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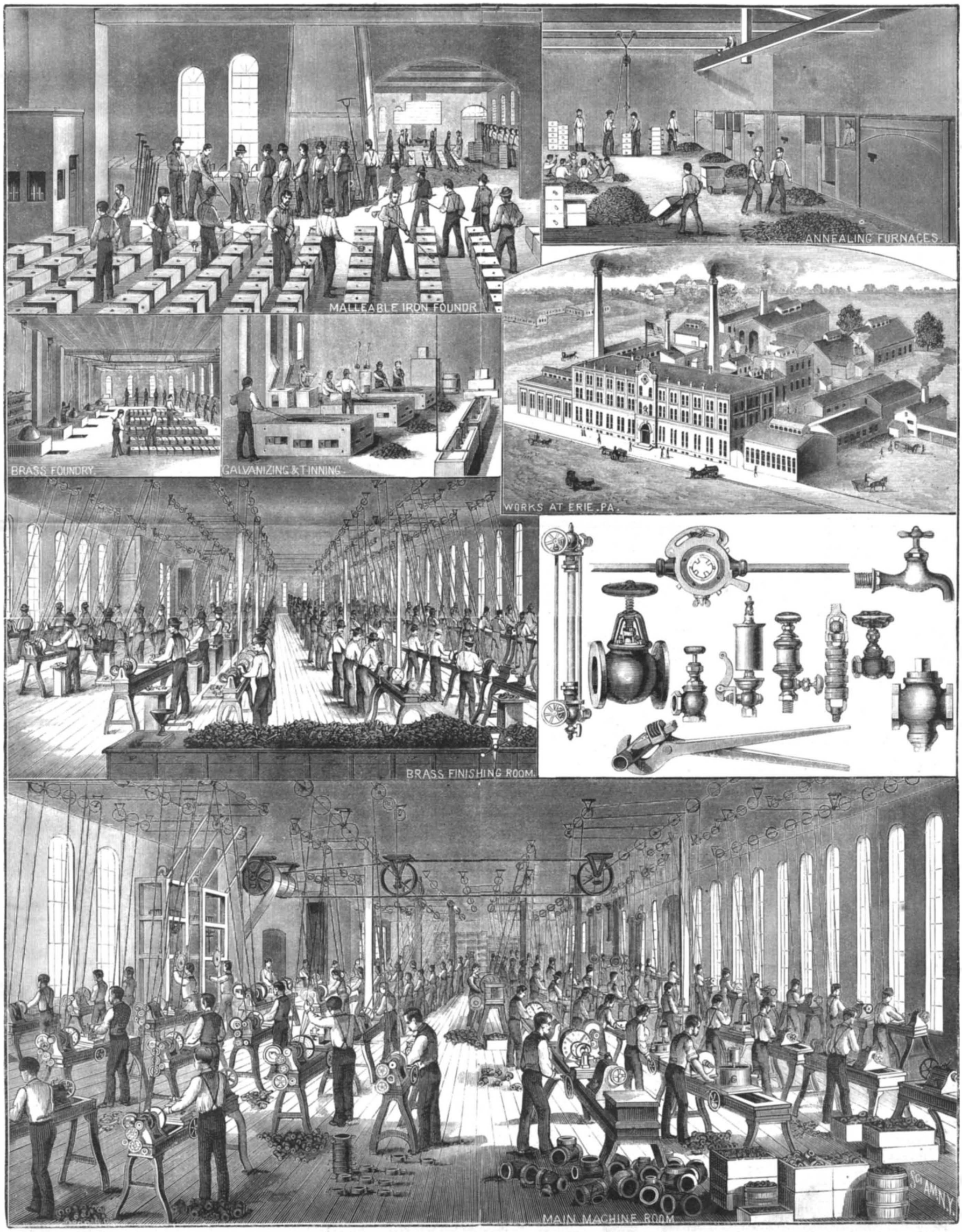

THE MANUFACTURE OF STEAM, WATER AND OIL-WELL FITTINGS.—THE JARECKI MANUFACTURING COMPANY ERIE PA.—[See page 264.]

Scientific American.

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NEW YORK, SATURDAY, OCTOBER 22, 1881.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT.

No. 303,

For the Week ending October 22, 1881.

Price 10 cents. For sale by all newsdealers.

AMERICAN ART IN TOOLS.

The SCIENTIFIC AMERICAN has had frequent occasion to commend the artistic construction of American tools and machines, and has unsparingly condemned the lofty disdain with which the self-constituted artists—in reality mere picture makers and copyists for the most part—have looked down upon everything mechanical as of necessity inartistic. The great truth that genuine art effects have always and in all countries resulted from work in which the art element has been held subordinate to utility, has been too largely overlooked in the art schools; and while the would-be artists have accomplished little and added less to the world's stock of artistic forms and ideas, the despised artisans have developed—in the one field in which their work has not been misguided by conventionally artistic designers—results which command the admiration even of artists and art critics. This simply because their chief aim has been to make not "artistic" machines and tools, but such as should be best adapted to perform the work required of them, with the least outlay of material and working force, not disregarding shapeliness and harmony of proportion.

Unexpected confirmation of the correctness of our position, heterodox as it may have seemed, appears in a communication from Florence, Italy, to the New York *Times*. The writer, Mr. J. J. Jarves, has been studying some illustrated trade circulars which American merchants have sent to that market. As an art critic he finds in them new ideas regarding American art.

After reviewing rather caustically and at considerable length the failure of American artists and architects to do much more than to copy in a fragmentary and inartistic way the styles, designs, and decorative ideas of other races and ages, with no central creative principle as a guide, Mr. Jarves says:

"The finest art yet developed in America, one in which my countrymen excel all other peoples, is in a direction which they themselves have never recognized or suspected. They have perfected it in its department simply because they have been governed by sound principles joined to a keen consciousness of lines and forms, wedding sharpest practical use to completest beauty of its kind by unconscious pursuit of perfection—in a very limited direction, it is true, but one which forms the starting point for all others, highest art inclusive. I refer to our tools—the axes, hatchets, spades, shovels, hammers, and other metal weapons, by which we hew, plant, and conquer our virgin soil and tame it to our needs. So shapely are they, so nice their gradations of lines, so thoroughly adapted to their ends, graceful, light, and strong, bright and cheery to look at, honest of purpose, sincerely made, that there is in them a touch of the æsthetic as well as the sense of the artistic, unmistakable as the repose and beauty of Greek art. Their makers have worked better than they knew, and nature has led them into art while thinking only of use."

If Mr. Jarves could go into many of our machine shops and study as intelligently the construction and admirable adaptation of our larger and more complicated machines, he would find them as worthy of admiration as the simpler tools he so justly commends. In the designing and construction of these the conventionally misinstructed "artist" has had no hand. The mischievous though unrecognized work of this class of designers is seen by Mr. Jarves, when he compares our tools with more ambitious products—furniture, organs, pianos, etc.—good in themselves practically, but made hideous by abortive attempts to make them beautiful. These—the work of professional designers—tell, he says, "a story of defective æsthetic training, and what deformity is sure to result from attempts at ornamentation before the taste is sufficiently trained to distinguish artistic truth from falsehood. If the makers of these things would simply try to perfect them, keeping their objective aims strictly in view, following the example of the tool makers—and I can include in some degree makers of wooden ware—they would produce far more artistic work in the end than they are now doing with all their eagerness to recommend their wares by labored, overdone decoration. Theirs is the slang of ornament, as ungrammatical and false as pigeon Chinese or backwoods speech, and tenfold more unnatural. We cannot make any substantial progress in industrial art until this whole haphazard system of decoration is thrown away, and we begin anew at the right end, *i. e.* learn the simple alphabet of art before trying to make eloquent speeches in its language. Years ago, when the material interests of the nation, and its heart, also, went oceanward in seeking to build the fastest ships, our builders, following the hints of nature and keeping their own aims steadily in view, succeeded in producing the most beautiful vessels possible; perfections of marine architecture, complete works of art, the like of which the world seems destined never again to witness. This was the result of knowing what they wanted, and, perseveringly studying means to ends, perfecting the ships as to character, and consequently as to comeliness; for even in material things the spiritual holds sway and begets beauty from truth of form. I honor these American tool makers as serious pioneers of American art, unwittingly though it may be to themselves. Theirs is the correct principle and right path of labor and progress."

There is a popular cry just now, and a just one, for a multiplication of schools of decorative art, schools in which our young artisans shall be trained to be artists also in their respective callings. In the right hands such schools may be and must be of inestimable value. In the wrong hands they cannot fail to be mischievous. If their motive is "art for its own sake," they may succeed in teaching our artisans to make pretty imitations of antiques and such like, but nothing better. At the worst they may do much to turn our workmen from "the correct principle and right path of labor and progress." The art which has sprung up in our machine shops from sincerity of purpose and a practical sense of economy and fitness, looking first to utility and then to beauty, is the art which the new schools should encourage and cultivate.

A TEA CULTIVATOR WANTED.

The manager of a large tea farm in India appeals, through the SCIENTIFIC AMERICAN, to American inventors for what we may call a spading machine, to be used in the cultivation of tea plants; the machine to be worked either by bullock or steam power.

The tea bushes on the estate in our correspondent's care are mostly planted four feet by four feet apart, in plots eighty plants broad by four hundred and twenty plants long; a few acres are planted four feet by five feet and five feet by five feet, in fields of the same length and breadth. Many tea gardens, however, are planted five feet by five feet. The tea bush grows from three to four feet high; it occupies about a square foot of ground at bottom, and at top spreads so that the lines of bushes almost (sometimes quite) touch each other. The nearest approach in America to a tea field, our correspondent thinks, is a plot of gooseberry bushes, which somewhat resemble the tea bushes, minus the thorns. In general aspect an ordinary cotton field might be compared, we imagine, to a tea field; and possibly a machine suited for the cultivation of the one might be readily adapted for use in the other.

The India tea fields are dug by hand from twelve to fifteen inches deep, the upper surface, grass, etc., being turned over and buried and the subsoil brought up to the top. A day's work for a cooly is to dig one line across a field, or 1,280 square feet. The ordinary plow will not answer for this work, as it leaves one side of the bushes uncultivated and cuts the roots of the bushes on the other. The horse hoe or cultivator has been tried, but it does not cut deep enough, it does not turn the soil over, and it injures the outer stems of the bushes.

What is required is a machine working a blade or blades set at right angles to the handle, with an up and down motion, and so operated as to turn the soil over. It must dig to a depth of fifteen inches and turn the soil thoroughly. It must dig close to the root of the plant, yet not injure the side stems; and it must be able to do much more work than a cooly can do—say ten or twenty times as much, when drawn by a bullock or by a fixed steam engine working with wire ropes. A machine of this character, able to compete successfully with cooly labor, both in cheapness and efficiency, would bring, our correspondent thinks, a small fortune to the inventor, "as there are upward of a thousand tea gardens in India hard up for coolies and looking out for something of this kind."

We may add that the inventor's right may be protected in India by patents. Also that the extension of tea culture in Java, Formosa, and other islands, not to mention Japan or China, would seem to offer a wide field for the introduction and sale of a successful cultivator. The same machine might also, as already suggested, be adapted to the requirements of cotton and other fiber plants.

Our correspondent's address is R. B. Macnaughton, East Hopetown Estate, Dehra Doon, British India.

The Work of the Patent Office.

The Commissioner of Patents has forwarded to the Secretary of the Interior his report of the operations of the Patent Office for the past fiscal year, and his estimate of the amount necessary during the next fiscal year. The number of original patents issued during the first nine months of the present year was 13,084, an increase of 2,261 over last year. The receipts of the office for the same period were $65,447 in excess of those for the corresponding nine months of 1880. The report recommends a considerable increase in the examining corps and the clerical force of the office, and the following appropriations: $50,000 to carry out the abridgment of patents and the publication of 10,000 volumes of the same; $15,000 for reproducing burned and exhausted drawings; $10,000 for photo-lithographing drawings; and $9,000 to complete the *Official Gazette* for the present year.

American Society of Microscopists.

At the fourth annual meeting of this society, held at Columbus, Ohio, August 9, 10, and 11, 1881, the following officers were elected for the ensuing year, namely: President—Dr. George E. Blackham, Dunkirk, N. Y.; Vice-Presidents—Dr. Lester Curtis, Chicago. Ill., and Dr. Thad. S. Up De Graff, Elmira, N. Y.; Secretary, for three years—Prof. D. S. Kellicott, 119 Fourteenth street, Buffalo, N. Y.; Treasurer for three years—Geo. E. Fell, C.E., 162 Prospect avenue, Buffalo, N. Y.; Executive Committee—E. H. Griffith, A.M., Fairport, N. Y.; Dr. Robert Dayton, Cleveland, Ohio; Prof. Albert McCalla, Fairfield, Iowa. The next meeting will be at Elmira, N. Y., in August, 1882.

NEW METHOD OF ASSASSINATION.—A merchant of Santanda, Central America, was lately murdered by a new and ingenious use of dynamite. The charge was placed in the large lock of his store door, with the exploder arranged to be set off by the door key. He was instantly killed on attempting to unlock the door.

STEAM BOILER NOTES.

The coroner's jury in the case of the Bullman & Brown boiler explosion in Jersey City, N. J., which occurred on the 13th of September, rendered, October 6, the following verdict:

"That the effective cause of the explosion, on the morning of September 13, 1881, of the boiler on the drydock of Bullman & Brown, located at the foot of Essex street, Jersey City, causing the death of Lionel D. Decker, was from an imperfect safety valve in the hands of a careless, incompetent engineer, in the person of George Everson; and we further censure Messrs. Bullman & Brown for leaving the boiler without an engineer from 7 to 8 o'clock in the morning; and we would recommend that the Legislature of this State enact some law requiring the licensing of engineers and the inspection of all boilers once a year."

Whatever else may be said of the phraseology of this document, it certainly cannot be called ambiguous or equivocal.

In pursuance of this verdict, Joel W. Brown and Adam Bullman, the drydock firm, were arrested and held in $2,000 bail each, to await the action of the Grand Jury in the matter of the killing of Lionel D. Decker, by the explosion of the boiler. Each defendant was compelled to furnish two bondsmen. George Everson, who was in charge of the boiler, was also arrested, and his late employers became his bondsmen in the sum of $2,000. Bullman & Brown, it is said, have paid Capt. Decker's widow $3,500 in settlement for the loss of her husband.

This explosion was fully reported, with illustrations, in the SCIENTIFIC AMERICAN of October 1. The case was so plain that no other conclusion could have been reached by practical men who took the trouble to look for themselves at the corroded safety valve.

The safety valve having been tested by direction of the coroner while in the corroded state in which it was picked up after the explosion, it was found that 2,000 pounds, equal to about 400 pounds to the square inch, did not move it from its seat. The iron stem of the brass valve was perfectly cemented in the hole in the iron bonnet, in which it was intended to slide freely, by corrosion. It was forced out partly by the application of about 4,000 pounds, and completely by driving with a hammer. It was then cleaned and adjusted for another test, which showed that the valve would have blown off when in order with the weight at the point on the lever where it was found firmly fixed by a set screw, at between 50 and 60 pounds per square inch, and with the weight at the extremity of the lever it would, when in order have blown off at 100 pounds per square inch. This boiler was used only at intervals, and with the appearance indicating that the valve had been leaky, the conditions could scarcely have been arranged better for the promotion of results.

On the morning of the explosion the young man who generally built the fire for the usual attendant, then absent, found the fire low, and thinking the engine would soon be wanted to pump the dry dock, put coal in the furnace, closed the furnace door, and went away to other duty. At the end of about three-quarters of an hour steam began to issue from the seams, all steam outlets being closed, and increased to such an extent that the boiler could not be approached by the terrified dock hands for the purpose of opening the furnace door, although pike poles were used for the purpose. It is said that it blew up while the temporary attendant was still at work with his pike pole at the furnace door. He was blown into the water and badly injured. The verdict appears to be severe on the owners, since they thought that their man had been long enough acting as engineer to know something about the duties required, while there was no means provided for testing his knowledge or the soundness of his judgment of the reliability of the most important safety device about a steam boiler. There is still another party, the one who put an iron stem through an iron valve bonnet, that ought, perhaps more than any other, to be indicted for manslaughter in this case. If the coroner had hunted up and brought him or them to taste Jersey justice he would have been entitled to the "cake" as a model coroner in boiler explosions. Notwithstanding the testimony of the valve itself, more than one human witness testified that this valve would blow off at seventy-five pounds, and had done so within a few days before the explosion. The valve was perhaps leaky at that pressure, but it is not at all probable that it would automatically relieve the boiler as it ought, or so that whatever the fire might be steam could not rise to a dangerous pressure.

The boiler in Landue & Plinney's car factory at Carrollton, Mich., exploded October 2. Two brothers, named John and James Picard, were killed, and damage was done to the extent of $7,000.

On October 4, one of the boilers at B. S. Nichol's machine shop in Burlington, Vt., exploded, demolishing the two story brick building in which it was placed. No one was injured, though the engineer and fireman were in the room at the time. The loss will be several thousand dollars. The cause of the explosion is not known.

Compound Steam Engines.

Hallauer's recent experiments have led him to the conclusion that the difference between engines of one and two cylinders, in point of economy, is very slight. In ranging from 80 to 8,000 horse power, with revolutions varying from 25 to 90 per minute, the expenditure of steam for a given amount of work remains the same for the same type of motor; the consumption for two cylinder motors are identical for Woolf and compound, whatever may be the volumes of the cylinders, provided the motors are regulated so as to give the maximum efficiency; the expenditures of steam in motors of one, two, and three cylinders, suitably regulated and constructed, are so nearly alike that the choice may be governed in each instance merely by the fitness of the type of the engine for the particular purpose desired.

MICA.

As in times past, when the search after the "philosopher's stone" resulted in the discovery of many unsought, but nevertheless valuable substances, it frequently happens that the treasure seeker of to-day brings to light some unthought of ore or mineral—not as valuable as the substance sought, but certainly well worth finding—if the discoverer is wise enough to understand this.

The discovery of good merchantable mica in some of our Western gold mining regions is illustrative of this We have recently received many samples of this peculiar mineral—chiefly from Dakota, Colorado, and California—and some of these compare very favorably with the best products of the celebrated Carolina mines. We are glad to note this, for mica is peculiarly well suited for hundreds of useful applications in the arts for which it is not now available on account of its cost.

Mica is a very common mineral in some localities, but the merchantable article is by no means common, and a large body of "mica rock," capable of affording large, clear, and colorless sheets of the mineral, free from flaws and of uniform structure, is worth developing almost anywhere.

Muscovite or oblique mica—the clear variety—is essentially a silicate of aluminum and potassium. When the crystallization is uniform it can be easily separated with a knife blade into very regular flexible and elastic sheets of almost any required thickness. It is not affected by water or strong acids (with the exception of hydrofluoric acid), and may be heated quickly to redness without danger of melting or cracking it. In thin plates or sheets it resembles glass, but it is not brittle, and this, in connection with the other peculiar properties alladed to, make it available and serviceable as a substitute for glass under conditions which preclude the use of the latter. Mica is never quite colorless, although in good samples the color is barely perceptible in the thin sheets. That having a faint wine or brandy tint commands the best prices.

