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MARINONI'S ROTARY PRINTING PRESS.

The greatest progress that has been made in recent years in the art of printing is in the invention of the high speed press provided with continuous paper.

Three French constructors, Messrs. Marinoni, Alauzet, and Derriey, have brought this kind of apparatus to such a degree of perfection that the majority of foreign journals having a large circulation buy their presses in France. We reproduce in Fig. 1 a perspective view of the Marinoni press, and in Fig. 2 a diagram showing the parts of the same. In order to give a complete description of it we cannot do better than to reproduce the very interesting study that has been made of it by Mr. Monet, a civil engineer.

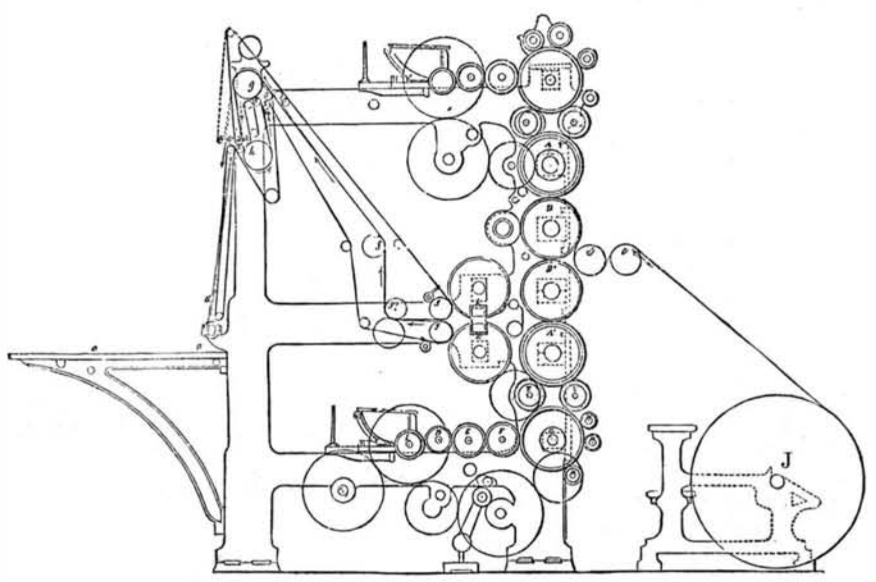

Fig. 2.—DIAGRAM OF THE PARTS.

The roller, J (Fig. 2), is placed in the machine in the state in which it is received from the paper manufacto y. The paper unwinds, runs over the rollers, *e* and *e'*, which serve only for tautening it, and then passes between the two cylinders, A and B. The cylinder, A, carries the form, and B carries the blanket, and the paper thus receives its first impression. It afterward passes between the cylinders, A' and B', and receives an impression on the other side, the cylinder, A', carrying the form, and B' the blanket. Being now printed on both sides, it passes between the cylinders, K K', which cut it off and allow the sheet to slide between the cords of the rollers. These latter lead the sheets over the rollers, *g h*, on which they wind, one over the other, when the rollers, *a a'*, are in the position shown by unbroken lines in the cut.

The part of the machine that holds the rollers, *g h*, and the different cords that wind over them is the *accumulator*, and it is in this part of the press that the sheets accumulate, one over the other, to any number desired.

The size of the rollers, *g h*, and their distance apart are so regulated that when the sheet reaches the accumulator, it falls exactly on those that have preceded it. When the proper number of sheets is in the accumulator (4 or 5 being the number most employed for afterward facilitating the separation into packets on the receiving table), the two small rollers, *a a'*, advance over the rack, N, and the sheets, instead of continuing to roll over into the accumulator, fall on the rack and are deposited by it upon the receiving table, O.

The rack having fallen twenty times, and deposited five sheets each time, or one hundred in all, the table moves in such a way as to prevent the sheets subsequently deposited from getting mixed with them. When the rack has fallen twenty times, the table returns to its initial position.

The distributing rollers, D, come in contact with the inking rollers, I, once during each revolution of the printing cylinders, and are mounted on racking levers provided with regulating screws that permit of easily regulating the amount of ink taken up. The supports of the inking rollers are movable and can be made to approach or recede from the distributing rollers, so as to still further vary the amount of ink taken up by them.

The distributing rollers supply the ink to a roller, E, of large diameter, which, having a backward and forward motion, begins to distribute the ink and to transmit it to a second roller, F, of the same diameter. This latter then spreads it over a metallic cylinder, G, which is of the same diameter as the printing cylinders, and against which revolve three distributing rollers, H, that have a backward and forward motion.

Between the cylindrical inking table, G, and the type cylinder, there are situated inking cylinders, T, of large diameter, that constantly take up ink from the inking table and distribute it over the types.

The machine here described, when designed for printing large sized journals, has cylinders, whose circumference correspond to the size of paper for two widths of pages, and whose length is sufficient to allow it to receive two forms. Each cylinder, then, carries four forms, or eight in all, and prints two complete copies at each revolution.

The large sheet cut off by the cylinders, K K', contains, then, two copies; and this sheet, on passing under the roller, *f'*, is again cut in two by a disk which separates it in a direction perpendicular to the cylinders.

To this press there may be added a mechanical folder of Mr. Marinoni's invention, capable of folding a journal five times.—*Annales Industrielles.*

Filtering Distilled Water.

Eiselt recommends the use of sponge for filtering distilled water. The filtration goes on with great rapidity, and the product is clear as crystal. When filtered through paper, distilled water soon exhibits a *felty* sediment, which is never formed when filtered through sponge, so that the bottles scarcely need cleaning after several months' use.

The apparatus that he employs consists of a bottle with an opening near the bottom from which descends a bent glass tube. This tube is about 6 inches long and 1 or 1½ inches in diameter; at each end is a perforated rubber stopper bearing a narrower glass tube. The wide tube contains one or two long strips of fine sponge that has been cleaned with dilute hydrochloric acid and then dried. The bottle to which this filter is attached must not be larger than the one placed beneath to catch the filtrate.

The sponge, of course, must be cleaned every few months. —*Neuste Erfahrungen.*

Improved Restrainer for Gelatine Developers.

Wilde, of Görlitz, who employs the oxalate developer, has given up the use of bromide of potassium as a restrainer, but uses instead tincture of iodine. The tincture is made by dissolving one part of iodine crystals in 200 parts of alcohol, and then adding an equal volume of water.

Of this solution he adds from three to six drops to every ounce of ferrous oxalate of normal strength, when developing portrait negatives.

For reproductions, four or five times as much of the tincture is employed, together with a small quantity of citric acid, which keeps the liquid clear and restrains development at the same time.

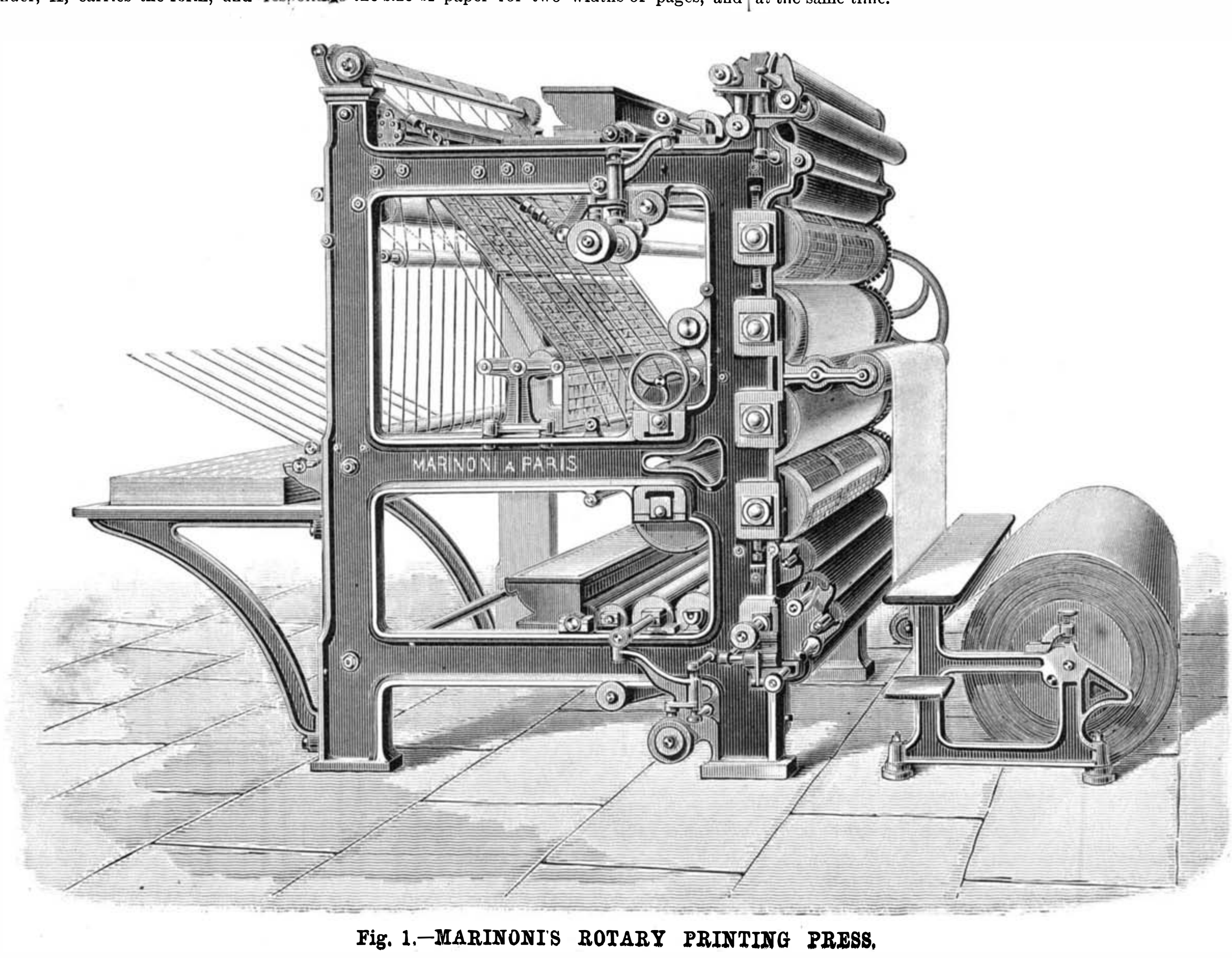

Fig. 1.—MARINONI'S ROTARY PRINTING PRESS.

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Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 390,

For the Week ending June 23, 1883.

Price 10 cents. For sale by all newsdealers.

THE NATIONAL EXPOSITION OF RAILWAY APPLIANCES AT CHICAGO.

The managers of the Railway Exposition have succeeded in making an exhibition interesting to the general public, in a field which at first glance would seem to attract only specialists. The most attractive popular features are the old locomotives and the electric railway, yet the exposition as a whole is striking, surprisingly so, even to the mere sightseer, while attracting the deeper interest of railroad men. As one goes through the vast building and its extensive annex, groups of railway employes are seen gathered here and there around novelties in brakes, couplings, and other appliances, and the comments heard of these practical men are certainly pertinent though sometimes brusque. No one knows better than a brakeman the fact, which statistics prove, that the safety of the men connected with the movement of trains is the weak spot in the system. Everything that ingenuity and care can provide is used to protect the passengers; and looking at the various appliances for safety as they are brought together here every possible contingency seems provided for; yet where the employe is solely concerned, especially in the coupling of cars, it is notorious that the companies are sadly indifferent. Possibly there are practical objections to most of the coupling devices intended to insure safety, but certainly the many excellent features shown in the exposition can be drawn upon to produce a perfect device.

The old locomotives, which naturally are the center of attraction, have been so frequently described, I need not dwell on them. As the visitor steps from the shed containing these pioneers, across to the array of modern locomotives, an epoch is bridged from experimental years to the present times which have brought forth these triumphs of the present century. The modern locomotive represents the finest achievement of our civilization in the application of means to attain a result. I confess I cannot pass one of these great engines, wherever met, without a desire to remove my hat, because to me they seem to have taken to themselves some of the brain and brawn spent in their production, and because I know somewhat of the time, the labor, the genius, and the lives that have been given to perfect them. Study the history of any part of a locomotive, and you shall learn a story of wearied brains and long experimenting before success. True, that one being produced, they can readily be duplicated in any number; that is also true of the sculptor's work, yet who begrudges him his meed of praise on that account? To the men from Stephenson down, who by their genius and skill have made locomotion what it is, is due the homage of history.

The exhibition of locomotives embraces all varieties of steam motors from the first class passenger to the drilling engine. The principal works of the country are well represented by their masterpieces. The Baltimore and Ohio Railroad sends from its own shops a magnificent specimen as a contrast to its pioneer locomotive, also on exhibition.

In the car department twenty or more street cars are shown for both horse and cable roads. The handsomest is one made for the North Chicago line by the John Stephenson Company, of New York. In cars for steam roads there is one of every type, including all the Pullman palaces, passenger coaches, and freight and stock cars. This array of cars and engines of what is in actual use throughout the country strongly hints of the large amount of capital and labor required for their production and operation. In the lines of car wheels, trucks, switches, and railway supplies the display is large, the latter class, which embraces an endless variety of articles, showing a high grade of workmanship, and being one of the most striking portions of the exposition. In the various classes of machinery for railway shops, and for the construction and repair of roads, there is a fine display, and as a novelty which has been perfected in the West a track laying machine is noticeable. It consists mainly of a platform car, having a forward extending frame and endless apron, by which the rails and ties are carried from the car and deposited on the track.

The railway companies centering in Chicago have contributed to the exhibition both cars and locomotives, and some have sent products of the country through which they pass. The Illinois Central from its southern lines has sent fine trees and palms, while the Pennsylvania roads furnish native ores, typical of the diversified interests of the whole country, held together by bands of railroad iron.

Among the many notable exhibits are the following:

Several novelties in freight car doors, and in that connection let me say there is a fine chance for inventors to improve on the common form.

The Keystone Bridge Company exhibit forged eye bars and a turntable truss of the largest size.

The Allen Paper Car Wheel Company make a fine exhibit of wheels and trucks, as do also in their own specialties the Westinghouse Air Brake Company; the Union Switch and Signal Company, of Pittsburg; the Keystone Car Spring Company; the Ashcroft Manufacturing Company in steam gauges; and the Jersey City Iron Company. The Janney coupling for freight and passenger cars is also deserving of notice.

The Roebling Wire Company, in connection with their display of wire rope, exhibit sections of the cables of the Niagara, the Covington, and the Brooklyn suspension bridge. Of course these are not actual sections of the cables in place, but similar, and the superior greatness of the ropes that fasten New York and Brooklyn together can be realized by the comparison with the other two cables.

Taken as a whole, the exposition is worthy of its appellation "National," as it fairly exhibits the state of the art in railroading in the United States, and I doubt whether perfection has been so closely sought and nearly attained in any other country. There is little or nothing of catchpenny and claptrap devices. The whole affair appears earnest and means business.

W.

RAINFALL ON THE ISTHMUS OF PANAMA.

According to the observations of Mr. John Stiven, director of a gas company in Panama, the quantities of rain that have fallen at the Isthmus of Panama during the last four years have been as follows: 2·152 meters in 1879; 1·683 meters in 1880; 1·792 meters in 1881; and 1·158 meters in 1882. The rainy season in this region lasts six months, from May to November, excepting an interruption of a few weeks of cold in June and at the beginning of July. This abundance of rain in the summer is explained by the movement of the stratum of rising air which accompanies the curve of maximum temperature in its annual oscillating progress from one side to the other of the thermal equator, and back again, which in its turn depends upon the movement of the sun to each side of the geographical equator. As the sun passes the zenith twice a year, on the 13th of April and the 29th of August, the ascending strata of air cover the isthmus from the beginning of May to the end of June, and from the end of July to the first of December. This forms the rainy season, the rest of the year the dry.

During the latter the ascending strata of air are all to the south of the isthmus. To the north of these strata is the trade wind of the northern hemisphere, which generally blows from the northeast over the isthmus. To the south of it is the trade wind of the southern hemisphere. In the zone covered by this ascending current the wind is fluctuating; when it is over the isthmus, then occurs the period of calms or of very variable winds, that are found as frequently upon the main land as on the sea.

It is understood that while the rising air strata are over the isthmus, then the rainy season occurs, since the trade winds, that are low winds scouring the surface of the ocean, gather up in these strata great quantities of aqueous vapors which on rising enter the lofty and colder regions of the atmosphere, are condensed, and produce that vault of perpetual cloud which arches over the earth, forming an obscure circle which the French sailors call Pot-au-Noir and the English and American the Cloud-ring, from which issue during the rainy season those great deluges that inundate the intertropical regions. Moreover, near to the isthmus passes the equatorial current that after passing Florida is called the Gulf Stream, and the waters of this current are relatively heated, and consequently the air which crosses them becomes charged with a great amount of aqueous vapor; on reaching the isthmus with the slight velocity that the wind has in the rising strata during the rainy season, it is forced to rise, since it becomes part of the former; it also encounters the slopes of the Cordillera, along which it rises, and in ascending dilates, producing refrigeration, which forms another cause that contributes to the abundance of the rainfall, at least over the Atlantic slope, since in the case of the Pacific coast the general current of the ocean is the reverse of that which obtains on the east shores, as it proceeds from the north, whence its waters are less hot and part with less moisture to the winds that sweep their surface.

Another interesting fact is that the excess of rain on one slope over that on the other is most marked in the second period of the rainy season. This is attributed to the fact that during the first part of the rainy season—May and June—the prevailing winds are southerly, while during the second period of the same they are northerly and are more freighted with moisture; also it is at that time that the contrast between the rainfalls of the Pacific and Atlantic coasts is the most striking.

Ancient Lake in California.

At a recent meeting of the Engineers' Club of Philadelphia, Mr. T. M. Cleemann showed a map and profile of the Southern Pacific Railroad in California, showing where it crosses the dried up bed of a lake, being below the surface of the Pacific Ocean for 58 miles, and attaining a depth below said surface of 266 feet. At this point it skirts a deposit of salt from six to twenty-four inches in thickness. He also showed a number of photographs of the Tehachapi Pass on the same railroad near San Fernando. In order to attain the summit with a sufficiently reduced grade, the line was "developed," advantage being taken of a conical hill to wind about it in the form of a helix, crossing itself, and continuing on its way with several meanderings. The Saint Gothard Railroad has several such helices, but they are cut in the solid rock.

Long Steel Plates.

Some long steel plates have been rolled by the Otis Iron and Steel Company, of Cleveland, Ohio. The plates were 50 feet 6 inches in length when sheared, 51 inches wide in the center, and three-eighths of an inch thick, and the ingots from which they were rolled weighed 4,400 pounds each. They were made for Messrs. Morgan, Williams & Co., of Alliance, Ohio, and they will be used in the construction of a large traveling crane, which the above firm are building for the Dickson Manufacturing Company, of Scranton, Pa.

MOLECULAR VIBRATIONS.

No scientific doctrine is more generally believed than that of the conservation of force. The great students of nature almost universally accept it. So many old and credited theories have been overturned that advanced thinkers are prepared to see this one share such a fate. This is a possibility only; the theory is considered eminently a proved and true one.

Briefly stated, it amounts to this: In the universe there is no natural power known to us that can create or destroy force. All that man can do is to transform it and change the form of its manifestations. Whenever force becomes manifest to us, we can trace it back to anterior forms. It never appears spontaneously generated, and from no origin. Heat, one form of force, can be changed into useful effort. It is assumed to represent an intense vibration of the molecules. The minute heat vibrations of the molecules, which create impulses infinite in number, and, considering the size of the molecules, of almost infinite force, can be lengthened, and made to coalesce into a single prolonged effort. A cubic inch of water may be heated, by the combustion of carbon, until the repulsive force among its vibrating molecules has developed, and the paths of vibration have been increased to twelve times their former length. Thus steam is produced. The steam may be admitted into a cylinder, under a close-fitting piston, which it will raise until the space under the piston is of one cubic foot volume. If the steam is allowed to condense the piston will return. The minute vibrations of the molecules, too small to be measured, or fully conceived of, have been joined together so as to produce a single wave of a foot front, it may be, and of a foot altitude. The first phase of an oscillation is represented in the rise of the piston; its descent represents the second. The motion of the piston only renders the expansion of the water into steam visible in its effects. The true transformation of power was anterior to all this. The proximate origin of the force was the combustion of the fuel.

The chemical affinity of carbon for oxygen was called upon. These two elements were made to unite. They rushed together with very great yet measured velocity. As molecule of carbon came against molecule of oxygen it was split up into atoms, and immediately combined with the oxygen. Under the effects of the atomic concussion the newly-formed molecule of carbon dioxide started into vibration. The vibration was one of that character which affects our nerves with the sensation called heat. The myriad of vibrations was imparted to the cubic inch of water, and a measure of their amount arrived at. It came to some two thousand foot pounds.

This, it must be remembered, is theory, and unproved except by analogy. The resemblance between the phenomena of sound and heat is very great. Both can be reflected and refracted; both can start from a center and be radiated through space, in accordance with identical laws. Sound is unquestionably due to vibrations. They can be seen by the unassisted eye. Such are the vibrations of a long string or turning fork. From the analogies between the phenomena of sound and heat, the conclusion is drawn that heat is also due to vibrations.

We reach thus a true conception of the theory. Heat vibrations are invisible. They have been invented by scientists to explain existing phenomena. The proof of their existence is an analogical one only; and analogy has so often failed that the whole theory is provisional. The probability of the existence of the vibrations is founded on their capability to explain known facts. As soon as a discordance is shown they must be abandoned by the theorizer. As soon as such discordance between their existence and the phenomena of nature is shown, the proof and probability of their existence vanishes.

The weakness of any attempt to seek among molecular vibrations for a new source of force is thus very evident. They serve only to illustrate the possibility of the mutual transformation of different kinds of force. They are not absolutely known to exist, and may at any time be discredited and a new theory be adopted. To take such an unproved and unknown quantity as a reservoir of new and hitherto undiscovered power is going beyond the bounds of analogy or probability. S. T.

Electricity as a Motive Power.

