SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

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

Vol. LI.—No. 19. [NEW SERIES.] NEW YORK, NOVEMBER 8, 1884. [$3.20 per Annum. [POSTAGE PREPAID.]

THE EDWARD WESTON EXHIBIT AT THE INTERNATIONAL ELECTRICAL EXPOSITION, PHILADELPHIA.

In an exposition where apparatus connected with electric lighting occupied so important a place as it did in Philadelphia, it was meet that one to whom that branch of electric science owes so much should be represented by his work. Few persons save those immediately interested in the subject were aware how important a part Edward Weston had played in the electric lighting field until they examined this exhibit. For Weston, to his credit be it said, has been content to work silently in his Newark laboratory, and leave to others the pleasing duty of announcing from time to time the results of his investigations in the field of applied science. Perhaps no other man has of late years accomplished so much with so little display as Edward Weston; and his work, after standing the test of long and continuous use in the field, has been found to possess even more merit than be claimed for it when first introduced. The Weston exhibit was in the northern part of the main hall, and contained that which at the same time pleased the eye of the casual visitor and attracted the serious attention of the scientist. Facing the thoroughfare on the south, a sheet of water fell upon a mass of crystal rocks, concealed in the crevices of which a score of incandescence lamps lay hid that threw back with undiminished intensity the dazzling glow of similar lamps springing from the lilies and ferns growing upon either bank. Few of the thousands that daily visited the halls of the Exposition had ever seen lights glowing under water before, and the passages about the Weston exhibit were therefore frequently crowded with admiring spectators. Even in the arrangement of this waterfall could the careful and original work of Edward Weston be seen. The fountain in the center of the great hall was a ponderous affair; in fact, an ordinary spouting of water illuminated by electric lights in much the same manner as were those at the Munich and Paris expositions. But the mechanism which controlled the waterfall of the Weston exhibit was contrived with such nicety that, even near by, it looked like a huge mirror, curving outward; for the sheet of water seemed never for an instant to vary in dimensions, and was never broken. Yet seven hundred gallons of water fell every minute, coming from a centrifugal pump which in turn was coupled to a Weston electric motor.

On either side of the waterfall were groups of arc and incandescence lamps of the Weston type, and which have served to make the name of the United States Electric Lighting Company so well and favorably known.

It was a pardonable pride that induced Weston to exhibit these lamps in all the many varieties, for each type has scored a very decided success in the field for which it was designed. The arc lights stood what might be called a competitive examination not long since before the trustees of the Brooklyn Bridge; all the best known arc lamps in use being examined at the same time.

In two long rows they now stretch across the East River from New York to Brooklyn. The Weston incandescence lamps are made both large and small, and, as shown in the exhibit glowing from many-colored globes, are pleasing to the eye, constant, and diffusive. They are improvements on the Maxim type, which heretofore was used by the United States Electric Lighting Company. What is most remarkable about these incandescence lamps is, that they have been shown to have an average life of more than two thousand hours, which, in the dwelling house, where artificial light is required, on an average, five hours per diem the year round, would permit of their being left undisturbed and without renewal for the entire year.

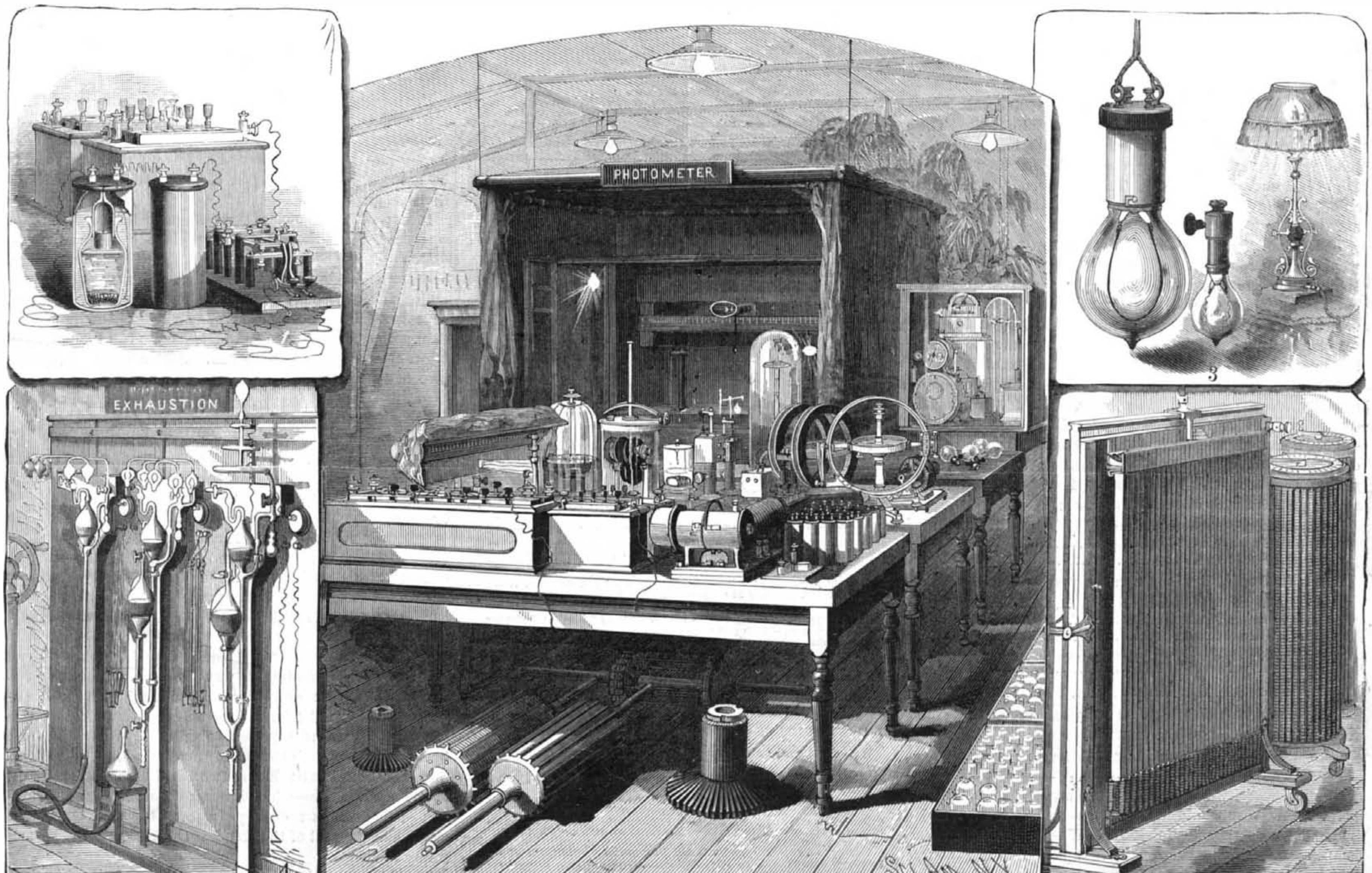
The large incandescence lamps in the exhibit were from 125 to 130 candle power, there being about 16 candle power of intensity in an ordinary five foot gas burner when new, and about eight or ten when long in use. The circuits of these were so arranged that they could be fed at long distances from the generators with the same size conductors as are commonly used in the arc light system. There is by no means so much loss of current while *in transitu* when these large incandescence lights are used as is the case with the smaller lamps, and the lights may, at the same time, be more widely distributed. These, as well as the small incandescence lights, may be used or turned down without in any way affecting the generating machine or the other lights, and a corresponding change is immediately discoverable in the current generated as well as in the power used.

The electric motor, as designed by Weston for use in the shop, was exhibited both at rest and in motion. For the latter exhibit the interior of a shop was shown, the tools being operated by the Weston motor, which ran rapidly, smoothly, and noiselessly. The electrometer, designed by Weston, while not as a whole novel, has interesting features, and is especially fitted for measuring the currents generated by the Weston dynamo. The system of lamp manufacture designed by Weston was practically exhibited from the hydrocarbon process for making the filaments to the treatment of the lamps at the mercury pumps.

One of the most interesting features of the Weston exhibit was what might not inappropriately be called the historical section, wherein were contained the various crude devices and mechanisms, the continued improvement of which finally led to the perfect lamps, switchboards, and like contrivances. The progress made by the inventor may thus be traced step by step, difficulty after difficulty is seen to have been met and mastered, until what seemed but a crude conception, and gave little hope from a practical standpoint, is observed to have gradually been reduced to a simple, smooth working, and efficient apparatus.

That part of the Weston exhibit which was designed to represent his system for central stations naturally attracted much attention. It contained three engines, together having an accumulated capacity of 250 horse power. There was a group of dynamos which fed about 1,500 lamps, scattered throughout the main hall, comprising 65 arc lights, 150 incandescence lights, each of 125 candle power, and 1,275 lamps of 16 candle power.

The circuits from the dynamos and from the ouside lines were all brought to a switchboard, by means of which the dynamos were coupled together as desired. By this any of the outside circuits could be coupled up or coupled to any of the dynamos, and rapidly changed from one battery of dynamos to another; the others meantime not being appreciably affected. By means of the Weston switchboard the



THE EDWARD WESTON EXHIBIT AT THE INTERNATIONAL ELECTRICAL EXPOSITION, PHILADELPHIA.

dynamos could be connected with either of the three engines. The wires leading to the switchboard were carefully protected, as in the large central stations which have been established in New York city and elsewhere by the United States Electric Lighting Company, which, as said before, uses the Weston patents. Any combination can be made by means of this switchboard with any combinations of machines, and by means of cables the circuits are connected with the machines. A plug on either end of the cables serves, the one end to connect with the circuits, the other with the machines. In order to prevent lightning from reaching the dynamos during thunder storms, lightning arresters are affixed to each circuit. From the switchboard the circuits are extended, and so arranged that the lamps may be adjusted to each circuit. It does not injure the outside circuit when these lamps are either placed in position or removed. All the lamps are tested upon the circuit upon which they are to be used before being regularly adjusted on the line.

The types of dynamo machines exhibited for the arc and incandescence systems, as devised by Weston, do not materially differ, save in the winding of the armature and field coils, these being somewhat modified in order to produce the different kinds of currents that are demanded. The current generated by these machines does not pulsate, but, on the contrary, is continuous, which, besides giving a very steady light, is less dangerous than that of the pulsating type.

In the Weston arc lamps exhibited, the arc or distance between the carbons is short, being one thirty-second of an inch in length or thereabouts. There is a palpable advantage in this, for it permits a given number of lamps to be worked with a current the tension of which is correspondingly low.

The large incandescence lamps shown in such profusion in the Weston exhibit were really the only lamps in the Exposition which showed a new and important departure in this type of illumination, although there were those of the smaller description which exhibited marked improvement when considered from an economical standpoint. The big lamp can be used in multiple arc or multiple series at points far removed from the generator.

In the Weston dynamo the current generated has an E. M. F. of 1,500 volts. In the two great incandescence machines exhibited the E. M. F. was shown to be of 160 volts, the small lamp machines having an E. M. F. of 120 volts or thereabouts. The field magnet of the Weston machine resembles the letter C, having the poles in the center; the magnets are wound in shunt circuit, and are oblong in section.

The armature, which revolves between the poles, is composed of a core of iron disks strung like beads upon the shaft, being insulated the one from the other by disks of paper. The type of cylinder thus constructed may be said to be a modification of that employed in the Siemens machine. There are numerous coils, which serve to equalize the current generated, and brass bearings serve to insulate the shaft from the magnet.

In the automatic rheostat exhibited in connection with the arc lights, a magnet wound in shunt circuit attracts an armature connected with ratchet wheels. When, by reason of the turning off of lights, the current shows too great intensity, the armature acts, rotates the wheel, and this leads to more resistance being thrown into the field circuit. The field magnets, as a consequence, exert less magnetism; a smaller current results, and the power which has been driving the machine may be reduced. The resistance is released by an opposite process, and the full power of the shunt circuit may be thrown upon the magnet.

The incandescence system of lighting must be able, if it would be generally employed, to compete with gas in cost. Hence it may not prove uninteresting, having described the Weston incandescence light, to explain what it has accomplished when practically compared in cost with gas by persons having no interest in either the one or the other. A large manufacturing firm of Olneyville, R. I., recently tested two Weston dynamo machines, one of one hundred lights capacity and the other of fifty lights. The test was made during an entire year, from April 15, 1883, to April 15, 1884—3,397 hours, an average of 11 hours each working day; the object being to discover whether incandescence lighting or gas was the cheapest. The following figures were given by the firm as the result of their experience:

Number of lamps in the two circuits....	170
Number of lamps broken in 3,400 hours....	133
Average life of lamps....	2,207 hours.

The cost of operating for the entire year was as follows:

133 lamps broken, at $1.50 each....	$199.50
Cost of power....	500.00
Cost of attendance....	468.00
Cost of brushes, oil, and other supplies....	52.00
Interest, 6 per cent, on $4,100....	246.00
Total....	$1,465.50

They compare this with what they had previously paid for gas as hereunder:

Cost of gas, 170 seven-foot burners, 3,397 hours, 4,042,430 feet of gas, at $2.00 per M....	$8,048.86

In Providence, where they say gas may be had for $1.75 per M., this cost would have been reduced to $7,074.26. This shows, as they say, that their Weston incandescence lamps cost them only one-fourth cent per lamp per hour, which is equivalent to gas at 37 cents per thousand feet.

ACCORDING to the last annual report, the American Association for the Advancement of Science had 2,011 members.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included....	$3 20
One copy, six months postage included....	1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address

MUNN & CO., 361 Broadway, corner of Franklin street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free. on receipt of *seven dollars*. Both papers to one address or different addresses as desired.

The safest way to remit is by draft, postal order, or registered letter. Address MUNN & CO., 361 Broadway, corner of Franklin street, New York.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information: (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 361 Broadway, corner of Franklin street, New York

NEW YORK, SATURDAY, NOVEMBER 8, 1884.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 462,

For the Week ending November 8, 1884.

Price 10 cents. For sale by all newsdealers.

COMPOSITE STEEL AND IRON.

According to the recently published statements of a master railroad car builder, the union of ordinary machinery steel scrap with iron scrap in making a pile for forging into bars is ruinous to the entire work. The bars showed handsomely on the surface, but when broken the fracture showed that the metal was unsound and not homogeneous; the steel and iron had not welded. In some of the bars the flaws were in the form of wide cracks, while in others there were seams completely separating the two metals; true welding had nowhere taken place.

If this result of experiments is to be received as conclusive, working mechanics must have been greatly mistaken in their estimates of machinery and other low steels. The general belief has been that these steels were so scarcely removed from iron that their union by welding was one of the easiest of processes. We find no difficulty in uniting by welding the highest cast steel with iron; all our large cutting implements are so made; and the union of the two is not a mere cementing or gluing together, but is a chemical combination. It is somewhat singular (if it is true) that low steel and iron cannot be thoroughly united under the influence of the welding heat and the compressive action of making a bar from a fagot. Certainly such a union is possible; for in the ordinary scythe there are three equally longitudinal strips of iron, low steel, and crucible steel, and it would be difficult to find cracks or seams in any one of the thousands of scythe blades turned out every week from the factories of Western Connecticut. The report of the master car builder was probably based upon imperfectly recorded experiments.

USES OF GAS PIPE.

The machine shop is a great user up of "unconsidered trifles"—at least the job shop is. There was a shrewd job shop machinist in an Eastern city who procured a large portion of his stock at the junk shops or the sale of the results of fires. Gas pipe, shafting, iron plates, rods, bars, and all sorts of metallic fixtures found a congenial home in his shop. Gas pipe he doted on. From pipe he fashioned a number of articles which otherwise would have been made of the solid bar.

Gas pipe of convenient diameters was cut off in the lathe to lengths, plugged at one end with iron, and at the other end with iron and steel, and welded and finished into barrels for ratchet drills. The iron plug was drilled and tapped to receive the screw of the drill, and the iron plug with a steel center became the conical top of the barrel. The barrel thus made was sufficiently strong, was much lighter than one made from solid iron, and cheaper.

A very particular workman at the lathe, who prided himself on his skill with the hand tool, made a set of handles for his turning tools from gas pipe. He cut off the pipe to length; heated and drew it near the end by means of "fuller" and the anvil horn; turned and polished it; filled it half full or more of plaster of Paris; then put the shank of a tool in the handle, and poured melted lead around it. The tool could be readily removed, and the lead held the shank or tang of another tool just as closely as the first.

For bolting work to a chuck on lathe or drill, or securing it to a planer or boring machine, long washers—tubes—are frequently required. If thin washers are used, it is almost impossible to get a hold on a pile of twenty or more so as to be secure. Varying lengths of gas pipe do the business thoroughly.

It is possible to make very effective hollow shafts for some small machines from piping; there is generally stock left enough after turning and finishing to secure a pulley, or other wheel, by set screw or key; or in some cases the pulley, if of iron, may be shrunk on.

For truing the grindstone there is no better hand implement than a piece of gas pipe from half inch to full inch, according to the fancy of the workman. Such a razer will always present a cutting edge.