In the New York market the mineral is usually sold by the pound, in sheets cut to sizes varying from two inches to fifteen inches square, the price varying with the size and number of sheets to the pound, color, and quality. When the sheets are properly split, trimmed, and cut to size the prices for good clear mica vary from twenty cents to eight dollars per pound.

Of the numberless uses to which this mineral glass has been put it is chiefly in demand for the glazing of stone and furnace or heater doors, and as a substitute for glass in some kinds of lanterns, as it is much lighter and tougher than glass, and is not easily ruptured by jar or concussion. The latter consideration has caused its substitution for glass lights on gunboats and naval vessels.

Mica is peculiarly well suited to the construction of light roofs and walls for galleries, conservatories, greenhouses, or hotbeds, etc., as it can be easily shaped and bent, and secured with tacks after the manner of shingles; is not easily fractured, and requires very light supports. We have seen structures of this kind, and they would seem to leave little to desire in this line, except, perhaps, larger sheets of the mineral and a reduction in its cost. The sheets may be tinted or colored by dipping them momentarily in a very dilute alcoholic solution of pale shellac suitably colored with any of the soluble coal tar or aniline dyes, and exposing them for a few minutes to warm air to dry. Very pretty color effects can thus be produced. A simple way of producing a frosted or ground appearance on the sheets of mica is to coat them with a thin milky varnish prepared by mixing together solutions of one ounce of pale shellac in three pints of wine spirit and one ounce of pale resin in a pint of good benzine. A rather thin sirupy solution of water glass, with which has been mixed a trace of zinc sulphate dissolved in water, can be used in a similar manner to effect this object.

A colorless cement for joining sheets of mica is prepared as follows: Clear gelatine is softened by soaking it in a little cold water, and the excess of water is pressed out by gently squeezing it in a cloth. It is then heated over a water bath until it begins to melt, and just enough hot proof spirit (not an excess) stirred in to make it fluid. To each pint of this solution is gradually added, while stirring, one-quarter ounce of gum ammoniac and one and one-third ounces of gum mastic previously dissolved in four ounces of rectified spirit. It must be warmed to liquefy it for use and kept in stoppered bottles when not required. This cement, when properly prepared, resists cold water.

Flexible mirrors are made from sheet mica, the silver being deposited from a solution of the nitrate by one of the processes described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 105. Small mirrors of this description are used in some kinds of inlaid work and for various decorative purposes. As their flexibility admits of their application to irregular surfaces they can be used where glass mirrors cannot. With the aid of a little gold leaf, bronze powders, size, and variously colored thin transparent varnishes or collodion mica has been worked into hundreds of beautiful articles for decorative purposes, toys, etc.

When mica is heated to redness for some time in a muffle and then allowed to cool rather quickly the laminæ become distorted and the sheets present a silvery-white appearance by reflected light, the mineral losing much of its flexibility The dust of this whitened mica is used to some extent by the French as a silver bronze powder. Mixed with a weak solution of gum arabic it makes a good silver ink. The powder is sometimes variously tinted by washes of very dilute colored solutions of gums or varnishes. To prepare the glistening powder the sheets of whitened mica are simply crushed (not ground), boiled in hydrochloric acid, rinsed, dried, and assorted to size of laminæ. The finer filaments have a pearly luster and are made to adhere to semi-softened gelatine and wax to imitate pearl. The silvery powder is used on metals, glass, wood, paper, plaster, tapestry and furniture. It has also been used in calico printing in place of the heavy bronze and glass dust of Lyons fabrics, and for the decoration of china and glassware.

Mica is used by electricians for certain insulating purposes and also to some extent by makers of philosophical and optical instruments. Good mica, because of its lightness, is often employed as a substitute for glass in spectacles designed to simply shade the eyes or to protect them from dust, cinders, or flying particles of metal or stone for travelers, millwrights, grinders, polishers, and others whose work necessitates such protection. Vessels of mica are often used in the chemical lecture room, and are particularly serviceable in the experimental illustration of the properties of certain gases—the burning of metals in oxygen, etc.

The powdered or crushed mineral has recently been used, in connection with nitroglycerine, in the preparation of a kind of dynamite called mica blasting powder. It has also been employed as a filling for fireproof safes, as a non-conducting covering for boilers and steam pipes, and, in connection with water glass, as a fireproof varnish or paint. The larger sheets, applied after the manner of shingles, make a very good fireproof roofing material.

Formerly most of the merchantable mica used in this country was imported, but for the past few years—since 1867—our supply of the mineral has been derived chiefly from mines located in Mitchell, Heywood, Yancey, McDowell, and Macon counties, North Carolina. The product of these mines is at present hardly equal to the demand, which is increasing very rapidly.

The discovery—or rather rediscovery (for some of them show signs of having been worked centuries ago)—of these valuable beds of mica in the Carolina gold fields was, like the Western "finds" above referred to, one of the results of a search after the precious metals.

The Atlanta Exposition.

The International Cotton Exposition at Atlanta, Georgia, was formally opened October 5. Among the thousands of visitors present were many representatives of the North and West. The assemblage was called to order by Governor Colquitt. After prayer by Bishop Elliott, of Texas, the buildings and grounds were presented to the Exposition Association by Director General Kimball. In responding Governor Colquitt highly complimented the executive committee and expressed the belief that the energy bestowed in the development of the enterprise thus far had never been exceeded. All the space in the several large buildings has been taken, but a fortnight must elapse before all the exhibits can be in place and in presentable condition. After the machinery was started Senator Vance, of North Carolina, delivered an address of welcome on behalf of the Southern people. Senator Voorhees, of Indiana, followed with an oration in which he took strong grounds in favor of the development of Southern industry through the fostering influence of a protective tariff. "Free trade," said he, "is a seductive sound that can mean nothing except where it is purely reciprocal, and exists between nations of equal strength. It is the duty of the government to protect its own industries before it practices benevolence."

This is the first world's fair ever held in the South, and while it properly takes its name from the leading Southern product its scope includes all the material interests of the Southern States. The two hundred and twenty-two classes of exhibits are distributed in forty-one groups arranged in six departments, the first four of which are for competitive exhibition and awards, the other two for exhibition only. These departments are: I. Productive machinery, implements, processes, etc. II. Natural products, especially textile products. III. Manufacturing machinery, chiefly textile, etc. IV. Manufactures. V. Miscellaneous natural products. VI. Non-textile machinery and manufactures, art products, etc.

The site of the fair is Oglethorpe Park, which covers fifty acres, just outside the city. The buildings cover more than twenty acres, the number of exhibits having vastly exceeded anything at first contemplated. The exhibits pertaining to cotton, its cultivation, handling, and manufacture, are beyond comparison superior to anything ever seen before. The wealth of general exhibits is not less a surprise to all. Particularly rich is the show of minerals, woods, and other natural products of the South. The Executive Committee announce the following special weekly exhibitions:

Fruits and flowers, commencing October 25; cattle and mules, commencing November 1; sheep and swine, commencing November 8; bench show of dogs, commencing November 15; poultry, etc., commencing November 22; dairy products, commencing November 29.

October 27 is set down for "Governors' Day," it being expected that the State Governors in attendance at the Yorktown Centennial Celebration will that day visit the Exposition accompanied by their several staffs.

NEW GRADUATING APPARATUS.

This apparatus was designed to facilitate the accurate graduation of glass tubes—burettes used in volumetric analyses, technical assays, pharmaceutical work, etc.

The tube, A A, to be graduated is secured by brass clamps, *e e*, to the wooden frame, P. The piston, S, of brass, loosely packed with rubber, is rigidly connected by the brass rod, F, with the block, *b*. The smaller end of the glass tube, A′, is tightly connected by a piece of rubber tubing with the glass tube, G, which joins, at right angles, the small upright graduated glass tube, E E′. This tube is continued downward, and connected by a short piece of rubber tubing with the feathered delivery tube, B, a pinch cock serving to stop the tube at O. The upper part of the tube, from *c* to *c′*, is graduated to contain one cubic centimeter of water, and this space is subdivided into tenths of a centimeter. Water from D is introduced into the tube through the small funnel. The hard-wood rod, T, has a fine steel point rigidly affixed at *i*, the other end being similarly fitted with a wedge-shaped blade, *p*.

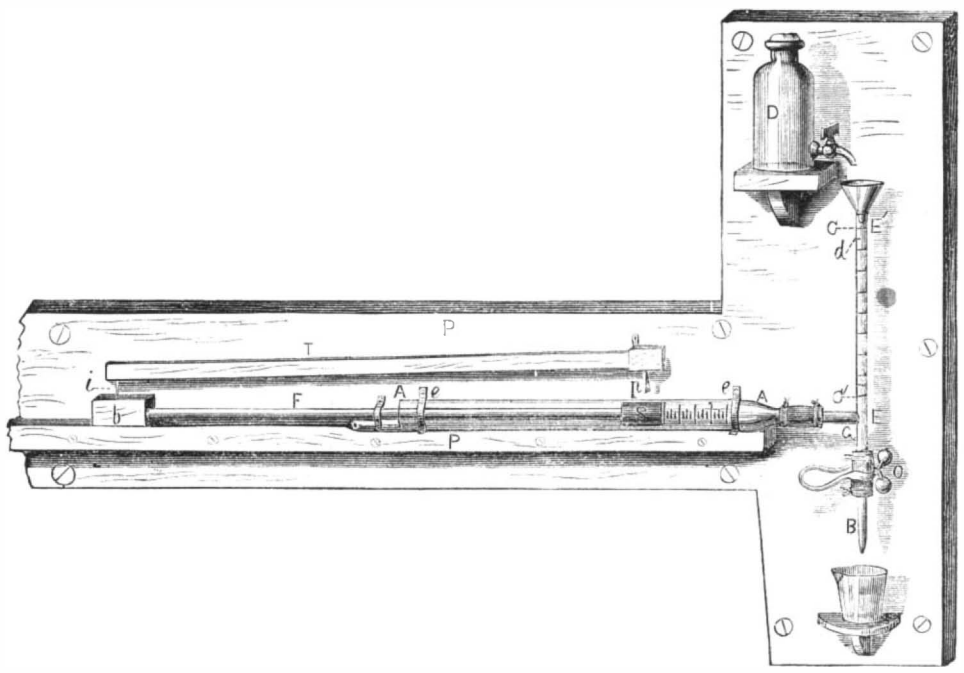
In using the apparatus the tube to be graduated is uniformly coated with a thin film of white wax or collodion. A small quantity of water is then put into it, the piston adjusted so as to fit snugly but loosely, and the tube securely clamped in position, connection having been made with the tube, G, the pinch cock at O is opened, and the piston forced up to the end, A, of the tube, expelling the water (and air) through G and B. The pinch cock is then closed and water (at 0° Fah., or 16° C.) let into the tube, E, from D, until it is filled to the mark, C, any excess being drawn off through B.

The block, *b*, is then grasped and slowly drawn back until the water in E E′ has fallen to *a*, the first mark on the scale. The steel point, *i*, on the rod, T, is then inserted in a fine hole, nick, or cut line on the upper side of the block, *b*, and held in position, while the blade, *p*, at the other end of the rod is brought down on the coated tube, and a fine line cut through the coating to the surface of the glass. The block, *b*, is again drawn back until the water in E E′ falls to the next line on the scale, when the rod is brought into requisition, as before, and another mark made on the tube, These operations are repeated until the water in the tube, E E′, falls to C′, when it is again filled to C, from the reservoir, D, and so on, until the graduation of the tube, A A′, is completed.

The lines are etched in by exposing the tube to gaseous hydrofluoric acid—evolved from a mixture of powdered fluorspar and warm oil of vitriol contained in a suitable leaden dish or by the use of liquid hydrofluoric acid. Wherever the film of wax or collodion has been cut so as to admit of contact between the acid and glass, the glass becomes sufficiently etched in a few minutes.

The wax may be removed from the glass by washing with benzine, the collodion by hot water and a brush.

Tubes graduated in this way are much more accurate than those graduated by the usual methods, or where variations in internal diameter of the tube are not taken into consideration. The time required in the operation is reduced nearly one half over the older methods of volumetric graduation.



NEW GRADUATING APPARATUS.

Statue of Marco Polo in Venice.

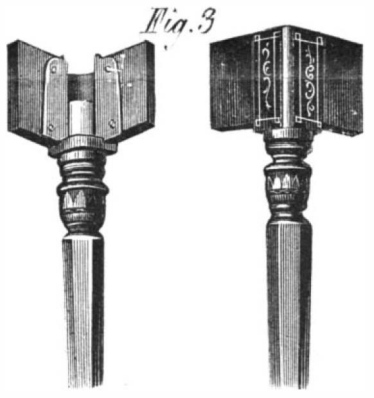
A statue of Marco Polo, discovered in Canton, has been received at his native city, Venice. It is life-size, made of wood, and gilt. According to a foreign contemporary, the famous Venetian traveler is represented seated, wearing the Chinese attire, although the cloak and hat are after the European fashion. His moustache and beard, which surround his face, are tinged dark blue, and while the Chinese artist has given him a peculiar form, the features in no way resemble those of a Mongolian type. Opposite the large, red, easy armchair upon which Marco Polo is seated is placed a porcelain bowl, intended to receive perfumes, with which he was honored in the same manner as is the protecting genius of China in the temple of Canton. The statue has, at the foot, an inscription in Chinese characters.—*Builder*.

The Faure Battery and the Electric Light.

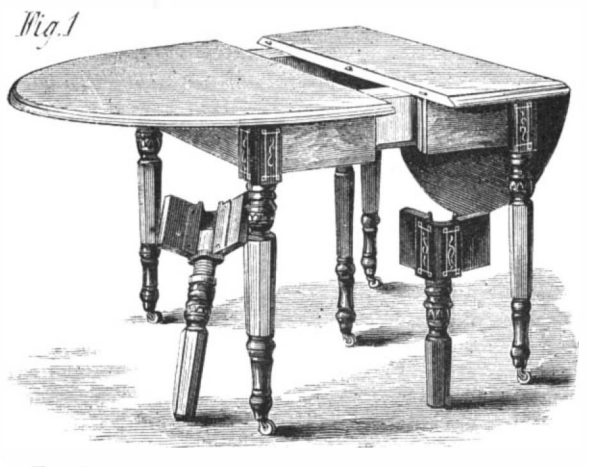
Some experiments of considerable importance have lately been carried out by Mr. Keates, the Consulting Chemist to the Metropolitan Board of Works, in which a Faure accumulator has been employed in the production of the electric light The lamps used on this occasion were respectively those of Maxim and Swan, one of each description being attached at a time. M. Faure states that in these experiments 40 cells represent about half an available horse power for three hours. The Maxim light being placed in connection with the accumulator, 30 cells were found to give the light of 16 candles. With the same number of cells the Swan lamp gave the light of 22·4 candles; with 35 cells the lights became respectively 45·3 candles and 65·6. With 40 cells the Maxim light rose to 101 candles, and the Swan to 141. Thus far the Swan light gave the greatest amount of candle power. But with 45 cells the Maxim light rose to 229 candles, while the Swan only displayed 204. The capacity of the latter was evidently being overtaxed, for in about a minute the carbon loop broke. A power of 50 cells was then connected with the Maxim light, which then rose to 333 candles, but in about a minute the carbon loop shared the same fate as the Swan. The experiments are also interesting as showing the great increase of light obtained by a comparatively small increment of power. Thus, in the case of the Maxim lamp, taking 30 cells as the standard, an increase of one-sixth nearly trebled the light; an increase of two-sixths augmented the light more than six times; three-sixths increased it fourteen times, and four-sixths twenty-one times.

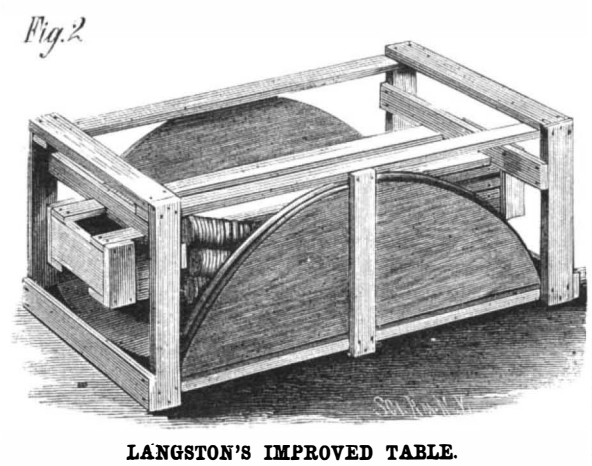
IMPROVEMENT IN TABLES.

The engraving represents a simple and inexpensive device for uniting the rails of tables and the legs with the rails to



facilitate the "knocking down" and putting together of the table. The invention is a corner or angle plate provided with vertical wing sockets for the reception of the ends of opposite rails, and with inner central socket for receiving the upper end of the table leg. Fig. 1 in the engraving shows a complete extension table having the improved corners attached. It also shows the inside and outside of the corner piece in detail. Figure 2 shows the table "knocked down" and ready for shipment, and Fig. 3 is an enlarged view of the angle plate. The table corner is a casting having an outer corner or angle plate that fits against the outside of the table rails. To the inner angle of the plate, and forming an integral part of it, is attached a socket having opposite projecting side wings to fit against the inside of the table rails; these wings completing the sockets for receiving the ends of the table rails.





LANGSTON'S IMPROVED TABLE.

The cylindrical socket that extends upward from the lower edge of the angle brace, and within it, is of sufficient length to hold the table leg firmly, and the table is made fully as solid as with mortises and tenons. This socket may be screw-threaded and the table leg screwed in; or it may be plain inside, or fluted. From the upper edges of the wings sharp studs project for firmly holding the table top.

A table made in this way can be more readily put together or taken apart, knocked down for packing, and be more easily transported than those of ordinary construction, while at the same time it is strong, durable, and cheap.

Further information may be obtained by addressing the inventor, Mr. H. J. Langston, Garrettsville, Ohio.

NEW INVENTIONS.

An improved stove mat for coffee pots and other utensils has been patented by Elizabeth C. Zumwalt, of Port Orford, Oregon. The invention consists in a mat made of a plate of sheet metal, having apertures and a handle to adapt the mat to be placed upon the top of a stove to receive a coffee pot or other utensil, the object being to prevent the bottom of the vessel from burning.

An improved balance for obtaining the lea of yarn has been patented by Mr. Thomas Finigan, of Mechanicsville, N. Y The invention consists in a balanced scale beam provided at one end with a graduated scale, indicating the number of leas, and at the other end with a graduated scale with larger subdivisions, indicating the ply or number of strands of the thread, a movable unit weight being suspended from the latter end of the beam, whereas a certain length of the thread or yarn to be tested is suspended from the other end of the beam.

Mr. Curtis Griffin, of Middlefield, N. Y., has patented an improved adjustable frame as a substitute for the poles in raising hops. The invention consists in an upright having two crossed bars, with two cross pieces at the ends fastened to its top, which cross pieces have hooks at the ends to receive rings at the upper ends of a series of rods having rings fitting over the tops of a series of short posts around the upright, or on hooks at the upright, attached to their lower ends. The hop vines grow up on these rods, and the latter need only be unhooked when the crop is to be harvested.