Professor George Forbes recently delivered a lecture on the above subject in London. Speaking of the frequency with which water power is brought into the question of obtaining energy in the form of electricity, he refers to the idea of utilizing the water power to charge accumulators, which are to be placed upon cars and wagons and used to drive them over tramways. At first sight that seems very feasible, he says; but, as he believes that compressed air tramcars are a success, he pertinently asks, in effect, why the water power has never been used to compress air. Sir W. Thomson's question at the York meeting of the British Association was whether 40 acres or 100 horse power is the more valuable, the 40 acres representing the area of the reservoir that would be required to give that power with a fall of six feet seven inches (two meters). He was alluding to the construction of reservoirs around the coast to utilize the tides; but electricians mean the utilization of waterfalls, running streams, and the rise and fall of the water in river gorges, and there is obviously no difficulty whatever in causing water wheels and turbines to drive dynamo machines. The question is rather, How is the current to be conveyed to the places where it can be utilized? In Deprez's latest experiments he obtained a return of 47½ per cent, and 4·4 horse power of work was actually given off by the motor. Professor Forbes calculates that turbine and dynamos to transmit 6 horse-power through a resistance of 12 ohms will cost in their places £200. Neglecting the cost of the conductor, he points out that such an amount of power from a steam engine, with coals at 20s. per ton, will cost £60 per annum. (He takes 300 days of twenty-four hours, and allows 3 lb. of coal per horse power.) The interest and depreciation on the boiler and engine would be about £30 per annum, making altogether £90 as the running expenses, without reckoning wages, which may be considered as equal in the two cases. Electrically transmitted, the interest on plant, at 15 per cent, would be £30 per annum, leaving £60 from which to deduct the cost of the conductor, or rather the interest and depreciation, and therefore a very large margin in favor of current as compared to steam.

Cork.*

Cork is yielded by the cork oak, *Quercus liber*, which chiefly flourishes on the shores of the Mediterranean. There are, in Spain and Algeria, large forests of this tree, which is also cultivated in the departments of Lot-et-Garonne and Var, in the south of France, and in Corsica.

The cork oak arrives at its full growth in about one hundred years, when, in hot climates, it attains a height of sixty or seventy feet, with a diameter of six to eight feet. The bark consists of two distinct portions, the inner formed of a fibrous tissue, and the outer tuberous, and of a porous and elastic consistency, which constitutes the cork proper. The first cork naturally produced by the tree is called the male, and has scarcely any value; but if this be removed, a second layer is formed, finer, more elastic, and less irregular, which is known as the female cork; and this it is which is generally used. The stripping of the cork takes place in summer, when the circulation of the sap facilitates the separation of the outer from the inner layer of bark. The removal of the first growth is effected when the tree is twenty to twenty-five years old. Several annular incisions, and one vertical incision, are made with a hatchet, care being taken to cut the cork only, without touching the inner bark; the layer of cork is then easily detached. A young oak yields about 10 lb of cork at the first stripping, while it is capable, ultimately, of yielding over 300 lb. The first cork has a thick and hard exterior, which diminishes with each successive growth. Formerly, after the first stripping the tree was left to itself, without any protection. Being very tender, it was liable to be killed by exposure to variations of temperature, while numerous insects, attacking the tender surface of the tree, reduced the value of the future cork. Besides, a thick and irregular crust formed, which it was necessary to remove, thus causing a loss of thirty per cent of cork.

A better plan is to employ the method of M. Capgrand-Mothes, which consists in covering the tree, during several months after stripping, with the cork which has been removed. A few vertical incisions are made in the inner bark, to prevent irregular furrows being formed. The pieces of bark are then restored, being fastened by iron wire; and the joints are made good underneath with strips of cellulose cardboard. After three months, in the autumn, the pieces of bark have become quite dry, and are taken off. The effect of this practice is to induce the formation of a protecting layer, tuberous, homogeneous, and elastic, under which the growth of the cork goes on without danger of injury.

The detached pieces of cork, flattened by being piled up with the outside uppermost, are freed from their external surface by boiling and paring. The boiling of the cork, which lasts about half an hour, is effected in large cubical boilers fired with refuse cork, and closed by a cover which presses upon the pieces. The paring is done by hand, or by means of horizontal rollers provided with iron blades; but this last-named operation may be dispensed with when the practice of covering the tree with the detached pieces of bark is adopted.

The principal use of the outer bark is to make bottle corks. They are more frequently cut by hand, though sometimes by a machine, a horizontal knife giving a rotary motion to the piece of cork, and thus cutting into a cylindrical form. Cork is also used for making life buoys, swimming belts, floats, non-conducting linings, etc. It is moreover used advantageously in the form of powder, for packing fragile objects, as a substitute for lycopodium powder, and for the manufacture of linoleum and cork-leather. Cork is, however, on account of its elasticity, reduced to powder with great difficulty. To effect this, mills with grinders in the shape of rasps, mill-stones revolving in a pan, and artificial stones revolving at great speed are employed.

Linoleum consists of cork powder consolidated with dried linseed oil. The mixture, in the proportion of about three parts of oil to one of cork powder, is passed under heavy rollers, and then stuck on to cloth by means of drying oil. It is allowed to dry for about three months, when the product is ready to receive various designs, and may be readily washed. Linoleum is adulterated by adding sawdust to the cork powder. Cork leather, which is waterproof and very elastic, is cork powder consolidated with India-rubber.

Cork refuse is used for making partitions that do not conduct heat or sound; it also yields a light and porous charcoal. M. Combe d'Alma has proposed to distill them, so as to obtain a very rich gas, free from sulphureted hydrogen. Old bottle corks are sometimes collected, boiled and washed in acidulated water for again serving to cork bottles.

* From a paper by M. Henri Mamy, Ingenieur des Arts et Manufactures, in the columns of the *Moniteur Industriel.—Jour. Soc. Arts.*

A Chance for Inventors.

In the heavy thunder storms which occurred in various parts of the country last week the lightning manifested its well known affinity for petroleum. Three large oil tanks were struck. One of them was near Olean, in this State, another at Muncy Station, Pa., and the third in the yard of the Standard Oil Company at Communipaw, N. J. This last one had very little oil in it, and was not consumed, but the others, with their contents, were burning at the latest accounts.

The attractive influence exerted by petroleum, or its vapor, which renders these great oil tanks so liable to destruction by thunderbolts, does not seem to be very well understood. If it was, we should hardly be without any efficient means of guarding such structures against lightning. The subject is well worthy of attention and study on the part of men of science. At present the safeguards are so inadequate that an oil tank is not only very likely to be destroyed by any thunder storm, but to act also as a firebrand to every building anywhere near it.

The inventor who devises a method which shall afford to oil tanks absolute protection against lightning, ought to be able to make a million of dollars by the invention.—*N. Y. Sun.*

Solemn Science.

An article in *Science* takes exception to the small tricks of thoughtless newspaper paragraphists in using strictly scientific terms as a means of ridiculing study and investigation in pure science; and cites an instance in which a newspaper of deservedly high character characterized by the heading, "A Thrilling Government Report," a bulletin from the United States Geological Survey on "Hypersthene Andesite, and on Triclinic Pyroxene in Augitic Rocks."

Progress in true knowledge requires attention to particulars and to details; and such attention is to be fixed and such details defined only by the use of the most exact language—language allowing of no deviation from its literal meaning and of no room for differing readings. So the language of science is an exact language, and although it may sound odd to one who puts all his thoughts into the changing vernacular, it conveys a distinct meaning, and the same meaning, to every one of the large and increasing army of men and women who are gradually exploring and expanding the stores of Nature as applicable to human weal. The use of the stable and unchanging terms of the preserved and petrified languages of Greece and Rome is entirely applicable to the unvarying facts of Nature, and it affords no legitimate opportunity for cheap and ignorant wit.

A Chinese War Ship.

On the 10th ult. the Chinese Ambassador at Berlin invited a select and distinguished company to Stettin to witness the trial trip of the Ting Quen, or Everlasting Peace, a fine ironclad corvette, built for his government by the Vulcan Shipbuilding Company there. The vessel was launched some time ago, and has now received her proper equipment of guns, etc. The *Times* Berlin correspondent says the trip was most successful, the corvette, with engines of 6,000 indicated horse power, achieving a speed of 14½ knots an hour. This ship is of peculiar construction, with a rather shallow draught, having been specially constructed for coast defense. She will soon proceed to the East—all the sooner, perhaps, that a French fleet threatens to make its appearance in Chinese waters. A sumptuous repast was served on board to the guests of Li Fong Pao—among whom was the British Consul General in Berlin.

New York and Liverpool Large Steamers.

The City of Rome, having had additional boilers put in and other improvements made, is now probably one of the fastest of Atlantic steamers, as on her trial recently she reached a maximum speed of 18·7 knots, or 21½ miles an hour. The engines developed 12,000 horse power, as against 8,000, which was all that could be obtained from them previously. The City of Rome is over 8,400 tons measurement.

The new Cunard liner Aurania, which enjoys the reputation of being the broadest vessel afloat in connection with the Atlantic trade, also attained a maximum speed of 18·7 knots. The Aurania is 470 feet long, 57 feet broad, and 38½ feet depth of hold. She measures 7,500 tons, and has engines capable of indicating 10,000 horse power.

Diffusion Engine.

At a recent meeting of the London Physical Society, Mr. Woodward described an experiment illustrating motion produced by diffusion. A porous reservoir of clay containing air was suspended from one end of a weighted balance beam. A glass tube projected from it below and dipped into a vessel of water. A jet of hydrogen gas was allowed to play on the outside of the reservoir, and the balance beam began to oscillate. This is an adaptation of Graham's well-known experiment, and is, in fact, a diffusion engine.

Tomato Flour.

The Italians dry and pulverize the pulp of the tomato. Large districts are devoted to the culture of the fruit for this purpose, the plant being usually raised between rows of vines in vineyards for the sake of economy of land. The ripe fruit is macerated in water, and when reduced to a thin pulp is strained to take out the seeds, cores, etc., and then spread in the sun to dry. It is afterward ground and put up for market. There seems to be no reason why evaporating ovens, so much in use for drying less succulent fruit, as apples, might not be utilized in this country for preparing tomatoes by drying.

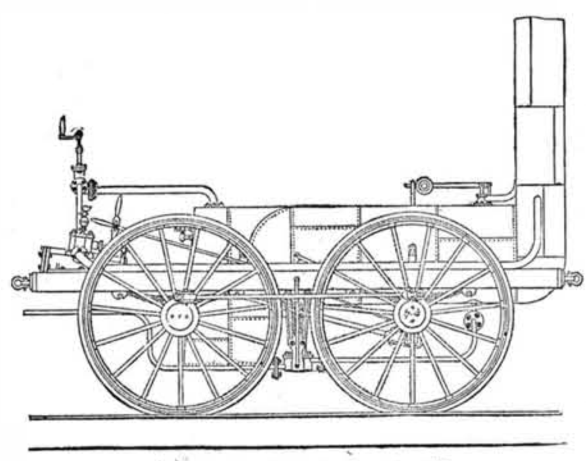
Of course powdered tomato might not supersede the canned fresh fruit. Its chief use would be for soups, sauces, and other auxiliary uses in cooking. But there are many consumers of the fresh tomato who refuse the tinned canned tomato from fear of the action of the acid of the fruit on the leaded tin of the can, the resultant being in their estimation a virulent lead poison. Tomatoes put up in glass—quite high priced—have therefore been welcomed by lovers of the fruit—or vegetable. Possibly there is room here for an addition to our list of dried or evaporated food articles.

A Lack of System.

It is the general impression that system and uniformity were becoming the rule in practical mechanics, the reduplication of parts and machine-produced articles not being confined to a few departments, but being gradually extended so as to promise eventually to embrace most of our industries. In railroading, especially, it has been the common belief that uniformity was gradually taking the place of independent diversity, an indication being the growing adoption of the ordinary gauge for width between rails.

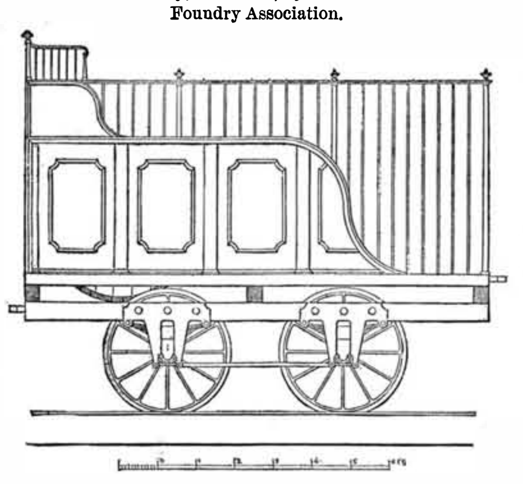
But from a circular issued by the secretary of the Master Car Builders' Association it appears that the very opposite of uniformity is the rule among car builders for railroad companies. The master car builder of the Boston and Albany Railroad says he has forty different kinds of brake heads and shoes, eleven of journal boxes, thirty-seven journal bearings, ten cast iron and five or six wrought iron draw bars, eight or ten different draw bar side castings, and a multitude of various other different parts of a car. The master car builder of the Baltimore and Ohio road reports sixty-five different kinds of journal bearings, and in eleven other articles in common use varieties numbering from twenty-five to six. And similar reports have been sent from other railroad authorities.

It is a singular exhibit. It would seem almost that human perversity and not mere chance, or individual convenience, had produced this wide diversity. It was generally known that human lives—brakemen's lives—were sacrificed to the lack of uniformity in the height of couplings, but it is appalling to learn that "the most careful estimates show that from 1,200 to 1,500 railroad employes are killed in this country annually, and from 5,000 to 10,000 more or less seriously injured; and a very considerable proportion of this sacrifice of life and limb is preventable by improved and uniform methods of constructing cars."



"DE WITT CLINTON."

Copy of original drawing of the "De Witt Clinton," the third locomotive engine built for actual service on a railroad in the United States. Made for John B. Jervis for railroad between Albany and Schenectady, A. D. 1831, by the West Point Foundry Association.

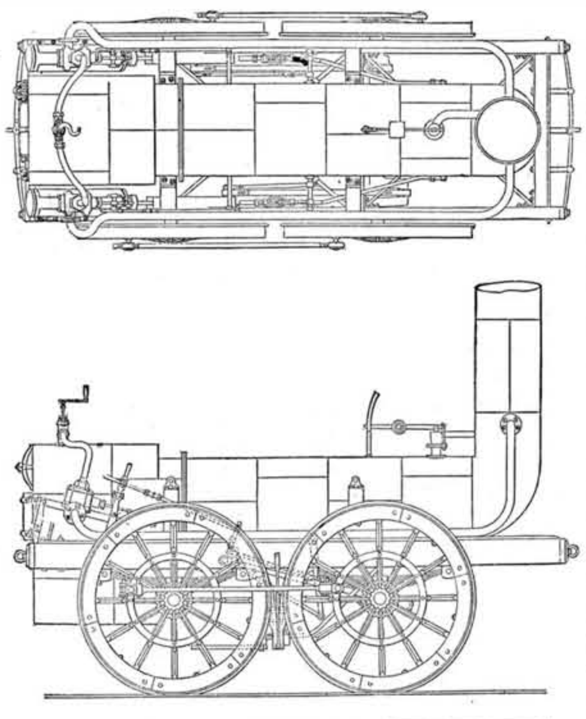


LOCOMOTIVE TENDER.

Built by the West Point Foundry Association.

THE CHICAGO RAILWAY EXPOSITION.

Among the interesting things to be seen at the Chicago Exposition of Railway Appliances, lately opened, are the original drawings of several early locomotives, diagrams of which we give herewith. The drawings were presented by the West Point Foundry Association to the American Society of Civil Engineers. Our diagrams are from larger cuts given in the *Railroad Gazette.*



"THE WEST POINT."

Copy of original drawing of "The West Point," the second locomotive engine built for actual service on a railroad in the United States. Made for the South Carolina Railroad, A. D. 1830, by the West Point Foundry Association.

The inscription in each of the engravings is copied from the original drawings, and gives the date when the engines were built.

The "Best Friend" was shipped to Charleston, and arrived there in October, 1830, and, according to Brown's "History of the Locomotive," "continued to do the necessary work of the road, hauling materials, workmen, ballast, lumber, etc., used in the construction." On June 7, 1831, its boiler exploded, being, it is said, the first locomotive boiler explosion on record.

The "West Point" was the second locomotive built for actual service. It was ordered from the West Point Foundry, and constructed from plans sent by Horatio Allen, Esq., then Chief Engineer of the South Carolina Railroad. It arrived in Charleston in February, 1831.

The locomotive "De Witt Clinton" was ordered by John B. Jervis, Chief Engineer of the Mohawk and Hudson Railroad, and was the third locomotive built in America for actual service upon a railroad. It was built at the West Point Foundry, and taken to Albany in the latter part of June, 1831, and was put upon the road and run by David Matthew. The first experimental trip was made on July 5, 1831.

A variety of illustrations of these engines have been published, which differ materially from each other. The engravings herewith have the merit of being authentic, as they have been made direct from tracings of the original drawings.

The Bower-Barff Process for Preserving Iron and Steel Surfaces.

At a recent meeting of the Society of Engineers, London, a paper was read by Mr. George Bower, on "The Bower-Barff Process of Preserving and Ornamenting Iron and Steel Surfaces."

The subject of the paper was of necessity interesting to all those who had to use iron and steel for constructive purposes, but although the author's and the Barff process of coating these metals with magnetic oxide had been before the world for several years, yet it was astonishing how few there were who really understood what these processes were.

There were two methods of producing the film of magnetic oxide, one of them, the Barff, by means of subjecting the articles at a red heat, inside an iron muffle, to the action of a superheated steam; the other, the Bower, by subjecting articles, at a similar heat, inside a brick chamber, to the action of products of combustion and of superheated air.

The Bower-Barff Company having acquired both patents, a furnace had now been devised which embraced the good points of both systems.

Iron at a sufficiently elevated temperature decomposes water; the oxygen entering into combination with the iron, in certain definite proportions, forms magnetic oxide, which is impervious to rust. This is especially applicable for wrought iron.

The Bower process was more especially adapted for cast iron, and it proceeds on the principle of first forming sesqui-oxide and then reducing it to magnetic by hydrocarbon gases or carbonic oxide. The Barff process produces magnetic oxide at one operation, but it is costly and takes a long time, while the Bower is obtained in two operations, and a very cheap and effective coating is produced in less than half the time of the other.

A model of a Bower-Barff furnace and drawings were exhibited as well as specimens of various articles which had been treated, consisting of stoves, ornamental castings, kitchen utensils, etc., which were most interesting.

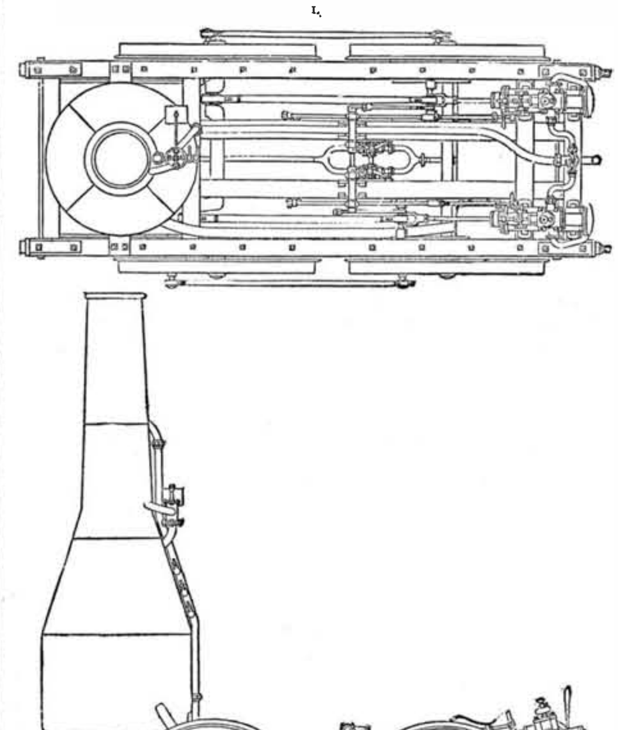
NOVEL MODE OF DEPOSITING METALS ON IRON.

The author showed a very curious property of magnetic oxide. He applied a brush formed of wires of different metals, first of all, to a casting which was not coated, and on which no effect was produced; then to a similar one which had been coated, when it was immediately covered at all parts touched by the brush with a beautiful shining coat of the metal of which the brush was formed. The author attributes this to the fact that magnetic oxide not being metallic, and to some extent gritty and porous, it had rubbed off by attrition some of the metal from the wires; and he expected that this would supersede the existing methods of bronzing and of depositing metals for the commoner kinds of Birmingham goods.

The author concluded a very interesting paper by saying that iron and steel were the kings of British industry, and he trusted it would be acknowledged at some time or other that the Bower-Barff process had contributed in some degree to maintain them in their supremacy.

Carbonic Acid and Bisulphide of Carbon.

At a recent meeting of the Royal Society, a paper was read "On a Hitherto Unobserved Resemblance between Carbonic Acid and Bisulphide of Carbon," by Dr. John Tyndall, F.R.S. He said: "When, by means of an electric current, a metal is volatilized and subjected to spectrum analysis, the 'reversal' of the bright band of the incandescent vapor is commonly observed. This is known to be due to the absorption of the rays emitted by the hot vapor in the partially cooled envelope of its own substance which surrounds it. The effect is the same in kind as the absorption by cold carbonic acid of the heat emitted by a carbonic oxide flame. For most sources of radiation carbonic acid is one of the most transparent of gases; for the radiation from the hot carbonic acid produced in the carbonic oxide flame, it is the most opaque of all. Again, for all ordinary sources of radiant heat, bisulphide of carbon, both in the liquid and vaporous form, is one of the most diathermanous bodies known. The analogy between the two substances extends to the vibrating periods of their atoms, and the bisulphide, like the carbonic acid, abandons its usually transparent character, and plays the part of an opaque body, when presented to the radiation from the carbonic oxide flame. Of the radiation from hydrogen, a thin layer of bisulphide transmits 90 per cent, absorbing only 10. For the radiation from carbonic acid, the same layer of bisulphide transmits only 25 per cent, 75 per cent being absorbed. For this source of rays, indeed, the bisulphide transcends, as an absorbent, many substances which, for all other sources, far transcend it."



"THE BEST FRIEND."

Copy of original drawing of "The Best Friend," the first locomotive engine built for actual service on a railroad in the United States. Made for the South Carolina Railroad, A. D. 1830, by the West Point Foundry Association.

Why there are no Water-rats in Ireland.

In an interesting article on the vole or water-rat, by Mr. Grant Allen, in the English *Country Gentleman*, the writer discusses the question why certain animals, such as snakes, vipers, water-rats, etc., are not found in Ireland. For the real solution of the problem, he says, we must go back to the time when England, Ireland, and the Continent were united by a broad belt of land across the beds of the English Channel, St. George's Channel, and the North Sea. It is now an ascertained fact that in the very latest geological period, known as the glacial epoch, the whole surface of the British Islands (except an insignificant strip of the south coast) was covered from end to end with a deep coating of glaciers, like that which now envelops all polar lands, and while this condition of things prevailed there were, of course, no animals of any sort in all Britain, or, at any rate, none but a few Arctic types. After the ice melted, however, the existing British fauna, such as it is, began to occupy the land, and the fact that it did so is one proof, though by no means the only proof, that a communication with the Continent then existed across the bed of the North Sea. Now, the animals only pushed their way very slowly into the newly cleared region as the ice melted away, and the consequence is that only some forty kinds of mammals out of the whole European fauna had penetrated as far as England before the gradual submergence of the lowland belt separated it from the Continent by forming the inclosing arms of the sea.