DRILLING AND BORING WOOD.

The hand drill or breast drill, originally intended for the hand drilling of metals, has taken its place among woodworking tools. In many instances it has displaced the bit-brace, or at least has filled a requirement left unsatisfactorily supplied by the bit-brace. The breast drill may be used for drill, gimlet, or bit, and its speed—on the best forms—may be changed at will without a change of speed of the hand. It has its advantage, also, in the more natural motion of the hand—the vertical crank movement instead of the horizontal crank motion. A drilled hole in wood, for whatever purpose, is better than a bored hole. The drill cuts a clean hole; not merely finding its way between the fibers by displacing them, but removing the material entire as it advances. The gimlet form of wood borer is crude at best; a thread at the end is supposed to enter the solid wood, and by spiral friction pull the cutting portion after it. This cutting portion is a twist like a twist drill or auger, supposed to deliver the chips—which it never does deliver. The pressure of the hand is necessary to force the gimlet into the wood, and the pull of the hand is required to release it and empty the chips.

The drill cuts a clean hole, and has none of the objections of the gimlet. Unlike the gimlet, it may be resharpened so long as it lasts. Its speed in the breast drill is very much greater than that of the gimlet in the bit-brace.

EMPLOYER AND EMPLOYED.

The garrulous proprietor of a jobbing "variety" shop, in rehearsing some reminiscences of his earlier shop days, related six personal anecdotes, every one of which turned on his smartness in circumventing or in "showing up" the ignorance of his boss or foreman. This old time sentiment of opposition between employer and employed is not yet extinct, and it finds expression not only in the conversation of the workmen, but frequently in the manner in which they do their work.

Some workmen resent, as an unwarranted interference, any suggestion from the employer or the manager as to how a job should be done. Assuming that they "know their business" and have "learned their trade," they receive any direction or expression of preference of method from the employer as a meddling interference. It may be said that employers sometimes direct from their ignorance instead of guiding from their absolute knowledge; but that is no valid excuse for slighting or spoiling a job. A respectful explanation will generally serve to convince the employer of his error.

With many employes the maxim, "Obey orders if you break owners," is an actual rule of work. There never was a precept more baneful to the workman's moral character nor more harmful to the employer's interest. Expensive work has been ruined by its observance Some years ago a prominent Eastern shop had an order for some experimental machinery. Among other parts were some forgings of an oblong square form with a projecting stud at the center of one end. From this stud, which was to be turned and threaded, the flat portion was suspended and worked —a reciprocating movement.

The flat portion was to be planed and finished to exact gauge. It would be evident to any first class mechanic, who had the drawings before him, that the turned and threaded stud was the true center and initial point of the work. So thought the competent mechanic who had the job allotted to him; and he began at that portion, when the foreman came and told him that the flat portion should first be planed. The workman knew better, but he believed in the "obey and break" adage, and ruined two of the costly forgings before he was corrected. In this case it was plainly the workman's duty to have suggested and explained; if he had not been listened to, the fault would have been entirely that of the foreman. A foreman cannot often be found who carries in his head all the combined shop wisdom; and, unless he is one who believes that he is the wonderful exception, he will listen to common sense instruction even from a journeyman.

This spirit of opposition of interests, which sometimes develops into antagonism of feeling, probably has something to do with the strikes which occasionally work trouble for both employer and employed. In establishments where workmen's suggestions are heard, and heeded if valuable, strikes are not frequent. Many a prosperous establishment may be recalled where unity of purpose and fellowship of feeling is the rule and tendency of the management. To associate the idea of strikes with such establishments would seem absurd.

CAST IRON CUTLERY.

This title may appear anomalous, but cast iron cutlery of certain forms is far more common than its purchasers generally imagine. And it is not necessarily of a poor quality, although made of nothing but cast iron. In the writer's family is a pair of scissors of cast iron that has been used for three years, and has been several times sharpened. The writer has shaved with a cast iron razor, which did excellent work for months. There are in Connecticut two quite extensive establishments which reckon cast iron cutlery as among the important products of their work.

This allusion to cast iron shears and scissors does not refer to the combined cast iron and steel articles which are usually considered superior to the forged ones. These have a steel inner plate cemented on each blade by the fused iron when it is poured into the mould; but the cast iron shears and scissors are wholly and entirely of cast iron, and they are finished for the market precisely as they come from the mould.

The quality of the iron used is the same or similar to that used in casting for malleable iron, and for cutlery it is cast in chills. When broken, the crystallization is very similar to that of hardened cast steel, and, except for lack of elasticity, it serves the same general purposes. But although this cast iron is not adapted to tools which work by blows, it is sometimes made into ice picks and axes, hatchets, and steak choppers. The manufacturers of cast iron shears and scissors make no secret of the material, and sell their goods for just what they are. Of course they are sold cheaper than forged work of steel can be sold. Retailers, also, know that this cheap cutlery is not steel, and usually—unless dishonest—they will answer truthfully questions on the subject. But, really, a pair of cast iron shears or scissors for ordinary household work is just as good as one of forged cast steel. There is only one difficulty in the way of superseding cast steel forgings by cast iron castings in these implements, which is that the chill that makes the iron hard does not always extend to a depth that will allow of repeated grindings and resharpenings, the material crumbling before it can be brought to an edge. But when first ground and edged, the shears are as keen as those of tempered cast steel, and the blades retain their edges longer.

A New Anæsthetic.

A new and what promises to be a most important discovery to the medical profession was recently made through pure accident by a German student, who had occasion to experiment with hydrochlorate of cocoaine. Getting some by accident in his eye, he was amazed to find that it caused the surface to become insensible to all feeling. A few days since this anæsthetic was tried by a prominent oculist of this city, who had occasion to perform an operation for the removal of a cataract from a woman's eye, and with the greatest success.

Her eyelids were held wide open, and four drops of the liquid were cautiously dropped upon the surface of the eyes. It produced a slight anæsthetic effect upon the external coating. After an interval of five minutes, four drops more were applied, which caused the insensible condition to extend deeper, and after waiting another five minutes four drops more used. After the last application had done its work, the sensation of the eyes was tested, and they were found to be so entirely anæsthetized that the very severe and otherwise painful operation was performed without the slightest pain to the patient. Hydrochlorate of cocaine is the active principle of cocoa, and cannot be had in this country as yet.

An anæsthetic that would render a particular part of the human body without sensation, and avoid the necessity of using chloroform or ether, has long been sought, and this new discovery will be thoroughly tested and experimented with, in the hope that it may be found to have an effect upon other portions of the body than the eye.

The Railroad Warfare.

For some weeks past there has raged a fierce contest between the New York Central and West Shore railroads. The reduction of passenger rates on one line is followed by lower rates on the other, until persons can travel long distances at very small cost over either road. The *Railroad Gazette*, referring to this fierce competition, discusses the economic question of the contest very sensibly. The managers of both roads, says the writer, are bound to do the best possible for the proprietors of the railroads committed to their charge. If the New York Central could prevent the West Shore from ever making a dollar of profit, without loss to itself, it would be justified in doing so; if it can make it so valueless that it can buy it cheap for the benefit of its own proprietors, it is justified in doing that. It owes the West Shore absolutely nothing; its conduct toward it should be guided by the ultimate effect on the income of the New York Central Company. When the West Shore built its road by the side of the New York Central, it took the risk which every new business takes of being ruined by its competitors.

And so with the West Shore. If by any effort of theirs its managers could divert every dollar of profit from the New York Central treasury to their own, they would be bound to do it. As railroad companies are established and managed under our laws, none possesses any rights in traffic or profits against rivals. Each is liable to fight for its existence, and the contests can be judged only by the rules of war in uncivilized communities. The tribe that first occupies a fertile valley owns it just so long as it can outfight every intruder; and, burdened by its very wealth and the care of women and children, a rich and powerful tribe may have to yield part or the whole of its domain to a poverty-stricken band of desperate adventurers who have nothing but their lives to lose, and are reckless of them.

Curiously like war are such contests between railroads. Maneuvers are successful in proportion to the amount of damage they do to the enemy compared with our own loss. The company which is in position to make rates so low as to ruin the value of a traffic at a place where its business amounts to $10,000 a year and its rival's to $100,000, has an enfilading fire on its enemy. The one with a large income and light fixed charges can endure great losses and hold out long, like a wealthy and populous nation.

The Value of Vaccination.

That there are still intelligent people who oppose vaccination, and strive to make it appear that it is not only useless but injurious, need surprise no one acquainted with the vagaries of the human mind. For such persons, testimony is of no avail. They are not capable of seeing the conclusions of a logical train of reasoning. Facts to them are inferior in power to prejudices.

Yet there are facts which now and then are brought to one's notice, so startling in their native hideousness that it seems wrong to pass them over in silence. If it is only as a matter of medical statistics, we must print a reference to a letter from Dr. Neve, of the Mission Hospital in Cashmere, which has appeared in the *Civil and Military Gazette of Lahore:* "Thanks to the exertions of the English authorities, vaccination has been carried to some extent in that portion of India ruled by us; but in Cashmere the state of things in an entirely unprotected country was to be seen." Dr. Neve says it would be nearer the truth to say that the population is annihilated than to say that it is decimated by the scourge of smallpox. Smallpox is endemic in every village and town of Cashmere. "I recently obtained from all my hospital staff a statement of the mortality of smallpox among their immediate relatives They represent twenty-five families, and in these 190 members were born, of whom exactly 100 died of smallpox. Two or three children have not yet been attacked; all others have had the disease." Thus, of these 190 persons, at least 95 per cent had been attacked by smallpox, and of those 65 per cent succumbed. "There is not much room for hoping," Dr. Neve says, "that these figures indicate any very unusual rate of mortality, and, of course, the evils inflicted by the disease are lifelong in many who survive the attack."

Such is the condition of things in a country where vaccination is not practiced, and such it was here before the discovery of Jenner. So it would be again were the crazy notions of the anti-vaccinationists to prevail—which, however, we do not greatly fear. The world may be old, but it is not that senile.—*Med. and Surg Reporter.*

The Vulcanization of Rubber.

For vulcanizing India rubber there is generally employed a bath of sulphur and steam under pressure. Messrs. De la Tour du Breuil Brothers have conceived the idea of substituting therefor a concentrated solution of calcium chloride capable of furnishing a constant temperature of from 150 to 160 degrees. The advantages of this substitution are very important, and may be summed up as follows:

1. There is no modification required in the present apparatus existing in factories.

2. The iron plate vats, not being exposed to burning, last much longer.

3. The capital invested in the bath is insignificant compared with that required by the sulphur bath. Sulphur, in fact, costs in Paris about 200 francs per ton, while calcium chloride is but 80 francs.

4. The daily consumption of the chloride, when the bath has once been prepared, is almost nothing, since this salt is fixed and indecomposable, while with sulphur there is a continual consumption, on account of its volatilization and accidental combustion.

5. As a consequence of the suppression of the vapors of sulphur and sulphurous acid in the works, the manufacture has no bad influence upon the health of the workmen.

6. There is no danger of fire, and consequently the insurance rates are lower.

7. The apparatus lasts longer, since the iron employed for locking the moulds no longer has sulphur to combine with and make it brittle.

8. The consumption of fuel is greatly reduced (say about two-thirds), since the bath has a powerful calorific capacity, and the vats may be heated by an open fire.

9. Finally, as the boiling is much gentler and more regular, it gives products of superior quality, and little or no waste, on account of the facility that exists of always keeping the bath at a temperature of between 150 and 155 deg. —*Chronique Industrielle.*

The Art of Seeing.

In everyday life it is much more important to be an accurate observer than a mere book learner. I have frequently seen the latter made to blush for her deficiencies by the most unlearned, says a correspondent in an English contemporary, for in a contest between eyes and no eyes, eyes have generally got the best of it. Nature has given us such an inexhaustible store of interest that those who go through life without "seeing" lose much of the zest of it. The savage, who necessarily depends upon his keen eye and quick ear, cultivates those faculties in an extraordinary degree; for does he not see indications and hear sounds which to an unpracticed observer would be utterly unintelligible? So also with all persons who live near the heart of nature. The English shepherd, while perhaps ignorant of the very formation of the alphabet, stores up a fund of interesting knowledge, derived entirely from observation.

He can give you simple, interesting astronomical facts which might astonish a scientist, as well as trustworthy information on natural history and even botany. His pursuits lead him to study nature in all its varied phases; it is in this way that he can tell you that the arrival of the swallow may be expected on the 11th of April, and not later than the 14th. He will tell you the best time for noticing the flight of birds, and that nearly every bird has a different manner of flying, and that each has wings adapted to its different habits; for instance, those like the swallow, who catch their food while in the air, have long, pointed wings, while rounded, short wings are only for birds who have slow and short flight. He will also tell you how the tiny pimpernel warns him to house his lambs by closing tightly its petals on the slightest indication of rain; and thousands of other simple facts which to a student of nature are most interesting.

Thus, one may possess everything in the way of scholarship, but if he or she have that alone, those who are unlearned but observing will often make them feel very small. I would, therefore, urge my readers to cultivate the art of seeing or observing; there is nothing like seeing things for ourselves. Our ideas become fresher, more natural, and more in unison with latter day tastes when they are formed from observation. Nature's book is the one wherein we find the richest, the most varied, and the most inexhaustible subjects for thought. Whole pages of lessons may be learned from the very stones we walk on, and the most insignificant of God's creation possesses an interest unknown to those who go through life without "seeing."

LEMONADE FOR DIARRHŒA.—Dr. Vigouroux recommends a glass of hot lemonade, every half hour or less as indicated, in diarrhœa. It certainly is pleasant, and is stated to be effectual.—*Med. Bulletin.*

RETENONING MACHINE.

The upper part of the bed of the device, which is secured to the bench, is grooved longitudinally, one side being stepped, as shown in the cross section, Fig. 3. This groove forms a "way" for the plane, which fits in it, and which has a bit and marker like the ordinary rabbet plane. Passing transversely through the bed are one or more rectangular openings having guides on either side, as indicated in Fig. 4, which also shows the spoke in position. Tenon gauges (Fig. 3), having lugs fitting in the guides, have a vertical movement in the holes, and are for the purpose of adjusting the amount of material to be cut from the tenon on the spoke. The rear end of the bed is recessed sufficiently (Fig. 2) to allow the introduction of an inclined guide with a vertical adjusting screw. This arrangement is for the purpose of supporting a spoke while the ends and sides of the tenon are being beveled, so that it will easily enter a mortise. This work is done with the same plane that cuts the tenons. The tenon gauge plates may be of any thickness, or may be of several thicknesses to accompany each machine. When it is desirable to tenon an unfinished spoke, it is put in one of the openings in the bed and the gauge raised until the spoke is above the surface of the groove, and the plane being advanced a shaving is taken from it. It is then turned over, the gauge set, and a shaving taken off, the operation being repeated till the tenon is formed. The same operation is required to retenon a spoke. After the tenon is formed, the edges are beveled as above described.

This useful machine has been recently patented by Mr. John B. Simpson, of Poplar Creek, Miss.

Paper Negatives.

At a recent meeting of the London and Provincial Photographic Association Mr. W. Turner gave the following as his method of making paper negatives: The picture or drawing to be copied is made translucent by means of lard diluted with turpentine—one part of lard to three of turpentine. The mixture was then boiled for three minutes, which he claimed killed the grease, and it was then rubbed over the drawing. When surface dry the drawing was placed in a printing frame with sensitized silver paper, and a negative made, which was fixed in an old hypo bath rich in silver, and washed in the usual way.

The plain paper was prepared by floating Saxe paper on the following:

Sodium chloride	200 grs.
Gelatine	30 grs.
Water	20 oz.

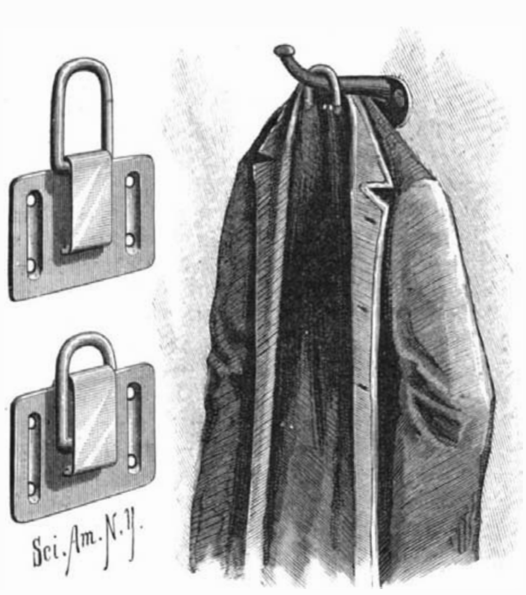
Dissolve the gelatine and chloride separately, and mix; float three minutes. When dry, sensitize by floating one or two minutes on the following:

Silver nitrate	1 oz.
Citric acid	1 drachm.
Water	14 oz.

He stated that the paper would keep good for six weeks.

LOOP FOR HANGING GARMENTS.