An improved wagon brake has been patented by Mr. Robert Rutter, of Dillon, Montana Territory. The object of this invention is to facilitate the reversing of the brake roller, to allow the brake lever to be placed at the left-hand side of the wagon when the brake is to be put on by a man riding the near wheel horse, and to be placed at the right-hand side of the wagon when the brake is to be put on by the driver riding in the wagon.

Mr. Edward Ebi, of Cedar Rapids, Iowa, has patented an improved brake rod. The invention consists in a rod passing through journal bearings on the under side of the car, and provided at the ends with pivoted connecting bars having spring catches for keeping them united, which connecting bars are locked to the brake rods by means of a lever pivoted to the connecting bar and passing into notches of a loose and a rigid circular plate on the brake rod, so that all the brake rods of the several cars of a train will be revolved together and the brake shoes will be drawn against the wheels simultaneously.

An improved harrow has been patented by Mr. William J. Campbell, of Reed's Gap, Pa. The object of this invention is to provide means whereby the center bars of the harrow may be weighted by the side bars, and thus caused to make deeper cuts; and also to provide a harrow the tooth bars of which may be readily detached from each other for convenience in transportation and stowing away.

Messrs. Reuben R. James and Mirabeau N. Lynn, of Rising Sun, Ind., have patented an improvement in grain meters. This invention relates to apparatus for weighing and measuring the amount of grain that passes through it by devices actuated solely by the weight of the grain, and hence automatic in its operation. The invention is an improvement on the grain meter for which Letters Patent were granted to the same inventor February 22, 1881, No. 238,122.

An improved mail bag catcher has been patented by Mr. Calvin I. Kimball, of Portland, Me. This improvement relates to apparatus used on mail cars for catching mail bags, and have for their object to allow adjustment of the crane to the direction in which the car may be moving without removing the crane from its supports.

An improved tire tightener has been patented by Mr. Russell Jennings, of Sedalia, Mo. This invention relates to the class of tire tighteners which consist in a threaded bar or screw having a vertically movable clamp and a nut, by which, with the assistance of a winch, the said clamp is brought to bear against the fellies, and thereby separates the fellies from each other and from the spokes, where they have shrunk, the spaces thus created being filled with wedges.

Mr. Benjamin O. Branch, of Friar's Point, Miss., has patented a novel construction and arrangement of devices, for displaying in the cars the names of stations on a railway.

Mr. Carl A. Türpisch, of New York City, has patented an improved brooch formed of a wire bent in the form of a ring or in a similar manner, so that the two ends will be pressed against each other by the spring of the wire. To one of the ends a cap is attached in such a manner that it overlaps the point of contact of the ends of the ring, upon which ring a short sleeve is loosely mounted, and has a pin attached to it, this pin being passed through the article to which the brooch is to be attached, upon which the end of the pin is forced through between the ends of the wire into the cap, in which it is retained as the ends of the ring snap together, thus locking the point of the pin between the cap and the ends of the ring.

An improved attachment for seed drills has been patented by Mr. Howard M. Fordham, of Great Bend, Kan. The attachment has a rotary shaft with spirally arranged rods attached to the shaft which pass between the drill feet and push off collected rubbish, and springs are placed upon the rods to keep them clear of rubbish.

An improved astronomical clock has been patented by John L. Blair, of Clear Spring, Md. This invention relates to certain improvements in what are known as "astronomical clocks," designed to show by object lesson the minutes and hours of the day, the day of the week and month, the daily revolution of the earth, the yearly revolution of the earth, the phases of the moon, the time for the different longitudes on the earth, the lunar revolution, the signs of the zodiac, the tides, and synodical as well as periodical time.

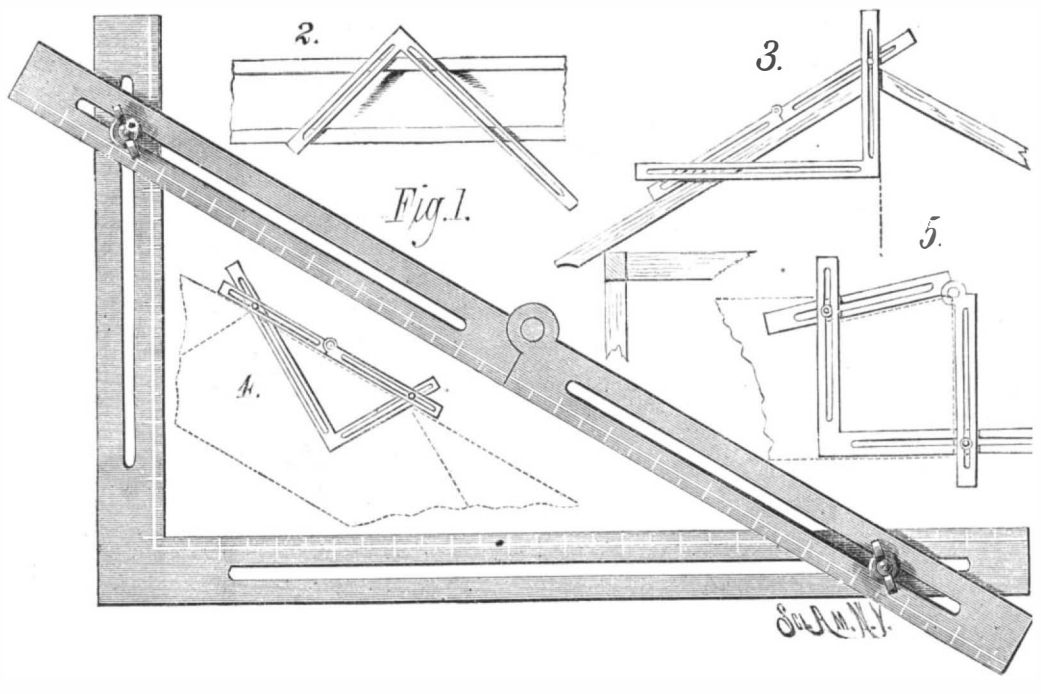
An improved sulky attachment for plows and harrows has been patented by Mr. Edwin M. Carroll, of Pittsford, Mich. This inventon consists in the peculiar construction and arrangement of the parts, which cannot be described without engravings.

Mr. Clinton O. Rockwell, of Roaring Branch, Pa., has patented an improved machine for cutting or pruning the runners from strawberry vines. This machine is provided with revolving knives which act against a hooked blade and cut the runners which are drawn upward by revolving hooks.

JOINTED PITCH-BOARD FOR SQUARES.

The engraving shows a carpenter's square provided with a middle jointed rule slotted in both sections, and connected by clamp bolts and wing nuts with the slotted arms of the square. The form of the instrument is clearly shown in Fig. 1. The square as well as the jointed rule are made of steel and have suitable scales engraved on them.

This instrument can be used for laying out miter boxes in the usual way, as shown in Fig. 2. It may be used for finding the length and bevel of rafters, as shown in Fig. 3, and it is found very convenient when used as a pitch board in laying out stairs, as shown in Fig. 4. It can be used for laying out dovetails on timber, as shown in Fig. 5; and it may have a straight-edge attached to it, so that it may be used as an extended square, and it will be found very convenient in solving many other problems in carpentry and joinery. The arms of the rule can be set respectively parallel with the blade and tongue of the square; then be used to size or box timbers. The arms of the rule can be adjusted to the blade of the square and used as a double bevel. The pitch board can be used to find the diagonal of a square; can be used to solve problems in proportion, such as finding the length of stair-string from the pitch-board; can be used to find the lengths and bevels of hip and jack rafters; can be used to find the sides and angles of hoppers and splayed work. It is the only instrument known to us that solves the right-angled triangle without calculation or drawing, that is, approximately. This useful invention was recently patented by Mr. Frederick N. Marvick, of Palatka, Fla.

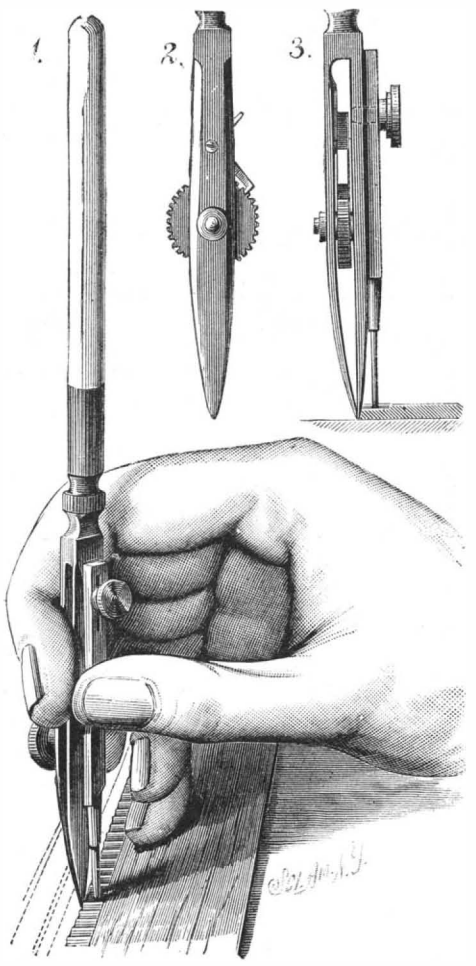


MARVICK'S JOINTED PITCH-BOARD FOR SQUARES.

CEMENT FOR REPAIRING GLASS.—Dissolve fine glue in strong acetic acid to form a thin paste.

IMPROVED DRAWING PEN.

The shading lines of a drawing must gradually increase in width toward the darker part of the drawing, and this is accomplished by increasing the distance between the points of the drawing pen a trifle after a line is drawn and before drawing the next line. This adjustment of the pen is not accurate, as the operator has no gauge to guide him, and relies entirely upon his judgment, and errors can hardly be avoided, except by using a drawing pen provided with some



NEW DRAWING PEN.

suitable gauge for adjustment, such, for instance, as is shown in the annexed cut.

Fig. 1 is a perspective view showing the method of making dotted lines. Figs. 2 and 3 are respectively front and side elevations.

The adjustment wheel is cogged, and its circumference is divided into a number of equal parts, which are numbered. An angular pawl is pivoted between the blades of the pen in such a manner that one end rests on the cogged adjusting wheel and the other end projects from between the blades, so that it can be depressed by the finger, raising the other end of the pawl from the surface of the wheel, which can be turned the distance of one or more subdivisions, as the desired increase in width of the line may require, upon which the pawl is released and locks the adjusting wheel.

If dotted or broken lines are desired a rule is used having undulations in its upper surface along the edge, and a pin or stylus is attached to that side of the pen toward the edge of the rule, the point of this pin resting on the undulated part of the rule. If the pen is drawn along the rule it will be raised and lowered alternately, and there will be corresponding breaks or interruptions in the line. The size of the blanks in the dotted line is governed by the size of the undulations of the rule. The pen has been patented by Wissmann & Wallegg, of Vienna, Austria.—*Wiener Technologische Blätter.*

The Ruby Gravel Company's Tunnel.

There is no part of the world where so much tunnel work is carried on as in California. There is, of course, more or less tunnel work in quartz mining, but in drift mining operations very long tunnels are necessary in many cases for "bottoming" the gravel channels. Long tunnels have often to be run in hydraulic mining work also. As an instance of quick work in this line may be cited the tunnel being run by the Ruby Gravel Company, in Cariboo ravine, one mile south of Rock Creek, Sierra county. It is thus briefly described by the local paper, the *Mountain Messenger:*

Work was commenced last December, and since that time 2,050 feet of tunnel have been made. In round numbers the tunnel, all but a few hundred feet of the outer end, is 10 feet square, nearly all through hard rock that required blasting, and that stands without timbers. For 1,950 feet, the tunnel follows an air line, the course being a little north of east. The last 100 feet is turned to the south 17° from the former course. The grade of the tunnel is half an inch to 12 feet. At the mouth of the tunnel the company have a substantial engine house, and a powerful engine which drives the air compressor and a Struve two-plunger ventilating pump. From the compressor the air passes to a large upright reservoir of heavy boiler iron, about 10 feet in height and 4 feet in diameter. From this reservoir the air is taken, under a pressure of 50 lb. to the square inch, in 4-inch wrought iron pipe, to the drills, running along the bottom of the tunnel.

The air from the ventilating pumps is taken in a 12-inch air pipe and boxes to near the face. The last 150 feet of tunnel is in softer rock, a species of quartzite, so hard as to require blasting, but not hard enough to stand long without timbering and spiling. About 150 feet from the face a shaft has been started, and is now up about 40 feet in blasting rock. It is designed to test the question as to whether or not there is gravel overhead. Mr. H. Jennings is now superintendent of the works, Mr. H. Wallis acting in the capacity of consulting engineer. Mr. Edge is the engineer in charge of the machinery. For rapidity of construction and size of tunnel, there is probably nothing in California that exceeds this work. From its inception until within a few weeks H. Wallis has been superintendent in charge, Hamilton Smith, Jr., being superintendent-in-chief.

The First Electric Railway in Great Britain.

Ground was broken the last of September at Portrush, Ireland, for an electric railway to the Giant's Causeway. Dr. Siemens is said to be a large contributor to the new enterprise. It is estimated that the expenses for haulage on a tramway such as this with horses would be twenty-three cents per mile, and by steam about fifteen cents, while it is supposed that the working expenses by an electrical motor will not reach two cents per mile.

New Columbia.

The hitherto inaccessible northern land known as Wrangell Land was "occupied" and claimed for the United States, August 12, by Capt. Hooper, of the U. S. Revenue steamer Corwin. In a letter to the Chief of the Revenue Marine Bureau, Capt. Hooper says:

"We took possession, planted the American flag, and now we want to give it a new name, as I believe we are entitled to do. I propose to call it 'New Columbia.' The land north of the continent, to The east, is all named for the English, and the islands further west are called New Siberia, so it seems to me that to call it New Columbia would be appropriate, and less likely to give offense to those who are interested in the old names on the different charts than to give a name of a less national character. Wrangell never saw the land, and after trying for three successive years to get a sight of it, refers to it as the 'problematical land of the north.' Neither was he the first to report the existence of it. The object of his cruise was to investigate the truth of the reports to that effect brought by previous travelers. Kellet, after whom it is called on the English charts, only dimly saw what he supposed was a small island, and which he called Plover Island. That is where we landed, at the mouth of a good sized river on the east end, which now appears on our chart as Clark River."

The new land is crossed by the meridian of 180° from Greenwich, the shore surveyed lying three or four degrees to the eastward of that meridian. Its southern point is about 71° north latitude.

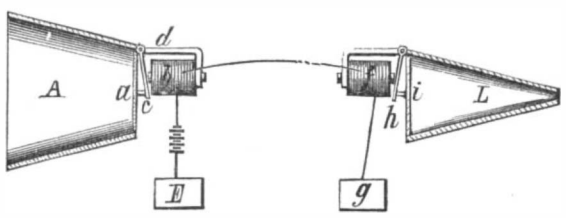
TO REMOVE INK STAINS.—Take of muriate of tin, 2 parts; water, 4 parts. To be applied with a soft brush, after which the paper must be passed through cold water.

THE TELEPHONE.—JUDGE LOWELL'S OPINIONS COMMENTED UPON.—INGENIOUS TRANSFORMATIONS.

BY NOTSERP.

A few days ago I chanced to see a small pamphlet that is being sent out by the American Bell Telephone Company to their agents, and containing the decision of Judge Lowell in relation to the alleged infringement of the so-called Bell telephone. Having been wrestling with the element electricity, experimentally and otherwise, for a number of years, and with acoustics and other forms of telephones, I at once found the pamphlet very interesting and exceedingly amusing.

Now, basing my opinion upon Judge Lowell's decision, I cannot believe that he had very much aged telephonic information laid before him by the defendants; for if he had his conscience would never have allowed him to render such an opinion. I may look at the judge's printed opinions in too



Bell's Apparatus.

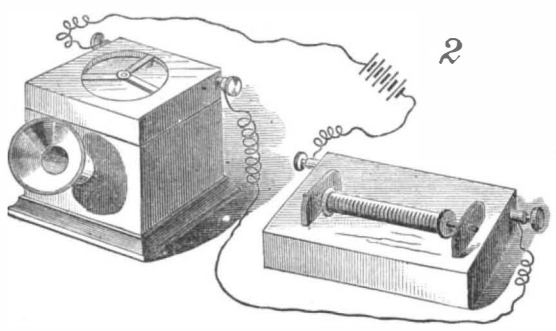
strong a light, and I may not understand them just as he would have me; but be that as it may, I do think that when he rendered this now famous decision he little thought of what valuable material he was furnishing for the future use of the defendants. Take the following for example—the Italics are mine:

"There is some evidence that Bell's experiments with the instrument, described in Fig. 7 (see Fig. 1), before he took out his patent, were not entirely successful; but this is now immaterial: *for it is proved that the instrument will do the work, whether the inventor knew it or not.*"

Now, if that is rock bottom law, Bell and his followers (especially the "followers"—for Bell is out of the business, slick and clean) must feel a little squeamish; because—according to the above ruling - the father of the telephone, and the rightful claimant, would be the person who took out the first patent upon an instrument or apparatus that would transmit articulate speech, "whether the inventor knew it or not."

Who is the fortunate parent?

Reiss, undoubtedly, was the first to discover and make public the fact that articulate sounds could be transmitted telegraphically. But, according to Judge Lowell, Reiss can-

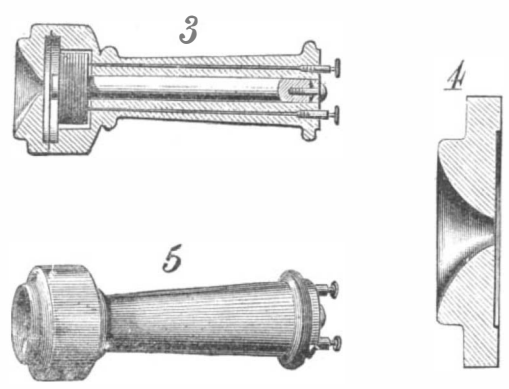


Reiss's Telephone.

not be credited with it, because, before Reiss's discovery there were thousands of instruments in use, and being made daily, that would transmit articulate speech, "whether the inventors knew it or not."

There is great satisfaction in knowing that Reiss cannot come down on us for exorbitant rentals, because he is not protected (?) in so doing by U. S. patents.

Why did Reiss neglect to patent his discovery and apparatus? Probably because he did not attach much importance to the discovery, or else that he was satisfied that he had not made an invention, and was too conscientious to try to inveigle any one into the belief that he had. It would not do to credit it to Reiss anyway, because he *did know* that his apparatus (telephone) would work, and gave an exhibition of the same (see Fig. 2) before a body of learned gentlemen, as early as 1861—fifteen years before Bell's patent was applied for.

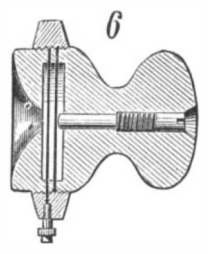


Morse, "his heirs or assigns," cannot bring in a legal claim for the telephone, because the Morse patents have expired. But then it might be credited to him, for two reasons: First, because he is dead and cannot object; second (Judge Lowell's reason), because Morse's instruments will transmit articulate speech, "whether the inventor knew it or not."

Here is another quotation: "But Bell discovered a new art, that of transmitting speech by electricity." Now why not give Judge Lowell a patent for the discovery of a new art—the art of discovering that *Bell* was the discoverer of the art of transmitting speech by electricity? Certainly no one but Judge Lowell has made this discovery, therefore he is entitled.