But Ireland lies even further west than England, and there is reason to believe that St. George's Channel had all been flooded some time before the waves of the Atlantic broke down the last link between Dover and Calais. Accordingly, Ireland never got her fair share of land animals at all, for though the wolf and fox and the Irish hare and many other quickly migrating creatures had time to cross the intervening belt before the submergence, several smaller or slower creatures, including the vipers, did not get over the ground fast enough, and were thus shut out forever from the Isle of Saints. Among them were the whole race of voles, and that is the reason why Ireland to this day has no water-rats.

Catching Float Gold in Streams.

We often hear mining men tell of the large quantities of float gold which pass down the streams of this State where mining is carried on, or which receive the waters of other streams where men are mining. No one seems to have thought it possible to catch any of this float gold after it passed out of the sluices into the streams themselves. Yet in other countries the people avail themselves of the opportunity afforded on streams where mining is done to catch the float gold—for it really does exist. It has been found, for instance, at Charleston, New Zealand, that the gold does not all settle in the tail races, but that, in the union of the water of several tail races, a small percentage, well worth saving, floats away.

The gold is arrested by a method termed "fly-catching," which consists of a series of blanket-tables placed across stream, like wiers, so that the waters shall flow over each table in succession. The tables are washed in turn, and the gold is streamed from the sand and caught up by quicksilver. Many of these "claims" yield from $20 to $45 per week, with little labor. In the Charleston district referred to, fly catching has become quite an industry in itself, and no doubt there are quite a number of places in this State where similar stations could be maintained with profit.

The tables are constructed entirely of timber. Piles two or three feet in length are driven firmly into the bed of the creek, and on these are nailed lengths of stout quartering, covered over with one-inch boards laid close together, so as to form a smooth table. Pieces of lighter quartering are then placed over the boards from top to bottom, forming divisions about four feet in width. Blanketing or cloth—ordinary grain sacks opened out are frequently used—is next spread smoothly along these divisions and securely fastened down by small strips of wood. The tables vary in length from seven to twelve feet, and are placed in the creek at intervals of from sixty to a hundred feet, extending quite across the stream. The proprietors of these rights are said to realize during rainy weather very good returns, ranging from $10 to $30 a week, according to the nature of the workings on the banks above and the number of tables set in the creek. The tables are liable to damage by flood. The tables are made in compartments, and when the blankets are lifted out of one compartment, spare cloths are kept to replace those lifted. The men wash out the cloths once or twice a day, in a box by the side of the creek. The fine tailings pass over several sets of tables in their course down the creek.—*Mining and Scientific Press.*

AN $800 silver brick from the Pioneer Reduction Works was exhibited at Nevada City last week.

NEW FUEL ECONOMIZER.

It is a matter well understood among steam users and engineers that from 50 per cent to 75 per cent of the steam generating powers of coal are lost by the passing off of the gases and smoke in an unburnt condition, caused by lack of oxygen sufficient to produce combustion. By the use of one part steam to fifteen of hot air commingled and injected rapidly into the furnace by vacuum, the otherwise waste gases are ignited and economy effected.

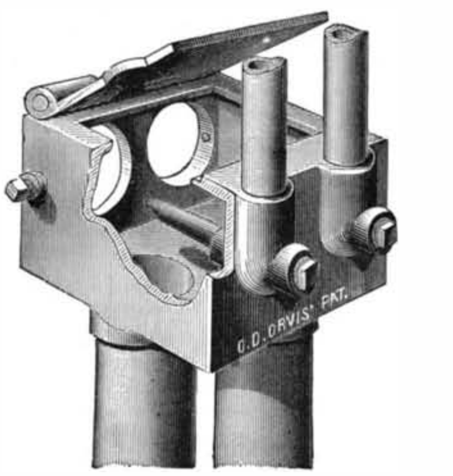


Fig. 2.—VACUUM CHAMBER WITH TWO STEAM JETS FOR INJECTING HEATED AIR AND STEAM INTO THE FURNACE.

When anthracite coal is burned, this attachment will, by the injection of hot air over the surface of the firebed, ignite the gases, utilize more completely the fuel employed, and, it is stated, show an actual saving of from 15 to 35 per cent. If bituminous coal is used, the economy will average about the same, with the additional advantage of burning all the smoke. The air is drawn through a heater in the ashpit, and projected into the combustion chamber by small jets of steam, as shown in Fig. 2.

The apparatus can be attached to any furnace in a few hours, without structural changes. It requires no fitting to or alteration of the boiler. It will invariably effect an economy in any grade or price fuel, varying according to condition of boiler, furnace, smoke stack, and fuel used. It will improve the draught and save the expense of high chimney stacks.

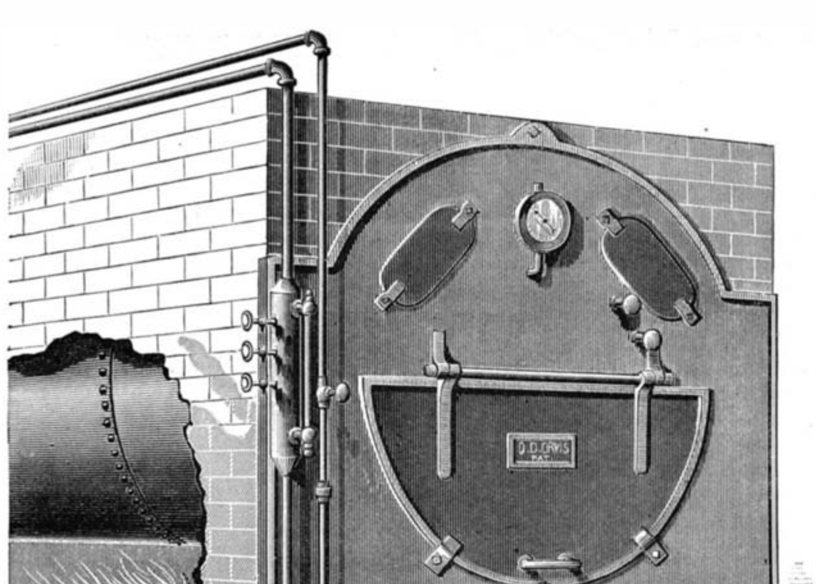


Fig. 1.—ORVIS COMBUSTION ATTACHMENT.

Practical experiments and exhaustive tests during a period of over two years both in this country and Europe, on various kinds of furnaces and fuels, have shown gratifying results in every instance.

This invention supplies the furnace by means of two vacuum boxes and four pipes opening into the fire chamber above the burning fuel. Through these pipes are introduced steam and heated air, that mingle with the heated gases arising from the firebed, and supply the requisite oxygen and hydrogen for consuming the gases and promoting perfect combustion.

This invention is the result of protracted study on the part of the inventor, Mr. Orel D. Orvis, who is also a capitalist, and the president of the company. Six companies have been organized to work the patent in different parts of this country. The New Jersey company has already declared a dividend of five per cent. Further particulars may be obtained by addressing Orel D. Orvis, President of the New York Combustion Attachment Company, 261 Broadway, New York city.

How to Make Printing Plates from Photos.—The Asser Process.

A sheet of unsized paper—white blotting paper, in fact—was laid on a slab of plate glass, and dabbed over with a thin starch paste, a soft sponge being used for the purpose, and care taken to only apply so much starch paste as would fairly sink into the texture of the paper.

The sheet was next dried, after which it was sensitized by being floated (starched side downward) for five minutes on a five per cent solution of potassium bichromate, and it was hung up to dry in a moderately warm room. When dry, it was exposed under an ordinary negative for about two-thirds of the time which would have been required to obtain a silver print, after which the print—now of a light brown color—was soaked in water until all traces of unaltered bichromate were removed. The wet print was now partially dried by means of blotting-paper, and then exposed to the air until dry, after which it was laid between sheets of ordinary white paper, and well ironed with an ordinary flat iron, heated to about 150° Centigrade; the object of this proceeding being to harden the altered starch, and to enable it to hold the fatty ink firmly.

The sheet was next moistened, laid on a sheet of damp blotting-paper, and inked by a velvet roller charged with rather thin lithographic transfer ink. This ink adhered to the exposed portions, which refused to take up water, as a kind of granular deposit, leaving the thorough damp portions of the paper clear and white. The stippled ink picture thus obtained was then laid on a cleaned zinc plate, and etched into relief.—*Photographic News.*

"Compound Oxygen."

Compound oxygen is a trade name given to various compounds of secret composition and of boasted medicinal qualities. Several varieties have been analyzed by Prof. Prescott, of the University of Michigan, and his results are published in the *Physician and Surgeon* of Ann Arbor.

1. COMPOUND OXYGEN. *Keep Dark.*—A colorless aqueous solution of nitrate of ammonium and nitrate of lead, the two salts being in nearly equal proportions, and together forming about three per cent of the solution.

2. OXYGEN AQUÆ. *For Digestion. Keep Cool.*—One of the grades of "compound oxygen." A colorless, odorless, and tasteless liquid—found to be water, of a commendable degree of purity, quite free from sophistications. Probably this is the original compound oxygen.

3. COMPOUND OXYGEN. *Dr. Green's,* 1880.—An aqueous solution of nitrate of ammonium, with a very little nitrate of lead.

4. COMPOUND OXYGEN. *A White Crystalline Solid.*—Obtained for analysis about five years ago, and then found to be nitrate of ammonium alone. "Contains all the vitalizing elements of the atmosphere, but combined in a different way."

5. COMPOUND OXYGEN.—Sent out from Boston. A colored, fragrant liquid, consisting of alcohol, chloroform, and balsam of tolu.

6. COMPOUND OXYGEN. *Dr. O'Leary's.*—Contains alcohol, chloroform, bitter almond oil, balsam of tolu, and red coloring matter.

The first two samples, Compound Oxygen and Oxygen Aquæ, were sent to Prof. Prescott for analysis by the editor of *Good Health,* who remarks as follows:

"It should be recollected that this solution is to be used by inhalation, a teaspoonful being added to a small quantity of warm water, through which air is drawn by means of a glass tube. Neither of the substances contained in the solution are volatile at the temperature at which the solution is used, so that it is impossible for any medicinal property whatever to be imparted by this boasted remedy, except what comes from the warm water, which is itself very healing when used in this way, as we have demonstrated in hundreds of cases. Prof. Prescott also tested the vapor given off from the pure solution when it was boiled, but found nothing more than the vapor of water.

"The Compound Oxygen is usually accompanied by what the manufacturers are pleased to call Oxygen Aquæ, which they recommend their patients to take as an aid to digestion. The analysis of this showed it to contain nothing but water. The most careful tests revealed nothing else."

Specific Heat of Gases.

The author has verified the identity of the specific heats of hydrogen, nitrogen, oxygen and carbon monoxide gases at temperatures up to 2,700°.—*M. Vieille, in Comptes Rendus.*

London Furniture Exhibition.

The Third Annual Furniture Exhibition, held at the Agricultural Hall, closed on May 16. The *Journal of the Society of Arts* says the main building was largely devoted to what we chiefly understand by furniture, that is, upholstery; and a considerable variety of objects and styles of decoration were exhibited. In the sides and in the galleries a very liberal interpretation of the term furniture was taken, but as in the Building Exhibition the main feature was structural, so in this exhibition the objects were chiefly connected with the contents of the structure. This classification did not, however, entirely hold good, for greenhouses and horticultural buildings generally had a special division set apart for them.

A considerable number of wood working machines were shown in action, and numerous specimens of new processes of wood carving, by which lengths of mouldings can be produced at a small expense, were exhibited. In the King Edward's Hall, which was devoted to domestic appliances, were exhibited a large number of useful objects. Here were shown specimens of pottery made from iron slag, and decorated in green, blue, and brown colors; and basins, trays, waiters, etc., made from pulp by the Patent Pulp Manufacturing Company, which are said to be practically unbreakable. The galleries were devoted to pianos, of which there were a large number; to carpets, chairs, stoves, and also to some of the lighter objects for exhibition. Messrs. H. R. Willis & Company, of Kidderminster, showed a three-quarter Brussels power loom, by Messrs. John Crossley & Company, at work. The loom is constructed to weave Brussels velvet (or cut pile) carpet, and is provided with the necessary changes to weave ordinary loop Brussels by a special construction of the Jacquard, and it can be arranged to weave either five or six frame carpet.

Messrs. Cardinal & Harford showed a small loom for the making of Turkey carpets, brought from Koula, in Asia Minor. This is very roughly constructed of such materials as came to hand, the appliances being of a very rude character. It was intended to show this loom at work, but owing to the impossiblity of prevailing upon a Moslem family to leave Turkey, the idea had to be abandoned. The Institut de Sculpture sur Bois, at Brienz, sent over to the exhibition some native workpeople, who were to be seen at work in the west gallery, surrounded by specimens of the wood carving for which Switzerland is so famous. In the Oriental Bazaar, arranged by Messrs. Holme & Company, the various articles were set out in stalls, each of which was devoted to the town from which the articles are obtained or shipped; thus, under Tokio, was shown porcelain and pottery from Tokio, Ota, Satsuma, Kaga, etc.; under Canton, furniture, gongs, etc.; under Benares, chased silver work; under Karachi, Scinde pottery; under Bombay, carved sandal wood, and inlaid box work and furniture; under Constantinople, Syrian, Turkish, Bulgarian, and Persian embroideries; under Tunis, lanterns, slippers, etc., and so on, making eighteen Eastern towns in all.

Of other more general exhibits, mention may be made of various specimens of stained glass, and of the new imitation called "glacier," shown by Messrs. Perry & Company. This material is supplied in pieces of different sizes, and is affixed to the glass simply by wetting the glass uniformly and then applying the design. It is stated that it will not crack or leave the glass under the action of heat or moisture. A large collection of morocco leathers of special dyes were shown, as well as the new Caiman and Zeddo grains. The material called "veloplastic," which is made to imitate leather, silks, damasks, etc., is used for upholstery purposes, dressing bags, fancy leather goods, and even for bookbinding. The Yale Lock Manufacturing Company exhibited a large supply of their special locks and keys, among which was their time lock, which, isolated from an external communication, can be set to be opened at any predetermined hour.

Printing and printing processes were also represented in the exhibition. Messrs. Wyman exhibited the "Cyclostyle," a copying apparatus, the advantages of which are stated to be that (1) copies are in a permanent jet black color; (2) any number of copies, from 10 to 2,000, can be obtained from one original writing; (3) no washing, no damping, no melting, and no press required; (4) the original may be left for any length of time, and further copies taken from it when wanted; (5) the last copy is as good as the first.

The World's Inventors.*

Usually when a man has invented something novel and useful, and has obtained a patent therefor, he is possessed of a feeling of pride that raises him in his own estimation, and frequently in the estimation of some others, rather above the average of mortals. He imagines, or at least hopes, that his invention will prove to be a lever with which the world will be elevated to a higher sphere of usefulness and happiness, while at the same time and incident thereto he fondly dreams that he has entered on the high road to fortune and renown, and that he is to become a millionaire. He looks upon the letters patent that display the great American eagle in all of his gorgeousness, and that bear the signature of those high in authority, as a most precious document, that is either carefully laid away among his archives to be handed down to posterity, to show how great a man and how inventive a genius he was, or ornately framed and displayed in such manner that all may behold and admire. There is nothing wrong in any of this, but rather much that is commendable. Notable inventions have marked the march of civilization in all ages of the world, and the epochs of history are marked by great discoveries none the less important. In fact, discoverers and inventors should be classed together. Among the great discoverers of the world in physical geography the discovery of America by Columbus in 1492; of Florida by Ponce de Leon, 1512; and of the Mississippi River by De Soto, in 1541; and in the arts and sciences, of the circulation of the blood by Harvey, in 1619; of making pictures by the aid of light by Daguerre, in 1838; and of electricity by Franklin, 1752, were of the utmost importance to mankind, the beneficial effects of which are apparent every day. On the other hand, the world would not have arrived at the high zenith to which it has attained had it not been for the inventive geniuses who bestowed their wonderful gifts upon it. What would railroading be to-day without such an appliance for stopping the motion of trains as the air brake patented by Westinghouse in 1859, or steel rails, the cheap production of which was invented by Bessemer in 1856? The invention of breech-loading firearms, by Thornton and Hall, in 1811, revolutionized the methods of modern warfare, even as the invention of gunpowder by Schwartz, in 1320, compelled the abandonment of cross-bows, spears, and slings, and substituted the matchlock and blunderbuss. The second century of the Christian era (A. D. 130) witnessed the invention of the mariner's compass, without which Columbus would never have been able to find his way across the wide, wild western ocean, and without which, without any essential difference from that used by the ancient navigators, extended traffic on the ocean would be simply impossible. We all appreciate the value of Whitney's invention of the cotton gin, in 1794; of the grain binder by Gordon, in 1872; of the grain harvester, by Haines, in 1849; of the knitting machine by Lee, in 1589; of the common match by Walker, in 1829; of the mowing machine by Scott, in 1815; of the machine for making pins by Wright, in 1824; of the lumber planing machine by Bentham, in 1791; of printing by Gutenberg, in 1444; of the type-revolving printing press by Hoe, in 1847; of the safety lamp by Davy, in 1815; of the screw propeller by Stevens, in 1804; of the sewing machine by Howe, in 1847; of the first successful steamboat by Fulton, in 1808; of the first successful steam engine by Watt, in 1744; and of practical telegraphy by Morse, in 1837.

The world appreciates all these inventions and thousands of others of greater or less usefulness, and from which the inventors in many instances have obtained both fame and great pecuniary reward. And the field is a wide one yet, open and free to all, with as large possibilities for the future as the past has shown.

But there are thousands of inventors, who have never realized as much on their inventions as their letters patent cost them, and never will; not always because of lack of intrinsic merit, but that their merits were not properly made known to the public. A man who may have a patent for a thing, no matter how valuable it may be, and does not direct public attention to it—does not "push" it—resembles the man spoken of in the Bible, who wrapped his talent in a napkin and hid it in the earth. It occurs to us that the talents all men possess to greater or less degree, particularly as regards their capacity for business—their adaptability for transacting the affairs of life—are very much like the inventions of men. One man may possess sufficient talent to make him a successful merchant, or manufacturer, or mechanic, or artisan, and by "pushing" it he attains to eminence in his profession, while another with equal talent, who does not "push" it, lags behind in the race of life, and when the end comes is like the man who hid his talent in the earth. It is folly for any man to say he can never find employment, if he is possessed of average intelligence, sufficient education, good character, and an abundance of "push." With these qualifications entrance can be gained into almost any office, store, or workshop in the land, but the "pushing" must be done, even as the owner of a valuable patent must "push" it before he can hope to realize any profit therefrom.

* *The Age of Steel.*

Protoplasm.

Dr. Dolley, of Rochester, has lately translated an interesting article from the German of Dr. T. W. Engelmann, of Utrecht, entitled "The Physiology of Protoplasmic Motion." The introductory portions repeat the familiar descriptions of the physical and chemical properties of protoplasm, and its peculiar and mysterious motion. From succeeding sections we gather the following instructive particulars, all of which has not the recommendation of newness, but seems to bear the warrant of established facts:

Temperature.—For all contractile protoplasm there is a higher and lower temperature at which the spontaneous movements cease; the minimum lies mostly in the neighborhood of 0° Cent., and the maximum about 40° Cent. There is a certain high temperature at which motion reaches its maximum. This is called the optimum temperature, and lies usually several degrees below the maximum. The maximum temperature produces heat rigidity, or heat tetanus, at which point protoplasm contracts, becomes motionless, and remains contracted as though held by strong artificial stimulants. On cooling, motion is again resumed. But too long warming produces death—coagulation.

There is also for all protoplasm a maximum and minimum capacity for the inhibition of water. The minimum may average below 60 per cent, and the maximum over 90 per cent.

At a maximum, movement ceases. This is called wet tetanus. There is also dry tetanus, at which point, owing to the absorption of water below the amount which insures movement, all motion stops. Protoplasm which has been completely dried in the air at ordinary temperatures may revive even after years upon remoistening.

It has been kept in sea water, so reduced through evaporation as to contain 10 per cent of salt.

It survives but a short time the absence of oxygen. High atmospheric pressure arrests the motion of protoplasm, and diminished pressure above a certain limit hastens it, or permits it to remain unchanged. Hydrogen acts fatally and causes death. The spontaneous movement of protoplasm is interfered with and prevented unless the fluid remain neutral, a slight excess of alkali and especially of acid producing stagnation. In dilute caustic alkalies protoplasm swells very much, and finally dissolves and flattens. In dilute acids death begins with turbidity and shrinking. The vapors of ether and chloroform, even when very greatly diluted by common air, produce coagulation, though if quickly removed pure air will again restore motion.

Veratrine acts quickly and its effects closely resemble those produced upon the "contractile substance of muscle." Quinine appears also to exercise striking toxic qualities in its effects upon protoplasm.

Irritants, such as changes of temperature, electrical and mechanical shocks, and even sudden illumination, affect the protoplasmic mass; their effects varying with various circumstances, as strength and character of irritation, unequal application of the excitant to different parts, and the nature of the protoplasm chosen. "Usually the result of artificial irritation expresses itself in that the protoplasmic parts directly reached by the irritant, transiently and without marked change of volume, draw themselves together, exhibiting the smallest possible surface, in a manner similar to an irritated muscle and strive to assume a spherical form." The theory offered by the author of the peculiar and hitherto unexplained motion of protoplasm, is that the mass is made up of molecular units which he terms inotagmen, which have in themselves powers of contraction and mobility, whereby the whole body of which they are parts is set in motion, upon the more or less rhythmical or axial motion of these monads, which bear to the whole substance of protoplasm some such relation as is borne by the constituent molecules of a crystalline body to the body itself. L. P. G.

Selecting a Horse.

The *Turf, Field, and Farm*, than which there is no better authority on the subject, says that "in buying a horse, first look at his head and eyes for signs of intelligence, temper, courage, and honesty. Unless a horse has brains, you cannot teach him to do anything well. If bad qualities predominate in a horse, education only serves to enlarge and intensify them. The head is the indicator of disposition. A square muzzle, with large nostrils, evidences an ample breathing apparatus and lung power. Next, see that he is well under the jowl, with jaw-bones broad and wide apart under the throttle. Breadth and fullness between the ears and eyes are always desirable. The eyes should be full and hazel in color, ears small and thin and thrown well forward. The horse that turns his ears back every now and then is not to be trusted. He is either a biter or a kicker, and is sure to be vicious in other respects, and, being naturally vicious, can never be trained to do anything well, and so a horse with a rounding nose, tapering forehead, and a broad, full face below the eyes is always treacherous and not to be depended on. Avoid the long-legged, stilted animal—always choosing one with a short, straight back and rump, withers high and shoulders sloping, well set back, and with good depth of chest, fore legs short, hind legs straight, with low down hock, short pastern joints, and a round, mulish-shaped foot."

