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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.

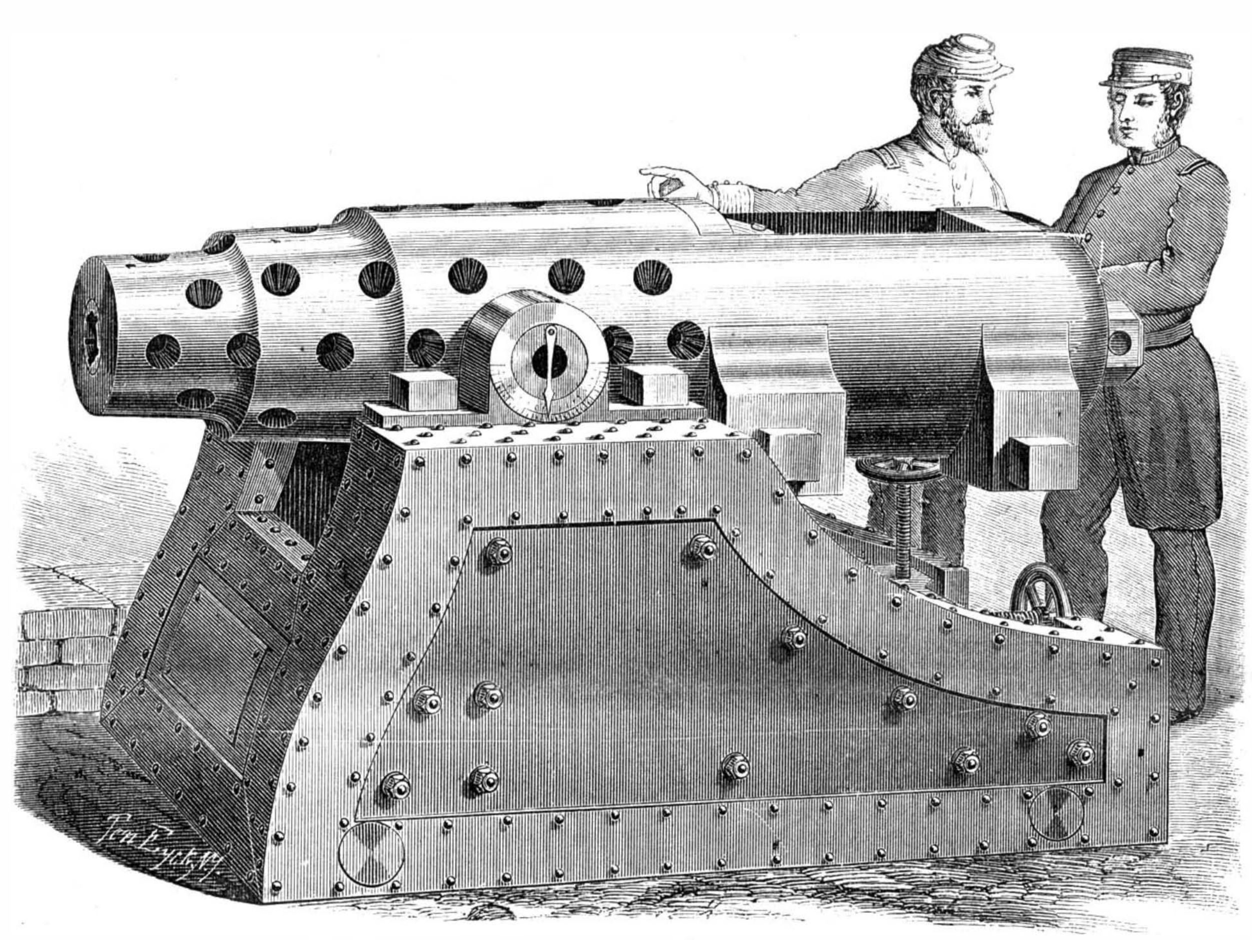
To receive the steel barrel, the reinforce is expanded by heat. It may be cast in sections, thus saving the great inconvenience attending the handling of the same if cast entire, and, in case of flaws in the casting, involving only the loss of the section in which they occur.