How, in the name of common sense, Bell can be credited with making the discovery of "a new (?) art," when, as long ago as 1861, Prof. Reiss published and gave to the world full particulars of this same "new art;" and not only Bell, but all other scientists throughout the globe were acquainted with the facts? Perhaps they were not aware of it at the Patent Office at the time Bell put in his application. It is not well that the examiners in any department should be thoroughly posted; because if they were it would greatly lessen the number of new patents issued upon old devices, and that would never do, for the business of the Patent Office is to issue patents—the more the merrier. Never mind whether they will hold water or not; the Office grinds them out, medical college fashion, and the people must abide by the results.

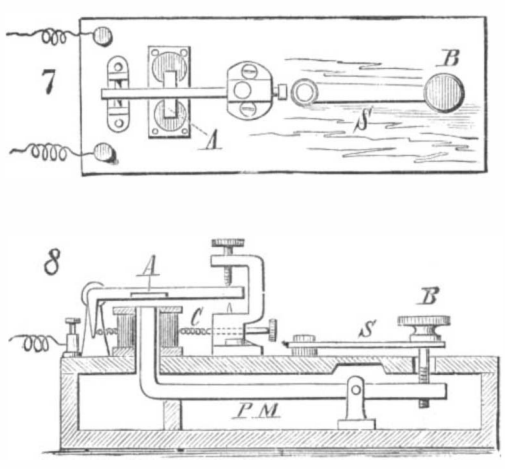
The judge is probably correct when he says: "It seems to me that the defendants use both the method and the apparatus of Bell." There is not a particle of doubt about that; but what did Bell use for his experiments, and as a model? Simply nothing but the methods and the apparatus of former experimenters. How much of the so-called Bell telephone, as now constructed (Fig. 3), was invented or contrived by



Dolbear's Receiver.

Bell? The most reliable information upon the subject credits the "permanent magnet" (as applied to an instrument constructed purely for telephonic purposes) to Prof. Dolbear, of Tufts College; the "converging mouthpiece," Fig. 4, to Prof. Pierce, of Providence, R. I.; and the general makeup of the instrument into the "butter-stamp" form, Fig. 5, to Edson S. Jones, of the same city. The butter-stamp form of telephone, Fig. 5, is the one now in general use. Compare it with Bell's apparatus, Fig. 1.

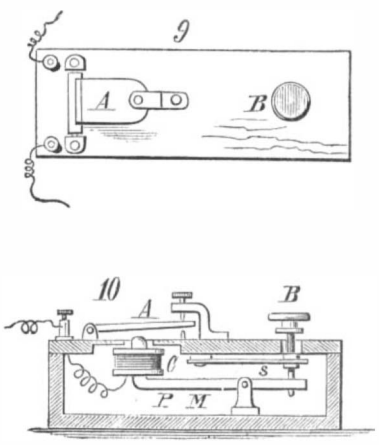
In referring to the Reiss telephone, the judge says: "The regret of all its admirers was, that articulate speech could not be sent and received by it," all of which is an exceedingly elevated mistake, for the Reiss apparatus will transmit articulate speech, and as perfectly as any of the hundreds of other forms that have since been constructed—a fact that is well known by telephone investigators throughout the land. Also, that "a Bell receiver must be used to gather up the sound before the instrument (Reiss's) can even now be adapted to a limited practical use." Bosh! Can it be possible that Judge Lowell *believes* such nonsense? Has he been mixed up in this case, all this time, and never heard of the simple little receiver contrived by Prof. Dolbear (Fig. 6)—an instrument that contains neither magnet nor helix; and yet it is a perfect receiver for the Reiss transmitter—a fact that explodes the above claim?



I devoted considerable time last winter to the examination of the Patent Office reports for the self-satisfaction of knowing what had been patented in the electrical line, in years gone by, that bore any relation to the articulating telephone of to-day. And, without entering into details, suffice it to say that I found one instrument—a "magnetic sounder"—patented by one Wm. Humans in 1874, two years before Bell was heard of, and containing every part—armature, helix, and *permanent* magnet—of the most perfect magneto-telephone as now made; and without one particle of alteration in adjustment or change in construction, it answers nicely for transmitting and receiving articulate speech.

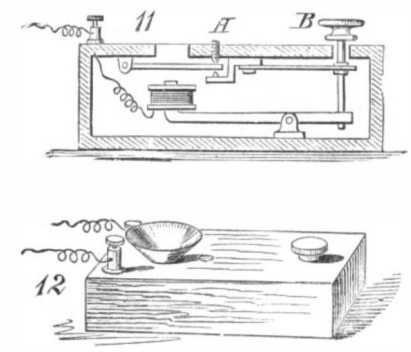
Within a few weeks I have had the pleasure of using these instruments, both double and single helix, for conversing over lines of considerable length, and the results were quite satisfactory—equally as good as I have obtained from many forms of specially constructed telephones.

Fig. 7 is a top and Fig. 8 a side view of the magnetic telegraph instrument. A is the soft iron armature; C, the coils; P M, the permanent magnet; and in this instrument it is of horseshoe form, with both pole ends turned up at right angles, and carrying the coils, C. The spring, S, retains the magnet in its normal position. The instrument is operated by working the knob, B, in the usual way; and it is so simple in adjustment, etc., that the merest tyro cannot fail to understand. To work it as a transmitter and receiver of articulate speech, you will simply hold or fasten down the knob, B—which will bring the magnet and armature nearly together; then talk and listen closely to the armature, A. A paper cone fastened around the helix will augment the sound very materially; but it is not necessary, for it will work nicely without it or any changes or attachments whatever.



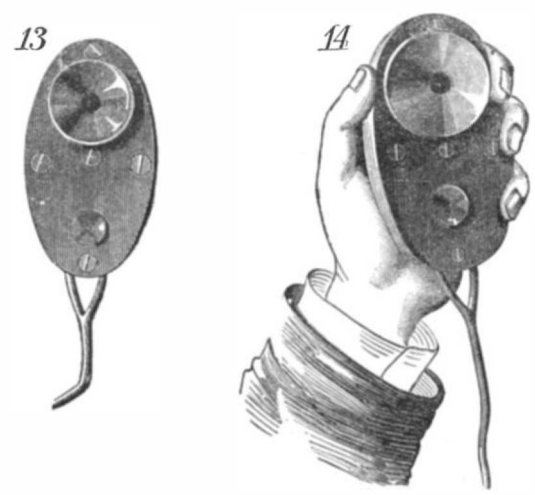
The single helix instrument is of a much cheaper form, and as a transmitter and receiver of vocal sounds is superior to the double helix sounder. Fig. 9 is a top and Fig. 10 a side view.

To save expense in finish the spring, S, and spool, C, are placed within the case; and all metal work reduced to the lightest and plainest form. In principle and operation it is identical with Fig. 8. To make it still less expensive in construction the armature can be placed within the case, as shown in Fig. 11, and the adjusting screw, H, left flush with



the top. The key knob, B, remains above the surface as before, for the purpose of operating it. And as a "sounder" it works equally well this way. Is there any difference (patentable) between Figs. 8 and 11? None whatever! Put on a converging mouthpiece over center of armature, like Fig. 12, and you can call it a "sounder," or a "telephone," whichever suits your fancy. No battery is required; and as to "currents"—whether they are vibratory, disturbed, undulatory, intermittent, or pulsatory—they are all there—"you pays your money and takes your choice."

Let us make the case in an oval form, instead of square, and bring the line wires out at the bottom, as shown in Fig. 13. Now compare it with the Phelps telephone, as illustrated



on page 23 of Prescott's book, "The Speaking Telephone, etc.," and as shown here, in Fig. 14, and tell me if they wouldn't make pretty fair twins?

Franklin, Mass., September 19, 1881.

MECHANICAL INVENTIONS.

An improved wagon scale has been patented by Mr. Jacob Mills, of Marshall, Col. The invention consists in constructing a wagon scale of sets of compound levers connected with the bolsters of a wagon having a cross bar resting upon their short arms to support the wagon body and its contents, and having a scale beam connected with the long arms of the said compound levers, so that the wagon body and its contents can be conveniently weighed.

Mr. Jacot Burmann, of Bienne, Switzerland, has patented an improved watch provided with devices for indicating the day of the week and month, the month of the year, and the moon's phases.

Mr. David J. Harrell, of Cochran, Ga., has patented an improvement in motors or mill powers, such as are placed on scows moored in a stream and adapted to be driven by its current. The inventor employs a rotating current wheel, provided with floats or buckets, and placed vertically in the usual way between two boats or floating structures that have like buoyancy and are rigidly connected, so as to move together as the stream rises or falls. He provides an automatic connection between the wheel and the machinery of a mill or factory located on the contiguous bank of the stream, so that no interruption in the operation of the machinery can occur by variation in the height of the water.

An improved spring attachment for whiffletrees, for the purpose of relieving the shoulders of the draught animals of jars or shocks, has been patented by Messrs. Frank S. Wagenhals and Chauncey P. King, of Columbus, Ohio. The attachment may be applied to a double-tree or whiffletree.

An improvement in breech-loading firearms has been patented by Mr. John H. Gramps, of Stone Arabia, N. Y. The invention consists in a breech plate pivoted to swing transversely to the barrel, and in a spring extractor combined with the breech plate.

An improved machine for spinning, doubling, and respinning silk has been patented by Mr. Francis Seymour, of Paterson, N. J. The invention consists in means for automatically throwing the spool-bearing tube out of gear when the thread breaks; also, in improved means for winding the thread solidly upon the spool.

An improved apparatus for concentrating ores has been patented by Mr. Arthur G. Charleton, of Marmora, Ontario, Canada. The apparatus is constructed with a series of settling compartments having inclined bottoms, and a series of divisional compartments having central partitions and side partitions, inlet passages to admit ore, outlet passages for the escape of the water and lighter ore, and discharge passage for the escape of the heavier ore.

An improved three wheeled vehicle, patented by Mr. Lorenzo D. Hurd, of Wellsville, N. Y., is so constructed that the vehicle can be turned in small space, that the whipping of the tongues will be prevented, and the vehicle will not be liable to tip over should the loading be unevenly placed upon them.

An improved railroad signal, patented by Mr. Joseph C. W. Stout, of Farmingdale, N. J., is designed to prevent accidents that occur at night or by day on railroads from the color-blindness of the engineers. Switch signal lights ordinarily present but one point of light, which to those afflicted with color-blindness is with difficulty distinguished from other lights about it, its apparent form being the same with them. This invention consists of a light night signal, presenting an elongated beam or bar of light, and capable of being moved in a vertical plane, and rotated at the same time, so that the beam of light may be presented vertically or horizontally, the intention being to provide a light signal that can, by its shape or form, be distinguished from all surrounding lights.

Mr. William W. Button, of Shenandoah, Iowa, has patented an improvement in railroad snow plows in which hinged and adjustable wings are used. The invention consists in affixing a heavy iron beam to the platform of a flat car and attaching to its extremity a vertical support. To this support is riveted a vertical knife or cutter, extending from within an inch or more of the ground up to any desired height. In the rear of the cutter two wings are strongly hinged to the beam, and held in position and adjusted by chains attached thereto and passing around a windlass, the windlass being fastened to the beam near its interior extremity.

Locking Railway Car Doors in England.

The locking of the doors of railway carriages is one of the mysteries of railway management. No passenger has ever been able to divine why such infinite pains are taken to lock him in. The only result of the process is that if there is an accident he is a prisoner, with a chance of being killed. If, on the contrary, his train arrive safely at his destination, he is still a prisoner, who has to wait till he is liberated, making, meanwhile, spasmodic signals to attract some friendly porter for the purpose, unless, having grown wise by experience, he carries a key himself, and is able triumphantly to emerge. Some people imagine that a regulation of the Board of Trade obliges this extraordinary precaution. No such regulation, however, exists. On the contrary, the greatest diversity of practice prevails on the subject. One company locks its carriage doors on the main line only, another on the branch and main lines both, a third on single lines only, a fourth does not lock its doors at all. And the extraordinary thing is, that the companies that entirely neglect the custom find no disadvantage whatever in doing so. On the contrary, their porters are able to attend to other matters during the time when they would have been locking and unlocking doors.

The following are the railway companies who do not lock their doors on either side of their trains: In Scotland—the Glasgow and Southwestern, Great Northern of Scotland, Highland and North British. In England—Great Eastern, London, Chatham and Dover and Northeastern. It is hard to see why in these days of falling dividends other companies do not follow their example.—*Pall Mall Gazette.*

On the Estimation of Nickel in the State of Sulphide.

BY ANTONY GUYARD (HUGO TAMM).

Analytical chemists know what a tedious operation it is, after obtaining nickel in the state of sulphide in the usual course of analysis, to have to redissolve this sulphide in acids, to filter the solution, and to precipitate it with a fixed alkali, in the form of an oxide of nickel which it is most difficult to filter and to wash thoroughly. It is in order to simplify these long and troublesome manipulations that the writer has devised the following method, which gives quite satisfactory results for most practical purposes.

Nickel having been separated by the usual methods from the metals which accompany it, is precipitated, as usual also, in the state of protosulphide, NiS, by means of a stream of sulphureted hydrogen. The precipitate collected on a filter, and washed, is calcined while still wet, in a porcelain crucible, until the combustion of the filter is complete. (Strange as it may appear, in these conditions no oxide of nickel is formed.) A little pure flower of sulphur is then thrown in the crucible, which is immediately covered with a well fitting porcelain cover, and the whole is heated over an ordinary Bunsen gas burner, until the excess of sulphur has been driven off. The residuum left in the crucible is a sulphide of nickel, which, after cooling, can be used for the estimation of nickel with as much accuracy as when this metal is weighed in the state of oxide; for, obtained in the conditions which have just been described, and which, it will readily be perceived, are those of ordinary analysis, this sulphide possesses the invariable formula, NiS_2, and a corresponding fixed composition from which the weight of nickel is calculated. This bisulphuret of nickel, thus obtained, is quite black, non-magnetic, and in the shape of a fine powder. This last remark is made in order to call attention to a very curious fact.

When pure oxide of nickel, such as the one obtained for the estimation of nickel, is heated with a little excess of flower of sulphur in a covered porcelain crucible, no bisulphide is formed, but a magnetic sulphuret of nickel is obtained in small semi-fused lumps, with a bronze tinge and luster. In certain cases the formula of this magnetic sulphuret is Ni_3S_4, but, according to the length of time it is heated over the Bunsen burner, its composition varies sufficiently to render it totally unfit for the estimation of nickel. Its color and magnetic properties remain unaltered, but the composition varies.

Similar researches on cobalt would be highly interesting and useful to the analyst, but the writer has not carried on further these investigations.

Luminous Meteors.

At the recent session of the British Association, York, Professor A. S. Herschel read the report of the committee on luminous meteors, in the course of which he referred to the aerolite which fell near Middlesbrough this year, and embedded itself to a considerable depth in the earth. It was estimated that it struck the earth with a velocity of 402 feet per second. There was no doubt it fell at least forty miles. The committee recommended that as the information they had received was of such a miscellaneous character, they should not make any further reports for a few years.

Sir William Thomson said the great majority of meteoric stones, instead of falling to the earth in a solid mass like the one produced, generally got shivered to pieces in the air through becoming so intensely hot.

Prof. Herschel observed that the stone in question had not been exposed to any great heat.

Sir William Thomson observed that in all probability some of the vegetation existing was of meteoric ancestry. The stone in question was not on the earth a quarter of an hour before it was picked up, and it was certain that it came from outside the earth. He also said there was a general consensus of sentimental belief that in many other bodies in the universe there was something like the life on this earth, but that was not a scientific belief; however, science was in what might be called a skeptical condition. Life elsewhere was a possibility, and science only went the length of saying that life elsewhere was not impossible. At the same time he did not say that the sentimental belief might not be as well founded as any scientific belief, but all he could say at present was that such a belief was not founded on scientific grounds.

The Cedars of Lebanon.

The once famous and extensive cedar forest of Lebanon, according to a writer in the Vienna *Politische Correspondenz*, has dwindled down to the dimensions of a mere thicket, numbering about four hundred trees. To save it from complete destruction and preserve it at least in its present extent, Rustem Pacha, the Governor-General of the Lebanon, has issued a special ordinance, containing a series of stringent regulations calculated to check, if not quite to put a stop to, the vandalism and carelessness of most travelers. It is expressly forbidden to put up tents or other kinds of shelter within the district of the trees, or to light fires or cook any provisions in their vicinity. No one is allowed to break off a bough or even a twig from the trees. It is forbidden to bring any beasts of burden within the district. Should oxen, sheep, goat, or other pasturage cattle be found within the prescribed limits, they will be irredeemably confiscated.

Weldless Ring Plates for Boilers.

J. Windle, of Manchester, has designed a mill to roll weldless ring plates for boilers from 2 feet diameter up to 14 feet, and 4 feet wide. The object of the invention is to avoid the longitudinal seams in boilers, which are necessarily a source of weakness, and this is accomplished by constructing the shell of the boiler of metal rings connected together, and formed by a rolling operation from an ingot of steel, or from a bloom or mass of metal, in a similar manner as when rolling railway tires, the ring being formed without a joint, seam, or weld. In the rolling mill which has been specially designed for this work, a fixed and a movable roller, adapted to roll the required rings, are employed. The axles of these rollers are provided with top bearings, and to enable the ingot ring or mass of metal to be placed in position and the rolled ring to be removed, the upper bearing of the movable roller is arranged to be withdrawn. This bearing is fixed on the outer end of a lever or lever frame, which is hinged to a sliding standard or carriage connected with the carriage which carries the movable roller, the sliding standard being actuated by means of hydraulic cylinders. Vibrating frames are also employed, each carrying two, three, or more rollers in place of one, the upper ends of the studs or shafts being stayed. A number of the carrying rollers are converted, by means of bevel or suitable gearing, with revolving shafts, so that they assist in the carrying round of the ring. In working out this method of rolling a hole is punched in the ingot or bloom, and a mandrel introduced. The mass of metal, with the mandrel in position, is then placed under a steam hammer in a swage, which is formed to confine the metal sideways, so as to produce an extension of the length under the blows of the hammer until a rough cylinder of sufficient length is obtained, but in some cases the ingot is cast in the form of a hollow cylinder, which, when necessary, is elongated in the manner above indicated. These ring plates can be produced in any required shape, and with flanged thickened edges if necessary, and we understand that a company is being formed to put down the necessary plant for the manufacture of boilers and plates on this principle.

The Fatal Worry.

In a leading English periodical, Dr. Mortimer Granville has been discussing a subject which should particularly interest all impetuous brain-workers. Referring to the increasing number of cases of sudden collapse from alleged "overwork," Dr. Granville offers some views which, if not exactly new, are at least not those currently entertained.

Constant warnings are being given at the present time against overwork. But, thinks the author quoted, these are generally misapplied. The brain can be tired by prolonged activity, just as may happen with a muscle. But we find that hard and persistent muscular work does not cause muscular collapse. Each day the reserve forces of nutrition renew the wasted protoplasm, and the frame keeps as strong as ever. So there is no more reason why there should be brain collapse from systematic, though severe brain work, than there is for paralysis or tetanus to strike down athletes or day laborers. And we do, indeed, find that brain workers are, as a rule, long-lived.