Manufacture of Rubber Shoes.

The *Shoe and Leather Reporter* says that there are sixteen rubber boot and shoe factories in the country, nine of which turn out from 1,000 to 5,000 pairs daily and seven of them from 8,000 to 20,000 pairs, aggregating about 90,000 pairs a day, or 27,000,000 pairs a year. A great deal of attention is now bestowed on the style and finish of rubber shoes. Some of the specialties made by leading manufacturers are as handsome as any that are made of cloth or leather. The sales have been largely increased by these improvements. On the other hand the rubber shoe people aim to put into their stock the utmost amount of dirt that is possible; for the more dirt the less the cost to them.

Clerks and Mechanics.

An exchange says that recently there applied three hundred candidates in answer to a call for six clerks, and one hundred and thirty-seven proved to possess the necessary qualifications, and adds that "there is no such rush when capable mechanics are wanted" There is no parallel in the two cases. A large proportion of young men just from their schools are capable of performing the work of clerks, at least with the added experience of a few months, perhaps weeks, in mastering the details of the particular position. But the "capable mechanic" is the result of several years' apprentice service in addition to his school attainments.

DECISIONS RELATING TO PATENTS.

BY THE SUPREME COURT OF THE UNITED STATES.

GAGE *et al.* *v.* HERRING *et al.*

Appeal from the Circuit Court of the United States for the Northern District of New York. Reissued Patent 4,712. Original patent 19,984.

If a patent containing a single claim for a combination of several elements is, within four months before its expiration, reissued and extended with the same description as before, but with two claims, the one a repetition of the original claim, and the other for a combination of some of the elements only, the reissue is invalid as to the new claim and valid as to the other.

A patent for a combination of several elements is not infringed by using less than all the elements of the combination.

In a patent for an improvement in cooling and drying meal during its passage from the millstones to the bolts, the claim was for the arrangement and combination of a fan producing a suction blast, the meal chest, a spout forming a communication between the fan and the meal chest, a dust room above to catch the lighter part of the meal thrown upward by the current of air, a rotating spirally-flanged shaft in the meal chest conveying the meal to the elevator, a similar shaft in the dust room conveying the meal dust to the elevator, and the elevator taking the meal to the bolts. Within four months before the expiration of the patent it was reissued and extended with two claims, the one a repetition of the original claim, and the other for the combination of the fan, the communicating spout, the meal chest with the conveying shaft in it, and the elevator, but omitting the dust room with its conveying shaft. *Held* that the reissue was valid for the old claim only, and was not infringed by the use of the fan, spout, meal chest with its conveying shaft, elevator, and dust room, without any conveying shaft in the dust room or other mechanism performing the same function.

Solders, Soldering, and Brazing.

A practical mechanic furnishes the *American Artisan* an article on soldering and brazing, which contains useful information for the young metal worker, and if the facts given are not new to some of the older and more experienced tin and copper smiths, they may find it convenient to have their memory quickened.

In uniting tin, copper, brass, etc., with any of the soft solders, a copper soldering iron is generally used. In many cases, however, better work may be done without the soldering iron, by filing or turning the joints so that they fit closely, moistening them with soldering fluid, placing a piece of smooth tinfoil between them, tying them together with binding wire, and heating the whole in a lamp or fire until the tinfoil melts. We have often joined pieces of brass in this way, says the writer, so that the joints were quite invisible. Indeed, with soft solder, and especially with bismuth solder No. 19 or 21, almost all work may be done over a lamp without the use of a soldering iron or fire.

Advantage may be taken of the different degrees of fusibility of the solders in the table to make several joints in the same piece of work. Thus, if the first joint has been made with fine tinner's solder, there would be no danger of melting it in making a joint near it with bismuth solder No. 16, and the melting point of both is far enough removed from No. 19 to be in no danger of fusion during the use of that solder. Soft solders do not make malleable joints. To join brass, copper, or iron, so as to have the joint very strong and malleable, hard solder must be used. For this purpose No. 12 will be found excellent; though for iron, copper, or very infusible brass, nothing is better than silver coin, rolled out thin, which may be done by any silversmith or dentist. This makes decidedly the toughest of all joints, and, as a little silver goes a long way, it is not very expensive.

In preparing solders, whether hard or soft, great care is requisite to avoid two faults—first, a want of uniformity in the melted mass; and, second, a change in the proportions by the loss of volatile or oxidizable ingredients. To obtain hard solders of uniform composition, they are generally granulated by pouring them into water through a wet broom. Sometimes they are cast in solid masses, and reduced to powder by filing. Nos. 10, 11, 12, 13, 14, and 15 are generally rolled into thin plates, and sometimes the soft solders, especially No. 21, are rolled into sheets, and cut into narrow strips, which are very convenient for small work that is to be heated by lamp. Of course, where copper, silver, and similar metals are to be mixed with tin, zinc, etc., it is necessary to melt the more infusible metal first. When copper and zinc are heated together, half the zinc passes off in fumes. In preparing soft solders, the material should be melted under tallow, to prevent waste by oxidation; and in melting hard solders the same object is accomplished by covering them with a thick layer of powdered charcoal.

Hard solders, Nos. 6, 7, 8, and 9, are usually reduced to powder either by granulation or filing, and then spread along the joints after being mixed with borax which has been fused and powdered. It is not necessary that the grains of solder should be placed between the pieces to be joined, as with the aid of the borax they will sweat into the joint as soon as fusion takes place. The same is true of soft solder applied with soldering fluid. One of the essential requisites of success, however, is that the surfaces be clean, bright, and free from all rust. The best solder for platinum is fine gold. The joint is not only very infusible, but is not easily acted upon by common agents. For German silver joints, No. 14 is excellent.

For most hard solders, borax is the best flux. It dissolves any oxides which may exist on the surface of metal, and protects the latter from the further action of the air, so that the solder is thus enabled to come into actual contact with the surfaces that are to be joined. For soft solders the best flux is a soldering fluid which may be made by saturating equal parts of water and hydrochloric acid (spirit of salt) with zinc. The addition of a little sal ammoniac is said to improve it. It is not impossible that fluxes of even greater efficiency might be discovered by a little well directed effort; but for the present these answer every purpose. In using ordinary tinner's solder resin is the best and cheapest flux, and possesses this important advantage over chloride of zinc—it does not induce subsequent corrosion of the article to which it is applied. When chlorides have been applied to anything that is liable to rust, it is necessary to see that they are thoroughly washed off and the article carefully dried. The following table gives recipes the writer has tried, and which he says will be found exceedingly reliable. Some are taken from the Mechanical Manipulation of Holzapfel, whose name is a sufficient guarantee for their excellence:

TABLE OF SOLDERS.

No.	Name.	Composition.	Flux.	Fluxing point.
1	Plumber's coarse solder	Tin, 1; Lead, 3	R	800° Fahr.
2	" sealed "	" 1; " 2	R	441°
3	" fine "	" 1; " 2	R	370°
4	Tinner's solder	" 1½; " 1	R or Z	334°
5	" fine solder	" 2; " 1	R or Z	340°
6	Hard solder for copper, brass, iron	Copper, 2; zinc, 1	B	
7	" " " " " "	Good tough brass, 5; zinc, 1	B	
8	" " " " " " more fusible than 6 or 7	Copper, 1; zinc, 1	B	
9	Hard solder for copper, brass, iron	Good tough plate brass	B	
10	Silver solder for jewelers	Silver, 19; copper, 1; brass, 1	B	
11	" " " plating	" 2; brass, 1	B	
12	" " " silver, brass, iron	" 1; " 1	B	
13	" " " steel joints	" 19; copper, 1; brass, 1	B	
14	" " more fusible	" 5; brass, 5; zinc, 5	B	
15	Gold solder	Gold, 12; silver, 2; copper, 4	B	
16	Bismuth solder	Lead, 4; tin, 4; bismuth, 1	R or Z	320°
17	" "	" 3; " 3; " 1	R or Z	310°
18	" "	" 2; " 2; " 1	R or Z	292°
19	" "	" 2; " 1; " 2	R or Z	236°
20	" "	" 3; " 5; " 3	R or Z	202°
21	Pewterer's solder.	" 4; " 3; " 2	R or Z	

Abbreviations: R, Resin; B, Borax; Z, Chloride of Zinc.

Steam Fire Engine Test.

A new third size Silsby fire steamer was successfully tested lately at New Haven, Conn., in the presence of a large number of city officials and prominent members of the fire departments from various cities.

The fire was lighted, says the *Fireman's Journal*, at 2:55 o'clock, and in two and one-quarter minutes the gauge indicated ten pounds of steam, fifteen pounds in three minutes, twenty in three and one-half, and thirty pounds in four and one-half minutes. A minute later, a stream was playing on the Green. In order to make the test thorough, the steamer was made to pump its water from the cistern at the corner of Court Street, which held at the start 20,000 gallons. The official record was as follows:

Test.	No. of lines.	Feet each line.	Nozzle inches.	Horizontal.	Vertical.
1	1	200	1¼	278	195
2*	1	350	1¼	274	...
3	1	150	1¼	...	210
4	2	100	1	240	170
5†	2	100	1½	260	160
6†	2	100	1¾	250	150
7‡	2	100	⅞	195	140
8	1	1,500	1	165	...
9§	2	50	1¼	319	215

* Pipe on top of City Hall tower at elevation of 160 feet. † Two lines of 100 feet each, siamesed into one. ‡ Two lines of 100 feet each, siamesed into four lines of 50 feet each. § Two lines of 50 feet each, siamesed into 1¼ inch nozzle.

The steamer for over two hours worked with the greatest vigor, pouring out immense streams of water wherever the pipes were directed. She carried 120 pounds of steam, and in no instance, no matter how severe the test, did she fail to respond. The new steamer is by far the most powerful and handsome one in the city, and is a great addition to the New Haven Fire Department. One big test was forcing the water to the top of the City Hall tower, 160 feet high, and throwing a stream out upon the Green, a distance of 274 feet. The throwing of a stream a distance of 260 feet through a one and a half inch nozzle, and 250 feet through a one and three quarter inch nozzle, excited the admiration of old firemen, as did the supplementary test suggested by Mr. Denne, in order to fully illustrate the great power of the steamer in throwing a stream a long distance through 100 feet of hose, siamesed with a one and one-quarter inch nozzle. The stream was carried the remarkable distance of 319 feet.

Professor Huxley on Oysters.

Professor Huxley lately lectured at the Royal Institution upon "Oysters." He stated that the shells of the oyster are held together by an India-rubber like ligament controlled by a muscle. By this ligament the oyster can hold his shells tightly together. When the animal is killed without the destruction of the ligament, the latter expands and acts like a spring, keeping the shells open, except when pressed. It is absolutely necessary to the life of the oyster that the shells should open to some extent, consequently any great pressure on the shells is injurious to the animal. He did not wish to set his hearers against eating an animal which plays about the palate like gustatory summer lightning, still the oyster possessed elaborate apparatus, such as a foot, mouth, and even liver, the latter of which he trusted was not liable to get out of order. In short, the animal was of much greater complexity than the best repeater watch, and it has a highly developed nervous system. Its mouth has no jaws, and it lives by food carried to it by oceanic currents. It lays an enormous multitude of eggs, which lie like cream upon what is called its beard. The eggs of the English but not of the American oyster are incubated by the parent. In about a fortnight, more or less—for much depends upon the temperature—the young larvæ, each about one one-hundred-and-fifteenth inch in diameter, are set free from the egg. The young one has a bivalve shell, as regular and symmetrical on both sides as that of the cockle, and a great disk protrudes from the back of the neck. One oyster may contain a million eggs, which is enough to break the heart of Malthus. The young one floats about for several days, during which it may be carried by currents perhaps seventy or eighty miles, when it falls to the bottom and turns over on its left side; one of its valves then becomes fastened to the support below, and grows thicker as time passes on; the upper valve becomes flat. The age attained by the oyster is said to be twenty or twenty-five years, but this is not quite certain. It requires at least three per cent of saline matter in the water in order to live.

Enormous numbers of oysters perish. Excessive variations in temperature kill off multitudes, and the oyster, in its early stage, is eaten by everything which has a mouth. Some are killed in the struggle for existence, for only a limited number can live in an oyster bed, the amount of food being limited in its supply over a given area. In its later life it becomes the prey of star fish, ground fish, and parasites which work through its shell. When its shell is very thick it is attacked by various tunnelers, more especially the dog whelk. The dog whelk has a curious thing like a center-bit in his mouth; he settles on the oyster, and bores a round hole in his shell; it is a beautiful bit of engineering; he takes his time over it, for he has nothing else to do, and does not finish under several hours. Then the master of the oyster bed comes along and plucks up the whelk, which looks at him with a molluscous, innocent, friend-of-humanity-kind of a smile, and says: "Why can't you let me go on making my tunnel? I only want to enter into international relations." The owner of the oyster bed, however, put his heel upon him. This dog whelk parable was loudly applauded by five or six of the listeners. The rest of the auditory laughed.

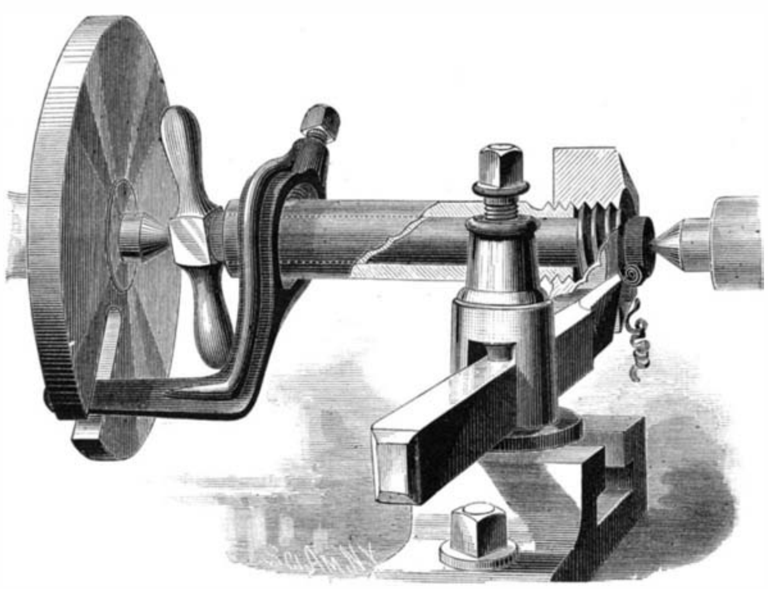
Next, said the lecturer, man comes in as a destroying agent. The scarcity and high price of oysters of late years are due to several causes. One of them is the increase of facilities, by means of new railways, for the transport of fish, not alone into the interior of the British Islands, but all over Europe. In England small towns which once had none now have fish shops. Another cause is that for many years the spatting has been bad; the meteorological conditions of the last twenty years have been bad for the oyster. There is no doubt that these two unavoidable influences have been at work, with the natural result of a rise in price with increased demand, without increased supply. Another alleged cause is over-dredging, thereby leaving too few to continue the brood. Professor Huxley said that it was useless to have a close time for oysters during a few months, if the fishermen might dredge as many as they pleased the rest of the year. And the general tendency of his closing argument, drawn from French statistics, was that over-dredging did not seem to have to do with the matter, the causes affecting the multiplication of the oyster being of too vast a nature to be much affected by such operations of man.

Slugs in Gardens.

Many gardeners have trouble with garden slugs. Baiting the slugs with bran is probably the surest way of catching them. The easiest way to proceed, according to James Vick, is to take some pieces of slate, or flat stones, or flat pieces of tin, and lay them about in the garden among the plants, distributing them very liberally; just at sundown go out and place a teaspoonful of bran on each piece of slate or tin, and the slugs will soon become aware of it, and begin to gather and feed on it. In about two hours, when it is dark, go out again with a lantern and a pail containing salt and water, and pick up each piece on which the slugs were found feeding, and throw slugs and bran into the brine, where they instantly die. It is well, also, to go around again in the morning, and many slugs will be found hiding under the pieces of slate, and can be destroyed in the brine. By following up this method persistently for a few weeks the garden may be effectually rid of the nuisance.

IMPROVED NUT ARBOR.

The useful tool shown in the engraving consists of a rod with centers in the ends to fit in the lathe centers, and a sleeve surrounding the rod the greater portion of its length, the rod and sleeve each having part of the screw threads upon which the nuts to be faced are screwed. The threads of one part may be shifted with respect to the threads of the other part after the nut is screwed on, so that one will check against the other, and thus hold the nuts to be faced by the threads alone. This will insure the facing of nuts true to the screw threads, and will avoid the imperfect work that results from the sides of the nuts being screwed against a shoulder of the mandrel when not true to begin with. This invention has been patented by Mr. Patrick Duffy, of New Bedford, Mass.



DUFFY'S NUT ARBOR.

Have Fishes Intelligence?

Dr. C. C. Abbott discusses in *Science* Mr. Romaine's opinion in regard to the intelligence of fish, where, in his "Animal Intelligence," he writes: "Neither in its instincts nor in general intelligence can any fish be compared with an ant or a bee."

Dr. Abbott thinks the words "any fish" open to discussion, and believes that "some fish" would be less open to criticism. Dr. Abbott cites the case of pickerel in a shallow stream, threatened by a net. One fish was caught. Then the others halted. Some sprang over the cork line, others made their way between the brail and the net, while others burrowed in the sand at the bottom and so worked their way under and out of the neck. The same authority cites the evidences of intelligence in the sunfish, the *Eupotomes aureus*. These fish pair, and the same fish live together for years. The same thing as to pairing and caring for their young happens with the black bass. But the last case cited by Dr. Abbott is at the least very remarkable as showing affection in fish, and consequently highly developed intelligence.

Having removed a brood of catfish (*Amirius catus*) from their mother, the young progeny were put in a glass globe. "The parent fish at once recognized that her young were not in the creek, although they were swimming in water. . . . At last its curiosity overcame its discretion, and it left the creek, and as best it could made its way to the base of the globe containing her young, a distance of about two feet." The young fish being liberated, "they immediately clustered about their parent, and followed her into deep water." Capt John H. Mortimer is authority for the fact of the concerted action of certain predatory sea fish, who maneuver as would a pack of hounds to secure their prey.

Spearing for Timber.

A new industry has recently been developed in Ireland—a sort of timber prospecting never dreamed of by our American pine hunters. It is a well known geological fact, says the *Northwestern Lumberman*, that immense tracts what are now bog lands in Ireland were once covered with forests of oak and pine, and that in cutting peat, immense trees of these varieties are found embedded in the earth at depths of ten, twenty, and thirty feet, in many cases whole groves being found standing just as they grew. To find out the location of these miniature subterranean forests is now the speculative work in which some industrious Irishmen are engaged. The timber, when brought to the surface, is found to be perfectly sound, and the oak, which is as black as ebony, is used extensively for ornaments of jewelry and fancy cabinet work, and sells at high prices. A recent visitor to the wild moor and mountain region of Donegal thus describes the way in which the seekers after buried forests operate. Two men, armed with steel rods about thirty feet long, traverse the bog, and by running their rods into the ground are able to ascertain where the trees are to be found. They work by what may be termed natural mathematics, and quickly determine the length of their prize, its approximate diameter, whether it is pine or oak, and is or is not a clumper—one of a company or clump. They fix on twenty or thirty feet square, and cross it with their searchers, say north and south, and then east and west, search it across each way, a stab to each foot or so, and in the course of a few minutes they know whether that area contains what they are looking for. The square lying next and next, and all near each other, are so searched, and the discoveries, if any, marked for future action. The unproductive are also marked, to avoid future loss of labor.

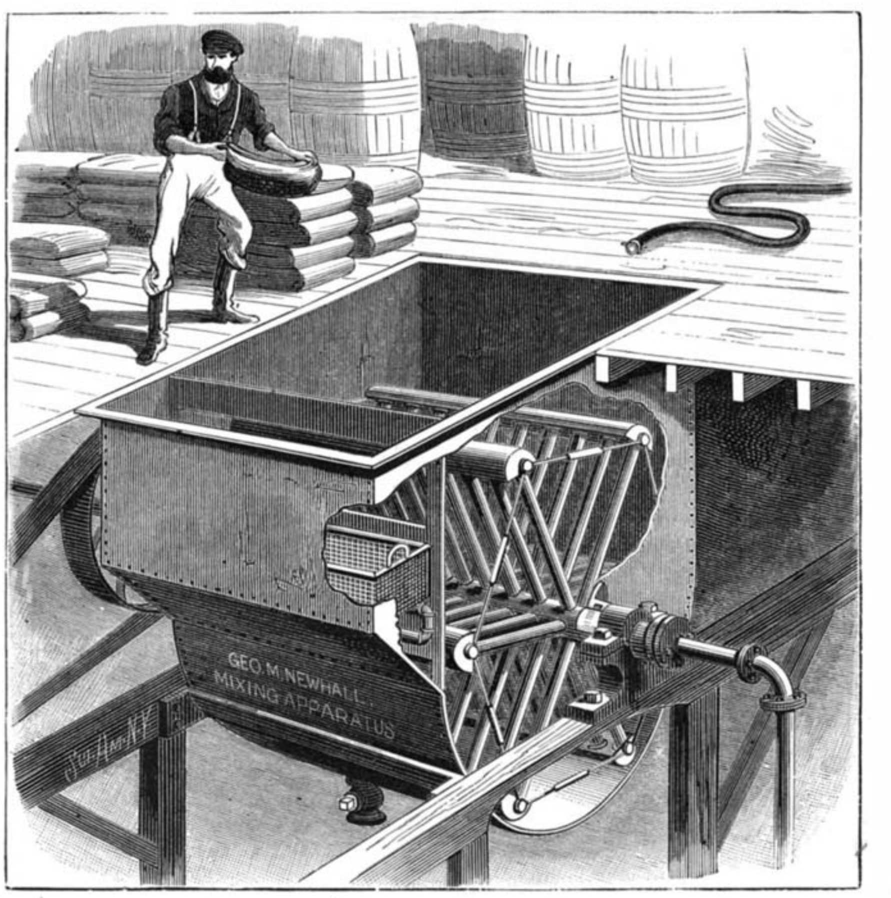
THE white perch of the Ohio are noted for the musical sounds they make. The sound is much like that produced by a silk thread placed in a window where the wind blows across it.

English Parcel Post.