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 escape of this force, and that his perforated reinforce supplies this provision.

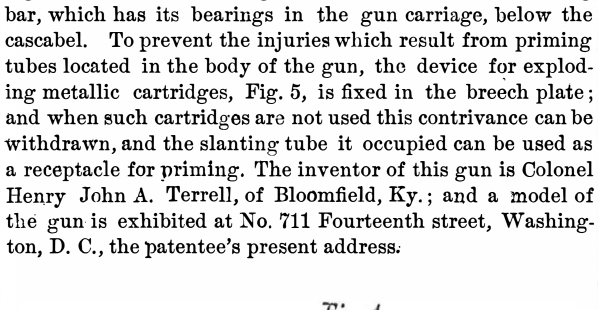
Another original feature of Colonel Terrell's invention is its ingenious breech-loading apparatus. Reference to the engravings will enable the reader to understand the details of this feature. Fig. 1 is a perspective view of the gun. Fig. 2 is a vertical longitudinal section, showing the hinged breech 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 crudemilk.

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 the r 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 Grüyeres 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 ("Milk maid 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 enoug 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.

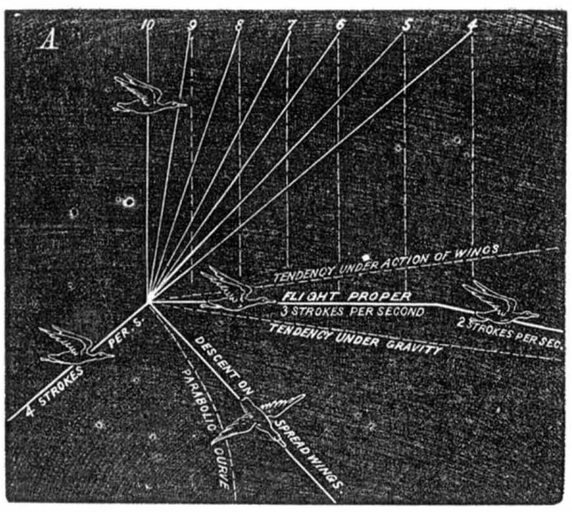
[For the Scientific American.]

THE FLIGHT OF BIRDS.

BY R. 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.

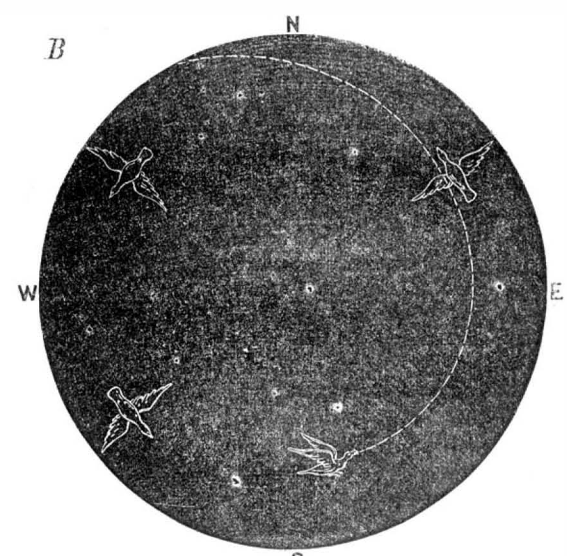
Referring again to the diagram, and supposing that a bird, in making his ascent upon the angle indicated, by four strokes per second, should continue to exert his wings at that rate, it will be seen that he must continue to rise upon the same angle of elevation, and thus soon attain a considerable hight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