The cause of the frequent breaking down of men engaged in the active work of life is referred, therefore, by Dr. Granville, to another source, and that is worry. Doubtless it is no new thing to be told that it is not work but worry which kills. But it is often useful to have general impressions fixed upon a definite and more or less scientific basis. Therefore we follow our author in the expression of his views.

It may be assumed that, as the contraction of a muscle is caused by successive waves of nerve impulses, so the mental activities are made up, after an analogous fashion, of undulations of nerve impulses. In ordinary work, however hard, these impulses are sent out in a regular and rhythmical manner. It is the worry which comes in and disturbs this rhythm, exhausts the nerve force, exhausts further the reserve or recuperative power, and breaks down the man. The strength does not weary of digesting digestible food; but add an unmasticated bolus of tough beefsteak three times a day, and there will be trouble eventually. Worry produces a kind of dyspepsia of the mind. It is to the encephalon what a restaurant pie is to the stomach.

The first inference from this presentation of the matter is easy and natural. It is that we should not worry. Such advice is perhaps the most fruitless that can be possibly given. Nevertheless, a diligent inculcation of it, and especially its application in educating the young, may not be without some avail.—*Medical Record.*

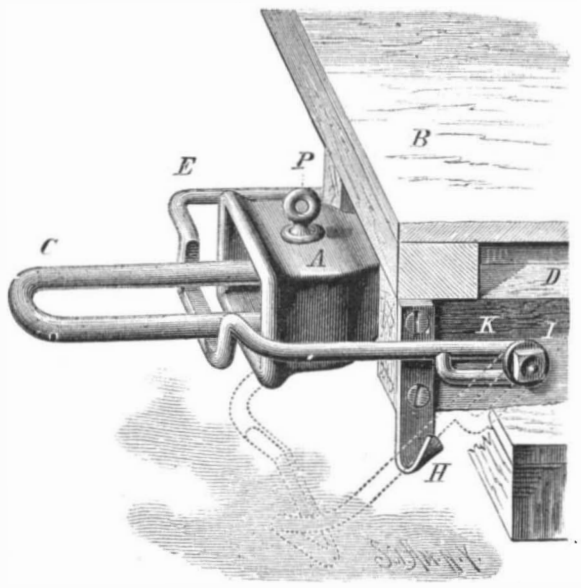
NEW METHOD OF PREPARING CHLORINE.—J. Townsend, of Stassfurt, prepares chlorine by mixing a heated solution of magnesium chloride of 40° to 50° Baume with about ten per cent of manganese dioxide, and then exposing it to the action of heated air, whereby the chlorine is liberated, which may be used in the ordinary manner. The process is facilitated by the addition of 25 to 50 per cent of calcium chloride.—*Dingler Poly. Jour.*

NEW CAR COUPLING.

This invention is the outcome of a long and continued observation of all appliances and devices used in coupling cars where any ordinary link or pin is used, and an extensive acquaintance with many unfortunate brakesmen and yard men who have been crippled for life by being caught between two meeting drawheads.

This invention consists of a swinging bail, E, which may be pivoted to the sides of the drawhead, or to the longitudinal sills, D, placed on either side of the drawhead.

The bail, E, is bent downward in front to receive and raise the link in proper position for entering the opposing drawhead, the ends of the bail being arranged with slots, K K, which allow it to yield to any stroke or pressure it may receive from the opposing drawhead.



JOHNSON'S SAFETY CAR COUPLER.

The construction and operation of the coupling may be easily understood from the cut, in which B represents a broken off portion of the platform of a car, A an ordinary drawhead, C a link, and P a pin. D D are longitudinal sills, to which the bail, E, is pivoted by means of bolts or screws, I I, a portion of the platform being broken away to show the same. H H are supporters upon which the bail, E, rests when not in use, as shown by dotted lines. The operator takes the bail on either side, raises it up, and with it lifts the link and holds it in position to enter the drawhead of another car. When released from the operator's hand it falls down and out of the way and remains in position for use.

The bail may be easily and cheaply made, as it may be all bent on forms from a single bar of iron. This coupler is very cheap and simple, and can be adjusted to any freight car or caboose without changing car or bumpers. It is worked from either side of the car with or without a lever, alleviating the necessity of reaching in between the two meeting cars for the purpose of guiding and lifting the link.

The bail itself is a protection to the operator against falling, especially when the cars start unexpectedly, as is often the case.

This invention has been tested in the Wabash car shops of Toledo, and found very satisfactory.

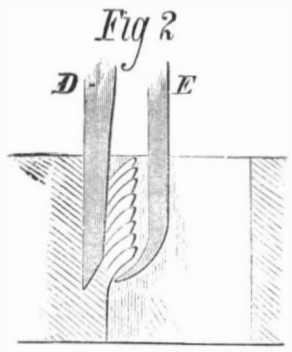
For further information address Mr. Ferdinand Johnson, 237 St. Clair street, Toledo, O.

IMPROVED MORTISING MACHINE.

The engraving represents an improved mortising machine recently patented by Mr. John C. Fiester, of 320 South Eleventh street, Reading, Pa. The object of this invention is to provide means for the automatic removal of the chips from the mortise as they are made by the chisel.

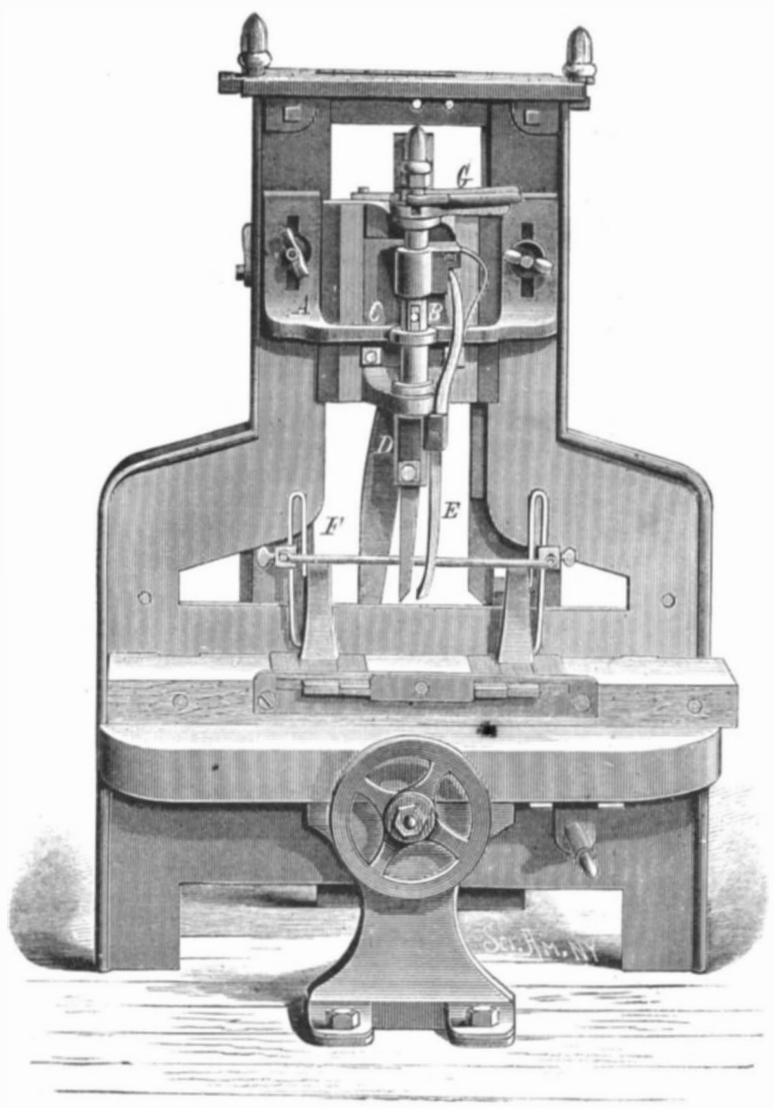
The larger engraving is a front elevation of the machine. The smaller one shows the manner in which the chips are removed from the mortise. The crosshead, B, has a vertical reciprocating motion between housings, and is fitted with lugs at the top and bottom, as guides for the chisel mandrel or carrier. Between the lugs on the chisel mandrel is placed a slotted sleeve, C, fitted at its upper end with a collar having a recess or indent, a curved spring pressing the upper end of the lever, E, and a projection or cam capable of engaging the lever. The sleeve, C, is fitted at its lower end with a stop collar, the sleeve passes through the adjustable trip guard, A, and reciprocates with the crosshead, less the length of slot where it slides on a starting pin. The trip guard, A is made adjustable vertically by wing nuts and slots, the object being to permit of its adjustment to suit the respective positions of the sleeve as the crosshead, B, is set to suit different thicknesses of timber in mortising, the guard, A, always requiring to be adjusted relative to the positions of the sleeve in order to assure the actuating of lever, E, at the proper time. Fitted to the chisel mandrel there is a chisel-socket, D, to which is pivoted the lever, E, curved near its lower end to permit its grasping the chips.

The operation of this machine is as follows: The timber



being secured to the table, the crosshead, A, is then set to the proper height relatively to the length of chisel and thickness of timber. The reciprocating motion is imparted to the crosshead, D, by a crank or eccentric. It is provided with an extension pitman to permit of adjustment of crosshead to various positions of vertical adjustment relative to the position of the crank and thickness of timber worked. One or more holes are bored to permit the entrance into the mortise of the lever. The trip guard, A, is then set in such position relative to the travels of the sleeve and chisel mandrel respectively, that it will arrest the travel of the sleeve by contact with the collar on the upper end of the sleeve just as the chisel is at the bottom of the mortise, and permit the mandrel to pass the length of the slot in the sleeve below the bottom of the mortise, and allow the lever, E, to grasp the chips and remove them from the mortise, as shown in Fig. 2.

Further information may be obtained by addressing Messrs. Fiester & Ammon, 320 South Eleventh street, Reading, Pa.



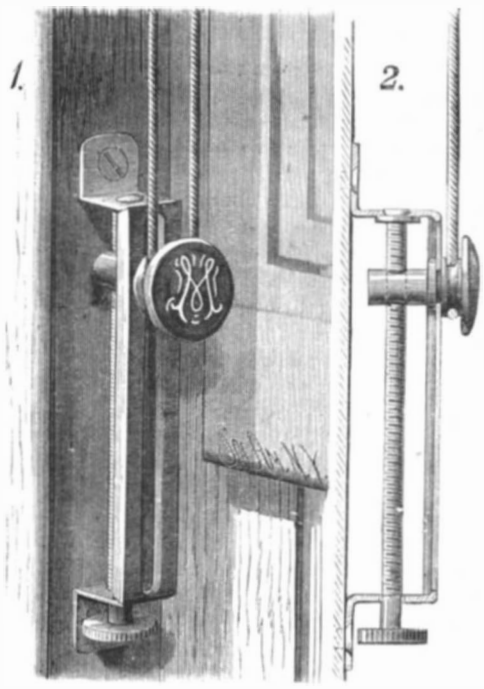
FIESTER'S MORTISING MACHINE.

Hilo Escapes the Lava Flow.

The *Advertiser*, of Honolulu, Sandwich Islands, says in its issue of August 24: "The lava flow, which has so long been threatening Hilo, may at last be regarded as at an end. In fact, it is quite impossible for it to come down again by the same channel which it has been using for the past nine months. As the support of the flowing lava in the tunnel beneath has been withdrawn, the roof has cooled, contracted, and fallen in, thus blocking up the tunnel, and also affording countless vent holes by which the molten mass might escape, even if it could overcome the obstacles offered by the *débris* which strews its path. A gentleman who has given careful and scientific attention to the flow, tells us that he had followed its course for over six miles, and that for the whole length of that distance the roof had caved in, say, every 150 feet or so. Another favorable indication of the cessation of the flow is the dense black smoke which is now rolling up from the terminal crater. This has usually been noticed at the close of former eruptions and flows. As long as the flow continues to advance, as long as the liquid lava pours out, the smoke is of a whitish color, but as soon as it becomes black, the danger, as a rule, may be regarded as at an end."

IMPROVED CURTAIN-CORD TIGHTENER.

We give an engraving of an improved curtain cord tightener patented by Messrs. F. E. Porter, of Baltimore, Md., and D. A. Beatson, of New York city. This tightener is mechanically correct in principle, simple and cheap in construction, and perfectly answers the purpose for which it is intended.



IMPROVED CURTAIN-CORD TIGHTENER.

The frame of the device consists of a suitable piece of sheet metal having a longitudinal slot, and bent twice at right angles at either end to form ears, which are perforated for the securing screws or tacks. This portion of the device is conveniently struck up at one operation by means of a die.

A screw extends from end to end of the frame, being secured after the manner of a rivet at the upper end, but being free to turn. At the lower end the screw is furnished with a milled head. A threaded block is mounted upon the screw, and to it is secured a roller. This roller receives the curtain-cord, whose tension may be readily regulated by turning the screw by means of the milled head.

Further information in regard to this invention may be obtained by addressing Mr. F. E. Porter, 33 South Charles street, Baltimore, Md.

RECENT INVENTIONS.

Mr. Theodore D. Lockling, of San Mateo, Costa Rica, Central America, has patented an improved method of securing covers to umbrella frames, so that they can easily be changed at will. The invention consists of the combination with the handle and notched and perforated ribs of an umbrella, of elastic rings, clamps, clips, and loops.

An improved watering pot has been patented by Mr. George F. McIntosh, of Hallowell, Me. The object of this invention is to facilitate the convenient changing of the delivery nozzles of the pot and prevent waste of water in supplying potted plants. The watering pot is provided with a closed top, upper and lower orifices to receive changeable nozzles, and a filling aperture and funnel on the rear above the handle.

In some of the Southern States there are large tracts of land that are infested by the "cutting ant," which destroys all vegetation, some of these tracts being literally undermined by them. Mr. Hiram B. Gray, of Columbus, Texas, has patented an improved apparatus for destroying these pests by blowing into their nests sulphurous or other poisonous fumes.

An improved table-leaf support has been patented by Mr. Horatio J. Locke, of Belfast, Me. The main object of this invention is to improve table-leaf supports so that the spring will only be allowed to exert its greatest power when supporting the leaf.

Mr. Joseph C. Higgins, of New Brunswick, N. J., has patented a detachable calk for horseshoes, which can be attached to or detached from the shoe without removing the shoe from the horse's hoof.

An improved winding roller for looms, etc., has been patented by Mr. John Connelly of Hallowell, Me. This invention relates to cloth-winding rollers used with looms to receive the cloth, and paper machines for winding the paper, and in winding web of other material, the object being to allow convenient removal of the material after being wound.

Protection in England.

To a country without competitors free trade may be a good thing. But when foreign competition arises to cut the ground from under the home laborer or to prevent the establishment of new industries free trade does not appear to work so well. Of this truth England is now gaining bitter experience; and as a natural consequence the more intelligent manufacturers are taking ground against free trade in favor of protection of home industry. As an illustration of the manner in which closet theories go to the wall when faced by the stern necessities of actual business life, nothing better could be asked than this change of front by many English manufacturers. The practical working of free trade in their case is forcibly put by Mr. John Lister, of Bradford, the founder of the vast silk business of that town, based on his patented silk and velvet looms. Explaining to a correspondent of the *Times* his reasons for subscribing $10,000 to the Fair Trade League, he said:

"A few years ago my looms were idle, while London was flooded with German velvets. I was undersold. For two years I paid my workpeople out of capital. In that time, however, I had considerably reduced their number, and their wages were not nearly as much as they are now. At the time I speak of we were also beaten not only in velvets, but the Swiss spinners were even sending their yarns into Bradford. Supposing that I had been a weak capitalist, and this German confederation had overthrown me—what then? The free trade theory, that if one trade cannot supply laborers another can, would have been put to a severe test. Could the worsted trade of Bradford have employed my thousands of workpeople? No, sir. Could it do so then or now, or is there any other trade that could? None. In a recent lecture I gave this as an illustration to show how necessary it is to see how the laboring classes are to be employed before you allow one industry after another to be destroyed by foreign competition. Let us look a little further. I pay £1,000 a year poor rate. What if I had closed my mills and ceased to pay that or anything else? And, supposing, instead of paying £1,000 a week and more—£52,000 a year and more—out of my own pocket to support my workers, the poor rate had been charged with it, what then? I think some of the free trade ratepayers would have found out the practical effects of unrestricted foreign competition. What pen or tongue can say what my workpeople would have suffered? And for whose benefit? Certainly not for mine, for had I been a weak capitalist and gone to the wall, I should have been one of the chief sufferers. For whose good, then, would all the misery have been suffered? For the good of the foreign capitalist and the foreign workman, in order that luxury might be clothed at a farthing or so a yard less! That is free trade!

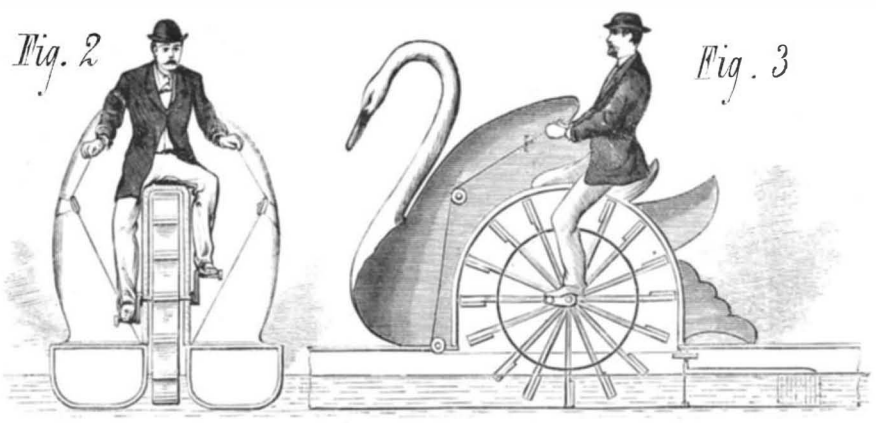
"In the early days of free trade there were no steamers, no means of rapid transit. We could not be inundated with foreign goods—even corn came in slowly. We were masters of the world in regard to manufactures. To-day we are not; to-day we have free trade in all its simplicity, and the result is disaster, the bankruptcy of the manufacturer, the ruin of the farmer, and the destruction of independent and profitable labor."

Nevada Monumental Granite.

The beautiful stone contributed by the State of Nevada to the Washington Monument has arrived in that city, and is described by the *Republican* as an object of great interest. It is a pure specimen of native granite, and is elaborately inscribed. The letters are of solid silver, and about as thick as a silver dollar, some six inches in height, and of proportionate width. They are so neatly fitted into the solid granite that the joint is almost invisible. Above the word "Nevada" is deeply cut in the granite the motto of the State, "All for Our Country," and below the date, 1881. The figures of the date are plated with gold. The granite composing it is the hardest ever seen. That part which is polished is almost blue in color, while the remainder presents a somewhat gray appearance. It is the most expensive stone contributed by any State so far.

The Survey of the Northwest.