The latest popular improvement introduced into the British postal system is to come into operation on August 1 next, under the following general conditions in regard to weights, dimensions, and rates of postage, viz.: Weights and postage: For an inland postal parcel of a weight of not exceeding 1 pound the rate of postage, to be prepaid in ordinary postage stamps, will be 3d.; exceeding 1 pound, and not exceeding 3 pounds, 6d.; exceeding 3 pounds, and not exceeding 5 pounds, 9d.; exceeding 5 pounds, and not exceeding 7 pounds, 1s. Dimensions: The dimensions allowed for an inland postal parcel will be—maximum length, 3 feet 6 inches; maximum length and girth combined, 6 feet. Examples: A parcel measuring 3 feet 6 inches in its longest dimensions may measure as much as 2 feet 6 inches in girth, *i. e.*, around its thickest part; or a shorter parcel may be thicker, *e. g.*, if measuring no more than 3 feet in length it may measure as much as 3 feet in girth, *i. e.*, around its thickest part.

NEW APPARATUS FOR STIRRING, MIXING, AND MELTING.

The stirrer in this apparatus is composed principally of steam heated tubes arranged to thoroughly mix the materials while maintaining them at a uniform temperature. A tubular shaft, concentric with the base of the vessel, extends through the vessel, and is provided with a pulley by which it is driven. A series of tubes radiate from the tubular shaft, there being in the present instance six rows of these tubes and ten tubes in each row; but the number of sets of tubes and the number of tubes in each set may be varied to suit requirements. The tubes of each row are closed at their outer ends, and a hollow bar or hood extends across the ends of each row of tubes, the several hoods being connected together by rods which render the stirrer rigid.



NEWHALL'S APPARATUS FOR STIRRING, MIXING, AND MELTING SUGAR, ETC.

A stationary pipe communicating at one end with any neighboring steam generator, and at the opposite end with a suitable discharge pipe, passes through stuffing boxes at the ends of the tubular shaft. A portion of this pipe, which extends into the tubular shaft, is open at the top, so as to form a trough. At one end of the vessel, and communicating therewith, is a receptacle which contains a removable basket made of wire gauze or netting, and supported on ledges in the receptacle; the bottom of the wire gauze vessel is inclined to the lower edge of the opening. There are beneath the basket steam heated pipes. While the above described apparatus may be used for obtaining solutions of salts and other crystalline substances and for dissolving gummy or resinous substances—as, for instance, in the manufacture of varnish and for thoroughly mixing liquids—it has been more especially designed for obtaining saccharine solutions.

The crude sugar, which always contains more or less insoluble foreign matter—such as sand, mud, and chips of cane—is placed with a supply of water in the vessel, and the stirrer is revolved from the bottom upward toward the wire gauze basket.

All parts of the mass are maintained at the same temperature and density by the steam heated stirrer, which revolves as close as possible to the bottom of the vessel without coming into actual contact therewith. There must necessarily be a persistent current of the contents of the vessel in the direction of rotation, and this, together with the movement of the crossbars or hoods of the stirrer so near to the bottom of the vessel, prevents the accumulation of sediment therein.

As the stirrer is rotated the particles of insoluble foreign matter are carried upward, and have a tendency to pass the side receptacle, where they are caught by the basket, accompanied with more or less of the solution, which is drained off from the basket, and returns to the main vessel through the opening below. More or less undissolved sugar will also find its way into the basket; hence the steam pipes below, the heat imparted at this point, together with the "wash" or eddy of sirup caused at intervals to pass through the opening as the stirrer revolves, tends to dissolve the sugar trapped in the basket.

When a thorough solution, free, or nearly so, from foreign matter has been obtained, the rotation of the stirrer is discontinued, the contents of the vessel drawn off, and the basket is emptied and cleaned. As the stirrer revolves, whatever water of condensation may be in the tubes will be discharged into the trough and pass off with the waste steam. This apparatus is capable of doing its work at almost any rate of speed, depending on the pressure and temperature of the steam and upon the speed of the stirrer. If desired, fluids may be used in the pipes for either heating or cooling.

The contents of the vessel can be held at the temperature of melting, by keeping steam on and stopping the stirrer. The upper portion alone is subjected to the extra heating; as the lower pipes soon fill with water, cooling occurs mostly from the surface, and in this apparatus it is not necessary to overheat the lower section in order to maintain the temperature of the upper.

The movement of the heating surface prevents the damage often caused in other melters by the mass of undissolved material lying upon the heating pipes previous to solution. It is well known that melting with "live steam" injected through perforated pipes, etc., leads to a dilution of the solution which is not always desired. Besides, one cannot well melt with very weak steam, as pressure is required to force against the pressure of the semi-fluid mass. This is considerable in *deep* vessels, which are the *quickest melters* with open steam.

Steam coil melters cumber up the lower portions of the melter, and are very unhandy to keep clean. They are expensive, rather ineffective, and often injurious to the substance treated. In this new melter and stirrer all these difficulties are avoided, and the work is perfectly and economically done. Further information in regard to this invention may be obtained by addressing the inventor, Mr. George M. Newhall, 225 Church Street, Philadelphia, Pa.

Singular Effect of Corrosive Sublimate.

A singular effect of corrosive sublimate, first observed by Salkowski, has recently been confirmed by Prevost and Trutiger, of Geneva (*Lancet*, April 14, p. 640). They have found that it causes the lime to be removed from the bones to the extent of 2 to 4 or sometimes 8 to 10 per cent, and to be deposited in the cortical substance of the kidneys, so that the kidneys appear almost as if petrified, while the bones, at least in the case of rabbits, become so altered that the epiphyses of the long bones are at length movable on the shaft. This decalcification takes place to the greatest extent when the doses of the poison are such as to cause death in three or four days.

IT is asserted that British capital to the extent of thirty millions went into Wyoming and Texas last year.

A NEW CONSTANT CURRENT PILE.

Dr. E. Obach, while experimenting with his movable bobbin galvanometer, had need of a battery that should furnish an intense and constant current of long duration, and was therefore led to devise and construct the pile which is shown in the accompanying cut.

This apparatus is nothing else than a Bunsen battery, employing zinc, water acidulated with sulphuric acid, carbon, and nitric acid, and so arranged as to secure a continuous renewal of the liquids. The internal resistance of each element is, on an average, 0·07 ohm, and the electromotive force is 2·09 volts. It is able, then, to furnish nearly 30 amperes in a short circuit.

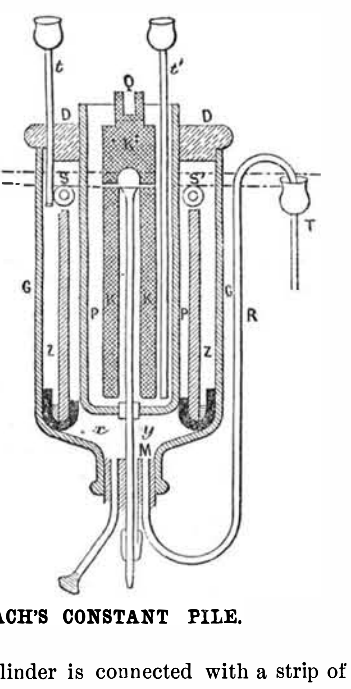
G G is a jar, 20 centimeters in height and 12·5 in diameter, placed in an inverted position over a proper support, and the bottom of which has been removed and replaced by a wooden cap covered with paraffine. The porous red earthenware vessel, P, which is held in place by a cork ring, is 23·5 centimeters in height and 6 in internal diameter. The choice of the porous vessel is very important, and the proper working of the element depends much upon the quality of it.

Those employed by Dr. Obach became entirely saturated one minute after having been filled with water, this giving the measure of their porosity.

The porous vessel is closed with a cork saturated with paraffine and traversed by a carbon, K. This latter, which is retort carbon, is 22·5 centimeters long by 3·5 in diameter, and contains in its center an aperture 15 millimeters in diameter and 18 in length. In its upper part there is a series of small radiating holes; and a glass tube, M, whose upper extremity is funnel-shaped, reaches its summit and traverses the porous vessel as well as the cap of the jar. The bottom of the porous vessel is paraffined, as is also its upper edge and the head of the carbon. Upon the bottom of the jar there rests a gutta-percha ring which forms a channel, *x y*, that is filled with mercury, and into this dips the lower part of a zinc cylinder 16 centimeters in length, 6 in diameter, and weighing 2 kilogrammes. Through the cork at the lower part of the jar there pass two tubes, R and *r*, and through the wooden cover the two funnel tubes, *t* and *t'*. The former of these, *t*, terminates in the upper part of the zinc, while the latter runs to the bottom of the porous vessel.

The liquids circulate as follows: The fresh nitric acid reaches the bottom of the porous vessel through the funnel tube, *t'*, while the spent acid flows off through the radiating holes in the carbon into the central tube, M, and into a receptacle placed at the lower part. The water containing sulphuric acid enters, on the contrary, at the upper part, at *t*, and, being rendered denser through the formation of sulphate of zinc, flows through the siphon tube, R, into the tube, T. The level of the liquids is not very different (as may be seen in the figure), but that of the sulphuric acid water is a little the higher of the two in the external vessel. S S' in a section of a glass tube bent into a circle and arranged at the upper part of the liquid, where it is warmest. This tube is traversed by a current of cold water in order to keep the liquid at a constant temperature. The tube, *r*, serves to empty the pile, and is always kept corked while the latter is in operation.

All the communications are established by mercurial con-



OBACH'S CONSTANT PILE.

tacts. The zinc cylinder is connected with a strip of copper contained in a glass tube that traverses the cover, and which dips into the mercury in the gutta-percha trough. The square end of the carbon is hollowed out at Q, and the cavity is filled with mercury which serves to establish communications with the external circuit.—*La Nature.*

Fatal Shock from Supposed Snake Bite.

That imagination may prove fatal receives fresh proof from the case reported in the *Med. Press*, April 25, 1883, by Dr. C. R. Francis. The patient, awakened from his sleep by something creeping over his naked legs, immediately jumped to the conclusion that it was a cobra, went into a state of collapse, and died, though it was discovered, even before death, that the supposed cobra was a harmless lizard.

GARDEN DESTROYERS.—THE OAK LEAF ROLLER MOTH.

The caterpillars of this pretty little moth are very destructive to the leaves of oak trees, particularly in the south of England, and they occasionally occur in such extraordinary numbers that they entirely divest the trees of their foliage. When this is the case, the trees suffer very much; in some seasons not only are a few trees here and there attacked, but acres and indeed miles of woodland are covered with swarms of this pest.

This insect is by no means very abundant every year, but, as is the case with many insects, for several years they may be positively scarce, and then for some reason, whether the absence of their natural enemies, or particularly favorable weather at a critical period of their existence, or some other

OAK LEAF ROLLER MOTH AND CATERPILLAR AND ROLLED LEAVES.

circumstance is uncertain, they make their appearance in very great numbers for one or more seasons, and then suddenly disappear as mysteriously as they came.

The birds, as usual, help immensely in destroying these caterpillars. The ichneumons and other parasitical flies attack them with great vigor, and on one occasion it was found that more than half the caterpillars were infested by some parasites.

The year before last I received a box full of caterpillars that were found feeding on the oak leaves and stripping the trees; they were in such a state of decomposition when they reached me that it was impossible to say what they all were, but no doubt there were some of these oak leaf roller caterpillars among them; in the box were also a number of hairworms (a species of Mermis, one of the Gordi), some of which were seven inches in length, and as thick as a piece of twine. As far as I could judge, nearly every one of the caterpillars must have been infested with one of these worms, which had no doubt left their victims at their death.

The moths appear toward the end of June, and lay their eggs on the twigs or buds; the caterpillars are hatched in the following spring when the young leaves are just appearing. They almost at once begin to roll up the leaves into a kind of tube, which forms a protection for them against the weather and their various enemies. This would seem an almost impossible task when we consider the minute size of the caterpillars and the comparative stiffness of the leaves, and that each caterpillar works alone on a separate leaf. Many, if not all, caterpillars are provided with the means of spinning a silken thread, as silkworms do, being furnished with two internal tubes containing a thick gummy fluid (liquid silk, in fact); these two tubes are joined together, and terminate in one very fine one, which projects slightly from the head just below the mouth. When the insect wishes to form a thread, it touches the object to which it is to be attached with the end of this tube and ejects a drop of the fluid; then, drawing back its head or letting itself fall, a fine stream of this sticky fluid is drawn out, which immediately hardens into a strong thread. When the young caterpillar wishes to roll up a leaf, it attaches a thread to the under side of the edge of the leaf, and fastens the other end to the leaf a little way from the edge. The thread in some way becomes tighter, causing the leaf to curl slightly. Some say the caterpillars tighten the thread by pressing it down and reattaching it, or by pressing it down and spinning a fresh and tight thread which holds the leaf in a bent position. I am of opinion that the threads contract as they dry, and my own observations bear out my views. It is quite possible that both theories may be correct; the result is, however, the same. Subsequent threads attached in the same manner cause the leaf to curl more and more; others are then attached to the outside of this roll, which eventually presents the appearance of those shown in the figure. Within this shelter the caterpillar lives in comparative safety, feeding on the internal coils of the roll. If disturbed by the entrance of any enemy at one end of its dwelling, it very quickly makes its exit at the other, letting itself fall, but still attached to the leaf by a thread, by which, when it considers all danger is over, it climbs up and regains its old quarters. When a branch infested by these caterpillars is shaken, large numbers may almost immediately be seen dangling at the end of their lines some feet in length. The caterpillars attain their full size about three weeks after they are hatched; they then become chrysalides within the curled-up leaves; in the course of about a month the moths appear, and after pairing lay their eggs as before mentioned.

The caterpillars are about five-eighths of an inch in length when full grown, and are of a dull green color with brownish spots; they are provided with a pair of legs on the first three, the sixth, seventh, eighth, ninth, and last six joints of the body. The chrysalis is of a very dark brown color. —*G. S. S., in The Garden.*

Hardwoods for House Finishing.

At the West, as well as in our Eastern cities and towns, the consumption of hardwoods for interior finish in buildings is a most important factor in the trade in such lumber. The woods in use by Chicago building contractors, says the *Northwestern Lumberman*, are mainly embodied in the following list: Birch, butternut, calico and white ash, sycamore, white and red oak, cherry, beech, walnut, whitewood, white maple, yellow pine, mahogany, Manila, prima vera, and coffee wood. Sycamore, white oak, and beech are the principal woods that are used quarter-sawed. On account of the growing scarcity of cherry, and the high prices charged for good lumber, other woods are sought after that will answer as a substitute, affording a similarly rich grain. Cherry is imitated with gum, and quarter-sawed beech is named as the lumber likely to take its place to some extent. Calico ash is obtained principally in Indiana and Michigan. White maple is a designation applied to the sap of the ordinary maple, which is sought after for finishing purposes. Mahogany has latterly been used to quite an extent in fancy buildings. Very often from six to a dozen different kinds of lumber are used in finishing an aristocratic residence, the plan being to have every room finished in a different wood. Walnut is less used for finishing, because of its high price, and the developing tendency to employ light shades in wood, to produce a cheerful and refreshing effect, rather than one of somber elegance. Calico ash costs about $35; quarter-sawed sycamore, $50; quarter-sawed white oak, $60; quarter-sawed beech, $50; white maple, $35; Manila, $150; and mahogany from 10 to 20 cents a foot.

IMPROVED RAILWAY RAIL CHAIR.

The rail chair shown in the engraving consists essentially of an iron bed plate, upon which the rail is securely clamped, an India-rubber block between the bed plate and tie, and a strong inclosing box bolted to the tie.

The advantage of this combination will be apparent to every engineer. The bed plate receives and retains the rail, and is itself securely held by clamps secured by bolts passing through the tie.

The rubber block upon which the plate rests takes up the vibrations, so that no pounding or shock is communicated to the structure beneath. The iron box containing the rubber block prevents the rubber from spreading out under con-

WODISKA'S RAILWAY RAIL CHAIR.

tinued use, and holds all of the parts securely in position. This construction will effect a great saving of rails and ties. It will also be of immense benefit to rolling stock. It will prevent the destruction of bridges and elevated railway structures by taking up the jar and vibration produced in the track by the rolling stock, and, finally, it certainly commends itself to public favor, as it will in a great measure, if not entirely, stop the noise and jarring of elevated railways now so much complained of, and will prevent in a great measure the abrasion that produces metallic dust, which is the cause of so much iron rust on the line of the elevated railways.

This invention might be applied with advantage to the New York and Brooklyn bridge, as it would protect the structure against the bad effects of jarring by the cars.

Incombustible Paints.

Waterglass is being extensively used in the production of a paint which in addition to its durability is also a protection against fire, and as a floor paint it is especially recommended.

The surface of the floor having been well cleaned, any crevices or cracks between the boards are next luted with a thick mixture of waterglass and pulverized chalk or gypsum; then, by means of a stiff brush, a coating of waterglass, of sirup like consistency, is spread over the floor, and to this succeeds a second coating of the same, mixed with the desired color—the latter a mineral color, as the alkalies of the waterglass commonly decompose vegetable colors. This coating having become dry, other layers of the waterglass are given until the floor acquires a fine lustrous appearance. In order to insure a polished brightness, the surface is ground off a little, oiled, and thoroughly dried. A number of patents have been granted for incombustible paints in this country, and among the foreigners who have experimented with different ingredients for accomplishing this end, MM. Vilde and Schambeck propose the following mixture for rendering wood work incombustible:

Pulverized glass	20
Pulverized porcelain	20
Pulverized stone	20
Calcined lime	10
Silicate of soda	30
	100

The solid elements must be reduced to as fine a state as possible and sifted, and then mixed intimately with the soluble glass, thus forming a glutinous mass which may be employed as it is for painting, or may be mixed with various colors.

The addition of the lime gives a certain unctuosity to the mass for painting, while the combining of this lime with a portion of the silicic acid of the soluble glass promotes the intimate mixture of the other substances.

Although the mixture given above is recommended as being the best, the proportions of the various elements may be changed according to circumstances, except that of the soluble glass, which must remain constant. Some of the substances may also be replaced by others; but it is advisable to retain the lime. Instead of silicate of soda, the soluble glass of potash may be employed, but the former is cheaper.

The paint is laid on with a brush, in the ordinary manner and as evenly as possible, on the surface to be protected. The first coat sets immediately, and the second may be applied from six to twelve hours afterward—two coats being sufficient. This composition may also be employed with advantage for protecting iron bridges, sleepers, etc., from oxidation.

Chinese Poisons.

The commonest poisons are said to be opium, arsenic, and certain noxious essences derived from herbs. But besides these, other things are taken by suicides and given by murderers to cause death. In some of the Southern provinces there exists a particular kind of silk worm, known as the Golden silk worm, which is reared by miscreants to serve either purpose as occasion may require. Quicksilver, which is also used with fatal effect, is either swallowed, or, like the "juice of cursed hebenon" which sent Hamlet's father to his account, is poured into the ear. The torture necessarily consequent on this last method of using it must be so excessive that it may safely be assumed that it finds favor only with murderers. Swallowing gold, on the other hand, seems to be the favorite way of seeking death with wealthy suicides It has been held by some writers that the expression "swallowing gold" is but a metaphorical phrase meaning "swallowing poison," just as when a notable culprit is ordered to strangle himself he is said to have had "a silken cord" sent to him. But the "Coroner's Manual" puts it beyond question that gold is actually swallowed, and it prescribes the remedies which should be adopted to effect a cure. Gold not being a poison, death is the result either of suffocation or laceration of the intestines. When suffocation is imminent, draughts of strained rice water, we are told, should be given to wash the gold downward, and when this object has been attained, the flesh of partridges, among other things, should be eaten by the patient to "soften the gold" and thus prevent its doing injury. Silver is also taken in the same way. But though wealthy Chinamen thus find a pleasure in seeking extinction by means of the precious metals, they have never gone the length of pounding diamonds to get rid of either themselves or their enemies, after the manner of Indian potentates.—*Nature.*

Vulcanized Fiber.

The *Ironmonger* (London) speaks in the highest terms of a new vulcanized fiber for lubricating purposes, which it describes as follows:

The fiber is made in two qualities—hard and flexible. The hard, which may be turned in the lathe, takes a very good thread, and may be highly polished, is supplied in three colors, black, red, and white, in imitation respectively of ebonite, vulcanite, and ivory. It is used extensively for journal-bearings and bushes in light cotton-mills; for railway track bolt washers, the London and Brighton Railway, among other companies, using them for this purpose; and for pneumatic carriers, the General Post Office authorities employing them as such in place of leather and gutta-percha. For use in connection with electrical apparatus it is of great value, and a number of electric light companies are using it exclusively for the insulation parts of lamps and for certain parts of dynamo machines, as it will stand great heat, and is in other respects a better insulator and cheaper than either of the other substances usually employed. Another of the many uses to which the hard quality is put is that of ferruling the condenser tubes in marine engines. Such tubes are generally joined with wood ferrules, which, after being in use a little time, are liable, owing to expansion and subsequent contraction, to fall off. The vulcanized fiber ferrule obviates this drawback. It expands like the wood, but does not go back again; consequently it retains a firm hold on the ends of the tubes. The fact that grease does not affect the fiber is a great advantage. The soft fiber is an excellent substitute for leather, rubber, gutta-percha, etc. Its ability to withstand the action of hot and cold water, acids, and grease renders it of particular value to brassfounders, plumbers, engineers, etc., and it is in extensive demand for making into clacks for sewer and other pumps, plumbers' and carriage builders' washers, etc. As illustrating its wearing and imperishable qualities, it may be mentioned that an axle box washer removed from an omnibus after nine months' use was found little the worse for wear, and without a crack on its surface.

Natural Gas Fuels.

Years ago, in their eagerness to tap from the earth its hidden treasures of oil, drillers generally expressed disgust when nothing but gas rewarded their efforts. Later, some enterprising men began to turn their attention to this great source of caloric, and, one by one, a number of iron and glass manufactories in Pennsylvania carried the gas into their mills. The *Engineering and Mining Journal* says they have not made much bluster over what they were doing, and have quietly pocketed the increased profits which their saving of fuel, due to the use of gas, has given them. Of late, however, the subject is attracting considerable attention in a quiet way, and recent developments indicate that the territory which may possibly be able to draw upon the new source of fuel supply is much greater than is generally believed. Gas wells have been opened and are utilized as far west as Detroit, and as far south as West Virginia, and Pittsburg is now getting excited over the extension of the business of the Murraysville well in Westmoreland County. Pipes have been laid down to a number of glass and iron works in the eastern part of the great Smoky City, and a rapid extension of the field of the gaseous fuel is looked forward to. The belief is expressed by men whose opinion is worthy of much consideration, that the number of localities capable of being supplied with gaseous fuel in the States of New York, Pennsylvania, Ohio, West Virginia, and Michigan is much larger than the majority have any conception of, and the permanency of the flow of some of the older wells gives rise to the hope that it is a reliable fuel supply. Its cheapness and cleanliness are, of course, matters which are beyond all doubt. There are indications that during the present year a considerable number of companies will form to sink wells, and a "boom" is looked forward to that may bring forth the usual crop of unsound enterprises.