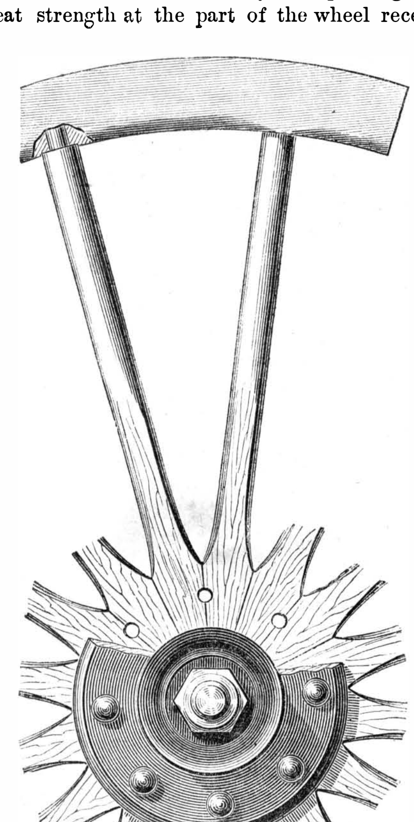
SPRING STEPS FOR STAIRWAYS.

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 des ription 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

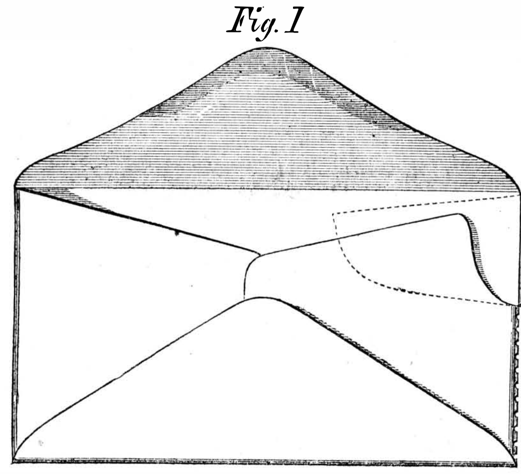
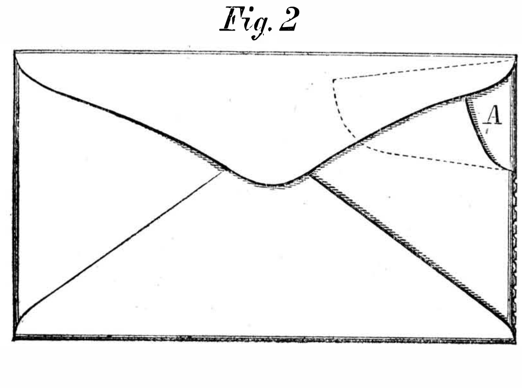


Fig. 2



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.

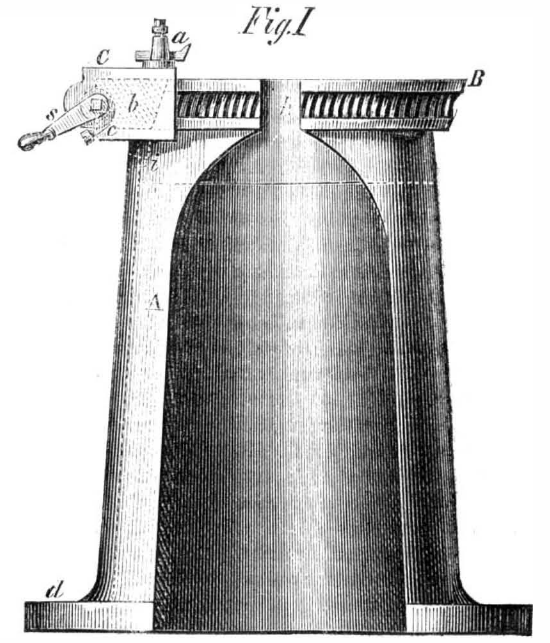
BORAX.—Every day brings us accounts of new discoveries of minerals in the West, the last of which is an enormous deposit of borax in Nevada Territory. The great increase in the use of this invaluable product gives value to the discovery, for the amount of the mineral is such that a very small portion 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.