Mention has been made in this paper of the projected scientific survey of the country tributary to the Northern Pacific Railway and the Oregon and Railway Navigation Company's lines, under Professor Raphael Pumpelly. The *Evening Post* announces that the work, which will be organized for a term of years, contemplates mapping the country "on a published scale of four miles to the inch," in order to show the geological structure, the distribution of minerals, of the different varieties of soils, of plants and animals, and the climatic conditions. For the thoroughness and high scientific quality of it the director's name is a guaranty, but he has also associated with him a number of trained men from the United States Geological Survey, including Mr. Wilson, the able topographer of the Fortieth Parallel Survey. The classification of the lands of the railroad companies according to their fertility and their mineral and timber resources will, of course, furnish a rational guide to the extension of branches, and will have a wholesome effect in turning immigration into remunerative channels. The bulletin which the survey contemplates publishing will thus be eagerly consulted. Meantime, the Signal Service will welcome the new meteorological stations to be established in the pre-eminently weather-breeding sections of the continent. In every way the country at large will profit by this nominally private enterprise, which anticipates the national exploration of the great northwest territory.



SECTIONAL VIEWS OF VELOCIPEDE BOAT.

VELOCIPEDE BOAT IN THE PUBLIC GARDEN, BOSTON.

We give engravings of a velocipede boat of novel design in daily use in the Public Garden, Boston, Mass. The boat is made after plans by Captain Thompson, and is not only an ornament to the lake, but is one of the easiest and most comfortable of small craft.

The boat is double, the two hulls being connected together by curved bars at the bow and stern. The paddle wheel plies between the hulls, and is located abaft the middle of the boat. It is worked after the manner of a velocipede wheel, and is covered by a metallic sheathing, which in turn is covered by a beautifully modeled swan in hammered copper.

The man working the wheel sits between the wings of the swan, and controls the rudder by tiller ropes extending upward over pulleys inside the swan, as show in Fig. 3. The hulls are of galvanized iron, and measure about twenty-five feet in length.

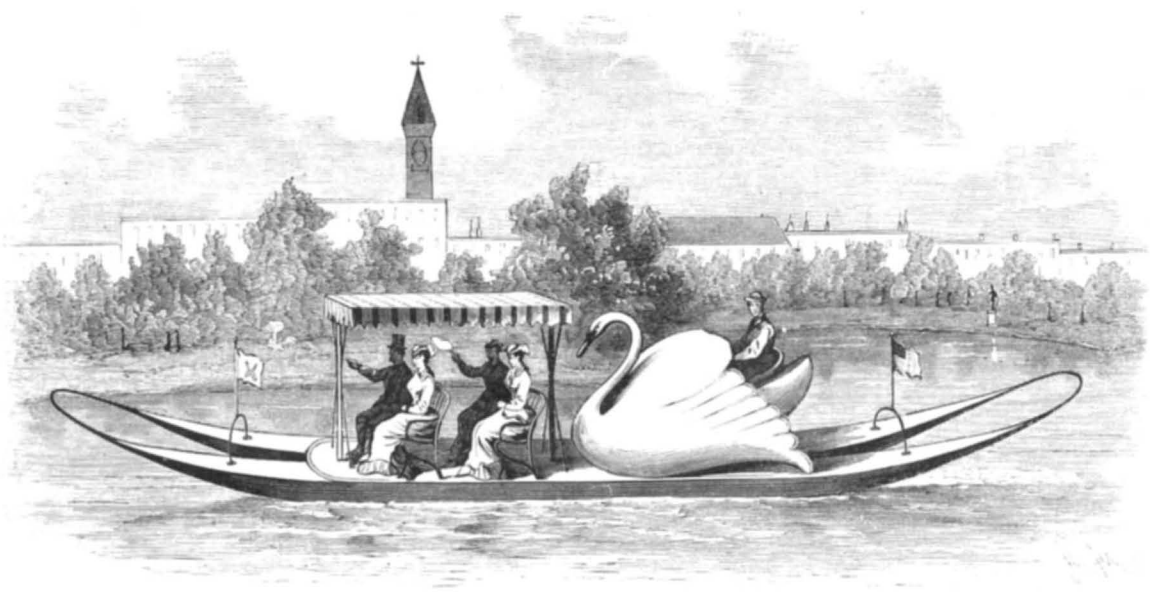


Fig. 1.—VELOCIPEDE BOAT IN THE PUBLIC GARDEN, BOSTON.

The boat does not attain a great speed, but it is free from rocking and tipping, and is a great favorite. A number of them are in use in Boston.

Another New Comet.

The Smithsonian Institution has received from the Astronomer Royal of Greenwich the announcement of the discovery, by Denning, on October 4, at 15 hours, of a bright comet in Leo, in 9 hours 22 minutes right ascension, 16° of north declination, with a daily motion of 30 minutes east.

This is the fifth new comet of this year, Encke's being an old acquaintance. All but comet A, 1881, are, we understand, still telescopically visible. Four of the six appeared in the constellation Auriga. It is quite unusual for so many of these erratic wanderers to be on view at once.

Some Practical Hints on Nickel Plating.

BY FR. HARTMANN.

Nickel plates and sheet nickel are now generally made by the manufacturers of nickel ware. These may be used in the production of a solution which is particularly well adapted for nickel plating. To this end the nickel is placed on a perforated board in a saturated solution of ammonium chloride (sal ammoniac), and the metal brought in connection with the positive pole of a strong battery. By the influence of the electric current the metal gradually becomes dissolved, and a double salt is formed (nickel ammonium chloride), which settles on the bottom of the vessel, while, at the same time, the metal is kept continually in contact with the ammonium chloride.

If the nickel has previously been weighed, the amount of the metal which has become dissolved can at any time be determined by weighing the as yet uncombined nickel. In order to nickelize with this solution, a plate of pure nickel is suspended in the fluid, and it is connected with the positive pole of the battery, while the metallic body which is to be coated, and which must, of course, be well cleaned, is connected, after it has been immersed, with the negative pole. The nickel is precipitated from the solution as a bright coat, whose thickness depends upon the length of time during which the current is acting upon it, and also upon the strength of the latter.

In order to operate directly with the nickel sulphate, it is necessary to have a salt entirely acid free, which may readily be prepared by adding a small quantity of sodium hydrate (caustic soda) to the solution of the commercial salt, after having first removed the copper in the manner which will presently be described. When the acid is neutralized, an apple-green precipitate of nickel hydrate is formed, which is boiled for some time and then filtered. The solution is now perfectly neutral.

To remove the copper from the nickel salt, the latter is first dissolved in water and acidulated by a few drops of sulphuric acid (commercial nickel sulphate is generally acid), then a current of hydrogen sulphide gas, which is prepared by pouring sulphuric acid over iron sulphide in a flask, is passed through the solution.

The copper and other metals which are likely to be present are thrown down in the form of a black precipitate. When the odor of the gas is distinctly recognized its passage is stopped, and the solution heated to expel the last traces of the hydrogen sulphide. It is then heated to boiling in a porcelain vessel with the addition of some metallic nickel. By this means the free acid is neutralized, and on evaporating to crystallization there remains a salt sufficiently pure for nickel plating.

The articles which are to be plated are suspended in the solution which we have just described, and they are connected with the positive pole. A nickel plate, which also dips into the liquid, is connected with the negative pole; and from time to time the liberated acid is neutralized by the addition of a slight quantity of ammonium hydrate. It is better still, for practical results, to spread a layer of nickel oxide over the bottom of the vessel in which the nickelizing is being carried on. This will dissolve in the free acid, and the solution will therefore remain neutral and of uniform strength.

The nickel oxide is prepared by completely saturating a solution of nickel sulphate with sodium hydrate (caustic soda), washing the precipitate, and then drying it. The nickel oxide thus formed is a heavy powder of an apple-green color, and may be either spread over the bottom of the vessel, or else it can be placed in a linen bag and suspended in the liquid. If a solution of nickel sulphate, acidified with sulphuric acid, is poured into a saturated solution of ammonium sulphate, crystals will separate out, consisting of the double salt of nickel ammonium sulphate. The crystals are washed with cold water, dissolved in hot water, and then the solution is completely neutralized with ammonium hydrate. It is then allowed to stand for several days at a temperature of 20° to 25°, until no more crystals separate out. It is also of importance that the liquid be maintained at this temperature during the nickelizing, for otherwise the nickel will not adhere firmly to the metal.

During the operation of plating a sheet of nickel, connected with the positive pole of the battery, is suspended in the solution. According as the nickel becomes separated from the solution the sheet dissolves, and thus the solution maintains its original strength. Plates of absolutely pure nickel are at present quite expensive, in consequence of the

very high temperature which is required for their fusing and casting. By the addition of one five-thousandth part of phosphorus its point of fusion may be considerably lowered. As the phosphorus is not objectionable in nickelizing, the plates are generally made of metal containing phosphorus, and they are used to the best advantage in rather thin sheets, for, the larger the surface of the nickel plate, the less will be the strength of the current required; and when the pieces to be plated are not large, as will occur in the majority of cases, two or three Bunsen elements will be sufficient.

In addition to the above methods for nickel plating others have been proposed, which also give good results, but which require more expensive preparations than those previously mentioned; thus, for instance, the double salt of nickel potassium cyanide and solutions of nickel nitrate have been proposed. On account of the vapors which escape from the cyanide solutions, although only in small quantities, they are particularly objectionable, and therefore the employment of cyanide preparations, on account of their poisonous properties, should be avoided whenever it is possible to do so. The nickel nitrate gives a beautiful and durable coat of nickel. The solution is most effective when it is composed of 4 parts of crystallized nickel nitrate dissolved in 150 parts of water, to which 4 parts of ammonium hydrate are added, and then 50 parts of the acid sulphite of sodium are dissolved in the above solution.

The acid sodium sulphite is prepared by heating copper with sulphuric acid in a retort, the gas produced is passed through a small quantity of water, which will retain the copper which has been mechanically carried over, and then the gas (sulphurous acid) is dissolved in water until the liquid smells distinctly of burning sulphur. The solution which has thus been obtained is divided into two portions; one part is saturated with sodium carbonate as long as effervescence takes place, the other half of the acid is then added, and in this manner the bisulphite of sodium is produced. This must be employed as it is, because it is impossible to crystallize the salt by evaporation, for in so doing one half of the acid would escape and the mono-sulphite of sodium remain behind.

For nickel plating of the finest kind, such as is produced in American factories, a solution is prepared from the nickel nitrate and acid sodium sulphite. It sometimes happens that the nickel will strip or peel off from the metals on which it has been deposited. It is said that this objection can be overcome by placing the dried plated objects into a bath of oil and heating them up to 250°-270°.

According to Weston, a plating of great beauty and durability is obtained by mixing a solution composed of 5 parts nickel chloride and 2 parts boracic acid with one made up of 2 parts nickel sulphate and 1 part boracic acid, and then adding, while continually stirring, sodium hydrate (caustic soda) until the precipitate is redissolved.

For the nickelizing of iron or steel, it is best to first coat the objects to be plated with a thin film of copper, which is readily accomplished by dipping the material into a dilute solution of copper sulphate.—*Neueste Erfindungen und Erfahrungen*, viii.. p. 411.

AMERICAN INDUSTRIES.—No. 77.

THE MANUFACTURE OF STEAM, WATER, AND OIL WELL FITTINGS.

It is only within comparatively recent years that it has ceased to be necessary for every builder of steam engines or boilers to make his own valves, pipe connections, and much other work of a similar character. The manufacture of these articles is now a separate industry. The expense formerly attending the production of these articles in connection with legitimate engine work, was necessarily very great, and no better evidence of this is needed than the success of the great manufactories of this class of goods, which are perfectly adapted to the purpose and provided with the most improved machinery and tools.

The views given on our title page illustrate the extensive establishment of the Jarecki Manufacturing Company, located at Erie, Pa., who have been very successful in building up and extending its trade.

The building was established about twenty years ago, without capital, and with apparatus consisting of only two hand-lathes of the crudest make, and a small furnace for melting brass. We cannot trace the developments of this concern from this small beginning to its present extensive proportions, although it would undoubtedly prove very interesting. The practical mechanical knowledge, industry, and sound business principles of the brothers, Henry and Charles Jarecki—the founders of the business—were elements that contributed most in placing this industry high among the manufacturing interests of the country.

Among the views on the first page is a sketch showing the general appearance of the buildings. They consist of several handsome structures having a frontage of 330 feet. The main building has an elevation of three stories above the basement, and covers an area 175x60 feet, and there is a wing attached to the rear which is 80x40 feet. To the right is the galvanizing shop, 70x40 feet, and the extension on the left is the malleable iron foundry, inclosing a space 80x150 feet. Attached to this at the rear and opening into it is the gray iron foundry, 60x100 feet. The annealing room, 50x80 feet, is back of this, and further to the right is the core shop, 50x160 feet. Situated between this and the main building is the rattler room, 40x100 feet. The buildings are all of brick, and substantial and strong in construction.

Entering the works at the west end, we pass through the office and into the main machine room (shown in the engraving), 175 feet long by 60 wide. All the available space is filled with lathes, planers, milling machines, and a great deal of other machinery employed for special work. Among the most perfect machines are those for tapping malleable iron fittings. They can be operated by an attendant having very little skill. For example, a T-fitting is placed in a chuck, which is then moved into position for the taps to enter the openings of the fitting. The machine is then put in motion, and while the taps are doing their work another Tee is put into a second chuck. As soon as the threading of the first fitting is accomplished the machine reverses itself, and when the taps have been carried back the proper distance it comes to a stop. The chuck holding the tapped fitting is then swung out, and the second one substituted. The method of procedure now is but a repetition of that already described, and the attendant has little else to do than to keep the chucks supplied with blank fittings.

In pipe fittings, such as Tees and elbows, it is very essential that the branches be at right angles to each other. To secure this result is next to impossible by the old method of tapping each opening separately. But the machines used in this establishment are so perfect that only correct work can be done on them.

The variety of sizes of the different patterns of malleable fittings made here is almost endless, and in their production due consideration is always given to the matter of adaptability and cost. Fittings for gas connections require only moderate strength, and are of a much lighter pattern than those designed for use as steam or water connections. For the convenience of the trade, manufacturers of this class of goods have a list, or chart, on which each fitting represented is supplemented with its number and size. Fittings sold by weight are numbered up to 671, and of these the greater portion are of two styles—the plain pattern for gas, and the beaded for steam or water. There are, besides, several other patterns of fittings, not sold by weight, which have no place on the chart.

With the larger and more massive machines, designed for tapping fittings varying in size up to three inches, the threading is effected with the same ease and smoothness of motion as in the case of the smallest machines. Fittings with openings varying in size present no difficulties, and a Tee with branches, each for a different size of pipe, is disposed of exactly as when the openings are all alike, and the tapping of one opening left-handed and the other right is just as easily accomplished.

Among machines designed for special work are those for making unions, flange unions, bushings, and a variety of other pipe connections, and the large upright machines for tapping gray iron fittings of the larger sizes up to six inches are especially noteworthy. Here the opening of the fitting is first reamed to the proper size, the reamer is then replaced with what is known as an expansion tap. The purpose of this tool is to do away with the necessity of running back the tap after the threading is completed. This is accomplished by shifting a cam arrangement whereby the cutters are drawn into the body of the tap, which is then removed without interfering at all with the motion of the machine, rendering stoppages unnecessary either for the removal or adjustment of reamer or tap. Other mechanism is employed for threading the still larger fittings, which include the size for 12 inch pipe connections. From a 12 inch Tee, which has a weight of about 300 pounds, down the range of sizes to the one-eighth inch elbows and Tees, of which eighteen or twenty weigh not more than one pound, the number of pieces of even the straight sizes of fittings is astonishing.

To one unfamiliar with the appliances in use in the production of petroleum in the Pennsylvania oil fields the purpose of many of the implements made in this establishment would be a matter of considerable conjecture. This company was one of the first to make a specialty of the manufacture of the class of goods used in the petroleum industry. They have, in fact, grown up with its development, and have never failed to keep pace with the requirements and constantly increasing demands of the oil producers. Most important in this line of goods are the oil well pumps. The pump chambers first in use were tubes of drawn brass, but in the matter of durability and cost they did not prove entirely satisfactory. The substitution of cast iron tubes for the purpose gave results most favorable in all respects, and now for many years this material has been used in their manufacture at this establishment.

The machinery for the production of these pumps consists of three upright boring machines, extending from the basement upward into the machine room, each with capacity for boring six pump chambers. Each machine is provided with six hollow spindles, into which are placed the solid cast iron cylinders, 5 feet long and 3 inches in diameter. By the action of the machine the spindles containing the cylinders are revolved, and the boring is done with drills which work upward to allow clearances for the chips. Afterwards a reamer is used to make the bore exact and true, and the now hollow cylinders are then transferred to a horizontal polishing machine, provided with plungers having at the ends fork-shaped attachments, secured to the tines of which are lead pieces, semi-cylindrical in form. As the pump chambers revolve at a high rate of speed, the plungers travel forward and back through the whole length of the bore, and by the aid of emery and oil the tubes are finished to a mathematical exactness in size and a most beautiful polish secured. These last mentioned machines, and many of the other specialties already referred to, were designed and built at this establishment.

A steam engine for oil well drilling is another production of this department. Its points of superiority are the perfection of its balance valve and the link-motion attachment, by means of which the engine can be instantly reversed, however high the rate of speed may be. For engines for deep well drilling this link motion is indispensable. Another useful and novel contrivance is the water packer, designed in part for use in deep wells to shut off water veins in the rock, but more particularly to confine the gas in the wells so that the accumulating pressure will force the oil up through the tubing and make a flowing well where otherwise the use of a pump would be necessary. A considerable portion of the machinery here is also employed in perfecting in its various parts the Jarecki adjustable pipe tongs, shown in the engraving. The superiority of these tongs has been well established. Each pair serves the purpose of six sizes of common tongs, and it takes but a moment to adjust them to any desired size. The steel bar or grip is reversible, the end that is made concave being intended for use in cases where injury to the surface is to be avoided. With the pointed end properly adjusted the tong is valuable as a wrench for square or other shaped nuts.

Another of the products of this department is a great variety of iron body globe and angle valves, safety and back-pressure valves, and gate valves, including all the sizes for which a demand exists, and varying in weight from ten pounds to one thousand pounds.

Equal in area to the main machine room, and in the story above it, is the brass finishing department, pleasantly situated and with windows on every side, affording ample light and ventilation. Here are made brass goods of almost every description, the supplies for steam purposes being most largely represented. With the relatively low prices prevalent for goods of this class they can be profitably manufactured only by the use of the most improved machinery and tools. Brass valves of any one size are here taken in work in lots of usually not less than one thousand pieces at a time, and many of the parts in the process of finishing pass through a succession of lathes before being completed. The brass valves and cocks include the sizes from one-eighth of an inch to four inch, and are of various patterns. For ordinary uses the bodies are left in the rough, just as they come from the moulds, except in such parts as can be easily finished. But of valves for steam purposes there is a great diversity of style and finish. The nickel-plated radiator valve, mounted with rosewood wheels, and highly polished over its entire surface, is an example of perfection of workmanship and elegance of finish. The smaller lathes are kept busy on such brass work as air cocks and bibbs, cylinder and gauge cocks, and everything in that line used for either steam, gas, water, or oil.

