor to Hartford Carpet Company, Hartford, Conn. Eight patents.
4,768.—SODA FOUNTAIN.—George F. Meacham, Newton, assignor to James W. Tufts, Medford, Mass.
4,769.—ORNAMENTATION OF RUBBER SHOES.—Christopher Meyer, New York city.
4,770.—LAMP BRACKET.—Frederick R. Seidedsticker (assignor to Bradley & Hubbard), West Meriden, Conn.
4,771 to 4,772.—CARPET PATTERN.—John H. Smith, Enfield, assignor to Hartford Carpet Company, Hartford, Conn.

TRADE-MARKS.

215.—WHISKY.—Mills, Johnson & Co., Cincinnati, Ohio.

EXTENSIONS.

MACHINE FOR CUTTING AND BENDING SHEET METAL.—Elliot Savage, West Meriden, Conn.—Letters Patent No. 16,868, dated March 17, 1857.
MACHINERY FOR CLEARING AND SEPARATING COTTON, WOOL, FUR, AND OTHER FIBROUS MATERIAL.—Isaac Hayden, Lawrence, Mass.—Letters Patent No. 16,855, dated March 17, 1857.
HARVESTING MACHINE.—George Esterly, Whitewater, Wis.—Letters Patent No. 16,873, dated March 24, 1857.
FLUID METER.—James Cochrane, New York city.—Letters Patent No. 16,945, dated March 31, 1857.

APPLICATIONS FOR EXTENSION OF PATENTS.

PLOW.—Blewford Bethel, Gerard, Ill., has petitioned for an extension o the above patent. Day of hearing, June 14, 1871.

IRON TRUSS FRAMES FOR BRIDGES.—Francis C. Lowthorp, Trenton, N. J., haspetitioned for an extension of the above patent. Day of hearing, June 14, 1871.

FACTITIOUS IVORY.—William M. Welling, New York city, has petitioned for an extension of the above patent. Day of hearing, July 19, 1871.

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LOCOMOTIVE ENGINEERING, AND THE MECHANISM OF RAILWAYS: A Treatise on the Principles and Construction of the Locomotive Engine and Railway Plant. With Examples Selected from the International Exhibition of 1862. Illustrated with sixty large engravings and numerous wood cuts. By Zerah Colburn, Esq., Civil Engineer. Part XVII. New York: John Wiley & Son, 15 Astor Place.

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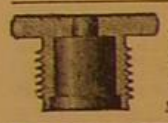
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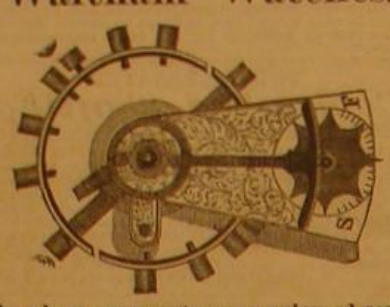
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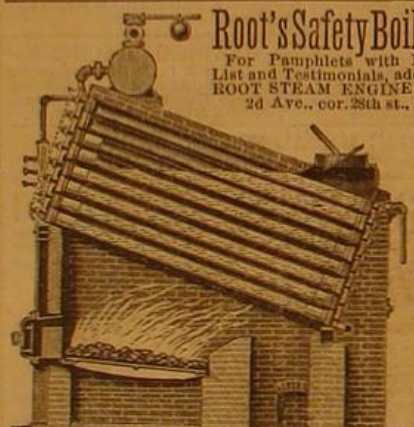
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