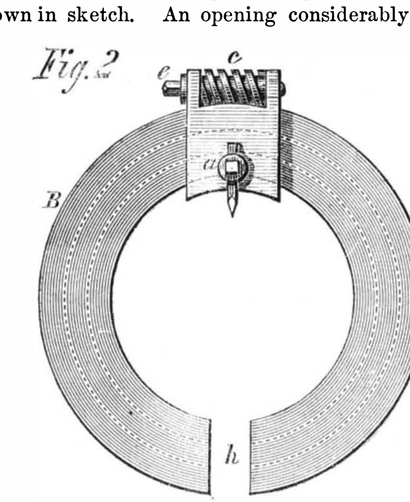
Turning Plunger for Cylindrical Ring.

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



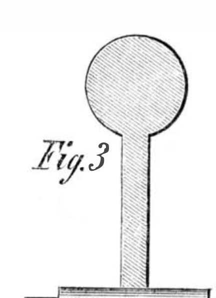
pipe, or cast iron. It has a flange, *d*, at its base, to secure it in place upon the saddle block of an engine lathe. Upon this hollow post, at its upper end, is secured an annular ring B, by a flange, *i*, that passes down into the pipe, A. Both the inner and outer sides of this ring are beveled or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



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.



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 val able 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, 2¼ 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 2¼ 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.

$\frac{SL}{8D}=H$: 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 *Farm and 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 becomes 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.

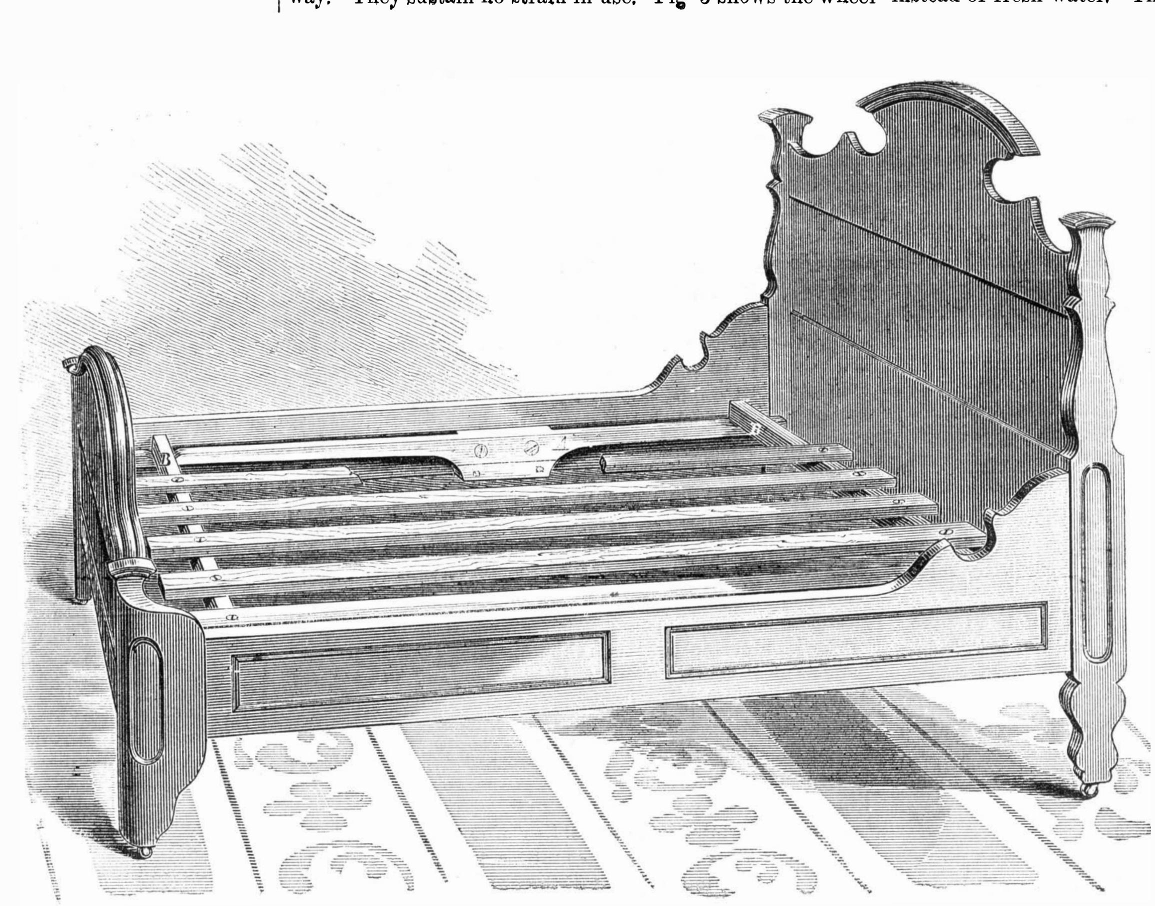
Our engraving illustrates a new method of supporting spring bed bottoms, which is cheap, durable, cleanly, and easily made by any ordinary workman in wood, and which, being itself a spring, adds to the elasticity and comfort of the bed.