In each end of a plate of light sheet metal, made of suitable length and breadth according to the size and weight of the garment to which it is to be applied, are formed two holes through which the plate is sewed on. Upon the up-



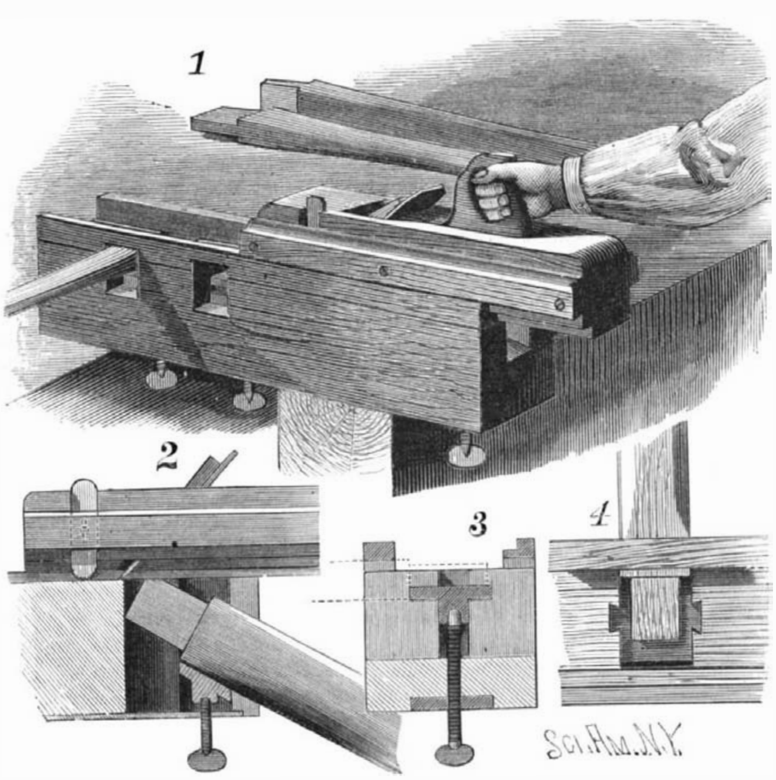
HARRIS' LOOP FOR HANGING GARMENTS.

per edge of the plate is formed the end of a narrow tongue, which is bent over the plate so as to form a keeper to receive the ring. The plate is designed to be placed between the body and lining of the garment, the upper part of the ring projecting so that it can be readily drawn out and passed over a hook or nail. When not in use, the ring is pushed down in the keeper.

This invention has been patented by Mr. William E. Harris, of 414 East 117th Street, New York city.

The New Cunard Steamship.*

The launching of the Umbria and the Etruria, the two vessels which have recently been added to the fleet of the Cunard Company, marks a considerable advance in shipbuilding. It is not long ago that the mere voyage to and from New York occupied from twenty to twenty-four days in its performance, so that a visit to our American cousins could not be undertaken in a holiday which did not at least extend over a month. But latterly the journey from one side of the Atlantic to the other has been made in many cases under seven days, and the Oregon, the Alaska, the City of Rome, the Servia, and the America have all at one time or the other performed this feat.



SIMPSON'S RETENONING MACHINE.

On Saturday, September 21, the Etruria was launched, and at the lunch which followed it Mr. Pearce, of the firm of Messrs. John Elder & Company, the builders of the vessel, described it and its sister ship, the Umbria, as the most powerful vessels in the world, and prophesied that the records of the Oregon and the other vessels named above would have to give way to those of the new Cunard liners, as he confidently anticipated they would perform the journey in six days. Neither is he disposed to think that six days is the limit, but looks forward to the time when he will be able to build a vessel that should undertake the passage in five days. He thinks that it is a mistake to carry cargo and passengers on the same boat, and advocates the separation of the two branches of traffic, a suggestion which if adopted would almost revolutionize the Atlantic traffic.

At the same time Mr. John Burns, of the Cunard Company, contrasted the first steamer of their fleet with these latest additions, and showed how great the progress during the interval between their being built had been. The Britannia, he says, was considered a wonderful ship forty-five years ago, although she was not half the length of the Umbria and Etruria, being only 207 feet long as compared with 520 feet; her tonnage was 1,155 tons against 8,000 tons possessed by the new vessels, and her horse power was 1,155, that of the Etruria being 12,500, while she never went faster than 8½ knots an hour, whereas it is confidently anticipated that the new Cunarders will go from 18 to 19 knots an hour.

A few words respecting the dimensions, etc., of the Etruria may be interesting to our readers. She is 520 feet long, 57 feet 3 inches broad, 41 feet deep, with a gross tonnage of 8 000 tons, and is a five decker. The promenade deck, which is to be reserved for the use of first class passengers, extends for nearly 300 feet amidships, the full breadth of the ship. On this deck there is a large teak deck house, inclosing the entrances to the saloon, ladies' saloon, captain's room, and chart room; above this is placed the officers' lookout bridge and house for the steersman; and over this is the flying bridge. The extremities of the upper deck are protected aft by a turtle back 75 feet long, which covers the wheel house and hospitals, and forward by a large top-gallant forecastle, extending 110 feet aft from the stem, having below accommodation for petty officers, ice rooms, store rooms, and other conveniences. The music saloon, smoking saloon, several large family state rooms, kitchen, bakeries, sculleries, and other offices, together with the accommodation for the officers and engineers, are situated on the upper deck, and are chiefly contained in a large central deck house 275 long by 32 feet broad.

The smoking saloon is 35 feet long by 32 feet broad, and handsomely fitted up in hard wood. The dining room, 76 feet long, the full width of the vessel, and 9 feet high, is arranged to seat a large number of passengers. The vessel is built to accommodate 720 first class passengers, and the state rooms are fitted up in the most luxurious manner. The lower deck state rooms are made so as to be easily removed and the space utilized for steerage passengers, troops, or cargo. The electric light on the incandescent principle is used throughout the vessel.

The Etruria will be fitted with three steel masts, full bark rigged, in accordance with the style generally adopted by the vessels of the Cunard line, and will carry 12 lifeboats. Steam steering gear is fitted up, but as an additional precaution hand steering gear is also provided. A large steam windlass is placed under the top-gallant forecastle for working the anchors, and five steam winches are fitted at the hatchways for loading and discharging cargo. She is divided into ten watertight compartments, and any compartment may be isolated. She will be entered in the Admiralty list, and rank as a transport of the highest class, being specially designed so as to be adapted for service as a mercantile auxiliary in time of war. The engines, supplied by Messrs. Elder & Company, are of the compound inverted vertical surface condensing type, with three cylinders, one of which is 71 inches in diameter, and two 105 inches, with a stroke of 6 feet. Steam is supplied by 9 circular steel boilers, having in all 72 furnaces, and a working pressure of 110 pounds per square inch. The engines will indicate 12,500 horse power.

* The *Mechanical World* (London).

The Motor Power of the Human Body.

Dr. Marey, of Paris, read a paper on this subject at the International Congress of Hygiene, in which he described the ingenious manner in which he had succeeded in measuring the motive power of the human body in its every movement. Planks, with India rubber coils underneath, recorded, by expelling the air they contained, the exact pressure of the foot. The motions were measured; and photographs, taken in one-thousandth of a second, recorded every attitude during a leap, and where and when the effort was greatest. By such studies, M. Marey had been able to prove that something was gained in the power of walking in quickening the step from forty to seventy-five steps per minute. But the latter figure was the extreme limit; with a greater number of steps power would only be lost instead of gained.

CHARGER FOR LOADING REVOLVERS.

The ring for the shell of the charger is of thin sheet metal, pasteboard, or other material, is about as wide as the length of a cartridge, and about as large in diameter as the diameter of the cylinder of the revolver. One end is formed with an inwardly projecting flange, and the other end flares outward. At one side is an open space about as wide as the lever of the revolver, Fig. 2, the sides of which are connected by a clasp hook. Together with this case is a core piece formed as shown in Figs. 3 and 4. After placing the cartridges in the charger the ends of the ring are hooked together by the clasp, which springs the flanged sides of the ring together a little to prevent the escape of the cartridges in case the charger should be inverted. The charger thus loaded is presented to the open end of the cylinder of the revolver, as shown in Fig. 1, so that the flaring end passes down over the cylinder, the ring being placed with the opening in range with the lever of the revolver. The flange on the ring then pushes the cartridges into the cylinder; the core, being stopped by the cylinder, drops out. The clasp hook is pushed from the hooks by the end of the lever, so as to permit the case to be pushed far enough on to the cylinder to push the

MUNCH'S CHARGER FOR LOADING REVOLVERS.

cartridges home in the chambers. The case is then pulled off, and is ready to be refilled. This charger will be found very useful in economizing time by being charged beforehand, in order that all the cartridges can be placed in the revolver at once; and it will prove especially convenient in cold weather, when it is difficult to handle a single cartridge with fingers stiffened by cold.

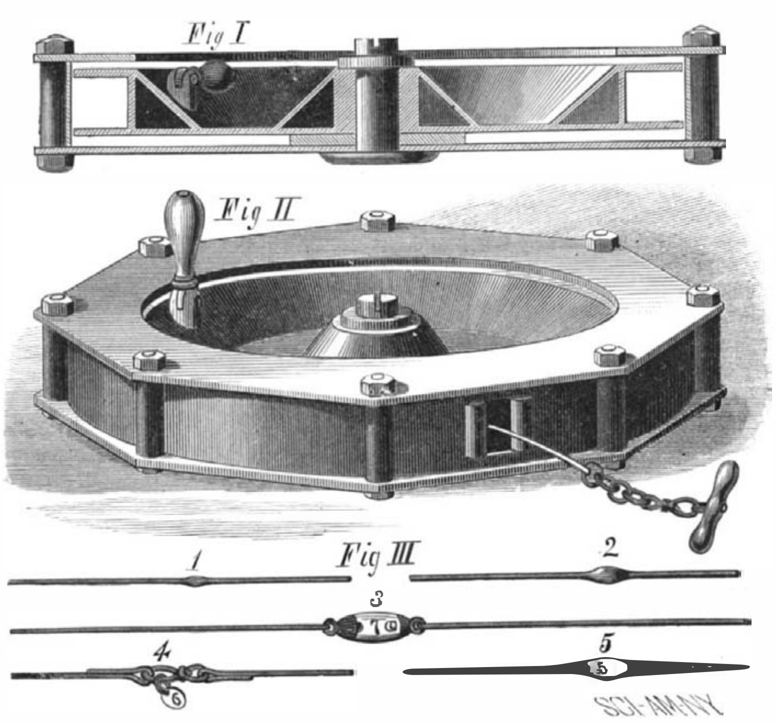
This invention has been patented by John H. Munch, Sergeant Troop C, 8th Cavalry, San Antonio, Texas.

WIRE MEASURING DEVICE.

The engraving shows a wire measuring device for surveying and other purposes, recently patented by Mr. Alfred Atkins, of Wanganui, New Zealand. Figs. I. and II. show very clearly the form and construction of the reel. Between the head of the screw and the spindle is inserted a washer, which rests upon the upper edge of a bearing fixed to the wheel. The spindle is fixed to the back of the frame, which is separated from the wheel by a leather washer. Upon the periphery of the wheel is formed a groove, in which the wire is wound. The reel is provided with a jointed handle, and is placed in a case or frame, in one side of which is a large circular aperture as shown in Fig. II.

The wire is fractionally divided, thereby dispensing with a separate tape or measure for giving the fractional parts, and is composed of several sections, which are united by swivels to prevent kinking. The swivel may be formed as shown at 4, Fig. III., and furnished with a tally to indicate the distance; or it may be made as shown at 3, in which the number is cut upon the flat portion in the center. The smallest divisions —say links—are formed by a very small swelling, shown at 1; those for the next larger divisions—say five links—by a larger swelling of the same form, as at 2; and those for the next larger divisions—say ten links—by a slightly larger but flattened swelling with the number cut upon it, as at 5. When considered necessary, a spring swivel can be attached to the inner end of the wire next to the reel, to be used when any distance is to be measured with extreme accuracy.

By inserting swivel joints in the wire at regular intervals all danger of kinking and breaking is obviated; and as the marks separating the several divisions are easily and quickly perceived, distances—as in surveying—can be measured rapidly and with almost no chance for error.



ATKINS' WIRE MEASURING DEVICE.

Change of Plumage in the Wild Duck.

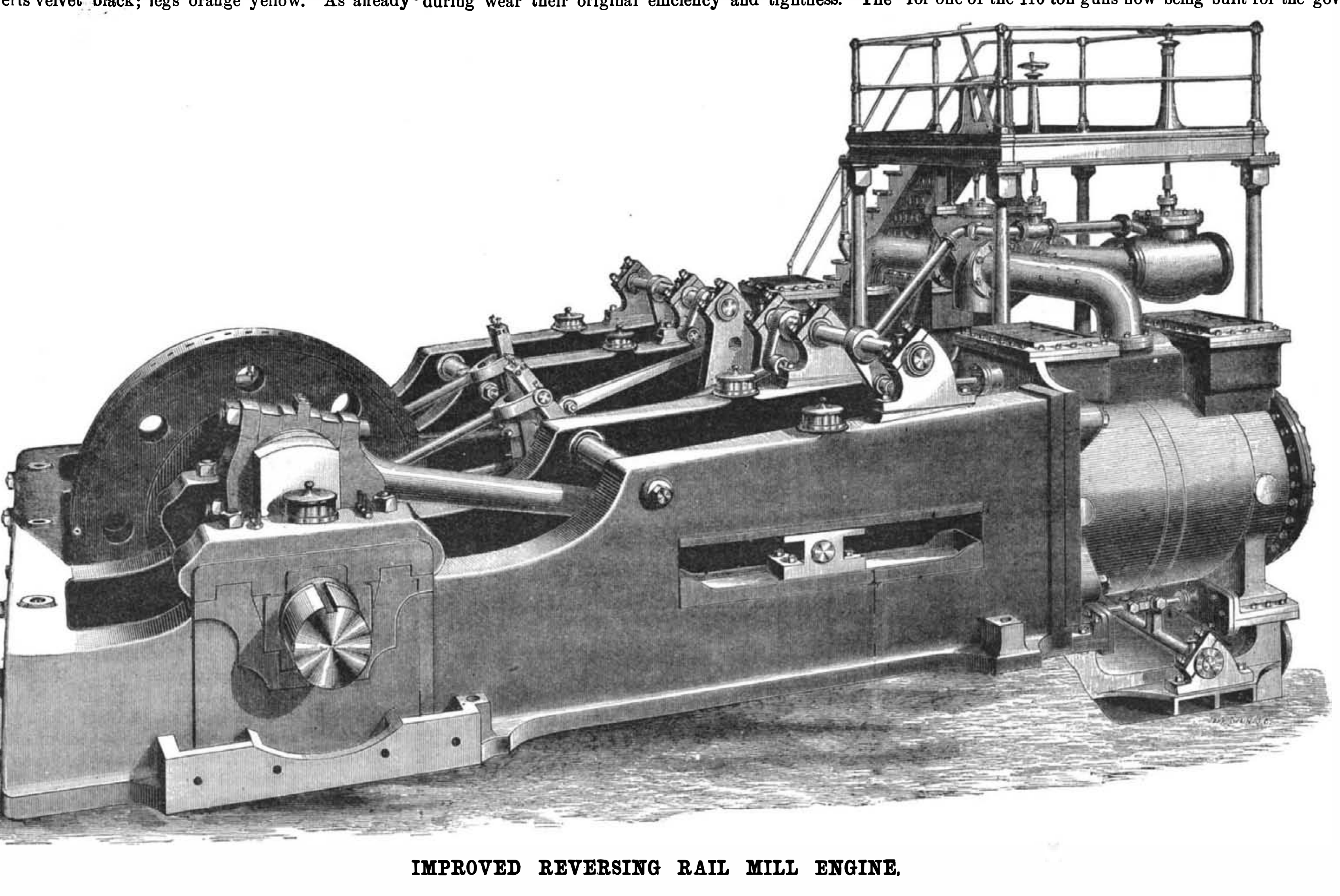
The drake leaves his mate, says a writer in *Familiar Wild Birds*, as she commences to hatch, and then undergoes, in common with many other male birds of the duck family, one of the strangest transformations known to naturalists. The plumage of the drake is, up to this time, exceedingly handsome. The bill is yellowish green; the irides hazel; the head and upper part of the neck a rich glossy green, with a ring of white; the lower part of the neck and the back a grayish chestnut-brown; the rump and upper tail-coverts bluish-black; the middle tail feathers velvet black, and curled upward; front and sides of the neck rich dark chestnut; breast, belly, vent, grayish-white; under tail-coverts velvet black; legs orange yellow. As already mentioned, a wonderful change takes place in the appearance of the drake at the time of breeding. First, the back and breast change color, then the curled feathers are lost, the splendid plumage of the head and neck becomes dull and gray, and about the first week in July all the handsome markings have disappeared, and the bird has assumed the dull brown color of the female.

An Invention Wanted.

A correspondent suggests that a simple and cheap device for registering the distance traversed by a bicycle or other wheeled vehicle would be an invention of which great numbers could be sold. Here is a chance for some ingenious individual to rack his brain.