Water Level for Shafting.

Mr. A. C. Reuss, M.E., writes to the SCIENTIFIC AMERICAN from Allahabad, India, describing his application of the water level to the lining of shafting as preferable to the ordinary method by the use of the spirit level. He says: "For leveling long lines of shafting I use a rubber tube of three-quarters of an inch diameter, and fix on each end of it a water stand glass of the same diameter, or nearly so. The tubing should be long enough to reach from one bearing of the shaft to the second one beyond, and lie on the ground or floor, without kinks or short turns. The tube and glasses should be filled with water sufficient in quantity to reach about half up the height of the glasses, so that the level in both the glasses is visible.

"With this device a line of shafting of from 800 to 1,000 feet may be leveled in an hour, or the bearings for the shaft can be leveled ready for the shaft. Let one man hold one end of the tube—the water glass—to bearing No. 1, and another hold the other glass to bearing No. 3. The man at No. 1 holding his water level at the bottom of the bearing No. 3 levels to it. Then level from No. 1 to No. 2, and from No. 3 to No. 2. This being done, proceed from No. 3 to No. 5, and from No. 2 to No. 4 and so on."

Patent Medicines in Japan.

In respect to the sale of patent medicines, *The Pharmaceutical Gazette* (London) thinks that we might advantageously take a lesson from the Japanese. We learn from the first report of the Central Sanitary Bureau of Japan, just issued, that they have established a public laboratory for the analysis of chemicals and patent medicines. The proprietors of patent medicines are bound to present a sample, with the names and proportion of the ingredients, directions for its use, and explanations of its supposed efficacy. During the year there were no fewer than 11,904 applicants for license to prepare and sell 148,091 patent and secret medicines. Permission for the preparation and sale of 58,638 different kinds was granted, 8,592 were prohibited, 9,918 were ordered to be discountenanced, and 70,943 remained still to be reported on. The majority of those which were authorized to be sold were of no efficacy, and but few were really remedial agents. But the sale of these was not prohibited, as they were not dangerous to the health of the people.

Cement for Leather.

When pieces of leather are to be cemented together, which are not subjected to traction or need not sustain heavy weights, *New Remedies* says that common glue will probably be the best binding substance; for thin leather, ordinary flour paste may also be used.

If the leather is subjected to a moderate strain, the following method may be used: Soak equal parts of glue and of isinglass for ten hours with enough water to cover them, then add about one-fourth part of tannin, and boil until the mixture becomes sticky. The surfaces of the leather must first be roughened with some coarse tool; they are then well rubbed with the above mixture, while warm, and firmly pressed together. After a few hours they will be found united.

Or glue (8 parts) may be soaked with water until soft, the excess poured off, and the vessel then placed on a water bath until the glue melts. One part of glacial acetic acid is then added, and the mixture transferred to small vials. This liquid glue will also stick leather together very firmly.

An Austrian firm manufactures a glue which is said to be made from the entrails (skins?) of cattle, which goes by the name of dermatin, and is reported to be used in England as well as on the Continent. This is said to glue leather together so effectually that the mended place will be as good as new, while it leaves it perfectly flexible.

American Manufactures in New Zealand.

A "New Zealand subscriber" sends a letter on the importance of the British colonies in the South Pacific as a market for American manufactures. The proprietor of a large iron works in England has been making a tour through these possessions with a view of ascertaining, from personal observation, the requirements of customers. Our correspondent advises similar visits by American manufacturers to correct erroneous impressions and get exact information as to the needs of the people. He mentions one lack in woodcutting tools sent to Auckland, and that is their want of adaptedness to the timber, as the New Zealand pines are as hard as American hard woods, and the saws and edge tools sent from America are not strong enough for their work. He says, however, that such American mechanical tools and agricultural implements as find favor are imitated by English manufacturers, who make inferior articles and undersell the American products.

Drilling Glass.

For drilling holes in glass, a common steel drill, well made and well tempered, the *Glassware Review* claims to be the best tool. The steel should be forged at a low temperature, so as to be sure not to burn it, and then tempered as hard as possible in a bath of salt water that has been well boiled: Such a drill will go through glass very rapidly if kept well moistened with turpentine in which some camphor has been dissolved. Dilute sulphuric acids is equally good, if not better. It is stated that at Berlin glass castings for pump barrels, etc., are drilled, planed, and bored like iron ones, and in the same lathes and machines, by aid of sulphuric acid. A little practice with these different plans will enable the operator to cut and work glass as easily as brass or iron.

Trichinæ.

J. E. Morris, M.D., in the *Clinical Brief*, says in regard to trichinæ in swine that it is a well established fact that the real source of infection in swine lies entirely in the rat. A committee of Vienna physicians found in Moravia thirty-seven per cent of rats examined trichinous; in Vienna and its environs ten per cent; and in Lower Austria about four per cent. The well-known voracity of the hog, and its special fondness for meat, cause it to feed upon the flesh and excrements of other animals infested with these parasites, and especially rats and mice. To prevent trichinous swine it is highly important to cut off all the sources of disease in the diet of these animals.

Phosphorescence in Animals.

According to Radziszewsky, the luminous animals like *Pelagia noctiluca, Beroe ovatus*, etc., owe this fact toa peculiar fat that they contain. These little animals do not give light when at rest, but when stimulated give a quick flash of monochromatic light resembling lightning. The author separated some of this fat and found it was a thick, pale yellow, neutral liquid, easily saponified by alkali. It gave a flash of light when shaken with caustic potash. The animals themselves have an alkaline reaction.

Orange Peel Fuel.

A gentleman in Manchester claims to have succeeded in applying orange peel to a very useful purpose. Orange peel dried in or on an oven until all the moisture has been expelled becomes readily inflammable, and serves admirably for lighting fires or for resuscitating them when they have nearly gone out. Thoroughly dried orange peel will keep for a long time, and might be collected when the fruit is in season and stored for winter use. Buyers of Florida orange groves should remember the above.

RECENT INVENTIONS.

Newspaper Wrapper.

The object of this invention is to provide a wrapper for newspapers and other like matter, which can be secured over the paper very quickly and easily without the use of adhesive material. The wrapper has on the inner surface a wire provided with loops at the projecting ends. This wire is held on the wrapper by a strip of paper secured on the inner surface of the wrapper and over the wire. When the wrapper is folded over the paper, the projecting ends of the wires are twisted together; or one projecting end of the wire is passed through the loop of the other end. The engraving shows the manner of applying the wrapper, and represents the package when secured. This invention has been patented by Georgia Fay, 2107 East Grace Street, Richmond, Va.

New Bottle Stopper.

This invention, although applicable to bottles for containing different substances, is more especially designed for such bottles as are used in chemical laboratories, including bottles used for containing various reagents and acid or corrosive liquids. These bottles are usually fitted with two different kinds of stoppers, known respectively as the "flat headed" stopper and the "hood" stopper. Both have their special advantages and both their peculiar defects. The invention shown in the engraving combines all the advantages of these two forms of stoppers without the defects of either. It consists in a bottle stopper having its plug or body part provided with a hood or shield arranged to cover the mouth and outer end of the neck of the bottle, and having a pendent flange arranged to fit outside of the rim or collar of the neck of the bottle, and this, again, surmounted by a flat sided head or finger piece. This useful invention has been patented by Mr. F. F. Jewett, of Oberlin, O.

What Paint best Protects Iron?

Mr. Louis Matern writes as follows to the *Carriage Monthly:* While perusing the supplement of the SCIENTIFIC AMERICAN, I noticed in vol. xv., No. 379, an article on painting the New York and Brooklyn suspension bridge, wherein it is stated that the trustees of the bridge company had agreed upon the following mixture, as being the best protective paint for iron, namely: 70 pounds of first quality white oxide of zinc, 30 pounds of best white lead, 6 gallons of raw Calcutta linseed oil. The above named mixture has but one advantage—its color—but all the following disadvantages:

1. It needs driers to harden the paint, thereby losing its durability—as all driers, so far as known, to some extent deteriorate the oil, through destroying its binding quality.

2. It, through excess of zinc white when dry, becomes brittle. Not giving way to expansion or contraction, it cracks, making channels for water to corrode the iron, which in turn undermines the paint, causing it to peel off.

3. All American white lead is made by the wet process, and holds a good deal of sugar of lead, which at once charges the iron with rust when exposed to damp, rendering it entirely unfit for the purpose wanted. Even the strictly pure Dutch process made white lead in some measure attacks the iron when exposed to damp, as all old carriage painters are well aware. This sugar of lead also destroys the adhesiveness of oil.

4. The mixture will not harden through where it is spread thickly, but forms a shriveled mass.

These four disadvantages of the mixture I consider the worst of all conditions. Any mineral paint would answer the purpose much better.

RED LEAD THE BEST.

I maintain that the paint that most effectually protects iron is red lead. Not in color is it as well suited; but that is only a secondary consideration, and easily overcome by painting it over with any color desired. Red lead contains the following advantages for the preservation of the iron, which is the main object to be gained:

1. It dries easily with raw linseed oil, without an oil destroying drier. All known driers decompose oil.

2. After drying, it remains elastic, giving way both to the extension and contraction of the iron, without causing the paint to crack.

3. It imparts no oxygen to iron, even when constantly exposed to damp—a fact to which all farm wagon makers can testify.

4. It hardens, where it has been spread thickly, without shriveling, forming the toughest and most perfect, insoluble combination of all paints. As proof of this assertion, it is used by calico printers for red figure prints, holding out against soap and water; by gas pipe fitters, as the best paint to resist ammonia and tar; by the English iron ship builders, for painting the hulls of iron ships—namely, two coats of red lead and two of zinc white; by wagon and plow makers, for painting wagon gears and plows; by knowing carpenters, for painting wood that comes in contact with damp brick in walls, as it preserves wood from rot, insects, etc.

For those among us who are uninstructed how to mix pure red lead for paint, it should be made known that pure red lead powder, after being slightly pressed down with the finger, shows no lead crystals. When they are visible, it is merely partly converted, and not first quality. It should be ground in pure old linseed oil, and if possible used up the same day, to prevent it combining with the oil before it is applied, losing in quality. No drier is necessary, as in the course of a few days the oil forms a perfect, hard combination with the lead. American linseed oil is as good as any imported, where the manufacturer has given it age, and not subjected it to heat, as is the custom, by steaming it in a cistern to qualify it quickly for the market. It deteriorates in quality when heated above 160° Fah.

This red lead paint spreads very easily over a surface, and the best of finish can be made with it, even by a novice in painting.

Success of the American Eclipse Expedition.

Professor E. S. Holden, of the Washington Observatory of Madison, Wisconsin, with his party of observers, who were sent out by the United States Government to the Caroline Islands to make observations on the total eclipse of the sun of May 6, has arrived at San Francisco in good health. Professor Holden reports that the weather on the day of the eclipse was favorable, and that a number of excellent photographs were taken showing good views of the corona. Some fine observations of the spectra were made. The supposed planet Vulcan was not, however, discovered.

The Caroline Islands are a group in the South Pacific, and lie near the equator, between 140° and 150° west longitude, and are distant about 2,500 miles southwesterly from San Francisco.

The party went from New York city to Lima last March, thence in the United States sloop of war Hartford to the Caroline Islands.

The full reports will be looked for with interest, as the duration of the eclipse was comparatively long, and the opportunities for observation good.

Aeronautical Exhibition, Paris.

An exhibition of everything that relates to ballooning was held in the Trocadero Palace, Paris, from 5th to 15th of June, to celebrate the centenary of the invention of balloons. It comprised—

1. Raw materials used in the construction of balloons, such as silk, cotton, rope, nets, cane, etc.

2. Gas balloons, captive or steering, montgolfiers, and separate parts used in the construction or working of balloons.

3. Parachutes, kites, and mechanical birds.

4. Books, MSS., plans, photos, drawings, and models relating to aeronautics.

5. Instruments for use in meteorology, such as barometers, thermometers, hygrometers, registering appliances, and photographic apparatus.

6. Apparatus for making pure hydrogen, carbureted hydrogen, and carbureted air.

7. Light motors, gas and petroleum engines.

8. Electrical apparatus, susceptible of being utilized in aeronautics, such as motors, telegraphs, telephones, and electric lamps.

9. Appliances for aerial correspondence, by optical telegraphy, or by carrier pigeons.

No charge was made for space; but exhibitors had to arrange their exhibits at their own expense.

The number of inventors in France who are now turning their attention to this science is considerable, including M. Tissandier, with his elongated balloon and electrical motor; M. Brisson, with his navigable aerial vessel; M. Tissot, with his aerostatic bird; M. Cayrol, with his winged balloon; and M. Pompeien, with his elongated balloon.

The Christian Era.

The much debated question as to the correctness of the hitherto accepted reckoning of the years which have elapsed since the birth of Jesus has again been mooted by Professor Sattler, of Munich, in the columns of a German contemporary. Professor Sattler (according to the *Jewish Chronicle*) claims the distinction of having solved the problem, and of having demonstrated the fact that the current year is probably 1888 instead of 1883. He bases his proofs mainly on three coins which were struck in the reign of Herod Antipas, son of Herod the Great, and which date, consequently, from the first half of the first century of the current era. Madden admits the genuineness of these coins, and other numismatic writers do the same. The evidence they offer coincides with the narrative of the Gospels and with astronomical calculations. The following are the results at which Professor Sattler has arrived: Jesus was born on the 25th of December, 749 years after the founding of Rome, and commenced his public career on the 17th of November, 780 years after the founding of Rome. He was then 30 years 10 months and 22 days old. The date on which he commenced his career fell in the 15th year of the Emperor Tiberius, and in the 46th year after the building of Herod's Temple. This is in accordance with St. Luke iii. 1 and St. John ii. 20. According to Josephus ("Antiquities," xv., 11, 1), the construction of Herod's Temple was commenced in the 18th year of that monarch, or in the year 734 after the founding of Rome, in the month of October. If we add the 46 years which elapsed after the building of the Temple we arrive at the end of the year 780, the year during which Jesus entered on his career. If, moreover, we subtract from 680 (779 years 10 months and 17 days) 30 years 10 months and 25 days, there remain 748 years 11 months and 25 days, which gives us the date of his birth—the 25th of December of the 749th year after the founding of Rome. Jesus died on the 7th of April, 783 of the Roman era, that is to say, on the Friday before Passover; for it has been ascertained by exact calculation that Passover fell that year on the 7th of April, 783; and as the latter year was a Jewish leap year, and consisted, accordingly, of 13 months, his public career lasted two years and seven months. Between the 17th of November, 780, and the 9th of April, 783, three Passovers were celebrated, viz., 781, 782, and 783. Those years correspond with the 27th, 28th, 29th, and 30th of the Christian era as at present calculated. Remembering, however, that the year of the birth of Jesus corresponds with the year 749 of the Roman era, and taking this year as the starting point of the Christian reckoning, the years of Jesus' career must be the 31st, 32d, 33d, and 34th of the new era. It thus results, according to Professor Sattler, that the Christian reckoning is at fault by five years, and that we are now in 1888, and not in 1883.—*English Mechanic.*

Eradicating Lawn Weeds.

During the last thirty years I have tried every mode of eradicating these suggested by every published correspondence, and, taking the result and cost of time into consideration, I have come to the conclusion that the best method of proceeding is, after the first cutting in the spring, to put as much salt on each weed through the palm of the hand as will distinctly cover it. In two or three days, depending on the weather, they will turn brown. Those weeds that have escaped can be distinctly seen and the operation repeated. The weeds thus treated die, and in about three weeks the grass will have grown, and there will not be a vestige of disturbance left. Two years ago I converted a rough pasture into a tennis ground for six courts. Naturally, the turf was a mass of rough weeds. It took three days to salt them, and the result was curiously successful.

I had one lawn with more daisies than grass, and on Sept. 2, 1881, I took up the turf, scratched the ground, relaid the turf upside down, scratched this also, well seeded it, sprinkled it with soil, and in one month it was green and hardly distinguishable from the other parts of the lawn. Similar trials had been made in each month from March, and as late as August 12, but the earth cracked.—*Berkshire in The Garden (London).*

Test for Wines.

M. Pradines has recently published a test for wines, by which wines may be examined for their purity. He proposes with this test to answer three questions. First, is the wine natural, secondly is it diluted, and lastly, has no product of the grape been used in its preparation? The reagent used consists of pure ammonia saturated with rectified ether, which is then filtered and kept in well stoppered flasks protected from the light. To make the test, pour some water in a test tube, add with a pipette or burette about fifty drops of the wine to be tested, shake the mixture, allow five or six drops of the reagent (Diano-Pradines) to run into the mixture, and shake again. If the wine is good in quality, a beautiful green coloration appears along the line of contact between the reagent and the mixture. If the mixture takes a pale green coloration the wine has been diluted with water, and the amount of dilution is approximately measured by the varying paleness of the tint produced. If this pale green coloration becomes rapidly clouded and obscured, the wine has been diluted with water and colored with some coloring agent. If the mixture gives no color or takes a grayish red tint, amaranthine or brick color with no trace of green, the wine is compounded. In this last case the colorations vary infinitely, modified by the coloring matters used in the wine's fabrication.

Kerosene as an Insecticide.

From reports made by C. V. Riley, entomologist of the Department of Agriculture, it appears that kerosene oil is a valuable agent for the destruction of insects inimical to corn, maize, cotton, and oranges, and by implication should equally affect other forms of insect life destructive to vegetation. Emulsions made with milk do not appear to be necessary, judging from the results of these experiments. For chinch bugs a mixture of one pound of coarse resin soap dissolved in ten gallons of water, to which is added about a pint of kerosene, was effectual applied in the form of a spray from a pump or by means of a watering can with rose nozzle. For rust mite and for the scale insect on orange trees, and for the cotton worm, a mixture of five pounds of common yellow (resin) soap, dissolved in one gallon of water, and one gallon of kerosene similarly applied, cleaned the plants and prevented further depredations for a considerable time.

BRICKS impregnated at a high temperature with asphalt are being successfully used in Berlin for street pavement. By driving out the air and water the bricks will take up 15 or 20 per cent of bitumen, and the porous, brittle material becomes durable and elastic under pressure. The bricks are then put endways on beton bed and with hot tar. The pavement has been laid down in a part of a thoroughfare where neither granite nor compressed asphalt had hitherto withstood the wear.

ENGINEERING INVENTIONS.

Mr. Thomas Keely, of Memphis, Tenn., has obtained a patent for an improved privy sink which is so constructed that it may be readily cleaned, smothers the odors generally arising from privies, and as a sanitary improvement possesses many qualities which recommend it as a safeguard against disease.

A new link guide for car coupling has been patented by Mr. Frank Sweetland, of Edwardsburg, Mich. The link is guided into the drawhead without endangering the operator by the very simple appliance adopted by the inventor, and which is an improvement on a patent granted to Mr. Sweetland on August 15, 1882.

Mr. James Robson, of Birmingham, Eng., has obtained a patent for an improved gas engine. It consists in a cylinder furnished with a main piston and provided with a charging valve and igniting orifice, of a charging piston in the rear of the main piston, and of means for operating the charging piston. For use in pumping water, stamping, and similar processes slight changes are made in the arrangement of parts of the engine.

An improved car brake in which the momentum of the car is made use of to brake the same has been patented by Mr. Charles W. Smith, of Coalesburg, Mo. This brake is so connected with a pinion wheel located upon the brake lever that the brake will only act upon the wheels of the car when the pinion is set in motion. Upon the axle of the car is attached a cog wheel with which the pinion wheel meshes when the brake bar is set. The momentum of the car rotates the pinion and sets the brake.

A railroad switch of simple construction, which can be operated with much ease by the attendant, has been recently patented by Mr. Jacob Elmer, of Biloxi, Miss. The movable rails are confined to a metal plate, one edge of the outer portion of which is provided with teeth, with which a corresponding pinion wheel on the vertical shaft meshes. On the upper end of the shaft a wheel is affixed for the convenience of the switch tender, and which he turns to change the position of the movable rails when the train is to be switched off from the main track.

A new gas motor of improved construction, and believed to embody several important advantages over other engines of this class, has been patented by Mr. Herbert Sumner, of Manchester, England. In this engine the combustible gas and vapor and the air are drawn together into a chamber by an outstroke of the engine, and are there intermingled. They then pass through a valve operated by a cam motion, and are there compressed in the usual manner. After the gases have been ignited and have performed their office on the piston, they are emitted by an exhaust valve placed besides the inlet valve on the back cylinder. In this engine the ignition of the charge is rendered more sure and prompt than in those now in use.

It is very desirable to have a traction or road engine geared so that it can operate with great power and little speed, or can be run at a higher speed when comparatively little power is required. For example, in traveling in one direction the engine may be loaded, and when returning from its destination it may be unloaded. In the first instance it should be geared for power, and in the latter it may be geared for speed to economize time. Again, some parts of the road may be heavy and the rest good, and in such case an adaptation may be made of the gearing to suit these circumstances. Messrs. I. G. Rider, W. H. Snyder, and A. O. Frick, of Waynesborough, Pa., have recently patented an improvement in traction engines which consists in the combination, with the two driving wheels, of a compensating gear which derives motion from the driving machinery and transmits it independently to each of the two wheels, so that either or both of the wheels may be driven, a locking mechanism for holding rigid one of the wheels of the compensating gears which transmit motion to one of the traction wheels, and an adjustment by which that traction wheel may be released and allowed to run freely or independently of its driving mechanism, so that the value of a compensating gear is preserved for turning corners, and whereby attaining two speeds for the traction engine is possible with very little addition to the ordinary mechanism.

MECHANICAL INVENTIONS.

An ingenious machine for folding the edges of fabrics in making shirts, collars, cuffs, etc., has been patented by Mr. J. L. McMillan, of Cambridge, N. Y. This machine is simple in its construction and should prove a boon to the large shirt manufacturing establishments throughout the country.

A novel method of shaping and mortising balusters and other railings has been patented by Mr. W. J. Tait, of Jersey City, N. J. By this improvement the cost of making and fitting balusters will be greatly reduced and the balusters will be more securely held in place than by the methods heretofore employed.

Mr. J. J. Souder, of Washington, D. C., is the patentee of an improved grain scourer and polisher which is designed to scour the cuticle off, and to polish the surface of each kernel, and to take away all dust and dirt from the grain, leaving it thoroughly cleaned before entering the flouring mill.

Mr. Aaron T. Clark, of Dannemora, N. Y., is the patentee of a new hat sizing machine which is claimed to possess considerable merit over other machines for the same purpose. The inventor employs flexible rollers, which of themselves are not new for similar purposes, but he has added other appliances to the flexible roller, whereby he produces a close approximation to hand work.