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.



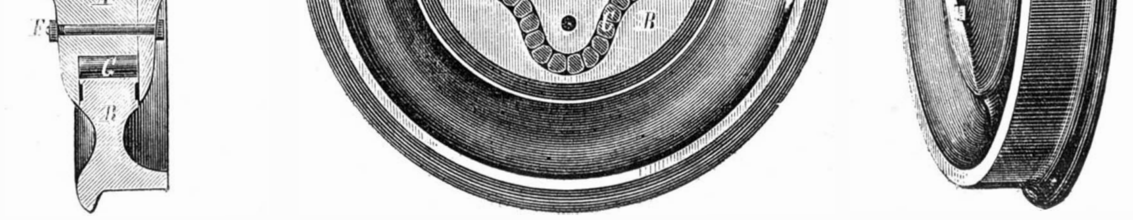
PATENT SPRING BED BOTTOM.

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.

Scientific American.

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NEW YORK, SATURDAY, MARCH 25, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

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 been 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 equitably 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.* (H. P.= $\frac{100\times8}{10}$=80). One evaporating 100 cubic feet per hour, with a consumption of 500 lbs. of coal, would rate at 160-H.P. ($\frac{100\times8}{5}$=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 the 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 feldspar 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 $30,000,000, 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 3th 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 therein 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, 1870, p. 139), 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, become, in reality, an addition to 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 renew 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.

NEW BOOKS AND PUBLICATIONS.

THE QUEEN'S REVENGE, and other Stories. By Wilkie Collins. Published by T. B. Peterson & Bros., 306 Chestnut street, Philadelphia, Pa. Price, 75 cents.

This enterprising house has a large list of standard popular works, by the best authors of romance, which are sold at very moderate prices. Send for their list.

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The New York Advertising Agents, have the monopoly of space and location in many hundred newspapers, and know, by their experience, just where to invest money to the best advantage.—*Berkshire Courier*.

Facts for the Ladies.

Miss Chamberlain, of Troy, N. Y., in three years and eleven months earned, with a Wheeler & Wilson Sewing Machine, $2,308.92, in stitching 638,652 collars, equal to 216 miles and 1,523 feet of seam, making 117,102,330 stitches, an average of 100,000 per day, and 12,500 per hour.

Business and Personal.

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

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 it 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 jacket, 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 expelled 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 constrnction 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 the 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.

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.

410.—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 CLEARERS 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.