REVERSING RAIL MILL ENGINES.

The accompanying engraving represents a pair of high pressure rail finishing engines recently erected by W. and J. Galloway & Sons, Manchester, for which we are indebted to the *Engineer*. The pair of engines has cylinders 50 inches bore, and a stroke of 4 feet 6 inches, the pistons being unusually deep, to dispense with back slides. The crank shaft is of the double sweep description, with journals 18 inches diameter, the crank pin being of the same diameter by 15 inches long. As will be seen from the engraving, the framing is of most substantial character, and one of the principal features in connection with these engines is the arrangement of the steam admission and exhaust valves, which consist of simple flat plates, which are found in practice to maintain during wear their original efficiency and tightness. The exhaust valves being placed underneath the cylinders, enable any water that may pass into the cylinders to be discharged freely, without the necessity for special relief valves. The engines are fitted with link motion of the Allen type; the reversing is effected by a steam cylinder, the piston being suitably cushioned, and actuated from the stage where the driver stands.



IMPROVED REVERSING RAIL MILL ENGINE.

Disinfecting the Sputa of Phthisis.

Dr. J. Sormani, Professor of Hygiene at the University of Pavia, gave some interesting details at the Hygienic Congress of the Hague concerning experiments made this year on 150 Guinea pigs with the sputa from phthisis. The object in each case was to ascertain what chemical or other methods would neutralize the bacillus which, it was previously ascertained, existed in large numbers in the sputa. The results of these experiments were summarized in the following manner: 1. The bacilli of tubercolosis were generally very difficult to destroy; dryness, exposure to oxygen, putrefaction, and most disinfectants failed to produce any effect. 2. A temperature of 100° C. only killed the bacilli after at least five minutes of ebullition. 3. The artificial digestion of bacilli showed that they were the last of all living organisms to be destroyed by the gastric juices or chloridic acid. A very active digestion is necessary to kill this microbe. A healthy man may destroy the bacilli in his stomach, but an infant or an adult with his digestive faculties impaired would easily allow the germ to pass the stomach intact, and retain its virulence in the intestinal tube. This determined enteric ulcerations, etc. 4. The bacillus of tuberculosis can be preserved intact for a whole year when mixed with water. It is probable, though not proved, that it has retained its virulence during that time. Thus drinking water may become the means of propagating tuberculosis. It is probable that contaminated linen retains its virulence for five or six months. 5. Alcohol does not destroy the germ, and hard drinkers often suffer from tuberculosis. 6. Cod liver oil, ozone, oxygenated preparations, and other similar remedies have no effect in killing the bacillus, nor are benzoate of soda, salicylate of soda, sulphate of zinc, and carbolic acid, iodide of silver, bromide, camphor, etc., of much greater use. They injure, perhaps, but do not absolutely destroy, the bacillus, at least not in the doses that can be taken without danger. 7. A more decisive action may be attributed to creosote, eucalyptol, pure carbolic acid, the naphthols, and bichloride of mercury. 8. For disinfecting spittoons, carbolic acid solution at 5 per cent is thought sufficient, and Dr. Sormani asserts that the breath never contains any bacillus. He also suggested that essences of turpentine or eucalyptol should be diffused in the houses as an agent for the destruction of this special germ.—*Lancet.*

A Large Gun Tube.

Sir Joseph Whitworth & Co., Manchester, have completed for one of the 110 ton guns now being built for the government a steel tube which is the largest that has ever been made for ordnance purposes. The length of the tube is 42 feet 6 inches, the outside diameter 27 inches, and it is made of fluid pressed steel forged hollow, with a hole through 14¾ inches diameter. The weight of the tube, as delivered by Sir Joseph Whitworth & Co., is 26 tons, but if it had been made in a solid casting it would have exceeded 40 tons.

The Human Blood Worm.

This parasite, the *Filaria Bancrofti* of Cobbold—*Filaria sanguinis hominis* of some authors—is second only to the dreaded *Trichina spiralis* in its interest, producing as it does a long list of diseases in the human system, some of which frequently prove fatal.

The male worm is unknown; the female presents the following characters: Body hair-like, smooth, and of uniform thickness. The head is furnished with a circular mouth without papillæ. The neck is narrow, and the tail blunt. The reproductive outlet is situated close to the head, and the anus just above the extreme tip of the tail. Length, three inches. The embryos attain a length of one two-hundredths inch, and the ova measure about one one-thousandth inch from pole to pole.

The embryo form of the blood filaria was first discovered by Waucherer in Bahia, in 1866, in chylous urine from a female patient in the Misericordia Hospital there; and six years later Lewis found the embryos in human blood, as well as in chylous urine, and in several organs of the body, notably the kidneys. As an instance of the enormous numbers of this parasite which sometimes infest the human body, the latter author calculated in one case that 140,000 filariæ were present in the blood of a single unfortunate patient.

The habitat of the adult parasite above described is the alimentary tract of man. Here fecundation takes place, and, finally, scores of embryos of a worm-like form, and measuring one two-hundredths inch in length, are extruded from the reproductive outlet of the female. These make their way into the blood, and there produce some or all of the following list of symptoms: Chyluria, bloody urine (hæmaturia), wandering muscular pains, elephantiasis—a very common symptom, occurring in more than one-half of all cases—leprosy, and various forms of lymphatic abscess, anæmia, and general ill health, ending frequently in complete destruction of the vital powers and death.

The *Filaria Bancrofti* has been found in Egypt, Australia, China, India, and South America, and doubtfully in several European countries, and in the southern United States; certainly, of the ready possibility of the disease being introduced into any temperate or tropical climate there can be no doubt.

In Bahia and in Brazil generally the blood filaria is especially common, 8½ per cent of the entire population of Bahia, it has been calculated, at some period of their lives harboring this parasite.

Nothing could be more interesting than the mode of propagation of this species of filaria. It is well known that the class of the *entozoa* generally must go through at least one stage of their metamorphoses outside the body of their host, frequently within the body of another animal, and at first sight it is difficult to imagine how this can take place in the case of a parasite which inhabits human blood; but the subject has now been entirely cleared up by the laborious investigations of Manson, Lewis, Cobbold, and others. The female mosquito, after gorging itself with blood, repairs to some pool of stagnant water, there to digest its meal, and finally deposit its eggs. Should the victim of the mosquito have been a person whose blood contained filariæ, these parasites are sucked into the digestive tract of the insect, and during the period while its sanguinary meal is being digested the embryos there undergo marked changes, finally developing a four-lipped mouth, and becoming cylindrical in shape, with an abrupt, sharply pointed tail. When they have attained the proper stage of development they abandon their insect host, and take up their abode in the stagnant water. Should a single pair of these microscopic larvæ be introduced into the digestive tract of man through drinking water containing them, or by eating water plants to which they had adhered, they rapidly develop into mature specimens of *Filaria Bancrofti,* and, fecundation having taken place, a new brood of embryos are produced to populate the blood, cause the diseases above mentioned, and form a new center of this hideous disease.

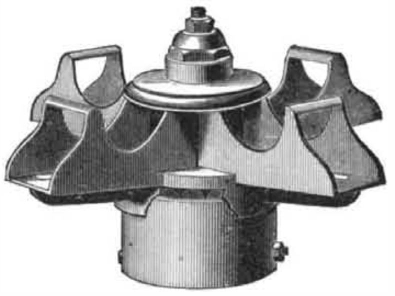
As the parasite under discussion can only be propagated through the agency of the mosquito or nearly allied blood-sucking insects, it is evident that if the race of mosquitoes were exterminated blood filaria disease would very soon cease to exist; but such a proposition needs only to be stated to show its absurdity, and the only practicable method of preventing the disease is to avoid taking the larvæ into the stomach, by the use of only carefully filtered water—except, of course, where a spring of pure water is the immediate source of supply—or of that which has been raised to the boiling point before being used for drinking or culinary purposes; a temperature considerably below 212° being absolutely fatal to this worm in all its stages of development.

The treatment of blood filaria disease is exceedingly unsatisfactory, no known mode of procedure having any great influence over the progress of the disease; a decoction of mangrove bark is a tropical remedy of great repute; gallic acid has been used with asserted benefit by European practitioners. Fortunately, however, the symptoms appear to be to some extent self-limiting. The percentage of deaths in cases of blood filaria disease, calculating from published records, is not high; but this is owing more to the insidious nature of the pathological condition than to its harmlessness to life, death frequently occurring suddenly in the course of the disorder from some acute disease, the latter always running its course rapidly, and often to a fatal termination when the constitution has been broken down by the ravages of filaria. Death may be often traced directly to the presence of this parasite in the blood, and it is certain that all severe attacks of blood filaria disease markedly injure general health and shorten life.

RALPH W. SEISS, M.D.

CLOTHES REEL.

Mounted on an upright is the reel, the track plate of which fits as a cap on top of the post. In the upper surface of this plate is a circular grooved track, fitted loosely within which are anti-friction rollers which run on the bottom of the groove and against the under surface of the head plate, which carries the wooden arms of the reel. This plate is formed with a circular rim on its under side, that receives the upper end of the track plate freely but snugly within it, to protect the rollers and track from rain and dirt. The track plate is formed with a tapering hollow upright projecting up through the eye of the head plate, which rotates around the upright and is centrally guided thereby. The head plate is constructed with radial sockets for holding the ends of the arms. The several working parts are held together by a bolt and nut, as shown in the engraving.



SCHWENDLER'S CLOTHES REEL.

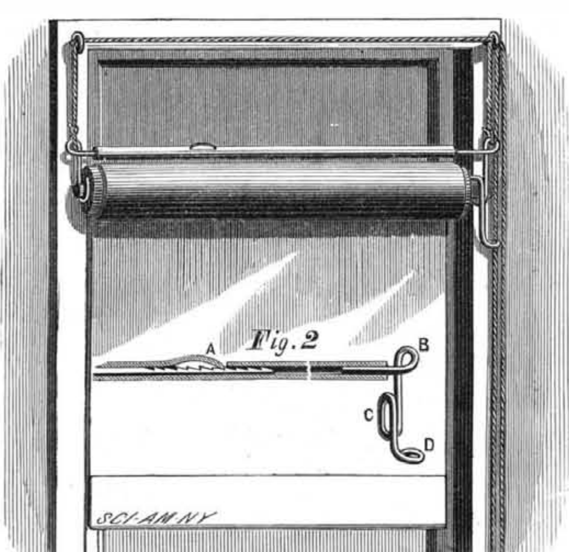
This device, which has been patented by Mr. William Schwendler, of Appleton, Wis., forms a roller carriage clothes reel working with the greatest freedom and steadiness.

The Electro-chemical and the Thermic Colored Rings

If we expose a plate of copper to the flame of a spirit lamp, of a Bunsen burner, or, better, to the fixed and narrow jet of an enameler's lamp, there are produced upon the metal iridescent coronæ around the heated point. If the experiment is well managed there are obtained fixed colored rings, apparently inalterable in the air. These thermic rings are quite similar to the electro-chemical rings of Nobili; like them they follow one upon another, and are propagated in waves. In both cases the colors succeed each other in the same order, which is that of Newton's rings as seen by transmission. Multiple thermic rings may be produced by means of drums surmounted by 2, 3, 4, etc., gas burners. These same pieces serve equally for the production of the electro-chemical rings, by fixing in the fine openings of the tubes needles of steel of equal length for each system. The thermic rings, simple or multiple, approximate the more closely to the corresponding electro-chemical rings as the jets of flame are feebler and less oxidizing.—*O. Decharme.*

SHADE HANGER.

The engraving illustrates a new shade hanger, which can easily and readily be adjusted for shade rollers of different lengths, and for which letters patent have been issued to



FINK'S SHADE HANGER.

Mr. Isaac M. Fink, of Akron, Ohio. The holder is formed of a tube, Fig. 2, in the ends of which wires are held, whose outer ends are bent down to form eyes, B. The extreme end of one wire is bent to form a hook to receive the round pin of the shade roller. On the under part of the other wire is formed an elongated eye, C, which holds the flattened pin of the roller, and below which is the guide eye, D. In the side of one wire are cut ratchet teeth, in which the spring pawl, A, engages, and by this means the hanger can be adjusted for rollers of any desired length by pushing the wire further into the tube or withdrawing it. Cords secured to the eyes, B, are so arranged that by pulling on them or by releasing them the shade roller can be raised or lowered at will uniformly at both ends.

The New Orleans Exhibition.

The exhibition opens at New Orleans December 1, and continues to May 31.

The main building is 1,378 feet long by 905 feet wide, without courts, and has a continuous roof composed largely of glass so arranged as to afford an abundance of light without subjecting the interior to the direct rays of the sun. The machinery department occupies a space of 1,378 feet long by 300 feet wide, within the main building, and has an extension added in iron 350 feet long and 150 feet wide for heavy machinery, described under the heading of factories and mills. Music Hall, with a seating capacity, in commodious chairs, for 11,000 people, a platform capacity for 600 musicians, and a mammoth organ built to order for the exposition, occupies the center of the interior. The main building will contain general exhibits. It is situated about in the center of the grounds.

The United States and State exhibits building is 885 feet long by 565 feet wide. It is one of the largest exposition buildings ever erected. At the time of the adoption of the plans it was supposed that the main building, having the largest capacity of any building heretofore erected, in conjunction with the horticultural hall and such minor outside buildings as were necessary, would afford ample space and accommodation for all exhibits; but the interest in the World's Exposition had become so widespread, and the inquiries and applications for space became so numerous, that the necessity for additional accommodation became imperative, and the management determined upon the erection of this magnificent structure specially for the United States and State exhibits. The government exhibition will be complete—of itself, almost a mammoth exposition. Each department will have its distinctive exhibit. The Department of State showing samples of cotton, wool, and cosmos fibers, and of the fabrics made from them from all parts of the world. This exhibit will be arranged in continental groups representing the geographical divisions of the world's commerce, etc. The Post Office Department will exhibit all the improvements in mail facilities, and establish a branch office in the building for the accommodation of visitors and to show the practical workings of the postal system. The Treasury Department will exhibit coast survey, light housing, life saving service, customs, internal revenue, engraving, printing, etc. The War Department will show arms, ordnance, engineering, medical, surgical, and hospital services, progress in same, etc. The Navy Department will show naval arms, ordnance, projectiles, torpedoes, dynamo-electric machines for firing, models of war vessels, ancient and modern, etc. The Interior Department, everything pertaining to the inventions and improvements in American industries and to the history, customs, and habits of the aboriginal races, etc. The United States Fishery Commission, the Department of Justice, Bureau of Agriculture, the Bureau of Education, and especially the Smithsonian Institution, will be exhaustively represented. The government exhibit will vastly exceed that made at Philadelphia. In addition to the government exhibits, the collective State exhibits and the general educational display will be located in this building. This structure presents a very attractive appearance. The Horticultural Hall is 600 feet in length and 194 feet wide through its center. It is the largest conservatory in the world.

The art gallery is 250 feet long by 100 feet wide. It is a structure built of iron. The building is an elegant and artistic structure, so arranged for mounting, accessibility, and light as to present the best effects, and with ample accommodation for as large a collection as was ever exhibited on this hemisphere.

The grounds embrace the space of 247 acres, bounded on the north side by St. Charles Avenue, on the south by the Mississippi River. The buildings front east toward the main portion of the city. An electric railway incircles the grounds.

The appropriation by the general government of $1,300,000, the contribution by the citizens of New Orleans of $500,000, and the appropriation by the city of New Orleans and the State of Louisiana each of $100,000, afford an ample fund.

Coloring Transparencies and Photographic Cards.

Mr. E. Edwards says: The first thing to be done is to prepare the paints. Get from any wholesale chemist a small quantity of different aniline colors or dyes, and dissolve them separately in spirits of wine, gradually adding the spirit until all is dissolved; dilute by about its own bulk of water, and add ox gall until the colors flow smoothly from a camel-hair brush over glazed paper; when this has been attained the colors are ready for use, and the painting may be commenced. It is advisable for the beginner to commence with a portion of the transparency which has the smallest surface of the same color, as it requires a little practice to lay on an even coat on a large surface, such as the sky or sea. If the color is piled on by degrees with dilute color, it renders the laying on of a smoother coat much easier. It is as well to give the transparency a coat of varnish when the coloring is completed and quite dry. For coloring cards the colors should be laid on very dilute (especially the flesh color), and should be laid on in successive washes until the desired color has been attained. The colors must useful are: Lemon-yellow, green, orange, red, blue, violet.

For flesh color—lemon-yellow and red. For different shades of green—lemon-yellow and blue. For lilac and purple—violet and red. For jewelry and fair hair—orange.

The commonest water color brushes will do.

Correspondence.

An Invention Much Wanted.

To the Editor of the Scientific American:

We are greatly in need of a cheap and speedy press which may be operated by a steam thrashing engine to press our grain straw into small, solid blocks to furnish fuel for this immense wheat growing but woodless and fuelless country. Such a press, if practical and cheap and durable, would certainly be one of the greatest blessings this country could be favored with.