An improved ring spinning frame has been patented by Mr. Michael E. Sullivan, of New Bedford, Mass. The object of the invention is to spin from the top of the spindle, so that the yarn will receive its twist in the bite of the rollers at the instant when the sliver is delivered, and thus avoid the use of guide wires, which hinder the twist from entering the bite of the rollers.

A very simple pneumatic clothes washer has been patented by Messrs. N. B. Elliott and J. T. Lloyd, of Holden, Mo. This machine is so constructed that the air within the washer is compressed, and thus the clothes are cleaned by forcing the water against them. By this pneumatic process the clothes are not likely to be torn, and the wear upon them is not nearly so great as when scrubbed in the ordinary way.

A micrometer gauge of improved construction has been patented by Mr. George W. Church, of Roseville, N. J. The object of this invention is to provide a micrometer gauge in which the measuring bar may be forced against the object to be measured, always with a certain uniform pressure, thereby insuring accuracy of measurement without reference to the force applied.

Mr. Charles H. Parsons, of Shauck's, O., is the patentee of an improved elliptic spring. This invention consists of an improved construction of the end joints of elliptic springs. In this improvement the lower plate is made to hold caps to keep the plates together, and the upper one rests on the coil of the lower one, so as to relieve the joint bolt of wear, and so that the welding of flanges on one of the plates to support the pivot bolt is avoided, and the injury thereby caused to the metal prevented.

Mr. J. E. Dowson, of Westminster, London, England, has received a United States patent for an apparatus for the manufacture of gas. This invention relates to the manufacture and treatment of non-luminous heating gas made by passing steam and air, or steam only, through incandescent carbonaceous fuel. The improvements chiefly refer to apparatus for making such gas; but the inventor claims that some of them may be also useful for other purposes.

Messrs. Geo. E. Bauder and A. M. Pease, of Sanborn, Dak. Ter., are the patentees of an improved harness pad block, which consists in recesses formed to receive and shape the pad leather, and a series of movable pressing plates for filling the pads. An arched bar of semicircular shape with hooks at either end to attach to the rim of the pad forming block is provided. A hand screw extends through this bar, and is operated for compressing the leather similar to an ordinary letter copying press.

A rope clamp designed to facilitate splicing hempen or wire ropes without cutting or otherwise injuring the same, has been patented by Mr. Charles Littlefield, of Vinalhaven, Me. The invention consists of two clamp plates connected by links and pins, one of the pins passing through and working in an inclined slot formed upon the back of one of the jaws or plates, whereby the device may be applied to ropes of any kind or size and may be readily attached to or detached therefrom.

An improved station indicator has been patented by Mr. Charles O. Ball, of Lowell, Mass. The casing of the indicator is provided with an opening at the front covered by a glass plate, through which the names of the stations are displayed. The names are indicated upon a band which has its end secured in rollers, one located at the top of the casing, and the other at the bottom. By pulling a cord at the end of the car the rollers will be rotated and the name of the station brought to view.

An improved feeder for cotton gins is the subject of a patent granted to Mr. A. L. Stietenroth, of Natchez, Miss. This invention consists in so locating the feeding apron in relation with the mouth of the feed box that convenient access may be had to the gin for the suitable cleaning of the box and the grate. The danger of fire from neglect of this is thus lessened. Access to the feed box is attained by raising the feeding apron at one end out of the way, and slotted legs and nuts are provided for securing it in any position desired.

Some improvements have recently been made in the manufacture of starch, of which Mr. Louis P. Best, of Davenport, Iowa, is the patentee. The invention consists in steeping, grinding, or disintegrating the grain, passing it over separators while subjected to sprays of starch water, regrinding the courser particles and passing the reground mass over separators while subjected to sprays of fresh water, whereby a more perfect extraction of the starch is produced and the refuse from the operation is prepared as an article of commerce.

An improved thread guide for spooling machines is the subject of a patent granted to Messrs. Robert Atherton and James Newby, of Paterson, N. J. The invention consists in a recessed block mounted to slide on the transverse bar of the machine, and adapted to receive a thread guide. The block is provided with spring rods for holding the guide in the recess in the block. The free ends of these spring rods rest in grooved tracks on the transverse bar, and are thus adapted to slide with the block for adjustment of the position of the thread guide.

An improved machine for making telegraph insulator pins has been patented by Mr. John B. Smith, of Sunapee, N. H. The blank is fed to a pair of revolving mandrels which seize and rotate the blank, while a pair of movable cutter holders are alternately brought into range of engagement with the blank. After the screw thread is cut the mandrels separate, and a hammer knocks the finished pin loose and out of the way for the next blank. Mr. Smith has also obtained a patent for a machine for making brackets for telegraph insulators. This machine is provided with a device for feeding and holding the blank while it is being turned, and also two independently rotating mandrels having a reciprocating motion, and bearing funnel-shaped cutter heads which advance, so as to turn the two ends simultaneously to form two brackets.

Mr. Joseph W. Wilson, of Wyandotte, Kan., is the patentee of an improved middlings purifier which is claimed to be more effective in its operation than those in common use. The invention consists in arranging a system of chutes and valves between the bolt and suction chamber in such a way that the current of air from the blower may be directed upon any portion of the machine. The bolt or sieve is mounted upon the rollers of the reciprocating frame, to which power is applied from the shaft. In this way the middlings are moved from the head to the tail end of the sieve or bolt, on a perfect plane entirely free from the rising and falling motion common to other machines, whereby the middlings will be more perfectly cleaned from impurities than is possible by the rocking motion. The bolt is made higher in the middle than at the sides, for the more even distribution of the middlings over the sieve.

AGRICULTURAL INVENTIONS.

Mr. E. R. Ham, of New Market, Ga., has patented an improvement which relates to wheeled cultivators, in which a number of plowbeams are secured to the axle and arranged side by side, with flexible connections to adapt them for various movements independent of the axle and of each other.

An improved separator and cleaner for thrashing machines has been patented by Mr. W. C. Buchanan, of Belleville, Ill. On the front end of a vibrating pan is attached an imperforate sheet metal section on which the straw, chaff, and grain are received from the thrasher and passed along the pan, which is caused to swing backward and forward on hangers. This metal plate is provided with long fingers which are raised from the pan, so as to enable the wind from a blast to act upon the material and carry off the chaff and short straws. The invention provides further improvements which render the operation of cleaning the grain expeditious and satisfactory.

MISCELLANEOUS INVENTIONS.

Mr. W. J. Morrison, of Nashville, Tenn., is the patentee of a novel process for manufacturing lard by a mixture of cotton seed oil, beef tallow, or fat, whereby the inventor produces an article which he claims far superior to hog lard for culinary purposes.

An improved dynamo electric machine which has a uniform magnetic field, and thus does not require a commutator, the entire construction of the machine being thereby simplified, has been patented by Mr. A. Floyd Delafield, Noroton, Conn.

Mr. William R. Flynn, of Bordentown, N. J., is the patentee of an improved sewing machine cover which is so constructed that a backboard, which is located at the top of the box, and so as to slide in grooves, may be drawn out and the box forthwith converted into a chair.

A compound consisting of the following ingredients mixed in certain proportions, has been found very effective for tempering steel: saltpeter, yellow prussiate of potash, sal ammoniac, carbonate of iron, cimolia purpurescens, common salt, and water. The patentee is Mr. J. T. Mercer, of Richmond, Ind.

Mr. Thomas A. Gause, of Moss Point, Miss., is the patentee of an improved umbrella holder. A forked clamp is secured to the seat, dashboard, or floor, so as to be turned in any direction to give the umbrella the proper angle of inclination to protect a person from the sun's rays.

A patent has been secured for a dental and surgical instrument by Mr. J. H. Doyle, of Hillsboro, O., which is used for depressing or elevating the lips or tongue in dental operations, and for the use of surgeons in the examination and treating of diseases of the mouth and throat.

Mr. Robert Nicol, Jr., of Oshkosh, Wis., has patented a safety pocket provided with a series of compartments for holding different articles, pencils, watches, money, toilet articles, etc., and so securing it to the garment that none of the articles can be abstracted from the pocket without attracting the attention of the wearer.

Mr. William H. Payne, of Western, N. Y., has patented a compound for removing rust spots or stains from fabrics or clothing, but more particularly from uncolored or light colored fabrics, by the use of oxalic acid, spirits of turpentine, and water, of such proportions, as to best accomplish the object.

Messrs. N. H. Darton and D. D. Williamson, of New York city, have patented a process for bleaching, defecating, and preserving sugar, sirups, molasses, cane, and beet root juices, etc., by treating the same with a solution of the tersulphite of alumina, and afterward decomposing said tersulphite by the use of carbonic acid gas.

An improved ice machine can is the subject of a patent granted to Mr. Henry F. Fordham, of Greenport, N. Y. The invention consists in an ice machine constructed with a raised and apertured bottom, by which arrangement it is claimed that the ice will form more rapidly, and that larger blocks can be solidified more thoroughly than the ordinary mode of freezing from the sides.

Mr. Frank Myers, of Aurora, Neb., has patented an improved end gate for box wagons. Two sections meet together at the center of the box and are hinged at their centers on the insides to a middle section. The latter has a staple projecting through notches in the other sections, and a key to hold them together, making a simple and efficient end board that may be readily released by simply detaching the key.

Mr. Phineas Topham, of Newark, N. J., is the patentee of an improved violin bridge in which it is claimed that the sound produced is much sweeter and more melodious than is the case with a bridge of the ordinary construction. This bridge is hollowed out and has a cavity formed in it, which is provided with a removable cover which may be adjusted for altering the size of the cavity, whereby the bridge may be readily converted into an open or closed sounding drum.

An improved stove top and cover, designed more especially for kerosene stoves, has been patented by Mr. W. H. Noyes, of Newburyport, Mass. The top of the stove is so constructed that it may be slid backward and forward, so that any particular boiler hole may be brought directly over or at any desired distance from the center of the heat, so that the cooking operation may be readily controlled. The position of the vessel on the stove cover may be changed, thus obviating the necessity of lifting it.

A tire heating furnace is the subject of a patent granted to Mr. Warner Lewis, of Stone Bluffs, Ind. This invention consists of an annular furnace with a dome having draught regulating deflectors for controlling the heat, and all so arranged that the tires will be heated more evenly, rapidly, and economically than with a common open fire.

A combined wire and picket fence of improved construction has been patented by Messrs. M. Harrison Brown and Charles F. Hyde, of Ottawa, Kan. This invention consists in a fence which is composed of fixed posts, and horizontal and diagonal wires, and interwoven pickets carried by the longitudinal wires, and it provides a fence which is quite durable and very strong, considering the small amount of material employed in its construction.

A device for uniting or coupling the ends of telegraph wire fence or other wires has been patented by Mr. Charles Collins, of Chicago, Ill. The invention consists in a strip of metal having apertures in the ends and alternating notches in the side edges through which the wires to be coupled pass, the wire being held in place by pressure and friction. The great advantage of this invention is the ease and rapidity with which the wires can be coupled and uncoupled.

An improved wire netting, so constructed as to prevent persons or animals pressing against or climbing over the same, has been patented by Mr. William H. Johnson, of Manchester, England. This improvement consists in furnishing the netting with wires or bands having barbs at or near the middle of its meshes, the barbs being formed by severing or notching extra wires or bands which have been incorporated with the netting for that purpose.

An improved picker stick holder for looms is the subject of a patent granted to Mr. William J. Dunn, of Lewiston, Me. The invention consists of a picker stick holder composed of a hollow casting adapted to receive the picker stick, and having screws to hold and adjust the stick, whereby the stick may be shifted as it becomes worn, and a foot piece pivoted to said casting and adjusted in position by set screws passing through arms on the casting.

An improved rub iron for vehicles, consisting of a metal casting provided with a pivoted metallic roller and adapted to be attached to the side of the wagon under the box, has been patented by Messrs. C. C. Keen and F. G. Keen, of North McGregor, Iowa. A rubber so constructed is quite cheap and may be easily applied to the box and will fully protect the vehicle box, while at the same time it does not wear the tire of the wheel like the ordinary rubber.

Mr. Henry H. Schneider, of Port Clinton, O., is the patentee of a rocking attachment for chairs. Rocking levers are pivoted to the rockers and leg levers to the legs, and these are connected by vertical arms with the rocking levers, whereby if the person sitting on the chair presses down the foot board attached to the leg lever and then releases it alternately the chair will be rocked. In case the chair is not required to be used as a rocker it may be readily converted into a stationary easy chair.

An improved ice freezing apparatus is the subject of an invention for which a patent was recently granted to Mr. John Bowes, of Halifax, Nova Scotia, Canada. The invention consists of an apparatus for freezing water by natural cold, the water being fed into shallow pans for that purpose. Steam pipes are provided for thawing the frozen blocks free from the bottom and sides of the pans, after which the pans are tilted up and the blocks of ice are discharged into the ice house by gravity.

Mr. William Hadden, of Brooklyn, N. Y., has patented an improvement in the class of railway signals employing electricity as a motive agent and using movable banners for giving signals. The improvement consists in a divided banner, the two halves of which are attached to pendulous arms operated by electro magnets. The design of the invention is to reduce the motion of the armatures of the electro magnets, so as to admit of having them in the stronger portion of the magnetic field.

A practical ferrule for pipe joints to be used where pipe sections of soft metal are to be connected with iron pipes has been patented by Mr. John F. Sullivan, of Brooklyn, N. Y. This is accomplished by spinning the end of the ferrule, so as to form a smoothly rounded ring. The particles of metal in this form brace each other. The construction of the end is fortified by inclosing a previously formed ring of wire of a size just sufficient to fill the ring of metal, which is so spun as to inclose the wire. Thus equipped, the metal of the tube is further re-enforced and braced by the ring, which is thus reliably engaged with it.

An ingenious refrigerator, the object of which is to cool water, beer, and other articles with a comparatively small quantity of ice, has been patented by Mr. Thomas Keely, of Memphis, Tenn. The invention consists of a refrigerator provided with an inclined platform for receiving the ice, so that the ice will slide down as rapidly as it melts and rest against a water tank which is attached to the inner surface of the door and provided with a cock, whereby the water drawn from the tank will always be cool. The invention further consists of two slides, one provided with a partition and the other with a compartment for receiving the dishes and other vessels containing the articles to be cooled.

A curbstone sidewalk underground conduit for electric wires is the subject of a patent recently granted to Mr. Edward Clark, of Jersey City, N. J. An open-topped iron box is provided, rectangular in form, and with the outer side made sufficiently strong and heavy to adapt it to serve as a curb. The upper edges of the sides of the box are rabbeted, or have shoulders formed upon them to receive and support the cover, which is made in sections, so that any part of the said cover can be turned back or removed to give access to the interior of the box. If desired, the sections of the cover can be hinged at their inner edges for convenience in opening and closing any desired part of the box. In case the sidewalk stones are too thick to be readily cut away, the box is placed beneath the said stones, and doors are formed in the outer side of the box to give access to the interior. The telephone or telegraph wires are thoroughly insulated, and are mounted upon suitable supports within the box.

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American Fruit Drier. Free Pamphlet. See ad., p. 381.

Drop Forgings. Billings & Spencer Co. See adv., p. 382.

Brass & Copper in sheets, wire & blanks. See ad. p. 380.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 20,000 Crank Shafts and 15,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

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The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 380.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

See New American File Co.'s Advertisement, p. 372.

Renshaw's Ratchet for Square and Taper Shank Drills. The Pratt & Whitney Co., Hartford, Conn.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 382.

20,000 Duc Spherical Elevator Buckets, sizes $3\frac{1}{2}$ to 17 inches, constantly on hand. Telegraphic orders filled. T. F. Rowland, sole manufacturer, Brooklyn, N. Y.

First Class Engine Lathes, 20 inch swing, 8 foot bed, now ready. F. C. & A. E. Rowland, New Haven, Conn.

Steam Pumps. See adv. Smith, Vaile & Co., p. 382.

Straight Line Engine Co., Syracuse, N. Y. See p. 380.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works. Drinker St., Philadelphia, Pa.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

NEW BOOKS AND PUBLICATIONS.

THE BREWER, DISTILLER, AND WINE MANUFACTURER. Giving full directions for the manufacture of beers, spirits, wines, liquors, cordials, etc. Illustrated. Edited by John Gardner, F.C.S. P. Blakiston, Son & Co., 1012 Walnut Street, Philadelphia.

This volume appears to be directly practical, not only giving instruction in the various processes of brewing, distilling, and fining, but describing adulterations and showing the method of their detection, usually by processes which may be wrought by any intelligent person. It may be a surprise to the general reader to ascertain, from this volume, from how many materials spirituous liquors are obtained by distillation. All the cereals are used, potatoes, Jerusalem artichokes, beets, carrots, cherries, milk ("koumiss" is fermented milk distilled), palm tree sap, molasses, sugar, and cider. These are exclusive of the products of the grape—wine and brandy.

TWENTY YEARS WITH THE INDICATOR. By Thomas Pray, Jr., C.E., M.E. Boston: *Journal of Commerce* Publishing Company.

The author introduces the indicator to the practical mechanic and engineer, to the manufacturer, to the user of steam power, and makes them acquainted, not only with its capabilities, but demonstrates its uses and instructs in its reading and handling. The volume, of 150 pages octavo, contains forty practical "lessons" in the use of the indicator, embracing diagrams taken from all classes of engine under all possible (or probable) circumstances, detailed instructions in the use of the indicator, and full illustrated descriptions of the instruments in use. It is a very thorough work, and appears to be amply sufficient for the guidance of the practical engineer and the information of the intelligent engine builder, or the manufacturer. The letter press is excellent and the working of the cuts admirable.

BERLEY'S BRITISH, AMERICAN, AND CONTINENTAL ELECTRICAL DIRECTORY. George Cumming, 219 East 18th Street, New York.

This is a handsome octavo of nearly 700 pages, containing a record of all the industries relating to electricity and magnetism as applied to the arts; a list of all persons and firms connected, in the trade or professionally, with the science of electricity, and information, in reading or in tabulated form, that makes the volume of value to all who are interested in electrical progress. The book contains, also, much information of a more general character, but germane to electricity as an applied science.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) E. C. asks: Can you tell me what is used to give the white coating to rubber hand stamps? A. The white coating in new rubber bands is due to the sulphur contained in the preparation, which comes out on the external surface and remains there till worn away.

(2) N. P. I. writes. 1. I am making a steam yacht 25 feet keel, 30 feet over all, and 6 feet beam. What size cylinder had I best put in? A. About 5 inches diameter of cylinder and 6 inches stroke. 2. Will you also please state the size of wheel and boiler to run a craft of that sort to the best advantage? I want all the speed I can get. A. Wheel 30 inches diameter and 3 feet 9 inches pitch. Boiler to have about 200 feet heating surface.

(3) L. J. W. asks: 1. What composition will prevent axle grease from penetrating the wooden boxes which hold it? A. Paraffine. 2. By what means can the tin on the tomato can be removed therefrom? A. No satisfactory means has yet been devised for this purpose.

(4) F. C. asks how to clean the pipes used with a beer pump (tin lined), a sort of a coating forms inside and comes off in flakes, have tried common soda, but it makes a taste in the beer afterward, and that is what I wish to avoid. A. The best plan is to use a solution of soda and then wash all traces of the soda out by letting water run through the pump. All taste will be removed if the pump is thoroughly cleaned by allowing sufficient water to run through it.

(5) S. F. asks: Will you please inform me in what manner the chloride of silver is fastened to the silver wire or strap in the chloride of silver battery? A. It is fused in a porcelain or platinum crucible and cast around the wire in a mould.

(6) H. M. G. writes: I am using an ice box or refrigerator (the ice is not in the interior) which has acquired an offensive odor, that repeated washing does not entirely remove; what must I use to render it sweet? A. Clean thoroughly with dilute sulphuric acid, then carefully wash away all traces of the acid with water.

(7) C. V. N. asks what coating there is, which can be applied to the insides of wooden or iron tanks to render them acidproof. A. Coat them with a mixture of 1 part pitch, 1 part resin, and 1 part plaster of Paris (perfectly dry) melted together.

(8) M. F. B. asks: What is the best material to use in painting a large wrought iron tank, to preserve from rust? (Tank is used for water supply.) A. A paint made with boiled linseed oil and red oxide of iron, or Prince's metallic paint; sometimes it is called iron paint. No turpentine.

(9) S. W. B. writes: You copy an exchange as saying that builders of machinery frequently design their machines for too narrow belts. In most small machine tools it is well to have a weak place in the transmittive machinery, where the machine will be certain to give way before occasioning serious accident to the attendant, to the work, or the expensive parts of the machine. The belt is usually made the weak point. Some carelessness is inevitable about machinery, and an important method for reducing the accident resulting from such carelessness is to make some inexpensive part proportionally weaker than the rest. This will be the belt nearest the working parts of a machine tool, a cheap piece of cast iron for the roll bearings to abut against in ore crushing, or the toggle joint in the Blake crusher.

(10) M. J. asks for a good receipt for welding two pieces of cast steel together. A. 10 parts borax, 1 part sal ammoniac; pulverize together thoroughly, with which sprinkle the parts to be welded.

(11) F. C. & Co. write: We have considerable trouble from the quantity of smoke and soot emitted from our boiler through the smoke stack. Being in the laundry business, it gives much annoyance by soiling work. If you can suggest a remedy other than using harder coal, we shall be indebted to you. A. You can prevent soot with soft coal only by making the combustion perfect. Construct the furnace so as to feed the fresh coal under the fire or at the front by pushing it in upon the front part of the fire, so that the smoke will pass over the red hot coal. There are several patented smoke burning furnaces.

(12) C. M. writes: Suppose that at the bottom of a well $4\frac{1}{4}$ inches in diameter, and 1,500 feet deep, there is pond of salt water 50 feet deep, and full strength. Now, if a tube $2\frac{3}{4}$ inches outside diameter, and $2\frac{1}{2}$ inches inside diameter is put into the well and extended 30 feet into the brine, so that no fresh water can enter it, and then the well outside of this tube is filled with fresh water to the top, how high will the salt water rise in the tube? What I want to ascertain is whether it would be practicable to force the salt water out by the use of a steam siphon? A. Your arrangement would work, provided you were sure that the pond of salt water had no outlets that would carry off the water under the great pressure which the filling of the pipe would produce. The probability is that the crevices in the earth that supplies the water to the salt bed would also empty it, under a hydrostatic pressure reaching to the surface of the earth.