Of materials made in this department for oil well purposes, the ball valves for use in the pump chambers already referred to are among the most important. Oil wells as at present drilled vary in depth from 1,700 to 2,000 feet, and experiments with valves of almost every description for pumping these wells have established the superiority of this ball valve, both in effectiveness and durability. The upper or plunger valve is among the views given. With the exception of the packing and seat, it is made entirely of brass, the ball being of very hard brass; the seat on which the ball rests is of hard steel, and is held in place by the valve crown or top, which clamps it to the body of the valve. For packing, cup-shaped leathers are used; they are arranged to admit of expansion under pressure to insure their fitting the pump chamber closely until worn too thin for further use.

The pressure to which the valves in actual use are subjected averages 1,000 pounds to the square inch. Under such conditions they are naturally rapidly worn out, but as all the like parts of the valves are made uniform, any worn or damaged part is easily replaced. The lower or standing valve differs from the plunger only in the arrangement of the packing, for which leather rings are used instead of cup-shaped leathers. The manufacture of these valves, under letters patent, has been carried on by this company for nearly twelve years, and during that time much progress has been made in perfecting machinery for the purpose. The finishing of the valve balls by the methods originally employed was an operation demanding a degree of skill in its accomplishment which few possessed, but with the mechanism now in use the process is a very simple one.

The deep well pumps include other sizes than those in use for oil wells. From the very small pump to be used in connection with one inch pipe they are made of sizes increasing regularly up to the monster pump for six inch pipe. The chambers for the larger sizes are heavy drawn brass tubes. These pumps are in use in all parts of the country, and many of the larger sizes are to be found in the Colorado mining districts, as well as at some of the principal breweries in New York city, where they are used in connection with artesian wells.

Another product of the brass department, although no brass is used in its production, is the Jarecki screw plate, shown in the engravings, the purpose of which is to thread and to cut off pipe. It is a tool capable of adjustment to different sizes of pipe. The cam plate and the face of the stock are stamped with corresponding figures, and to set the dies to any desired size the cam plate is moved until the figures corresponding to the size are in line, when the thumb nut is screwed down and the plate is ready for use. After a thread has been cut the stock can be instantly removed by

shifting the cam plate so as to draw the dies back from the pipe. An important feature of this tool is that when a number of pieces of the same size of pipe are to be threaded there is a stud bolt which, after the dies have been properly set, can be adjusted to limit the throw of the cam plate to that size, and thus the trouble of resetting after each operation is avoided. The plates are also provided with an effective appliance for cutting off pipe. The working parts are all made after a uniform standard, and can easily be duplicated. Five sizes are made, which are numbered from 1 to 5, and their combined range includes the various sizes of pipe from one quarter inch to six inches.

The floor above the brass finishing department is occupied in part by the pattern and carpenter shops, which are provided with everything necessary to that branch, and most of the remaining space serves as a place for grinding castings, for which purpose a large number of emery wheels are in operation. The drill presses here, and the machines for punching, stamping, and shearing, are for the manufacture of boiler flue cleaners, for which cast steel is used to make the springs and scraper pieces, the stems or stocks being of malleable iron. This flue cleaner meets with a large sale, and has proved very efficient and satisfactory.

Going down from this floor on the elevator there are found the varied products of manufacture stored, ready to be put on the market. The store room is 175 x 60 feet, and is provided with numberless tiers of bins for the thousands of sizes of fittings of the various kinds, and with closed compartments in which the brass goods are kept to be free from dust and dirt.

The motive power for the works is furnished by a 125 horse power engine in a room adjoining the main building, and two large boilers supply the steam. The blacksmith shop has eight forges, a power hammer, and other necessary appointments. Adjoining this is the brass moulding shop, spacious and well ventilated, provided with five melting furnaces in which fifteen to twenty heats are made daily. The operation of melting and pouring is shown in the engraving.

The malleable iron foundry presents a scene of bustle and activity. Here bench or snap flask moulding is the process mainly in use, which differs from the ordinary moulding in not requiring a separate flask for each mould. The snap flasks are frames of wood, hinged at the corners, to admit of being removed from the completed moulds, which are then transferred to the foundry floor, and, if necessary, placed one upon the other to a height of three or four moulds. When piled up in this way the top moulds are poured first, and when the metal has had time to "set," they are removed, and those next below are ready to receive the melted metal. Only brass patterns are used here, which are arranged in forms technically called gates, each gate being made up of as many pieces as the size of the articles and dimensions of the flask will admit. The iron for this department is melted in an air furnace, and without artificial blast, a chimney 120 feet high affording the necessary draught. At one end of the furnace is the fire grate, so situated that the flames are carried over the iron to be melted. Thus all the different grades of iron in the furnace are fused at one time, and the melted metal need not be removed until it has become thoroughly mixed and is of a uniform temperature of the degree desired—conditions necessary for an iron suitable for heavy malleable castings. Charcoal iron is almost exclusively employed for malleable work. The castings, as they come from the moulds, have a white luster and are very brittle and hard. The view given of this department shows the men in the act of receiving the melted metal from the furnace and pouring it into the moulds. In an adjoining smaller room are made malleable castings from cupola melted iron. These are only the smaller and lighter pieces for which this process of melting has been found suitable.

In the spacious gray iron foundry near at hand are made the castings for the various sizes of iron for body valves and cocks, and also for the gray iron fittings, of which the multiplicity of sizes is almost as varied as in the case of the malleable iron fittings. For the lighter castings the breech-moulding process is used.

An interior view of the annealing room is given, showing the annealing furnaces, which occupy the entire length of the room on one side. As the castings come from the moulds they are first cleaned of sand by the tumbling process and are then brought to this department, where they are packed in iron pots, with alternate layers of iron scale. As fast as the pots are filled the tops are covered over with a layer of clay and then placed in the ovens. When an oven is full the opening is walled up with bricks, which are then plastered over with clay. Heat is now applied, gradually increasing in degree until the castings become red hot, in which condition they are kept for a length of time, varying from six to eight days, according as the castings are light or heavy. After the pots have been drawn out from the ovens and are sufficiently cooled the castings are dumped. In the process of extracting the carbon the castings have also been considerably changed in appearance, being now covered with beautifully colored scales of varying hues, from straw color to dark blue, which, if not quickly removed, would expose the castings to rapid oxidation.

Situated convenient to the foundries is the large core shop, where more than fifty men and boys are employed to supply the various moulding departments with cores, in quantities not less than twenty five thousand every day. The material, as prepared for making the cores, consists of a mixture of sand with flour, rosin, molasses, sour beer, or such other materials as may be required. The cores are formed in metal core boxes, or moulds, from which they are transferred to iron plates and carried to the ovens to be baked. Much of the work here requires a practiced and experienced hand for its accomplishment, while for the more ordinary forms the rapidity with which they can be made depends entirely on the dexterity of the operator.

In a building separate from the others and located near the iron foundries, are the tumblers or rattle barrels, ten in number, which receive the iron castings as they come from the moulds and the annealing pots. They are operated by means of a shaft which receives its motion from a special engine provided for the purpose.

On the premises is a natural gas well, drilled to a depth of 700 feet, which has been in operation for the last ten years. During the first year after its completion the supply of gas was sufficiently abundant to be used as fuel for generating steam, besides furnishing light for the different shops. But after that time the volume of gas diminished considerably, and from then on the yield, though steadily maintained, was no more than adequate to the need for lighting purposes.

The department last to be reached is the galvanizing shop. The variety of malleable and gray iron castings and fittings here in course of preparation to be galvanized includes a large amount of castings for clothes wringers and washing machines. Galvanizing is not a complex process, but the experience gained by long practice and careful observation is a necessary condition to perfect work. As the castings come from the acid baths they are immersed into melted zinc, and when thoroughly coated with that material are plunged into water and held there a moment, which gives them a frosted and silvery appearance. The operation of tinning is also performed here, which differs but little from the galvanizing process.

The extensive trade of this concern in the oil regions of Pennsylvania and the adjacent States has necessitated the establishing there of branch stores at the various business centers. At present the number of the stores is eight, but every new development of territory is closely followed in order that additional branches may be provided wherever the indications seem to favor such a step.

In the factory at Erie employment is given to about four hundred men. The uniform excellence in quality and workmanship of the diversified products of manufacture has secured a market for them in almost every State in the Union, and in the Dominion of Canada.

Characteristic Incidents of the Michigan Fire.

Fires had been burning in Sanilac, Huron, and Tuscola counties, but no one apprehended any danger. Farmers had set fire to slashings to clear the ground for fall wheat, but this happens every fall, and the fact that not a drop of water had fallen in from fifty to seventy days was not considered by those who saw the smoke clouds and replied that there was no danger. There was danger. Behind that pall of smoke was a greater enemy than an earthquake, and it had a tornado at its back and two hundred miles of forest in the front. From noon until two o'clock a strange terror held the people in its grip; then all of a sudden the heavens took fire, or so it seemed to hundreds. In some localities it came with the sound of thunder. In others it was preceded by a terrible roaring as if a tidal wave were sweeping over the country. Almost at the same minute the flames appeared in every spot over a district of country thirty miles broad by one hundred in length.

At Richmondville, ten miles above Sanilac, one hundred and fifty people had comfortable homes, stacks of hay and grain, teams, cows, pigs, sheep, and no fear of the fire which they knew was burning a mile away. At two o'clock the flames rushed out of the woods, leaped the fences, ran across the bare fields, and swallowed every house but two, and roasted alive a dozen people. It is hardly forty rods to the beach of the lake, and yet many people had no time to reach the water. Others reached it with clothing on fire and faces and hands blistered. The houses did not burn singly, but one billow of flame seized all at once and reduced them to nothing in ten minutes.

I saw many and many a spot where the billows of fire jumped a clean half mile out of the forest to clutch house or barn. The Thornton family were wiped out with the exception of a boy. Thornton had hitched up his team to drive the family to a place of safety, but when he saw that they were all surrounded by the flames he unhitched the horses in despair. Before they could be unharnessed they bolted in different directions, and the old man became so confused that he ran directly toward a big slashing, which was than a perfect mass of flame, and dropped and died with his head toward it.

Meantime the mother and children had taken refuge in the root house. This was a structure mostly sunk in the ground and the roof well covered with earth. Here they were all right for a time, but when the father failed to join them one of the sons went out to see what caused the delay. He was hardly out of the place before the door through which he had passed was in flames. In this emergency he ran to a dry creek, and by lying on his face and keeping his mouth to the ground he lived through it.

I talked with a woman who lived neighbor to the Thorntons, and who escaped by fleeing to a field of plowed ground. This was only a few rods from the root house, and she said it was fully an hour before the screams and shrieks and groans from the people inside grew quiet in death. One by one they were suffocated by heat and smoke, and their bodies presented a most horrible appearance. To one riding through the district it seems miraculous that a single soul escaped. The fire swept through the green trees the same as the dry. It ran through fields of corn at the rate of twenty miles an hour, and fields of clover were swept as bare as a floor. Dark and gloomy swamps, filled with pools of stagnant water, and the home for years of wildcats, bears, and snakes, were struck and shriveled and burned almost in a flash. Over the parched meadows the flames ran faster than a horse could galop. Horses did galop before it, but were overtaken and left roasting on the ground. It seemed as if every hope and avenue of escape were cut off, and yet hundreds of lives were spared. People spent ten to twenty hours in ditches and ponds, or in fields under wet blankets, having their hair singed, their limbs blistered, and their clothing burned off piece by piece.

In dozens of cases the first flames spared houses and barns, but after seeming to have passed on for miles, suddenly circled back and made a clean sweep of everything. Unless one rides over the burnt district he cannot believe the eccentricities of a forest fire. In the great swamp, between Sanilac and Sandusky, it burned everything to the roots for a mile in breadth. Then it left patches from ten feet to ten rods wide. Then again it struck in and burned lanes hardly twenty feet wide, leaving half a mile of fuel on either side. In the timber it seemed to strike the geeen trees harder than the dry ones. It was like a great serpent making its way across the country. It would run within three feet of a wheat stack, and then glide away to lick up a house. It would burn a stack and spare a barn ten feet off.

People felt the heat while the fire was yet miles away. It withered the leaves of trees standing two miles from the path of the fiery serpent. The very earth took fire in hundreds of places, and blazed up as if the fire were feasting on cordwood. The stoutest log buildings stood up only a few minutes. The fire seemed to catch them at every corner at once, and after a whirl and a roar nothing would be left. Seven miles off the beach, at Forester, sailors found the heat uncomfortable. Where some houses and barns were burned we could not find even a blackened stick. Every log, beam, and board was reduced to fine ashes.

Seven miles back from the lake at Forester a farmer gathered up fifteen persons in his wagon and started for the beach. The fire was close behind them as they started—so close that the dresses of some of the women and children were on fire from the sparks. It was seven miles of up hill and down, with corduroy, ruts, and roots, and the horses needed no whip to urge them into a mad run. As the wagon started the tire of a hind wheel rolled off. They could not stop for it, and yet, even on a good road the wheel would have crushed down in going twenty rods without it.

It is an actual fact that the horses pushed over that seven miles of rough road at a wild run, and the wheel stood firm. A delay of five minutes at any point of the road would have given fifteen more victims to the flames which followed on behind. I saw the wagon at the lake, and I saw the tire seven miles away on the roadside.

The people who sought the beach had still to endure much of the heat and all of the smoke. Wading up to their shoulders, they were safe from the flames, but sparks and cinders fell like a snow storm and the smoke was suffocating. The birds not caught in the woods were carried out to sea and drowned, and the waves have washed thousands of them ashore. Squirrels, rabbits, and such small animals stood no show at all, but deer and bear sought the beach and the company of human beings. In one case a man leaped from a bluff into the lake and found himself close behind a large bear. They remained in company under the bank nearly all night, and the bear seemed as humble as a dog. In another instance two of the animals came out of the forest and stood close to a well from which a farmer was drawing water to dash over his house, and they were with him for two hours before they deemed it prudent to jog along. Deer came out and sought the companionship of cattle and horses, and paid no attention to persons rushing past them.—*Detroit Free Press.*

Reed Bird Shooting in Delaware.

As they go southward in the fall, our favorite meadow singers, the bobolinks, take to the marshes and become reed birds, much sought after by sportsmen and pot hunters. At Chester, Delaware, the headquarters of the bird shooters of the State, there are forty professional "pushers." The shooting begins the first of September. The Philadelphia *Times* makes a brief estimate of the results of a month's shooting. At Chester, at the Lazaretto, and the two hundred club houses that line both banks of the Delaware from League Island to Marcus Hook, there will be at least nine hundred shooters daily. At the former two places 2,000 birds daily—taking the scores of those who push themselves and of the professional shooters—will be killed. Eight hundred gunners daily from the private club houses is but a fair count, and, giving them each a score of 10 birds daily, the total will be 10,000 birds killed every day in the month of September, an aggregate of 300,000 scored at the above places alone. This is but a meager approximation of the grand total, probably ranging over 1,000,000 when the marshes from Bombay Hook to Bordentown are included in the estimate."

The Non-Condensing vs. the Condensing Engine.

Experiments made with a Corliss condensing engine at a factory in Mulhouse, Germany, in 1878, and others made with a Corliss engine of the non-condensing type at the fifth Cincinnati Exhibition, in 1874, have been compared and ably discussed by Chief Engineer Isherwood, of the U. S. Navy, for the purpose of determining the boiler pressure at which the non-condensing becomes equal in economy to the condensing engine. His paper is given in the *Franklin Journal*. The well known opposition of Mr. Isherwood to high measures of expansion in the marine engine need not affect the mind of the reader, as Mr. Isherwood considers it abundantly proved that no economic gain results from carrying expansion beyond the measures easily obtainable in non-condensing engines, when using steam at 70 pounds boiler pressure and upward. No motive, therefore, can fairly be imputed to him for departing from his usual accuracy and thoroughness in searching for the truth. It is assumed that, since the back pressure in good examples of both types of engines may be taken as constant at about 3½ pounds per square inch for the condensing and 16 pounds for the non-condensing engine, and the feed water at 100° F. for the former and 200° F. for the latter, there is an initial steam pressure at which the two types will be equal in economic effect.

To offset the less back pressure and the greater measure of expansion in the condensing engine we have the saving of the power required to work the air pump and the higher temperature of the feed water in the non-condensing engine; but the question of the boiler pressure at which the two types become equal must be determined by experiment for each new set of conditions, principally because of the variation of cylinder condensation, which has been shown to be, in former experiments with this size of condensing engine, cylinder, and measure of expansion, as much as 29 per centum of all the steam evaporated in the boiler. This amount is varied by the relative size of the cylinder, the grade of expansion, which affects the extremes of the temperature of the steam during a double stroke of the piston, the character of the metal of the cylinder as a conductor of heat, and the piston speed, with any given initial pressure.

The engines which are compared are not of the same size, nor were they worked at the same piston speed.

The non-condensing engine had a cylinder 16 1/16 inches diameter, and was worked at approximately 240 feet per minute piston speed. The condensing engine had a cylinder 24 inches diameter, and a piston speed of about 200 feet per minute. They were of the same length, 4 feet. The loss by cylinder condensation would have been something greater in the condensing cylinder if it had been as small as the other; and, on the other hand, the loss from this cause would have been greater in the non-condensing cylinder if its piston had moved at the slower rate, so that their differences in conditions may be considered as neutralizing each other as regards this loss. It is seldom, however, that conditions as nearly alike are subjects of careful tests for economic results. The horse power is measured by the number of Fahr. units of heat per horse power per hour. The cost of the heat, being a question of boiler efficiency, is ignored.

In his remarks after the discussion of the cost of the total horse power, the author says:

"The net horse power, representing the portion of the total horse power developed by the engine that was commercially useful, was obtained for the consumption of 31,707·0685 Fahrenheit units of heat per hour with the condensing engine, and of 32,091·6077 Fahrenheit units with the non-condensing engine; and if a very small allowance be made in favor of the latter for the greater economic vaporization in its boiler per pound of fuel, owing to the slower rate of combustion, the cost of the net horse power in both cases will be equal; showing that a non-condensing engine with an unjacketed cylinder of the experimental dimensions, using saturated steam of 70½ pounds boiler pressure per square inch above the atmosphere, with an expansion of nearly 4⅜ times, gave the same commercial result—that is to say, the same net power for the same quantity of fuel per hour—as a condensing engine with a 2¼ times more capacious unjacketed cylinder using saturated steam of 66½ pounds boiler pressure per square inch above the atmosphere with an expansion of nearly 8 times. Hence, under the experimental conditions, no economy would result from the employment of a condenser and air pump, when the boiler pressure was not less than 70½ pounds per square inch above the atmosphere. If the engine works with a variable load, this must be taken for the lower limit of pressure—not the average pressure—giving equality of economic effect.

"The foregoing results are true for only the precise experimental conditions, and they will be modified by any of the causes which diminish cylinder condensation, as, for example, steam-jacketing the cylinders, superheating the steam, employing larger cylinders, etc.

"It is probable," the author says, "that with boiler pressure of from 95 to 100 pounds per square inch above the atmosphere the non-condensing engine would give the net power with fully as much economy of fuel as the condensing engine using the same steam pressure with the measure of expansion found to produce the greatest economy, even with steam-jacketing, steam-superheating, and cylinders of the largest dimensions in both cases."