Millions of tons of straw are now burned in the fields which might be converted into valuable fuel by the use of such a press. LEWIS V. SMITH.

Beatrice, Beadle County, Dak., Oct. 1, 1884.

Is Salt Good for Wood Pavements?

To the Editor of the Scientific American:

In noticing an article in SCIENTIFIC AMERICAN regarding "Wooden Pavements," the thought came to me to inquire whether salt had ever been used in covering the plank on which the block rested, and if so, the result. I am aware that salt has been used with good results in and about frames of mills, and believe it an excellent preserving agency.

Have never known a stave from a salt barrel when dug from the ground, after being buried for years, to be in a rotten condition. W. L. C.

Chicago, Aug. 20, 1884.

Railroad Time between New York and Philadelphia.

To the Editor of the Scientific American:

On January 9, 1882, Philadelphia and Reading R.R. Co.'s engine No. 224 ran from our station in Jersey City to 9th and Green Street depot, Philadelphia, in exactly one hour and forty-one minutes (1 h. 41 m.), with train consisting of one ordinary coach and one Pullman car.

Engine No. 224 was manufactured in this company's shops, is provided with the "Wootten firebox," and is of the following dimensions, viz.: Cylinders, 18½ x 22; drivers, 67 inches; weight, 89,750; weight on drivers, 67,800 pounds. W. W. STEARNS,

Superintendent Philadelphia and Reading R.R. Co.

Elizabeth, N. J., October 24, 1884.

The Starvation Remedy for Disease.

To the Editor of the Scientific American:

You mention, in your issue of Sept. 6, a black snake cure for rheumatism, and properly suggest that a rubber tube filled with warm water would be better. Last spring, in Ohio, many who were bedridden with rheumatism were flooded out of their houses, and had to take refuge in trees, and open fields, and on their roofs. They were for several days without food, exposed to rain and cold. In every case the rheumatism was cured. Since then I have preached the starvation cure for rheumatism. Any man can, without permanent injury, go entirely without solid food for many days, and yet most people are terrified at the idea of missing a single meal; and I have had sufferers from rheumatism tell me, when I advised them to go without eating for just one day, that they preferred the rheumatism. SENEX.

Bradford, Sept. 10, 1884.

[Being put to soak in cold river water and then hung out to dry for several days in trees, etc., is not commonly deemed good treatment for the "rheumatics;" and the idea of curing the poor mortals by starving them, during their washing and rough drying, would seem very strange were it not that no crude fancies in connection with the removal of disease can be found too absurd to meet with abundant supporters. The starvation plan is every now and then suggested by some one of ill-balanced mind, but all fair experience shows that while occasionally a case of some sort may be found where long abstinence from food can be of service, they are only isolated instances, and that the common belief that food is a good thing has really some ground for adoption.—ED.]

[CORRESPONDENCE OF SCIENTIFIC AMERICAN.]

The Wooden Pavements in Paris.

The New York readers of the SCIENTIFIC AMERICAN will probably wonder to hear that in Paris they are now extensively laying wooden pavements. At present they are thus replacing the fine macadam on the two side roadways of the Boulevard St. Michel, the center alone paved with stone blocks remaining untouched. One side is completed from the Seine to the Boulevard de Port Royal, a distance of over a mile, and they are now at work on the Carrefour de l'Observatoire, opposite the Rue d'Assas.

Any one remembering the disastrous results of the wooden pavements in Maiden Lane and Wall Street, cannot help being struck with the apparent folly of changing a splendid macadamized road, finished less than a year since, for the wooden abomination so *dear* to the memory of New Yorkers. Yet on closer examination it will be seen that a radical difference exists between the modes of laying the two pavements. In New York the foundation for the wooden blocks consisted chiefly, if the writer's memory is not at fault, of wooden boards impregnated with tar, with a thin layer of gravel underneath. Here the foundation is got up with the greatest care, and without regard to expense.

From actual observation, and from information supplied very good naturedly by several of the foremen, the following particulars are gathered. To receive the foundation layer, the road bed is first dug sixteen centimeters (about 6½ inches) deeper than the thickness of the wooden blocks. The ground being properly leveled, and the curves and declivities being staked on the ground by surveyors, workmen begin by laying long lines of beton, capped with thin wooden strips, to the requisite level, thus dividing the work into sections about four yards wide and from ten to twelve long. As soon as these sorts of ribs are set, workmen proceed to fill each section with beton made as follows: Into a bottomless box resting on a board, and measuring half a cubic meter (about 5½ cubic feet), they dump by turns one wheelbarrowful of broken stones, half a bag of Portland cement, another wheelbarrowful of stones, the remainder of the cement, and finally one wheelbarrowful of fine gravel, which just completes the measure. The bag of cement is said to weigh 45 kilog., or about one hundred pounds. The stone is broken to the average size of nut coal.

The bottomless box having been withdrawn, the materials are first mixed dry, then with water, and dumped on the ground previously dampened with a watering pot. Each section is thus filled up to within a centimeter or so of the staked level, and the beton is allowed to set for a day. Lastly, the surface, purposely left somewhat rough, is finished with a mixture of one-third cement and two-thirds fine gravel made into a thin mortar with water, spread with shovels, and smoothed with a board sliding on the levels. When set, the foundation is as even as an asphaltum sidewalk, and in a few weeks becomes as hard as granite—so at least say the workmen. At any rate, it is now ready to receive the wooden blocks. This part of the process is not very different from that followed in New York. The blocks are laid edgewise, in lines perpendicular to the axis of the street, touching one another on the side, but each line being kept slightly apart by means of thin wooden strips. This is now quick work. Hot pitch is poured over the blocks so as to run to the foundation and form a layer of about half a centimeter, and all the voids between the blocks are immediately filled up to the surface with a semi-liquid mixture of cement, fine gravel, and water. Two or three days later the pavement is covered with a little coarse gravel, and open to circulation.

Of course the various operations described are going on at the same time at different places, so that no time is wasted, but one cannot help remarking the extreme care and nicety displayed at every stage of the work.

At first sight, the wooden blocks you could swear to be American spruce, but it seems they come from Norway, and are tarred and creosoted here. As to the pitch, it is apparently identical with the familiar article used for making "tar and gravel" roofs in America. When acquainted with the unsatisfactory experience of New York with wooden pavements, the foremen here agree in attributing the rotting of the wood, and other bad features in general, to the defective character of the foundation. They claim that a section of several blocks, laid properly in this city, in a well frequented thoroughfare has now lasted five years without scarcely any repairs. They admit also that the first trials of the "*Pave Americain*," as they call it here, made ten or twelve years since, were unsuccessful. But this they attribute to the adoption of tarred boards and gravel for a foundation. Their opinion, however, may not be unbiased, for a workman is not apt to decry the work he is paid for doing.

The admitted advantages of a wooden pavement are its smoothness, noiselessness, and ease for horses and carriages. Its chief disadvantage is its costliness. Even here, with comparatively cheap labor and strict accountability, each wooden block, of the old New York size, is said to cost twenty-three cents when laid as above described. J. C.

Paris, September, 1884.

Polishing Wood with Charcoal.

The method of polishing wood with charcoal, now much employed by French cabinetmakers, is thus described in a Paris technical journal:

All the world now knows of those articles of furniture of a beautiful dead black color, with sharp, clear cut edges, and a smooth surface, the wood of which seems to have the density of ebony. Viewing them side by side with furniture rendered black by paint and varnish, the difference is so sensible that the considerable margin of price separating the two kinds explains itself. The operations are much longer and much more minute in this mode of charcoal polishing, which respects every detail of carving; while paint and varnish would clog up the holes, and widen the ridges. In the first process they employ only carefully selected woods, of a close and compact grain; they cover them with a coat of camphor dissolved in water, and almost immediately afterward with another coat, composed chiefly of sulphate of iron and nutgall. The two compositions, in blending, penetrate the wood, and give it an indelible tinge, and at the same time render it impervious to the attacks of insects.

When these two coats are sufficiently dry, they rub the surface of the wood at first with a very hard brush of couch grass (*chiendent*), and then with charcoal of substances as light and friable as possible; because if a single hard grain remained in the charcoal, this alone would scratch the surface, which they wish, on the contrary, to render perfectly smooth. The flat parts are rubbed with natural stick charcoal; the indented portions and crevices, with charcoal powder. Alternately with the charcoal, the workman also rubs his piece of furniture with flannel soaked in linseed oil and the essence of turpentine. These pouncings, repeated several times, cause the charcoal powder and the oil to penetrate into the wood, giving the article of furniture a beautiful color, and also a perfect polish which has none of the flaws of ordinary varnish.

Improved Photographic Emulsion.

Mr. A. L. Henderson, of London, has recently made some improvements on what is termed his cold precipitation process of making gelatine emulsions. The formula is as follows:

No. 1.

Distilled water	1 ounce.
Nelson's No. 1 gelatine	5 grains.
Bromide of potassium, chem. pure	180 "
Iodide of potassium, chem. pure	2 "

The above is heated just enough to melt the gelatine; next is added—

Alcohol	4 ounces.

No. 2.

Distilled water	1 oz.
Alcohol	4 oz.
Nitrate of silver	240 grs.

Both of the above solutions may be prepared by day or gas light.

In the dark room, by a non-actinic light, such as a faint ruby light, three-quarters of an ounce of ammonia, 880 U. S. standard, is added to 2½ ounces of No. 2, which converts half of the silver solution into ammoniated silver. This is next mixed with the remaining 2½ ounces of No. 2, and the whole is poured into No. 1 and well stirred. Bromide of silver is thus formed, and it only remains to raise the temperature and add gelatine to complete the operation.

The emulsion, in a beaker, is next set into a water bath, the temperature of which is 120° F., and 240 grains of dry, hard gelatine (Heinrich's) is added, the liquid being continually stirred until all of the gelatine has melted.

It is then set away to cool, and in a short time the silver and gelatine coagulate at the bottom of the beaker into the form of a cake. The alcohol, about 8 ounces, is next poured off and preserved for future use.

The emulsion cake is then broken up into small pieces and subjected to a two or three hours' washing in constantly changing water; it is then remelted by means of the hot water bath as before stated, and enough distilled water added to increase the bulk up to from 11½ to 14½ ounces; then—

Thymol	6 grs.

dissolved in—

Alcohol	4 drachms.

is added, and the emulsion is complete; after being filtered it can be flowed upon plates.

If it is desired to mix up a small batch, one-half or one-quarter of the pellicle cake may be remelted, and the proper proportion of water and thymol added. The pellicle cake will retain its sensitive qualities for any length of time if kept in the dark.

Some of the advantages of the process are that successive batches of emulsions of uniform sensitiveness can be made with great certainty; emulsions can be economically made; less alcohol is required; the gelatine extracts all the water from the alcohol, leaving it free (or nearly so) from the nitrates, which will be found crystallized at the top of pellicle cake; lastly, the alcohol can be continually used over and over again as a vehicle to promote emulsification, provided it is carefully filtered each time and added to the silver and bromide in the dark room, and allowance made for the ammonia it contains.

Economy of Wood in France.

A correspondent of the New York *World*, describing how every foot of the soil is utilized in France, mentions the method pursued to supply the country with fuel by the growth of Lombardy poplar. The correspondent says: "In going from Paris to Geneva, via Dijon, we pass through the best portion of France. For hundreds of miles every inch of land is cultivated. The abrupt side hills are in grape vines, and the flat land in grain. Here we see the phenomenon of double crops—a crop of grain and vegetables growing under a crop of trees. The Normandy poplar trees are from an inch to three feet in diameter. They are planted thickly, but give no shade. They are trimmed within six feet of the top. The boughs, which are cut off every year, make fagots enough to warm France. We often see men and women cradling wheat or hoeing beets in the midst of a wood giving no shade. When you look across the country, the tall boughless trunks look like black streaks painted against the sky. They make the view very picturesque. Wood is sold in France for a third of a cent a pound. It is worth as much as corn in Kansas by the pound. So when the Kansas man burns corn, he is no more profligate than the Frenchman who burns fagots."

An Electrical Exhibition in Boston.

The two great fairs in Boston this fall are to be followed by an electrical exhibition, to open Nov. 24 and close Jan. 3. It will be held in the great building of the Massachusetts Charitable Mechanic Association, and applications for space must be made by Nov. 1. The exhibits will be classified under nine sections: production of electricity, conductors, measurement, applications, low and high power, terrestrial physics, historical apparatus, special novelties, and electrical literature.

A NEW VACUUM PUMP, AND ITS APPLICATION IN THE MANUFACTURE OF ICE.

The apparatus which we represent herewith is a new pneumatic machine, or vacuum pump, which is destined, we think, to render genuine services in a large number of industries.

Fig. 1 and the following description thereof will sufficiently explain the mechanism and its *modus operandi:* A is a large pulley for transmitting motion to the working beam, B, and to the two pistons; C is a large pump chamber with double-acting piston; D is a small pump chamber with single acting piston; E is a conduit through which the vacuum pump sucks out the air contained in the apparatus; F is a conduit through which the air passes from the large to the small pump chamber; G, pipe for injecting water during the descent of the piston; H, orifice through which the injected water and the air are expelled; *a*, *a*, suction valves; and *b b*, force valves.

Did we wish to enumerate all the industries in which a vacuum is of great use, we should be obliged to get up a list that would exceed the limits of our article, so we shall merely cite some of the more important of them. These may be classified as follows:

1. *The Stearine Industry.*—Here the use of a vacuum under proper conditions permits of the distillation of fatty bodies at a very low temperature—say at 170° instead of 300°. Owing to this, the materials treated are not changed in character by an access of heat, and they thereby gain in density and whiteness, and the yield in stearine is larger, since the production of tar is greatly diminished.

2. *The Manufacture of Sugar.*—The evaporation of the water contained in beet juice is almost completely effected under the action of a high vacuum and at a low pressure; and the juice gives a much completer polarization and yields its product with a perceptible diminution in the quantity of molasses. This is the industry that, for the present, is to obtain the greatest advantage from the use of a vacuum.

3. *Petroleums.*—The distillation of these products with the use of a vacuum will give advantageous results through the easy production of a greater quantity of volatile oil and a greater yield of a superior quality of illuminating oil. The heavy lubricating oils forming the residue of such distillation will be of good quality, and almost totally replace the waste tar produced during distillation at high temperatures.

4. *Milk.*—The use of a vacuum for concentrating milk may lead to a perceptible improvement in the quality of the product as regards color and odor, as the evaporation of water occurs, under a vacuum, at an extremely low temperature.

5. *Varnish.*—In the composition of varnishes, through the use of special apparatus, a vacuum will permit of obtaining white products, of collecting the alcohol that is now lost, and of performing all operations rapidly without any danger of fire, thus leading to a difference in the rates of insurance that ought to pay for such an application.

6. *Filtration.*—A vacuum, combined with filtering apparatus, is capable of giving valuable results as regards the rapidity with which the operation may be performed.

7. *Alcohols.*—The use of a vacuum in the manufacture of alcohols, combined with condensing apparatus, will permit of obtaining a greater yield of 96° alcohol, and an article, too, that will not need to be rectified, since the distillation will be effected at a temperature at which no empyreumatic substances are carried over.

8. Finally, the *Manufacture of Ice* may be carried on through the congelation of water under the action due to a vacuum, and it is of such an application that we shall more particularly speak, since we have seen it carried out upon a large scale at Mr. Paul Briere's brewery at Savigny-sur-Orge. Our engraving (Fig 2) gives a general view of the large ice machine which has been put up at this establishment, and which is capable of producing from 12,000 to 15,000 kilogrammes of ice per day.

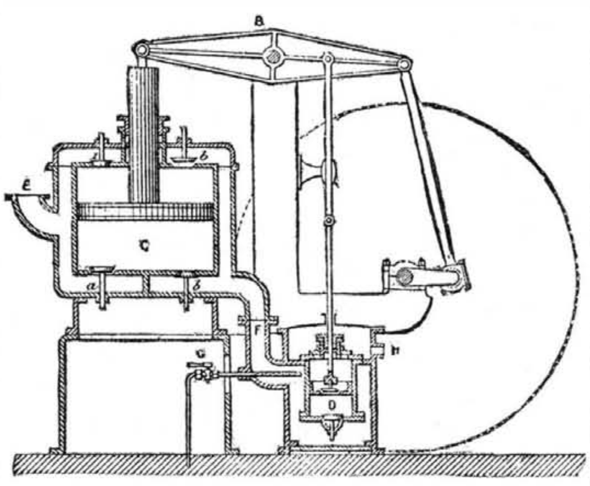


Fig. 1.—THE PNEUMATIC CO.'S NEW VACUUM PUMP.

The air pump that we have already alluded to is shown in the background. This produces a vacuum (1) in a large horizontal cylinder, or *absorber*, 8 meters in length by 1·2 meters in diameter, containing a little more than half its capacity of 60° sulphuric acid, in which revolves a helix; and (2) in six vertical cylinders, each having 400 liters capacity. When the vacuum is at from 2 to 3 millimeters of mercury, the water contained in the reservoirs is slowly admitted into the cylinders. To this end, the cock is regulated so as to allow a flow of about from 6 to 8 liters per minute; and then the helix of the absorber is set running.