(13) B. X. S. writes: I have a lot of glass castings seven-sixteenths of an inch thick, and they have a hole in the center three-eighths of an inch in diameter; with what and how could I make the holes five-eighths of an inch in diameter. A pulley that I have I wish to run under water; the pulley carries a V-shaped belt. One end the belt is out of water; what kind of belt should I use to give the least resistance and that will not pump up water? What shall I use to put on the pulley so that the belt will not slip? Would a kind of rubber cement do? A. Provide a vertical spindle with a copper cap the size of the hole you wish to make in the glass pieces. Drive the spindle with a band and hold the glass upon the end, and feed emery and water into the hole. It will soon cut through. For running under water use a rubber belt or band. Probably you cannot prevent the pumping of water by the belt: it depends somewhat upon the speed. You can cover the pulley with a strip of pure rubber, put on with rubber cement.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

June 5, 1883,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Agricultural machine, J. Bachelder... 278,675
Alarm. See Burglar alarm. Water alarm.
Album and book clasp, R. R. Baker... 278,762
Amalgamating ores, apparatus for, E. Bollinger.. 278,861
Ammonia and its salts, manufacture of, Rickman & Thompson... 278,823
Animal trap, A. W. Paull... 278,730
Antimony, producing golden sulphuret of, C. E. Parsons... 278,816
Automatic driving gate, F. Willard... 279,063
Axle box, car, Garland & Kenyon... 278,698
Axle gage, W. Buckeridge... 278,868
Axle lubricator, railway car, C. P. Holmes... 278,964
Axle, wagon, F. Ulrich... 278,755
Bale tie, O. P. Fannin... 278,787
Bar. See Harvester cutter bar.
Bark cutter, J. Daigneau... 278,686
Basket, W. F. Benedict... 278,856
Battery. See Storage battery.
Beamer, E. Cadigon... 278,873
Bed bottom, spring, A. F. Purefoy... 279,013
Bed, sofa, A. S. Burnham... 278,870
Beer chip, B. Rice... 278,019
Bell, horse, A. D. Jacobus... 278,709
Berth, self-leveling, J. H. & E. F. Porter... 278,732
Billiard cue, S. J. Gleason... 278.934
Bird cage spring, W. D. Chapman... 279,081
Blind stop, C. F. Vandervoort... 279,111
Blower, grate, C. A. Preston... 278,736
Board. See Center board. Game board.
Boat. See Torpedo boat.
Boiler. See Steam boiler.
Boiler tubes, closing, E. J. Moore... 278,998
Boot or shoe, felt, E. Waite... 279,055
Bottle packing box, F. A. Baier... 278,761
Box. See Axle box. Bottle packing box. Paper box. Steam engine link box.
Brake. See Car brake. Elevator safety brake. Vehicle brake. Wagon brake.
Bridle, L. C. Chase... 278,882
Bridle attachment, J. T. Massey... 278,988
Buckle for harness, etc., M. E. Simmons... 279,028
Burial casket, A. Freschl... 278,929
Burglar alarm and door bell, L. E. Williams... 279,064
Button, N. C. Newell... 279,002
Button fastener, S. L. Pratt... 278,734
Button or stud, J. Moore... 278,724
Button setting instrument, S. L. Pratt... 278,735
Button, sleeve, R. E. Brunacci... 278,772
Calcimine compound, B. L. James... 278,969
Calipers, micrometer, G. F. Stillman... 279,038
Camera. See Photographic camera.
Can opener, combination, H. Hartman... 278,951
Cant hook, H., C. A., & J. H. Peavey (r)... 10,336
Car brake, G. F. Renouf... 279,018
Car brake, W. B. Turner... 278,833
Car brake, automatic, W. B. Turner... 278,834, 278,835
Car coupling, J. S. Bayley... 278,764
Car coupling, A. W. Case... 278 880
Car coupling, W. Emmett... 278,693
Car coupling, W. F. Freeman... 278.789
Car coupling, W. B. Nichols... 278,728
Car coupling, C. Van Deusen... 278,838
Car coupling, C. Weik, Jr... 279,059
Car door and attachment, grain, C. C. Duffy... 278,895
Car signal, Thompson & Farrell... 278,831
Car starter, E. Utz... 279,049
Car wheel, J. R. Morgan... 278,726
Car wheel, H. G. Yates... 278,843
Card support, W. Hagelberg... 278,941
Carriage curtain fastener, S. C. Meckel... 278,989
Carriage top standard, G. M. Bechtel... 278,676
Carriages, equalizer for spring, O. F. Lowe... 278,984
Carrier. See Cash carrier.
Cartridge packing case, Livermore & Russell... 278,980
Cartridges, tubular package for blasting, N. H. Heft... 278,957
Carving fork guard, S. S. Ward... 2[illegible],056
Case. See Cartridge packing case. Ticket case. Type case.
Cash carrier, A. W. Bodell... 278,767
Cash transmitter, pneumatic, H. Gazaille... 279,090
Casting, divided, J. Yocom, Jr... 279,069
Cementing composition, W. W. Campbell... 278,681
Center board, folding, W. Childs... 278,776
Chair. See Child's chair. Surgical and invalid chair.
Chair seating needle, C. R. Long... 278,982
Charcoal, manufacture of, H. M. Pierce... 278,731
Child's chair, L. Schmetzer... 278,826
Chuck, lathe, C. H. Reid... 279 017
Churn, E. N. McKimm... 279,100
Cigars, making, I. Brach... 278,769
Circuit opener, automatic, D. Rousseau... 279,107
Clasp. See Album and book clasp.
Cleaner. See Flue cleaner.
Cloak, circular, C. W. Morrison... 278,727
Clock bell, H. Camp... 278,874
Clock bell, A. C. Sanford... 279,022
Clock movement, electric, J. Happersberger... 278,946
Clock pendulums, device for adjusting, M. C. Davis... 278,781
Clothes wringer, H. C. Hopkins... 278,966
Collar, F. Beiermeister, Jr... 278,677
Collar fastener, horse, F. Johnson... 278,970
Collar for female wear, standing, W. L. Weatherly 278,758
Colter hub, plow, C. R. Hartman... 278,949
Colter hub, wheel, C. R. Hartman... 278,950
Confectionery and pill coating and rounding machine, T. Daniels... 278,780
Comb. See Curry comb.
Composing stick, W. H. Golding... 278,700
Corn husker, sheller, and separator, combined, C. Roberts... 278,824
Cornice pole support, J. Day... 278,892
Corset, J. C. Tallman... 279,041
Counting and registering the revolutions of a rotating shaft, instrument for, G. D. Kittoe... 279,095
Coupling. See Car coupling. Pipe coupling. Thill coupling.
Crane, traveling, T. W. Capen... 278,774, 278,775
Cravat supporter, F. Smiley... 279,031
Culinary utensil, L. Haas... 278,939
Cultivator and cotton and corn planter, combined, D. J. McCall... 278,810
Cup. See Oil cup.
Curry comb, Bunce & Sammis... 278,869
Curtain pole, cornice, E. D. Mersereau... 278,721
Curtain roller, C. C. Clawson... 278,884
Cutter. See Bark cutter. Feed cutter. Vegetable cutter.
Dental engine, D. H. Gilmer... 278,933
Dental vulcanizer, T. J. Carrick... 279,079
Deodorizing organic substances, process of and apparatus for, W. S. Hatheway... 278,955
Desk, cash, J. Fanning... 278,921
Die or swage, M. L. Ritchie... 279,020
Digger. See Post hole digger.
Distillation, sublimation, or roasting of solid materials, apparatus for the continuous, F. Lürmann... 279,099
Door hanger, Eberhart & Stevens... 278,692
Door lock, J. Mathiesen... 278.719
Door securer, A. Boucher... 278,862, 278,863
Door spring, G. W. Downes... 278,783
Draft regulator, H. W. Norwood... 278,814
Draft regulator for locomotive and other furnaces, H. W. Norwood... 278,813
Dredger, H. R. Koon... 278,975
Drier. See Fruit drier. Sand drier.
Drill. See Grain drill.
Drilling machine, hand, G. W. Smith... 279,032
Dynamometer, A. H. Emery... 278,911, 278,912
Electric apparatus, commutator for, W. H. Chapman... 278,881

Electric circuit and apparatus for synchronizing clock pendulums, H. L. Bailey 278,846
Electric circuit opener, automatic, W. H. Sawyer. 279,023
Electric machine, dynamo, Loryea & Palmer 278,983
Electric motor, Peck & Chapman 279,007, 279,008
Electric motor, H. W. Spang 279,036
Electric wire, C. McIntire 278,811
Electric wire protector, J. O. Cottrel 278,886
Electrical apparatus for automatic signaling, J. C. Wilson 279,065
Electrical wire protector, J. O. Cottrell 278,885
Electro magnetic motor, W. M. Thomas 279,045
Electro magnetic motor, rotary, J. B. Atwater 278,760
Elevator. See Hydraulic and other elevators.
Elevator guard, J. J. Knapp 278,974
Elevator safety brake, automatic, W. J. Seaton ... 279,024
Embroidery, K. L. Tarbox 279,042
Emery wheel, Persson & Söderberg 279,009
Engine. See Dental engine. Traction engine.
Extension table, R. W. Tavener 278,830
Extractor. See Honey extractor.
Fan, F. Kinn 278,799
Fan, S. Van Campen 279,050
Fanning machine, Hoover & Newcomb 278,795
Fare register, L. A. Touchet 278,754
Feed cutter, M. Klima 279,096
Feed water regulator, G. C. Pyle 279,014
Fence, W. F. Ash 279,073
Fence nail, wire, W. M. Clow 279,113
Fence post, metallic, G. S. Curtis 278,779
Fence rails, manufacture of barbed, W. J. Lewis. 278,714
Fertilizer distributer, Thomas & Otstot 279,044
Fifth wheel, vehicle, Fallesen & Jensen 278,786
Filing machine, rotary, D. H. Stephens 279,108
Finger ring, H. Henrich 278,959
Fire arm, magazine, W. Mason 278,987
Fire engine water heater, W. V. Elliott 279,085
Fire escape, C. E. Baker 278,847
Fire escape, H. L. Barnard 278,763
Fire escape, S. H. Bills 278,858
Fire escape, J. S. Bowman 278,768
Fire escape, M. N. Brainard 278,865
Fire escape, C. F. Marskey 278,807
Fire escape, J. Reese 278,820
Fire escape, F. Vaughan 279,053
Fire extinguisher, C. W. Caryl 278,879
Fire extinguisher, G. F. Wagner 279,054
Fire place and chimney, W. C. Hamner 278,791
Fireproofing and furring device, G. B. Phelps 279,011
Fishing reel, J. M. Bryan 278,867
Flour dressing machine, W. D. Gray 278,702
Flue cleaner, boiler, R. P. Gerlach 278,699
Folding seat, Durant & Shupe 278,691
Food for infants and process of preparing the same, granulated, W. Horlick 278,967
Fork. See Hay fork.
Fruit drier, C. A. Curran 278,890
Fruit drier, Granger & Sibley 278,701
Fruit jar, J. L. De Steiger 278,893
Furnace. See Ore roasting furnace.
Furnace lining, iron and steel, E. L. Ford 279,089
Furnaces, feeding straw as fuel to, W. S. Prosser. 279,012
Furnaces, method of and apparatus for heating the gaseous fuel of, J. H. Cremer 278,898
Gage. See Axle gage. Pressure gage. Pressure and vacuum gage.
Game board, J. W. Larimore 278,712
Game counter, H. A. Russell 278,747
Gas lighting apparatus, electric, R. Einbigler 278,859
Gas, process of and apparatus for manufacturing, H. M. Pierson 279,010
Gate. See Automatic driving gate.
Gate, T. Sturgin 279,039
Generator. See Vapor generator.
Glass caster stand and mold, D. C. Ripley 278,745
Glass signal globes, manufacture of, D. C. Ripley. 279,746
Glycerine, extracting, E. O. Baujard 278,849
Governor, steam engine, W. Knowles 279,097
Grain, apparatus for the conversion of unmalted, E. Luck 278,985
Grain binder, D. McPherson 279,101
Grain binder band securing mechanism, J. S. Davis 279,082
Grain drill, W. P., Jr. & W. P. Shortridge 279,027
Grain drill, J. Smith 279,033
Grain, machine for dampening or wetting, J. Miller 278,996
Grain shovel mechanism, J. S. Metcalf 278,993
Grain transfer apparatus, pneumatic and automatic, L. Smith 279,034
Grate, shaking, C. B. Boynton 278,864
Grinding and graining device, C. N. Morris 279,001
Grinding mill, E. G. Hastings 278,954
Grinding mill, A. N. Wolf 279,067
Grist or flouring mill, A. Mariotte 279,718
Guard. See Carving fork guard. Elevator guard.
Gun, three barreled, W. T. Davis 278,688
Hair crimping tool, W. A. Hauce 278,944
Halter fastening device, J. Gibbons 278,931
Hanger. See Door hanger.
Harrow, L. S. Wheeler 279,060
Harvester, M. T. Ridout 279,106
Harvester binder, J. D. Heebner 278,956
Harvester cutter bar, W. H. Farra 278,922
Harvester rake, S. D. Bates 278,850
Harvester rake, C. Lidren 278,979
Harvester traction wheel, Whiteley & Bayley 279,061
Hats, ribbon or label holder for, W. Carrick 278,877
Hay fork, horse, J. S. Durning 278,897
Hay rake, horse, E. & H. H. Wayland 279,057
Head light, signal, W. Armstrong 279,072
Heater. See Fire engine water heater.
Hitching device, Klugh & Hudson 278,710
Hoisting machine, R. Reid 278,821
Holdback, T. A. Crabtree 278,887
Holder. See Knife blade holder. Mustache holder. Pen holder. Pillow sham holder.
Honey extractor, E. T. Lewis 278,713
Hook. See Cant hook.
Hoop coiling and nailing machine, J. J. Burk 278,773
Hoop fastening for buckets, etc., H. B. Phillips (r) 10,337
Horse detacher, Fougeres & Blair 278,928
Horse power, P. Beche 278,853
Hub attaching device, H. M. Hall 278,942
Hydraulic and other elevators, G. N. Reiff 278,739
Ice cream dasher, T. Mills 278,997
Insulating telegraph wires, T. A. Smyth 278,753
Iron. See Soldering iron.
Iron ware, manufacture of enameled, E. Kegreisz. 279,094
Jack. See Thill coupling jack.
Japanning metal sheets or plates, A. N. Hopkins. 278,707
Jar. See Fruit jar.
Joint. See Pipe joint.
Knife blade holder, C. W. Boman (r) 10,335
Knitting machine stop motion mechanism, W. Diebel 278,894
Knob attachment, door, W. F. Hall 278,704
Lamp black, process of and apparatus for manufacturing, M. J. Seymour 278,749
Lamp cut out, arc, Bosworth & Swan 278,679
Lamp, electric, P. Tihon 278,832
Lamp, electric arc, J. Olmsted 279,103
Lamp support, D. W. Parker 278,729
Lamp support, electric, A. L. Ide 278,797
Lantern, J. H. Ewing 278,920
Lantern, G. F. Fisher 278,927
Lead pipe, coiling, J. Farrell 278,695, 278,696
Liquors to the action of atmospheric air, apparatus for exposing, E. Luck 278,986
Lock. See Door lock. Nut lock. Track bolt lock.
Lock, O. H. & O. L. Woodward 279,112
Lock striking plate, E. Parker 279,006
Locomotive, D. R. Murphy 279,102
Loom, vertical, J. MacFarlane 278,715
Loom weft stop motion, J. M. Linscott 278,804
Lubricator. See Axle lubricator. Wrist pin lubricator.
Lubricator, F. J. Renchard 278,741
Lumber trimming machine, W. B. Swartwout 279,040
Magnetic separator, J. La Breche Viger 278,976
Measurements on fabrics, machine for marking linear, D. J. Bushorr 279,078
Measuring tank, E. A. Smead 279,030
Measuring vessels, apparatus for determining the scale of glass, R. M. Atwater 278,845
Mechanical movement, T. A. Macaulay 278,806
Mechanical movement, M. H. Webber 279,058
Medicated vapors, apparatus for administering, M. Goldberg 279,091
Metal by the Bessemer process, dephosphorizing, J. Reese 278,738
Mill. See Grinding mill. Grist or flouring mill. Saw mill. Windmill.
Motion, device for converting, Elson & Crockett. 278,899
Motor. See Electric motor. Electro magnetic motor. Power motor.
Mower, W. W. Ball 279,074
Mowing and reaping machine, I. Branch 279,077
Musical instrument, mechanical, E. H. Brown 278,771
Mustache holder, J. A. Moore 278,999
Nail. See Fence nail.
Nail plate feeder, J. F. Hammond 278,943
Necktie fastener, J. W. Dimock 278,690
Necktie or cravat holder, A. I. Burton 278,871
Needle eyes, machine for polishing, P. M. Beers 278,854
Needles while grinding them, clamp for holding and rotating, J. Berry 279,075
Newspaper wrapper, G. Fay 278,923
Nut arbor, P. Duffy 278,896
Nut lock, M. Moran 279,000
Oil cup, J. J. Renchard 278,742
Oil from crude petroleum, obtaining lubricating, Arendt & Weil 278,844
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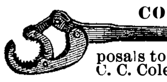
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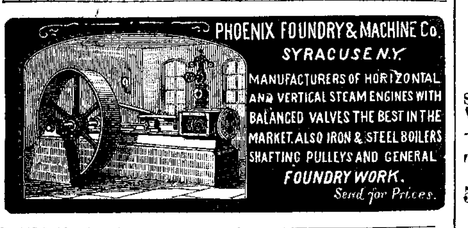

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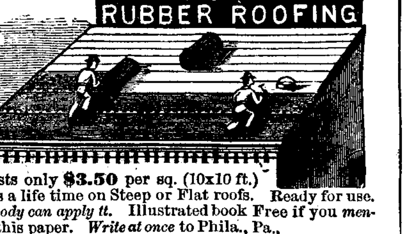
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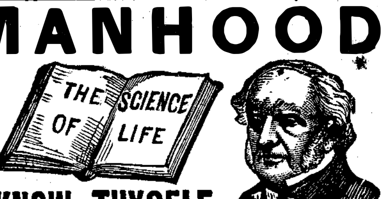

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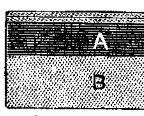
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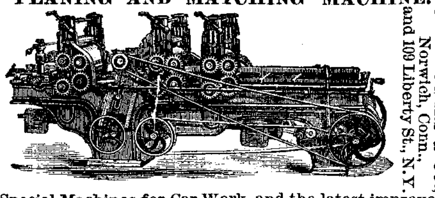
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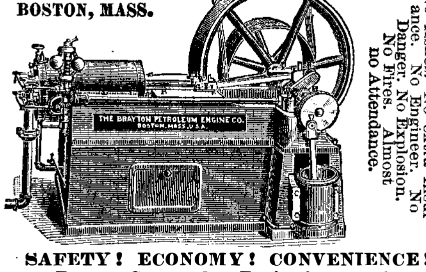
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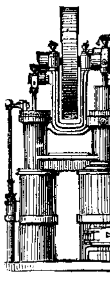
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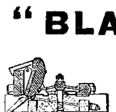
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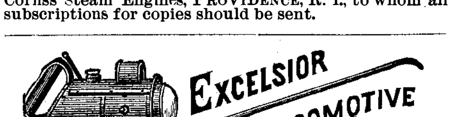

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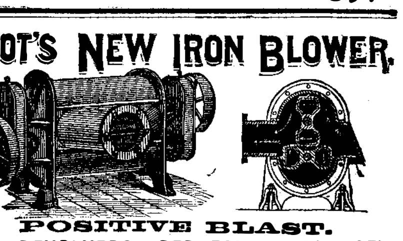
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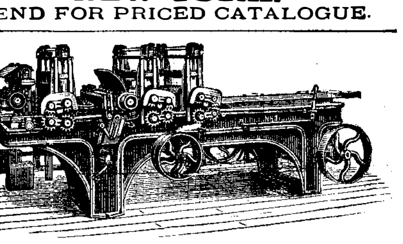
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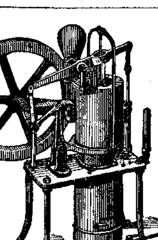
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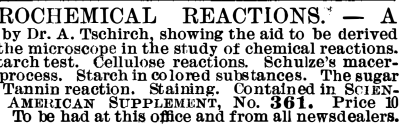

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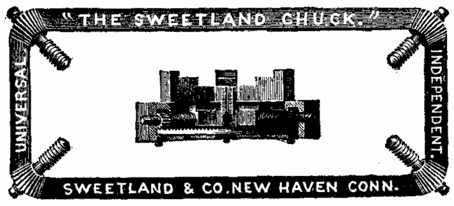

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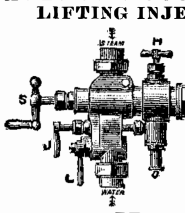

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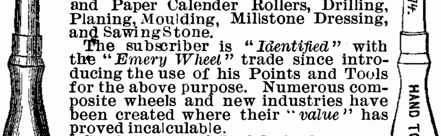

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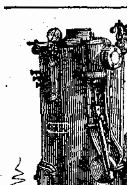

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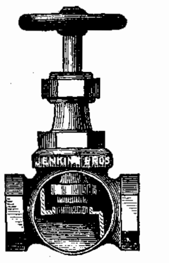

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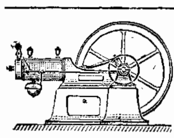

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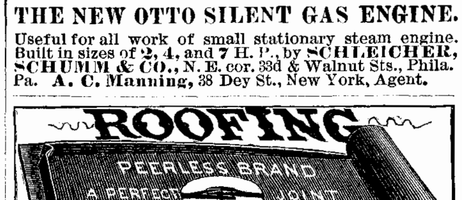

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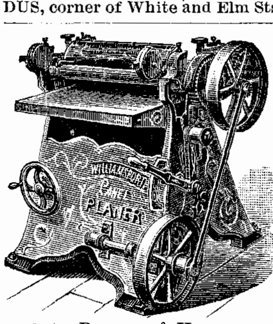

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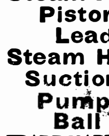

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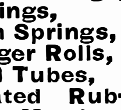

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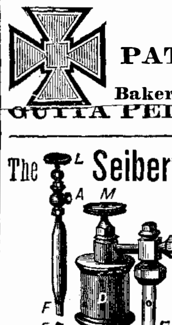

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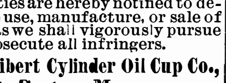

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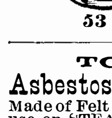

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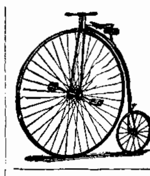

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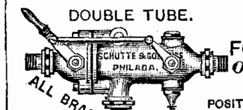

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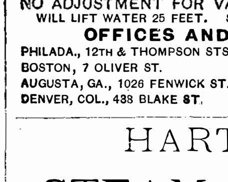

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