498.—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 petiitoned 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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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.—Fréjus 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.—Thomas 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.
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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.
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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.
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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 3, 1871.
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112,690.—GRAPPLE.—Edwin G. Crandal, Belfast, N. Y.
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112,697.—LADDER.—George Henry Ellis (assignor to Augustus Salem Dimsdate and Edward Bovine Lovell), London, England.
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112,753.—FASTENING FOR TEXTILE FABRICS.—Albin Warth, Stapleton, N. Y.
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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. 100,384, dated March 1, 1871.
4,296.—CARPET LINING.—Joel F. Fales, Walpole, Mass.—Patent No. 52,835, 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. 2,789, dated October 22, 1867; extended seven years.
4,301.—STEAM GENERATOR.—A. L. Pennock, Philadelphia, Pa.—Patent No. 103,363, dated May 24, 1870.
4,302.—STEAM BOILER.—Patrick Quinn, South Newmarket, N. H.—Patent No. 110,158, 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.

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4,707.—ORNAMENTATION OF GLASS WARE.—Frederick Ladner (assignor to Ladner & Bird), Philadelphia, Pa.
4,708.—FASTENING FOR BEDSTEAD.—William H. McPherson (assignor to himself and W. N. Carr, Sr.), Nashville, Tenn.
4,709.—GARDEN TOOL.—R. A. Moore, Kensington, Conn.
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.
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4,717.—CARPET PATTERN.—John T. Webster, New York city, assignor to Daniel M. Read and Charles A. Read, Bridgeport, Conn.
4,718.—PAINT BRUSH.—John L. Whiting, Boston, Mass.
4,719.—SPOON OR FORK HANDLE.—George Wilkinson (assignor to Gorham Manufacturing Co.), Providence, R. I.
4,720.—INKSTAND.—L. L. Woodruff, Cleveland, Ohio.

TRADE MARKS.

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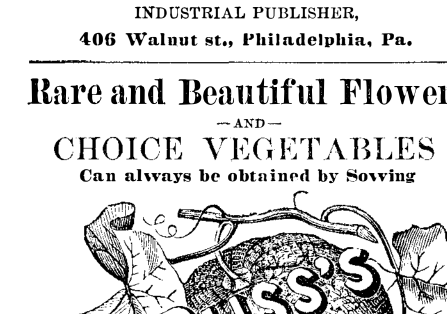

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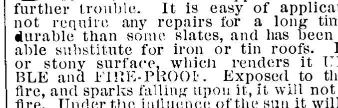

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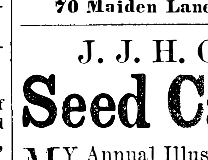

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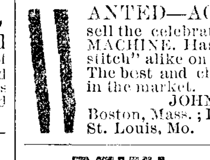

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New Loan of the United States.

IMPORTANT CIRCULAR.

TREASURY DEPARTMENT, WASHINGTON, Feb. 28, 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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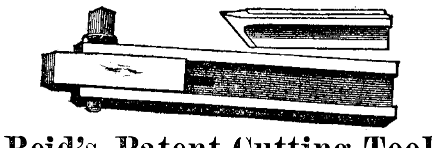

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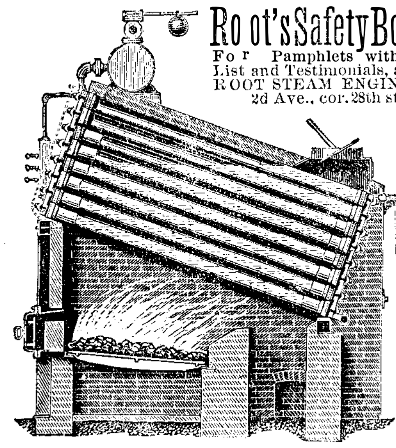

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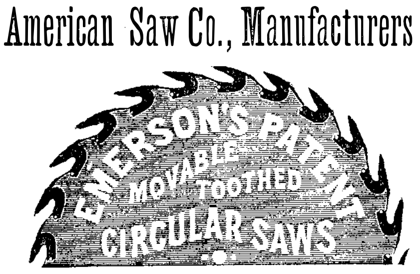

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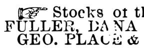

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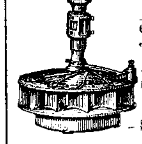

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