Under the action of the partial vacuum that exists in the interior, a certain quantity of water evaporates, and is absorbed by the sulphuric acid in the cylinder. In order to facilitate such absorption, the cylinder is traversed by a shaft provided with numerous paddles, which keep constantly stirring the acid, so as to renew and multiply the surfaces of contact with the aqueous vapor. This latter being absorbed in measure as it is produced, and the vacuum pump continuing to work, there results a depression of temperature that reaches about —10° in the cylinders. The water remaining in the latter is thus converted into ice. Into each cylinder there are introduced about 360 liters of water, and the blocks of ice removed therefrom vary between 300 and 320 kilogrammes in weight. It takes about thirty minutes to fill the six cylinders.

When once the blocks of ice are formed in the cylinders, the cocks that admit water are closed, and the ice is removed in the following manner: First, the valves that establish a communication between each pair of cylinders and the absorber are closed, so that the vacuum existing in the latter may not be lost.

Then the small valves through which the air enters the double jacket of the cylinders are opened, so as to re-establish an atmospheric pressure within the cylinders. The covers then open automatically, under the action of their own weight; and, finally, a jet of steam that is let into the double jacket of each cylinder loosens the blocks, and the latter then drop into tubs placed beneath. The workmen then break the blocks up with axes, and collect the pieces.

As we have already said, this machine is capable of producing from 12,000 to 15,000 kilogrammes of ice per 24 hours, in 6 or 7 operations that each gives about 2,000 kilogrammes.

The acid in the absorber, which in the beginning marks 60°, marks only 52° or 53° at the end of the operation. It is therefore emptied into a lead lined vat, and carried to a concentrator in order to be regenerated.

As soon as the absorber is empty, a vacuum is again created therein, and a communication is established between the absorber and the cylinder that contains the regenerated acid. While the ice is being made, the operation of concentrating the weakened acid is going on. To this end, the acid is passed from the vat into a heat recuperator, which has the form of a surface condenser, and contains 60 tubes. The hot and regenerated acid that descends from the concentrator circulates around the tubes, the cold acid becoming heated at the expense of the regenerated.

The concentrator consists of a vertical cast iron cylinder lined with lead, and containing 4 concentric leaden worms. The steam circulates in these latter at a pressure of from 3 to 3·5 atmospheres, corresponding to a temperature of from 125° to 130°. Under the action of this temperature and of the vacuum produced by a small pump at the side of the apparatus, the water evaporates.

In 6 hours it is possible to regenerate 6,000 kilogrammes of acid, a charge sufficient for the manufacture of 24 cylinders of ice. The vacuum machine, as a whole, requires a total power of 7 to 8 horses to start it, and 2 to 3 to run it.—*La Nature.*

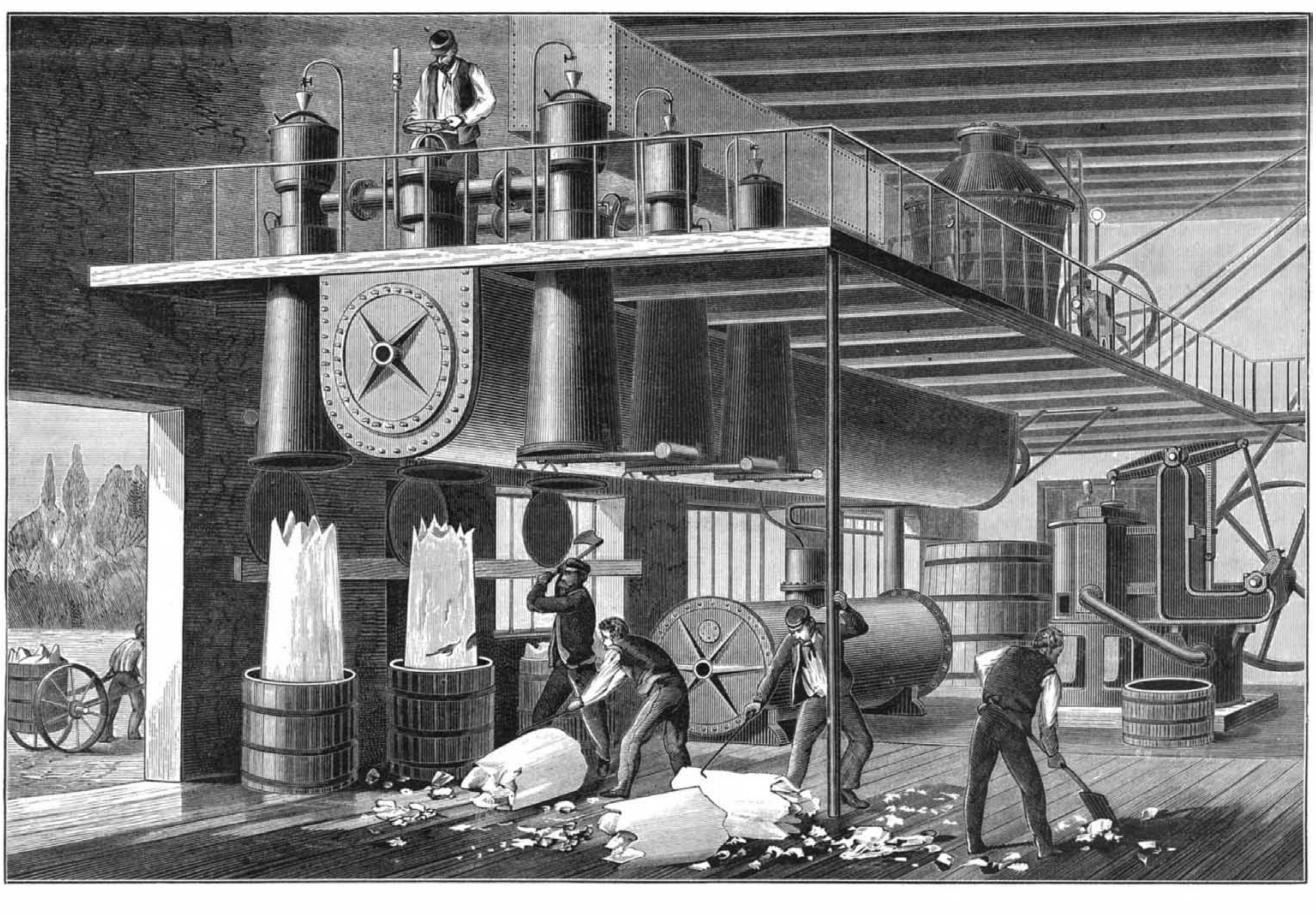


Fig. 2.—MANUFACTURE OF ICE BY MEANS OF A VACUUM AT SAVIGNY-SUR-ORGE.

Feeding Mice with Putty.

Having often noticed the white color of the dung of mice, as seen in buildings where the animals have little or no access to their usual forms of food, Prof. Storer (*Bulletin Bussey Institution*, ii., p. 264) followed the matter up, and found that the real source of the white mouse dung is common painter's putty, which is used not only for cementing the glass of windows, but also for covering the heads of nails, and for stopping cracks and holes. This putty is made by mixing ground chalk (whiting) with linseed or fish oil, and it is the oil in the putty which attracts the mice and serves them as food. Prof. Storer considers that the question of putty eating must have by no means an unimportant bearing upon the health of the community wherever water closets are fitted up in the manner often adopted, by fastening the leaden trap into the iron soil pipe by means of a putty joint. He was informed by plumbers that mice do eat the putty from putty joints, and that they cannot be prevented from doing so by mixing red lead or white lead with the putty. Prof. Storer confined mice in a cage, and fed them with an insufficient supply of oats, and with as much putty as they could eat in addition. Day after day three mice thus confined eat ten or twelve putty balls, three-eighths of an inch in diameter, besides their oats. To give figures, "besides their 3⅓ grammes of oats, the three mice ate daily during three consecutive days 12 balls of putty, weighing, all told, 20 grammes, and containing 16·7 grammes of whiting and 3·3 grammes of oil." That is to say, each of the mice swallowed every day and voided more than 5½ grammes of dry whiting. It is as if more than 50 pounds of dry chalk were to pass daily through a man of 150 pounds weight.

After the mice had become accustomed to eat large quantities of ordinary putty, various other mixtures of pigments and oil were offered to them. The results of many experiments may be thus summarized: Of red ocher mixed with oil, the mice ate a little at first, and then refused more. They refused putty made of three-fourths red ocher and one-fourth whiting, but would eat, not very freely, putty made half and half. Yellow ocher mixed with oil they refused at first, but were gradually brought to eat it by having fed to them putty containing more and more of the pigment. Powdered gypsum (with oil, of course) was eaten rather freely, plaster of Paris less freely, silica sparingly, and clay not at all unless mixed with whiting. Mixtures of oil with carbonate of baryta, carbonate of lead, carbonate of zinc, oxide of zinc, and slaked lime, all proved fatal to the mice, although in most cases the amount eaten was small.

Prof. Crampe, of Proskaw, Silesia found that the most effective of the poisons commonly employed for rats and mice was a paste made of precipitated carbonate of baryta with three times its weight of barley meal. Prof. Storer finds that mice can eat much more than the fatal quantity of either carbonate of baryta or white lead, provided they are mixed with whiting, the carbonate of lime seeming in some way to act as an antidote to the poison. He queries whether the protective influence of the lime carbonate, or some other analogous compound, might not be put to practical use in the case of ordinary paints—whether it might not be possible to "adulterate" white lead so as to diminish or do away with the colic of house painters. "The application of this idea would be beset with technical difficulties, but it might be studied nevertheless."

Detection of Oleomargarine.

Dr. Thomas Taylor reports to the Department of Agriculture that he has made a series of experiments with oleomargarine of different fats, using a variety of acids to ascertain what permanent change of color would take place by oxidation, etc. Of the various acids employed, sulphuric acid gave the most satisfactory results. The test is a very simple one. If a few drops of sulphuric acid be combined with a small quantity of pure butter, the butter will assume first an opaque whitish-yellow color, and, after the lapse of about ten minutes, it will change to a brick red. Oleomargarine made of beef fat, when treated in the same manner, changes at first to clear amber, and after the lapse of about twenty minutes, to a deep crimson.

That the changes in color do not arise from the action of the sulphuric acid on the artificial coloring matter (annatto) is certain, as I find that when annatto is combined with sulphuric acid a dark bluish-green color is produced, entirely unlike any of the changes mentioned.

Owing to the active corrosive properties of the sulphuric acid, in making these tests, a glass rod should be used in combining these substances.

Creeping of Rails.

At a recent meeting of the Engineers' Club at St. Louis, the paper for the evening was by Mr. J. B. Johnson, his subject being the "Creeping of Rails on the St. Louis Bridge." Mr Johnson said that on the St. Louis Bridge proper the rails had been known to creep 260 feet in one year, and on the bridge approach 400 feet. This creeping varied with the amount of traffic or with the weight carried over the rails. On the St. Louis Bridge the rails crept in the direction with traffic. These rails were supported from their base. The reason given by Mr. Johnson for the creeping was that the rail, being held fast on the extended ties, is caused to measure its length across the bridge on its extended flange whenever a heavy weight passing over it causes a wave in the rail. This wave has been known to raise the rail between the two trucks of a car three-eighths of an inch, and the creeping has been measured, and at times has amounted to one-half to three-quarters of an inch. If the rail is supported at a place above its neutral axis, the creeping will be opposite in direction to the traffic. This Mr. Johnson demonstrated satisfactorily with a circular track of hickory. There must be some intermediate point, Mr. Johnson argued, at which the rail would have no desire to creep.

LOUIS PASTEUR.

Since Jenner's great discovery of inoculation with virus for the prevention of smallpox, it has been the object of scientists to discover means for the prevention of other diseases in a similar manner. By means of the microscope, minute organisms, or microbes, were discovered to be the cause of many diseases of men and animals, and the question was to determine to what extent diseases could be prevented by inoculation of the diluted or weakened poison into the system for preventing the disease usually produced by this poison.

Louis Pasteur has made many wonderful discoveries in this new branch of medicine, but before that he was well known as a successful scientist in chemical and physical matters. He was born in Dole, in 1822, and was appointed teacher of chemistry at Besancon and then at Dijon, and finally was appointed Prof. of Chemistry at Strassburg in 1849. In 1857 he conducted the Normal School in Paris, and in 1863 was appointed Prof. of Chemistry at the Sorbonne. He was compelled to resign the latter position, as one side of his body became paralyzed; but he gradually regained his health sufficiently to be able to take up his chemical researches; and in order to enable him to give his full attention to the studies, the French Government has granted him an annual pension of 12,000 francs since 1874, which was raised to 20,000 francs recently.

In one of his first works, he discovered that crystallized organic substances, although having the same chemical properties, have decidedly different physical properties, specially in relation to the refraction of light. He made many valuable discoveries in relation to fermentation, and was able to prove that the process of fermentation, that is, the conversion of sugar into alcohol and carbonic acid, is due to the vitality of the yeast germ. In this matter the celebrated chemist Liebig was his opponent, but Pasteur's experiments were so numerous and new, and at the same time so absolutely exact, that his success was assured. He finally conceived the idea of making experiments to ascertain whether yeast germs, fermentation, mould, etc., could originate of themselves in fluids. His experiments proved beyond any doubt that this was not possible, and thus settled this question of long standing. He also discovered a method of preserving wine and beer by heating it for about thirty minutes to from 46° to 48° C., whereby the yeast germs are destroyed and prevent further decomposition of the liquid.

Since 1870 Pasteur has given all his attention to contagious diseases, such as anthrax, chicken cholera, and rabies of dogs. All these diseases are caused by parasites or microbes, and he claims that by inoculating part of the poison in small quantities and very much diluted into the system, a person is less apt to be affected by these diseases than those who have not been thus inoculated.

Toussaint previously made experiments with the blood of animals suffering from anthrax, but Pasteur has succeeded in raising anthrax bacilli in a drop of blood, and by preserving the germs upon certain substances, their strength as a poison was diminished to such an extent as not to cause any disease. Injections of this diluted poison protected animals to such an extent that very few suffered from anthrax where formerly entire herds were killed.

The latest experiments Pasteur has made are in relation to the rabies of dogs, and during the first months of this year he notified the Paris Academy that by inoculating dogs with microbe organisms they have been protected from the effects of bites by rabid dogs. The details of the results of these experiments are so well known that they need no further mention here.

The annexed cut, representing Louis Pasteur, was taken from the *Illus. Zeit.*

LOUIS PASTEUR.

Lindop's Improved Fire Escape.

This invention, recently patented by William E. Lindop, of St. Thomas, Ontario, Canada, provides for a compact and convenient arrangement of a coil of ribbon of spring steel in a small case, so that, for a single escape, it may be carried in the pocket, and then easily attached to the window of a building, and the descent of a person therefrom readily controlled, either by the person descending or by one remaining inside the window.

It is also so devised that the attachment may be conveniently sent back to a window, as desired, and carry means for facilitating the escape of others; but larger sizes are to be preferred for general use, as when built on a large scale firemen can be quickly sent to the windows of burning buildings. Of course the whole device must be of the best construction in this fire escape, and the work and materials necessary therefor of as good quality as would be required in making a bicycle or any such article.

A Gigantic Cylinder.

Messrs. Shorrocks, iron founders, Darwen, have just completed a gigantic cylinder for a paper mill at Hyde, near Manchester. It is 9 feet on the face, and 12 feet in diameter. It has been bored out inside, and is turned and polished like a looking-glass on the outside. The weight is 30 tons, independent of the 12 foot spur wheel and stand. It was drawn by two traction engines, and, according to the *Ironmonger*, is said to be the largest cylinder ever made.

[At the Dowlais Iron Works, England, they formerly had a blowing cylinder 12 feet in diameter and 12 feet stroke.—ED. S. A.]

Watermelon Oil.

Experiments have been made by M. Lidoff, with a view to defining the quantity of oil contained in the seeds of the *Cucumis citrullus*, a watermelon plant extensively grown in the South of Russia. According to a description of the process in the *Corps Gras Industriels*, the seeds are dried at a temperature of 266° Fahrenheit, after which the oil is extracted in a Tharn apparatus. By this method there was obtained a quantity ranging from 24 to 25 per cent of a lubricating oil, with a density at 64° Fahrenheit of 0·9298. It absorbs atmospheric oxygen very rapidly, an augmentation of about one-quarter per cent taking place within three days. M. Lidoff thinks watermelon oil suitable for culinary purposes, but fears that its extraction would be too costly to allow of its coming into general use.

A SHEEP DESTROYER.

JOHN R. CORYELL.

Growing on our Western plains is a pretty-looking kind of grass, resembling oats, and which is called, popularly, weather grass or needle grass—botanically, *Stipa spartea*. What may be its special sphere of usefulness to man or in the economy of nature, granting that it has such a sphere, is hardly worth considering in the light of its evil works.