This is certainly a matter of great importance in marine economy. The omission of the air pump and its appendages, and the reduction of the size of the engine, thereby relieving the vessel of a permanent deadweight, are worthy of our best efforts. The greater weight of boiler, if any, of the old marine types, rendered necessary by the higher steam pressure, may perhaps balance the mere weight of the omitted air pump itself, while the surface condenser is still needed to supply distilled water for the boiler. In making up an estimate of the economies, the room occupied and the weight carried, not only of the engine, condenser, and pumps, but also of the boilers, the fuel, and the water, in boilers and condensers are to be considered. It is known, however, that in using steam of high pressure, even in heavy condensing engines using high measures of expansion and great cylinder condensation, substantial progress in economy has been realized, and it may be that a still further advance may be made by improving the boiler and reducing the amount of water and fuel carried, as well as by omitting the air pump of the marine engine.

Effects of Lightning on Trees Near a Telegraph Wire.

Some instructive facts in this connection have been brought to light by M. Montigny, in recent examination of poplars bordering part of a road in Belgium between Rochefort and Dinant. The part in question is some 4,600 meters in length, and runs westward; it is level for some distance, then rises gradually to a height of 61 meters, through a wood, traverses a wooded plateau 200 meters in extent, then descends, still through wood, to a plain. A telegraph wire runs near the row of Virginia poplars on the north side, and it appears that, out of nearly 500 poplars forming this row, 81, or a sixth, have been struck by lightning. Hardly any have been struck in the other row. The trunks have been mostly struck on their south side and nearly opposite the wire. Comparing different portions of the road, it is found that in the horizontal part none of the (129) trees show injury from lightning, or at most only one (a doubtful case), but as the road rises through the wood the cases quickly multiply, and on the wooded plateau as many as 9 out of 14 trees, or 64 per cent, have been struck. On the slopes the proportion is 25 per cent.

M. Montigny distinguishes three kinds of injuries: (1) the bark torn and detached on a limited part of the trunk; (2) a furrow, straight or (rarely) spiral, made on the tree, from near the wire, down to the ground; and (3) a peculiar oval wound, with longer axis vertical, and lips colored light brown. Now, the furrows, which are probably due to the most violent discharges, are relatively most frequent on the plateau and on the western slope, which the storms usually reach first. M. Montigny is of opinion that the lightning, while provoked by the wire, does not strike this first, then the tree, but strikes the tree directly. His conception of the process is to the following effect: Suppose a thunder cloud charged with positive electricity. A long telegraph wire under it, though insulated, may acquire as great negative tension in the nearest part as if in direct communication with the ground, and the tension is greater the nearer to the cloud. While the inductive influence affects the wire most, near objects, such as trees, share in the influence according to their conducting power. The lightning, attracted in the direction of the wire, yet does not strike this, the insulating cups presenting an obstacle to its prompt and rapid escape. It finds a better conductor to earth in a neighboring poplar, wet with rain. From the facts indicated it results, that of two similar houses, one built on a plain, the other in a wood, and having a telegraph wire fixed to them, the latter is the more liable to injury by lightning, and the danger is greater if the wood inclosing the house be upon an eminence.

Positive Pictures on Gelatino-Chloride.

Two methods of preparing the chloride emulsion are considered—the first method (without ammonia) yielding pictures which may be bright brown or reddish toned, according to the developer selected; while the same emulsion, if digested for twenty-four hours, can be made to yield pictures having a fine violet-black tone.

The non-ammoniacal emulsion is prepared much after the manner generally adopted for the production of a gelatino-bromide emulsion, the soluble chloride being contained in a warm gelatinous solution, to which the silver nitrate is gradually added, while the mixture is kept in continual agitation. Twenty-five parts of gelatine are dissolved in 200 parts of distilled water, together with 7 parts of sodium chloride, and 6·40 parts of ammonium chloride, it being convenient to allow the gelatine to swell for half an hour before applying heat. The gelatine being dissolved, and the solution at 50° C. (122° F.), a silver nitrate solution containing 15 parts of the salt in 200 parts of water is gradually added with agitation; and it should be noted that it is advisable to warm the silver solution to the same temperature as the gelatinous liquid.

The chloride is deposited, under these circumstances, in a very fine state of division, and the mixture is at once poured out to set, a beaker or drinking glass serving very well as a mould, and external cooling may be resorted to when it is desirable to work expeditiously. The gelatinized emulsion may now be cut into strips by means of a horn spatula or a strip of glass; but if a more perfect state of division is desired, it may be forced, nutmeg grating fashion, through a piece of wire netting. In either case the material is tied up in a piece of muslin, and is suspended in a vessel containing a considerable quantity of water, this being changed five or six times, unless a stream can be kept flowing through the vessel. The washing may occupy a period of six to twenty-four hours, according to the state of division to which the emulsion is reduced, the temperature, the frequency with which the water is changed, and other circumstances. This operation being satisfactorily finished, the emulsion is well drained, and is next melted at a temperature of about 50° C (= 122° F.)

As regards the filtration of the emulsion, fine linen, purified cotton wool, or a special paper which is sold for the purpose at the German photographic stock houses, may be used. The emulsion is now quite ready for use in coating either ordinary glass, opal glass, or paper; but if it is considered desirable to preserve the emulsion in the jelly form any great length of time, it is advisable to add 0·2 part of thymol or phenol to each 100 parts of emulsion, the preservative agent being previously dissolved in 5 to 10 parts of alcohol.

For the dark room, used for the preparation of the chloride emulsion, it is sufficient to provide the ordinary yellow or orange illumination required in working the wet collodion process.—*Photographic News.*

Influence of the Weight of the Air on the Flow of Springs.

In the geological section of the British Association, Mr. Baldwin Latham, M. Inst. C.E., read an interesting paper on the influence of barometric pressure on the discharge of water from springs. He stated that it was alleged by some of the long established millers on the chalk streams that they were able to foretell the appearance of rainfall from a sensible increase in the volume of water flowing down the stream before the period of rainfall. He had therefore undertaken a series of observations to investigate the phenomena, and he found, in setting up gauges on the Bourne flow in the Caterham Valley, near Croydon, in the spring of the present year, and selecting periods when there was no rain to vitiate the results, that whenever there was a rapid fall in the barometer there was a corresponding increase in the volume of water flowing, and with a rise of the barometer there was a diminution in the flow. The fluctuation in the flow of the Croydon Bourne due to barometric pressure had at one period exceeded half a million gallons per day.

The gaugings of deep wells also confirmed those observations; for where there was a large amount of water held by capillarity in the strata above the water line, at that period of the year when the wells became sensitive and the flow from the strata was sluggish, a fall in the barometer coincided with a rise in the water line, and under conditions of high barometric pressure the water line was lowered. Percolating gauges also gave similar evidence, for, after percolation had ceased and the filter was apparently dry, a rapid fall of the barometer occurring, a small quantity of water passed from the percolating gauges. The conclusion he arrived at was that the atmospheric pressure exercises a marked influence upon the escape of water from springs. The increase in the flow of the water was attributed to the expansion and escape of the gases held by the water under low barometric pressure, which caused the water to escape more freely, while with high barometric pressure there was a condensation of the gases, which led to a retardation in the flow.

MISCELLANEOUS INVENTIONS.

Mr. Bat Smith, of Spanish Camp, Texas, has patented an improved composition for preserving wood, consisting of eight parts of coal tar, one part of crude carbolic acid, and three-fourths part of crude pyroligneous acid, mixed and heated, but not permitted to boil. The wood to be treated is placed in a vessel filled with the compound, where it remains until saturated.

Mr. Frank B. Miller, of Enon, Clark County, O., has patented a novel design for a sleigh. A life-size, graceful deer is represented on each side of the sleigh, complete in every respect, from the hoofs to the horns. It is made of of one and one-half inch material, and is beautifully rounded and carved on the outer surface, the legs first being tapered to size of runner. The runners are single bent and are fastened together in front (in addition to a light rod) by two darts or arrows, neatly trimmed with gold and silver paint. The dash, back, and seat are so adjusted as not to mar the general features of the design.

Mr. Edward E. Bishop, of Littleton, N. H., has patented an improved incubator which is simple, economical, and efficient.

An improved chimney-flue brush has been patented by Mr. David C. Greenway, of Abingdon, Va. The object of this invention is the production of a brush by which chimney and other flues may be conveniently and thoroughly swept, and one which is adapted to flues of different sizes.

An improved cultivator has been patented by Mr. Moses S. E. Pittman, of Harlem, Mo. The object of this invention is to facilitate the cultivation of plants and the adjustment of the cultivators to the distance apart of the rows of plants.

Mr. William S. Plummer, of San Jose, Cal., has patented an apparatus for pressing potatoes and other vegetables, and at the same time laying the pressed material upon trays in a convenient form for drying.

Messrs. John Greek and Francis M. Sellman, of Evansville, Ind., have patented an improved expanding rock drill for cutting a recess or cavity at the bottom of a drilled hole in a rock, or a coal or other mine, for the purpose of receiving the charge of powder or other explosive substance used in blasting. The invention consists in a novel combination with a drill rod or holder, of a pair of bits or drills, and the combination therewith of a cone of peculiar construction for expanding the bits or drills.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

TO THE CONSTANT CURRENT CURE COMPANY,
207 Main St., Buffalo, N. Y.

SIRS: Your Constant Current Electric Generator, which I have used for several weeks, has entirely cured me of rheumatism, and has proved extremely beneficial in other ways. With it I have counteracted the debilitating effects of overwork and warm weather, and have been invigorated and imbued with fresh vitality. Three of my friends, to whom I loaned my generator, have each ordered one from you. W. R. WARREN,
45, 47, and 49 William St., N. Y.

For Sale.—A complete set of Patterns, Flasks, and Core Arbors, for making Cast Iron Flanged Pipe, Elbows, Tees, and Greenhouse Fittings. Will be sold low to clean out a branch of a business. Address B, Box 233, New York.

For Sale.—9 in. x 9 in. Propeller Engine and Boiler, Shaft, Wheel, Pipes, etc. W.J.Sanderson, Syracuse, N.Y.

Cheap Engines, Boilers, Pipe, etc., for sale. See adv. of Logan Machine Works on page 268 this issue.

A pair of 15 x 24 Engines, good as new, for sale cheap, as they must be removed. J. C. Todd, 10 Barclay St., N.Y.

Pays well on small investment. - Stereopticons, Magic Lanterns, and Views illustrating every subject for public exhibitions. Lanterns for colleges, Sunday schools, and home amusement. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., N. Y.

Superintendent wanted.—A man competent to superintend a works employing about 300 hands in building machinery and tools, and in manufacturing goods for a regular trade. None but a first-class man in all respects need apply. Address B, Box 2333, New York.

Constant Current Electric Generator. Price, $3. Constant Current Cure Company, 207 Main St., Buffalo, N. Y. Send for circular. See advertisement, p. 253.

Clark & Heald Machine Co. See adv., p. 206.

Ajax Metals for Locomotive Boxes, Journal Bearings, etc. Sold in ingots or castings. See adv., p. 236.

New Comb'd Milling and Gear Cutting Machines, large range. C. A. Condé & Co., Makers, Philadelphia, Pa.

A valuable article on the Treatment of Acute Rheumatism, by Alfred Still, M.D., will be found in SCIENTIFIC AMERICAN SUPPLEMENT, No. 299. Anything from the pen of this eminent and experienced physician is interesting and instructive.

New Method of Graining, etc. J. J. Callow, Cleveland, O.

Foot Lathes, Fret Saws, 6c. 90 pp. E. Brown, Lowell, Mass.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Alden Crushers. Westinghouse Mach. Co., Pittsb'g, 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.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Cope & Maxwell M'f'g Co.'s Pump adv., page 254.

Punching Presses & Shears for Metal-workers, Power Drill Presses $25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N.Y.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

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

Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro. 234 Broadway, New York.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited. Erie, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N.Y.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 206.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 221.

Safety Boilers. See Harrison Boiler Works adv., p. 222.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 221.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 238.

The Sweetland Chuck. See illus. adv., p. 238.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor, Stiles & Co., Riegelsville, N.J.

Skinner's Chuck. Universal, and Eccentric. See p. 236.

For Machinists' Tools, see Whitcomb's adv., p. 238.

The American Electric Co. and Proprietors and Manufacturers of the Thomson Houston System of Electric Lighting of the Arc Style. New Britain, Conn.

See Bentel, Margedant & Co.'s adv., page 254

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Telegraph, Telephone, Elec. Light Supplies. See p. 253.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

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

Gould & Eberhardt's Machinists' Tools. See adv., p. 222.

The Medart Pat. Wrought Rim Pulley. See adv., p. 253.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 254.

Centrifugal Pumps, 100 to 35,000 gals. per min. See p. 253.

Barrel, Key, Hogshead, Stave Mach'y. See adv. p. 254.

Draughtsman's Sensitive Paper. T.H. McCollin, Phila., Pa.

Lathes, Planers, Drills, with modern improvements. The Pratt & Whitney Co., Hartford, Conn.

Catechism of the Locomotive. 625 pages, 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for a catalogue of railroad books. The Railroad Gazette, 73 Broadway, New York.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

Electric Lights.—Thomson Houston System of the Arc type. Estimates given and contracts made. 631 Arch, Phil.

Common Sense Dry Kiln. Adapted to drying all of material where kiln, etc., drying houses are used. See p. 254.

4 to 40 H. P. Steam Engines. See adv. p. 254.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Av., Phil. Pa.

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 this office. Price 10 cents each.

(1) G. E. M. asks: Can you give me a recipe for making black ink that will flow freely, be durable, and brilliant jet black at time of writing? There are plenty of inks that turn black. I want an ink that writes black and stays black. A. Try the following: add to a pint good iron gall ink from ten to fifteen drops of nitric acid, and heat over the water bath until reduced about one-fifth in volume, then add six drachms of pyrogallic acid and half an ounce of neutralized indigo-sulphate (paste). See other receipts for black inks in SUPPLEMENT, No. 157.

(2) A. W. asks: What are the expansive properties of air compared with steam? Suppose a vessel filled with air, say at 30 lb. pressure, we reduce the space occupied by the air to one-half, would the pressure be just doubled, or what would the pressure then be per square inch? A. Air follows the same law as steam. Reducing the volume one-half doubles the pressure within a small fraction, if the temperature remains unchanged. 2. How are air guns made? A. You will find a description of air guns in "Appletons' Dictionary of Machines, etc.," also in "Appletons' Dictionary of Applied Mechanics."

(3) O. R. M. asks: What kind of paper is used in making paper canoes, and how is it cemented together? A. Sheets of stout manila passed through a hot bath of aqueous solution of zinc chloride (at 75° B.), pressed strongly together and then soaked in dilute aqueous soda solution containing a small amount of glycerin, cohere to form a strong, stiff, waterproof board admirably adapted to the construction of small boats. Single sheets of paper passed quickly through the zinc chloride bath, pressed and washed and dried, are waterproof, and may be otherwise joined to form waterproof boards by any suitable cement.

(4) J. M. B. asks: How can I make indelible ink of good quality for marking on linen? A. (1) Add caustic alkali to a saturated aqueous solution of cuprous chloride until no further precipitate forms; allow the precipitate to settle, draw off the supernatant liquid with a siphon, and dissolve the hydrated copper oxide in the smallest possible quantity of ammonia. It may be mixed with about six per cent of gum dextrine for use. Before washing pass a hot iron over the writing. (2) Asphaltum, 1 part; oil of turpentine, 4 parts; dissolve and temper with printer's ink. Best used with a stamp. See other recipes on this page.

(5) G. A. H. inquires how to make a durable whitewash for outbuildings. A. Slake half a bushel good lime in boiling water in a covered vessel, and strain it through a fine sieve; add a peck of salt dissolved in a small quantity of hot water, three pounds of rice boiled with water to a thin paste, one pound of Spanish whiting, one pound of glue softened by soaking in water and then dissolved over a water bath, and five gallons of hot water. Agitate, cover from dust, and allow to stand several days. Apply hot. Slaked lime or hydraulic cement mixed with skimmed milk makes a cheap and durable paint for outdoor work.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

September 20, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Addressing machine, Panton & Holmes..... 247,397
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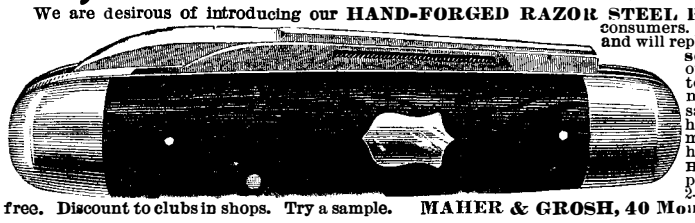

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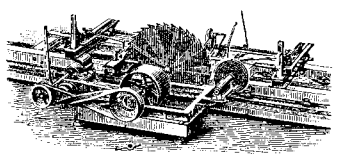

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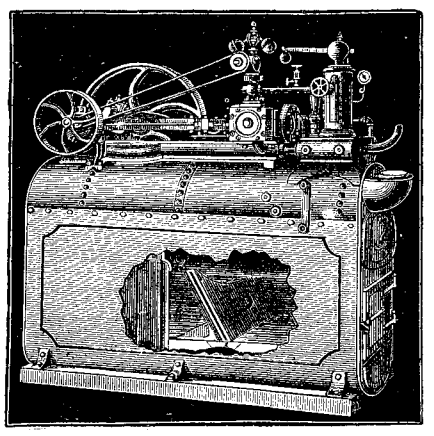

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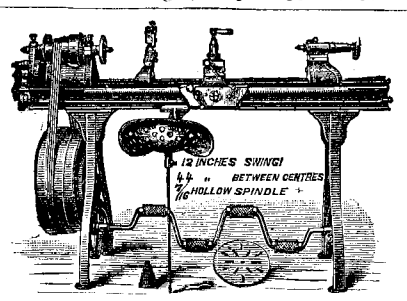

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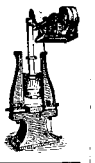

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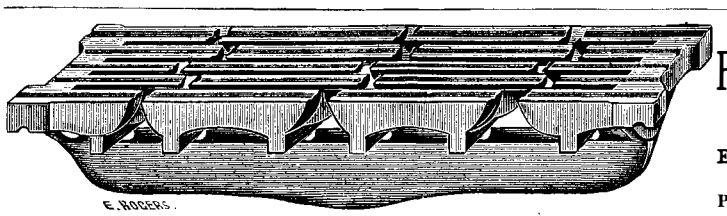

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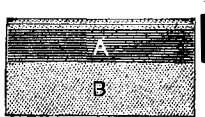

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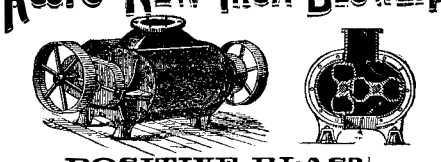

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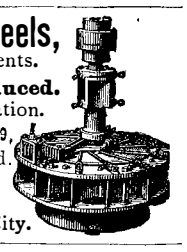

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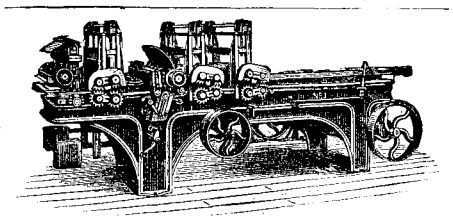

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