Looked at casually, while in its growing state, it might be mistaken for immature or bastard oats, although a moment's inspection would reveal its true character. The seed, particularly, would serve to emphasize its unlikeness to its useful cousin, and it is this seed which, as a seemingly insignificant but really potent agent of destruction, claims our attention.

The seed in general conformation, but not otherwise, is like the oat. Its base is tipped with a tiny point as sharp and hard as that of a pin. Almost hiding this tip, and extending upward to nearly half the length of the seed, is a soft, silky, hair-like growth. The remainder of the seed, which has a total length of about three-quarters of an inch, is bare, smooth, and flinty. A minute depression, made by the unfolding of the edges of the case, runs the entire length of the seed.

From the upper end of the seed runs a long awn or beard, varying in length from four to seven inches. This awn is a simple but beautiful piece of mechanism, designed apparently for the sole purpose of enabling the seed to sow itself. It is tightly twisted, screw-like for two-thirds of its length, and then turns abruptly into a right angle, the remaining one-third being untwisted. They who are acquainted with the so-called animated oats or the wild oats will be familiar with the action of the twisted awn under the influence of wet or dry weather. The awn unloosens or tightens its twist according as it comes under the influence of wet or dry conditions, and the untwisted, right-angled end remaining quiescent enables the seed to writhe and turn and burrow deeper and deeper into the earth.

This application of its mechanical powers to the proper end of saving its life is both beautiful and pleasing, but, unfortunately, those powers, being mechanical, act with equal vigor to an improper end. Caught in the seemingly impenetrable wool of the sheep, and there subjected to the influence of alternate moisture and dryness, the awns do their work, and, incredible as it may seem, propel the seed so far as to cause the needle to penetrate the hide of the animal. The awns break off, and the needles penetrate the vital parts of the sheep, causing painful death. The harmless-looking silky growth on the needle, tending backward from the point as it does, acts as a barb to prevent any retrograde movement of the intruding needle.

The points, too, not only enter the body of the sheep in this way, but also stick in the nostrils, nose, and lips, where, however, they do less harm than when eaten and swallowed into the stomach, in which event death must follow.

The tendency to underrate the work of weak agents may lead to the thought that no material damage can be done by means of the *Stipa spartea* to sheep. How erroneous such a conclusion would be will be seen from a statement of Mr. Henry Stewart, who, in his work, "The Shepherd's Manual," says, referring to sheep in the Northwestern district, that "the most frequent losses are caused by a native grass, which bears exceedingly sharp awns or beards, and called popularly 'needle grass.'"

Sheep men guard against loss from this cause by frequent examination of the sheep during the period when *Stipa spartea* is ripe, and by burning the pasture in June, at which time the deadly grass has just commenced its growth. Prevention in this instance, as in others, is better than cure, for it is no easy matter to examine every sheep of a large herd so carefully that all the needles can be detected and withdrawn.

A SHEEP DESTROYER.

An Improved Cab.

Carriages with the driver's seat behind, after the style of the English hansom, have never been very popular in this country, although a great variety of two wheeled carriages has been introduced within the past two or three years. All our leading carriage manufacturers have, however, been competing to see which could build the best vehicle of this kind, and one that would at the same time take the popular fancy. One of the latest inventions in this line is a two wheeled vehicle recently patented by Messrs E. P. Hincks and G. H. Johnson, of Bridgeport, Conn. The front is a projecting one, and presents a three-sided figure, the center being straight, and the doors on the sides, forming an angle therewith, opening toward the wheels, the side springs being so arranged that the doors may be readily opened wide without interference. The springs extend beyond the hinges of the doors to near the front of the wheels, and are supported at their forward ends by goose necks attached to the rocker frame of the carriage. The vehicle is low hung, and so far forward on the axle that, with the driver's seat arranged behind, it makes a well balanced as well as very convenient and easy riding carriage, and one which presents an extremely neat and attractive appearance.

How a Bear Catches Fish.

I came suddenly upon a very large bear in a thick swamp, lying upon a large hollow log across a brook, fishing; and he was so much interested in his sport that he did not notice me until I had approached very near him, so that I could see exactly how he baited his hook and played his fish. He fished in this wise: There was a large hole through the log on which he lay, and he thrust his forearm through the hole and held his open paw in the water, and waited for the fish to gather round and into it; and when filled he clutched his fist and brought up a handful of fish, and sat and ate them with great gusto; then down with the paw again, and so on. The brook was fairly alive with little trout and red sided suckers, and some black suckers. He did not eat their heads. There was quite a pile of them on the log. I suppose the oil in his paw attracted the fish and baited them even better than a flyhook; and his toe nails were his hooks, and sharp ones, too, and once grabbed the fish were sure to stay. They also catch frogs in these forest brooks, and drink of the pure water in hot summer days, and love to lie and wallow in the muddy swamps as well as our pigs in the mire. They often cross narrow places in lakes by swimming, and also rivers, and seem to love to take a turn in the water. I once saw one swimming from the mainland to the big island in Moosemaguntic Lake, with just a streak of his back out of the water, looking like a dog moving along. Sometimes you see only their heads out of water; at other times half their bodies are to be seen. We account for this difference by condition. If fat, the grease helps buoy them up; if lean, they sink lower in the water.—*Lewiston Journal.*

Olive Cultivation in Turkey.

Consul Heap of Constantinople, in his last report, states that olives grown in Turkey receive little cultivation after the young trees reach maturity. At the end of the autumn, or early in winter, a trench of two to three feet in diameter and from eighteeen to twenty-seven inches in depth is dug round each young tree, and filled with manure, more or less rich, according to the age and strength of the tree. The manure is well covered with soil, so as to prevent it being disturbed, and to keep it as long as possible in the position best fitted to feed the roots of the tree. The ground between the trees is generally neglected. The olive tree generally comes into full bearing about its twenty-fifth year when it has been grown from slips, but when grafted it yields abundantly between its eighth and twelfth year. In both cases it continues to produce largely, every alternate year, for about fifty or sixty years, and if cultivated it will continue to yield, though less largely, up to the age of one hundred years. Under ordinary circumstances a young healthy tree that has reached maturity will produce about eighty-two pounds of fruit in a poor year, and with careful cultivation the same tree will yield in a good year double that quantity.

The trees vary in yield every alternate year. An acre will contain 120 trees, and each tree will yield an average of 100 pounds of fruit, so that the produce per acre will be about 12,000 pounds; and as it takes about sixty pounds of fruit to produce one gallon of oil, the yield per acre would be two hundred gallons. When olives are intended for pickling, a small portion is plucked while green to be pickled in that state, but the larger portion of the fruit intended for preserving is gathered when it has fully ripened and has turned black; in Turkey it is preferred in this state, and there is a very large consumption of black pickled olives. To preserve black olives for the table, the fruit is packed in casks or boxes with a large layer of common salt, three-quarters of an inch thick at the bottom. On this is laid a layer of olives, about two and a half to three inches in depth, upon which a light covering of salt is sprinkled, and so on until the cask or box is filled, the upper layer of salt being deeper than the others, except the lower one. The staves of the cask are left loosely bound to allow the bitter water from the olives to drain off. In preserving green olives, the fruit after being washed is packed in cases in its natural state. The casks have a small hole bored in the bottom to allow the water to run off slowly. They are filled with olives to about three inches of the top, and the cask is then filled to the brim with fresh water once in twenty-four hours, until the bitter taste of the fruit has almost passed off. The hole in the bottom is then plugged, an aromatized pickle is poured on the fruit, and after the pickle has taken effect a little oil is added, to soften the olives and reduce any bitterness that may remain in excess of what is required to give them piquancy or an agreeable flavor.

In extracting the oil the method practiced in the interior of Turkey is the same as was employed in the earliest ages. The fruit is collected in a large receptacle near the mill where the crushing is done; this mill is simply a large circular shallow tank with an upright beam in the center, which runs through a large stone and serves as a pivot around which the stone revolves. A horse harnessed to a horizontal pole attached to the stone sets it slowly and laboriously in motion. An improved apparatus has lately been introduced; this consists of two stones attached to the horizontal pole, and which are dragged round with it. When a sufficient quantity of the fruit has been thrown into a tank the machine is set in motion, and a man precedes the horse with an iron pole to push the olives under the stones. After a short time, about two gallons of water at boiling heat are poured in to assist the action of the stones, and more is added as required, until the mass acquires the consistency of a thick paste. The mass is then put into a large jar and conveyed to the press, where it is kneaded with more hot water into a square cloth of coarse material, which will bear the greatest power of the press without bursting. The paste is then formed into a square flat mass, the cloth being folded neatly over it, and tied with a string attached to each corner, and it is then replaced in the press. The press is turned down by means of a hand lever, and when more power is required, a rope is carried from the lever to an upright rotary beam at some distance, which is rapidly turned.

The oil and water which are expressed run into a trough roughly hewn from wood. This trough is divided into two parts longitudinally by a partition, which comes up to about two inches below the level of its sides, so that, when the oil and water run in together on one side of the partition, the oil coming to the surface floats over to the other side, while the water is conveyed away by a pipe, placed at the level at which it is desired to maintain the water within the trough. After the press has been screwed down as far as it will go, it is loosened, and hot water is poured upon the pile to wash off any oil that may remain on the cloths, and they are kneaded without being unfolded. More boiling water is poured upon each package, and they are again placed in the press, to be again removed and undergo for a third time the same process until no oil remains. The oil comes out a light green color, and is poured into a large jar near the press, whence, after depositing any water or dirt it may contain, it is poured into skins. It is next emptied into large earthenware jars four or five feet in height, where it remains for at least two months until all impurities are deposited.

Fatal Accident from a Dynamo.

On the evening of Sept. 27, at the Health Exhibition, London, Henry Pink, an attendant in the electric light shed, met his death by incautious contact with one of the dynamos used for supplying the electric light. It was Pink's duty merely to go round and oil the dynamos, and to ascertain that they ran smoothly and without heating; and he had been repeatedly cautioned never to touch them with both hands at once.

William H. Tilley testified that he was a visitor at the Health Exhibition; he went into the electric light machine room, and witnessed the working of the dynamos. He saw the deceased put his left hand on the brush of the 25 light dynamo, and rub his finger up and down close to where the witness saw some sparks issuing. He had until then been almost facing witness, at right angles with the dynamo shaft; but he now turned round, so as to directly face the dynamo, and put his right hand on the bearing at the top of the standard, as though to feel if the bearing were warm, and without removing his left hand from the brush. He then slowly brought his right hand toward the lower brush. Witness could not swear that he actually saw deceased touch the lower brush; but he observed him give a convulsive clutch, and then appear unable take his hands away. At that time he had both hands on the machine. His head went gradually back; and then he let go with his left hand, and fell backward against the barrier, where witness was standing. All this took place in the time one might count three. Deceased then fell back on his right side, when another attendant came up and caught him,

Rufus Porter.—A Representative of American Genius.

One of our English contemporaries, *Invention*, in referring to the life and genius of the late Rufus Porter, pays a compliment to the energy, ingenuity, and versatility of the American in contrast with the Englishman, whose idea, the editor thinks, is generally confined to fitting himself for a single pursuit in life.

"That the true genius of the American people is inventive and mechanical is a self evident proposition," says the writer, "and it would appear as though invention, relatively speaking, has flourished more in the United States than in all the rest of the world, making due allowance for time.

"Yet how short, comparatively speaking, has been the period since the great American people assumed the homogeneous form of a concrete nation! There has just died at New Haven, Conn., as our readers are aware, one of the most typical of American inventors—Rufus Porter—and his long life, protracted to within six years of a century, virtually covers the period included in the history of the United States, and brings together at once the two very antithetical eras of George the Third and Queen Victoria. Rufus Porter, Benjamin Franklin, and Count Romford, the great apostle of economical and quasi-scientific cookery, were all Massachusetts men, and all illustrious, although in varying degrees, as inventors. The stories of two of these lives are familiar enough to all Englishmen, but it may not be so generally known that the last survivor of this extraordinary triad of inventors was undoubtedly one of the most prolific and versatile of inventors the world has yet known.

"Born in the presidency of the illustrious Washington, Rufus Porter lived through the reigns of twenty-one American Presidents, and was himself a living representative of the genius of American invention for over three-quarters of a century.

"From the first he was the true type of the smart American boy, who, so far from being impressed by the Carlylean idea of the great dignity of personal work in its manual forms, was nothing unless a labor saving machine in its most comprehensive shape. Thus Rufus Porter began his long career of usefulness as an inventor of turbine water wheels, windmills, flying ships, rotary engines, and sundry contrivances for abolishing as far as possible agricultural labor. He was as a youth, too, an ardent patriot, and in truth half a dozen other things, each of which, if followed up fully, might have sufficed to secure to most men a reasonable amount of distinction and prosperity. He fought against the British, and this occupation—a mere interlude in a life crowded with incidents, and usually at the white heat of some newly found enterprise—naturally led to the elaboration of war engines; and his well known revolving rifle enabled Colonel Colt to produce the revolving pistol, which initiated a host of small firearms on the same principle.

"For Rufus Porter, however, there was neither rest nor supreme success in any decade of his singularly active and abnormally busy career. He was a schoolmaster, a portrait painter by turns, and he founded the SCIENTIFIC AMERICAN, the greatest and best of all American mechanical papers, and one that indeed is unsurpassed in its new lines by any journal extant.

"Clocks, railway signals, churns, washing machines, and other appliances were among the many fruits of his active brain, and it was doubtless to this fecundity that his comparative failure in a worldly sense was due. His inventions were in a manner cast aside as soon as he had roughly completed them, and, heedless of the commercial phases of invention, this wonderfully prolific genius passed on to make a fresh essay in the great work of saving human manual labor—which is the real end of all truly American progress, and the main object of American civilization.

"To give a detailed account of all that Rufus Porter accomplished or attempted in the great field of invention would altogether transcend the limits of our space; but although a contemporary, writing of this great and original inventor, has remarked, that in spite of all he did and wrote, and the very extraordinary length of time accorded to him, he has gone to the grave leaving a name 'writ in water,' we still think that in the world of invention his name will be fully blazoned as a material benefactor to his fellow men.

"No doubt this career, so rich in actual matter of fact result, illustrates fully the different conditions of life in England and America, in regard to the encouragement given to inventors in the respective countries. Here the whole course of education, and the entire bias of prejudice, is toward each man equipping himself for a single well defined pursuit. In no country in the world is the saying more relished than that of a Jack-of-all-trades and a master of none, whereas in the United States it is precisely the reverse. There, in a still new country, handiness and ready adaptability is everything, and every possible encouragement is fully given to that versatility which has so little, comparatively speaking, in this country with its well defined and strictly preserved paths of infinitely subdivided industries. Probably in both countries, 'the falsehood of extremes' is sufficiently illustrated, and each would gain by a process of mutual adoption and adaptation of native peculiarities.

"There can be no doubt but that in America, invention has been more versatile and, to borrow a now familiar phrase, more 'differentiated' than among ourselves, while here it has achieved in certain lines greater results, perhaps due only to the greater concentrativeness of the English mind.

"We believe for own part that it is wholesome for Americans to study English, and for Englishmen to study American inventors. The mutual lesson is sure to be mutually profitable. Meanwhile we may add in conclusion that although he has not in any sense attained the fame and eminence of Morse, a Howe, or Edison, Rufus Porter will live as one of the best and brightest examples of the versatility of American invention."

The Enforced Use of the Metric System.

In a communication to the Philadelphia *Public Ledger*, dated at Eisenach, August 24, Mr. Coleman Sellers, a member of the firm of William Sellers & Co., of Philadelphia, gives his impressions of the very slow progress the metric system is making toward general adoption among the leading nations of the world, together with a statement of his objections to the system. He says:

The Librarian of the Paris Geographical Society has recently prepared a table showing what countries have adopted the French metric system and have made its use obligatory. The total population of these countries is given, and it professes to show that the people who use this system are vastly more numerous than those who do not, and among the minority are mentioned Great Britain and the United States. Thus, those using the system aggregate, say, 241,972,011, as against 97,639,825 not using it.

I notice among those countries where this system is said to be in compulsory use Norway, Sweden and Denmark. Now, I have just visited these three kingdoms, and while there I made it my business, as I have done in other countries, to make a full inquiry into the practical operation of the French metric system. I find that the governments of the three countries above mentioned have adopted the system, and have appointed a date a few years in the future when its use will be obligatory; but as yet it is not in general use, except among the employes of the government or in the government depots. The people at large know little or nothing about the subject, and small progress has been made toward preparing them for the change. In the railroad stations may be seen charts hanging on the walls that give the system in a graphical way, and the weight of the luggage upon which an extra charge is made is computed in kilos, not in pounds; while everything weighed in the shops or markets is reckoned in pounds or measured by a "yard stick" which is 25 of our inches in length; this I give from actual measurement, although the shopkeepers say that the Swedish measure for cloth is two-thirds of the English yard. In Denmark, so little is known about the enforced adoption of the French system that an important shopkeeper told me that it was never to be adopted.

What I wish to make clear to your readers is, that the mere fact that the inhabitants of the countries using the metric system are more numerous than those of the countries that do not use it does not furnish so strong an argument in favor of the enforced adoption of this system as would at first appear. The interests involved and the industries that would be affected by the change must be considered. The uprooting of any established system of weights and measures is a matter of very serious import, aside from any question of the relative merits or demerits of the adopted or abandoned systems, and this is especially true of manufacturing countries, where vast and varied processes depend on established standards. It is not an exaggeration to assert that the confusion and loss caused by a change in the system of measurement in Russia, with her millions of peasantry, would be less than that sustained in the city of Philadelphia alone from a like cause. England and America combined control the majority of the commerce of the world. England and America combined lead the engineering output of the world.

To the merchant who buys and sells, it makes no matter if the yard is one of 25, or 36, or 39·39 inches long, nor if the pound weighs more or less than a pint of water; but to the engineer, the matter is of more vital importance. I have gone this summer through the workshops of almost all the great countries on this side of the water and in those of Germany. I have seen the practical use of the system that I have for so long a time condemned. I frequently asked engineers if they like the system, and if they use it, and I will give the answer of one in Berlin: "We use it it because we have to, and it is better to have some uniform system than the many measurements that formerly prevailed in the German states. The unit of the machine shop is the millimeter in everything except bolts, nuts, and screws. All bolts and nuts are made to the English inch, because we use the Whitworth system. We do not like the metric system, because it has too small a unit, and the meter is too large and involves the use of decimals."

In Philadelphia, the firm of William Sellers & Co. adopted the French metric system in an important part of their works as long ago as thirty years, and have continued its use since, until their workmen are as familiar with it as with the inch. With all this long practice during my connection with the firm, I have written and spoken against the enforced adoption of the system, not only because of the expense involved in changing, but because it is not a practical system; it permits of no elastic gradation of shop or trade sizes. The millimeter is taken as the standard, to avoid the complication of the constant use of decimals, as nearly all measurements in machine work are less than one meter. This small measure involves many figures, and does not permit any good memorizable series. The inch cut up into the natural division by constantly halving permits the use of sizes best suited to the needs of the workmen.

The standard of the French system is a certain bar, kept for comparison; so is the English yard, from which we get our feet and inches. The high-flown notion that the meter is a measurable portion of the quadrant of the earth's circumference has been given up long ago, and the measurements of England and America are on a better basis of accuracy to-day than those of any other country. The French system theoretically predicates its weights on the weight of a cubic decimeter of distilled water at a temperature of 39·1 degrees Fahr., the weight of which is called the kilogramme, and is 2·2 of our pounds; but really the standard unit of weight is the platinum kilogramme weight deposited in Paris.

Swedish iron and steel are rolled to English inches in size; so, also, their boards are cut to the English inch, because their market is largely in those countries that use the inch. In the Russian machine shops, the English inch is used exclusively, and, as I have said, throughout all Germany it holds for all screw sizes. In France and in Belgium, the yard stick is the meter hung from a rod like the cross bracket of a drop gas light, placed about 18 inches above the counter. In Germany, the half-meter, or 26 inches, about, is the measure used, and that held in the hand of a salesman by a handle at one end of the measuring stick. The Swedish machinist carries in his pocket a rule on which he has the English inch, and by its side the French measures; on the other side he has the two Swedish feet, one long in use, and one ordered to be used, but never put into practice. The Swedish roads are laid out now in kilometers, and marked by iron plates, giving at each 10 kilometers the distance from some place, while half way between is a sign "5 kilometers." This division of the roadway seems to them to be fine enough, as the old Swedish mile was 6⅝ of our miles, and 5 kilometers is a less distance.

In Germany you never hear of the kilo, but they sell by the pound, their pound being the half of 1 kilo; this they cut up as they please into smaller weights, and you can buy half a pound of grapes or butter just as well as you can in America. It is claimed that, given the meter, all weights, etc., can be deduced from it. In theory this is very well. The most skillful workmen, however, are not yet able to make two liters of water weigh alike to the utmost point of accuracy, and the cubical liter is not used, but is converted into a circular or cylindrical vessel, with all the trouble of the problem of squaring the circle.

If a bar of ordinary forged iron be planed up to measure 1 inch square, and the bar be 1 English yard long, it will weigh 10 pounds, and the tenth of such a bar will weigh 1 pound more accurately than will the ordinary liter of water weigh 1 kilo. The English engineer, in these days of iron, knows when he uses shapes of iron rolled of uniform section that the tenth of their weight in pounds per yard gives him the area of the section, and this one admirable incident will long fix the desirability of the present unit of England and America. When we consider the interest involved, it will be seen that the population now making practical use of the English standard is greatly in excess of that using, by force, the French system. Millions of those numbered among the people who use the French system have no occasion to use any or know any system whatever save in the crudest form.

Carefully as I have considered this subject of weights and measures during the time I have been from home, I am the more confirmed in my opposition to the enforced adoption of the metric system of France in my own country, and firmly believe that those countries that have adopted it are at a disadvantage as compared with even the most imperfect of our systems. America has entered on the line of simplification of its metrology, and that is the direction that should be followed, not by any means giving up what is good, but by making what has been found to be practical, better and simpler. One has not to be long in England to find out how firmly are the seemingly complicated systems of weights and measures of that country fixed with the people. They weigh by the stone and compute by the sterling currency as rapidly or more so than we do with our dollars and cents, and that because their unit is larger. The English shopkeeper knows nothing about decimals, and says, if you ask him, that he has never learned what they are. England has lately made legal the admirable standard manufactured by Sir Joseph Whitworth, and the chance of her adopting the metric system is not in the most remote degree possible.

A Church Built from a Single Tree.

A redwood tree, cut in this county, furnished all the timber for the Baptist church in Santa Rosa, one of the largest church edifices in the country. The interior of the building is finished in wood, there being no plastered walls. Sixty thousand shingles were made from the tree after enough was taken for the church. Another redwood tree, cut near Murphy's Mill, in this county, about ten years ago, furnished shingles that required the constant labor of two industrious men for two years before the tree was used up. The above statements are vouched for as true by Supervisor T. J. Proctor.—*Santa Rosa (Cal.) Republican.*

TO GIVE CASTOR OIL.—The French method of administering castor oil to children is to pour the oil into a pan over a moderate fire, break an egg into it, and stir up; when it is done, flavor with a little salt or sugar, or currant jelly.

ENGINEERING INVENTIONS.

A combined feed pump and condensing apparatus has been patented by Mr. John Houpt, of Springtown, Pa. This invention consists mainly of a whistle or alarm attachment to the safety valve for indicating the internal pressure and working condition of the auxiliary force or feed pump, and relates particularly to a former patented invention of the same inventor.

AGRICULTURAL INVENTIONS.

A hay rack has been patented by Messrs. Jonas H. Hittle and Aurin D. Davis, of Mackinaw, Ill. The construction is such that the side and end pieces may be arranged on the wagon box to form a rack for carrying hay, and by a different arrangement may be adapted to carry hogs, calves, and other animals.

A stalk cutter has been patented by Mr. Robert M. Pierson, of Mayesville, S. C. Any number of pairs of cutters may be employed, but the construction is such that as the machine moves forward the stalks will be caught by the concave edges of revolving cutters and brought against the forward moving edges of stationary cutters, by which they will be cut to pieces and passed rearward.

A fertilizer distributer has been patented by Mr. Van Brunt Magaw, of Flatlands, N. Y. With the hopper and the side drive wheels is an intermediate smaller drive wheel, so one of the side drive wheels can drop into a depression in the ground, without affecting the operation of the machine, with other novel features to promote convenience and accuracy in distributing fertilizers.

MISCELLANEOUS INVENTIONS.

A cap nut has been patented by Mr. Chas. D. Thatcher, of Columbus, O. This invention consists principally in making the head of the nut separate from the main body of the nut or cap, the two parts being subsequently secured together by suitable means for completing the nut.

A machine for making and covering cords has been patented by Mr. Alfred Fornander, of Brooklyn, N. Y. This machine is a novel construction for twisting and covering the several strands of a cord with silk or other material, and then twisting the twisted and covered strands together to form a cord.

A carriage top prop has been patented by Mr. Charles D. Thatcher, of Columbus, O. It is so constructed that the employment of screw threads is dispensed with in connecting the bolt with the bow plate, the bow plate and bolt being locked together by means of an offset and lug.

A safety snap hook has been patented by Mr. Henry R. Hammond, of Foster Center, R. I. The snap hook has a pivoted and notched latch and a sliding and spring-pressed bolt, with a hook engaging the notch of the bolt, the hook being readily operated by hand, but one that cannot be accidentally detached.

A folding wardrobe bed has been patented by Mr. Adam Schieffer, of New York city. It consists of a case, with pivots to receive the bed bottom, and such other arrangements that the bed can be readily folded into a shallow case, and easily folded and unfolded, being firmly supported when unfolded.

A bottle stopper has been patented by Mr. Michael I. Dougherty, of Carbondale, Pa. It may be used for all bottles stoppered on the outside, may be quickly applied or removed with one hand, and if one part of the stopper is overworn or injured it can be replaced without discarding the whole stopper.

A bench for jointing lumber has been patented by Mr. Clarence A. Williams, of Webster City, Iowa. This invention relates to certain improvements on a former patented invention of the same inventor, and consists of a special arrangement, construction, and combination of parts.

A press for moulding letters from artificial stone has been patented by Mr. Chester A. Weller, of New York city. The artificial stone mixture is filled into a hopper, thence moved where it can be pressed by a lever, movable press plate, and die, and delivered by the machine for drying and finishing.

A screw driver has been patented by Mr. James M. Ricketts, of Charleston, Ill. This invention consists of an attachment for holding screws upon the point of a screw driver, a rectangular frame being placed on the lower or point end of the screw driver, and having guide slots to hold jaws which secure the screw.

An improved gate has been patented by Mr. Wiley M. Grisham, of Winchester, Ill. The object is to afford means whereby a rider may open a gate on approaching it, and close it on leaving, without dismounting, and means are provided for raising the gate latch and opening the gate by one continuous movement.

A fire escape has been patented by Mr. Thomas D. McKinzie, of Colorado, Texas. This invention is designed to save life from burning ships as well as houses, and provides means whereby a boat or car may be lowered from the side of a vessel, or a car may be raised or lowered to and from the windows of a house.

A brick machine has been patented by Mr. Robert Underwood, of Bowling Green, Ky. The material placed in the mill is ground and tempered by the action of the fingers on a revolving shaft, and settles down through an opening in the bottom plate into the moulds, which are completely filled by the action of a pressure roller.

A stump puller has been patented by Mr. David L. Grossman, of Rutland, Ind. The base frame has bars at its forward part, supporting pulley blocks, and a rope or chain, and at its rear end is a capstan and sweep for pulling the stumps, the whole being constructed to be easily operated, and yet simply made and powerful in operation.

An elevator has been patented by Mr. Samuel Keim, of Altoona, Pa. It is a contrivance of mechanism and supporting frame for working an elevator platform by a hand crank for raising and lowering barrels and other heavy goods out of and into cellars, and also for loading and unloading wagons, and other like uses.

A draught bolt has been patented by Mr. Frank Wirty, of Appleton, Wis. It is made in two jointed half sections, and provided with pinchers, wrenches, hammer, hatchet, nail pull, and screw driver, these tools being so arranged as to provide for their convenient use on removing the bolt from its place in the tongue.

A belt fastener has been patented by Mr. Louis C. Gleason, of Terryville, Conn. It consists of a plate of metal with one or more rows of hollow punches adapted to be driven through the belt ends, and the edges of the punches then turned down upon the belt, forming an annular rim upon the belt, holding the fastener firmly and securing the ends of the belt together.

A hame tug has been patented by Mr. Charles Hostert, of Hastings, Minn. It is so constructed that the tug is adapted to all the adjustments required, both up and down upon the hame, and as to lengths, so that a perfect fit of the hame tug may be always effected, and the invention may be readily applied to hames already in use.

A combined table, bedstead, and chair has been patented by Mr. Robert C. Balke, of Bloomington, Ill. This is a novel construction and arrangement of the sectional jointed sills or side rails of the bedstead, in combination with head and foot boards and folding chairs, making an article of furniture which can be changed in character according to necessity.

A dumping wagon has been patented by Mr. Henry Hild, of Britt, Iowa. This invention provides means whereby the driver may direct the power of the team either to haul the load to dump it, or to return the parts of the wagon to their normal position after dumping, and embraces a special construction and combination of parts with this object.

A stave jointing machine has been patented by Mr. Willard F. Wellman, of Belfast, Me. It joints both edges of a barrel stave at once, and makes the proper curve for the bulge on staves of all widths; it is also automatic, except as to the putting on and taking off of the staves and the starting of the saw carriages when the staves are set ready for jointing.

A fence making machine has been patented by Mr. George Q. Adams, of Quincy, Ill. This invention covers various novel features in mechanism for aiding manual labor in making fences of wires and pickets, by twisting the wires between the pickets, spacing the pickets, and winding into a roll the finished fence.

A ditching machine has been patented by Mr. Charles Shelmidine, of Boone, Iowa. It has a series of carrier forks, the shafts of which are pivotally secured to an endless chain, and it automatically raises the earth out of the ditch that the machine cuts, and deposits it on the surface of the ground at the sides of the ditch.

A brick machine has been patented by Mr. Napoleon M. Plante, of Verplanck, N. Y. This invention provides a novel construction of the operating mechanism of brick machines, to make provision for graduating the pressure on the clay and to insure the moulding of clean, sharp cornered bricks of uniform density from clays of different qualities or stiffness.

A cotton sack holder has been patented by Mr. John B. Robinson, of Dresden, Texas. The object of this invention is to provide a simple, inexpensive device for holding sacks or receptacles upon pickers of cotton or other plants or fruits, so as to distribute the weight of the sack and contents over the body of the picker and to enable him to work more easily.

A cockle seed separator has been patented by Mr. Richard B. Wilson, Jr., of McLeansborough, Ill. It is made of a series of inclined sieves, sieve boards, and discharge spouts and chute, arranged in a vibrating shoe, a cylinder covered with perforated sheet metal, and a driving mechanism, the construction covering a variety of novel features.

A combination drawing instrument has been patented by Mr. Joseph McM. Scott, of Allegheny City, Pa. It consists of a triangle, with the margins figured with different scales, having also another triangle, a protractor, irregular curves, circles, ovals, and other figures cut within the margins, so one instrument will serve the purpose of many single instruments.

An elevating and dumping apparatus has been patented by Mr. Benjamin K. Prater, of Mount Olive, Ill. The elevator platform is hung to be raised and lowered, and so that it may be swung to one side at the top of the shaft, while there are devices to hold the car or box on the platform, so that when the latter is tipped the load will be emptied, with other novel features.

A quartz crushing machine has been patented by Mr. Cyprian Dandurand, of Virginia City, Nevada. The beater arms are pivoted to the periphery of a horizontal rotating drum, to be thrust down the descending side of the drum on the quartz lying on a die bed, and there is a novel combination of screens to facilitate the discharge of the pulverized ore, with other novel features.

A wagon box strap has been patented by Messrs. Dwight H. Finch and William H. Nattrass, of Aurelia, Iowa. Instead of the usual wooden cleats for securing end gates, this invention covers the use of a metal cleat or strap made in one piece, and centrally grooved, the lengthwise ribs at either side of the groove preferably having a facial outline, to give the necessary strength with lightness.

An excavator has been patented by Mr. Cyrus Howard, of Pittsburg, Pa. With the excavator or truck body are two sets of wheels with an axle for each set and means for rigidly fixing either axle from turning under the truck, with various novel features, so the excavator will take up earth from the line of excavation and deposit at some distance to one side or on a wagon.

A diffusing, defecating, and circulating apparatus has been patented by Mr. Reginald M. Sandys, of New Orleans, La. This invention covers improved arrangements for charging the tanks, means for heating apparatus for effecting the circulation, and for examining the liquor, in the manufacture of sugar from cane, bagasse, sorghum, or beet roots, for the more thorough extraction of the juice from the plants, and the treatment of the residues.

A combined horse power and jack has been patented by Mr. Alfred Mauck, of Toronto, Kansas. Combined with the base frame is a pivoted frame having upwardly projecting rabbeted arms, sweep sockets, and a separable wheel, the drive rope or chain being connected with pulleys connected by a short belt and attached to shafts pivoted to a frame, whereby the machinery may be driven at a greater or less speed as desired.

The manufacture of razor blades forms the subject of a patent issued to Mr. James Memmott, of Worcester, Mass. The invention consists of the mode of forming the blades by cutting the blanks from steel bars rolled with concave sides, then bringing the blanks under a trip hammer to the general form of two razor blades placed edge to edge, then by means of dies bringing the blanks to the desired shape, with the edges properly hammered, and cutting the blades apart.

NEW BOOKS AND PUBLICATIONS.

A TREATISE ON VALVE GEARS. By Dr. Gustav Zeuner, Zurich. Translated from the German by Prof. J. F. Klein. E. & F. N. Spon, London and New York.

German thoroughness in mathematical demonstration and the indefatigable working out of details are distinctively characteristic of this book. It has been accepted as good authority and attained general acknowledgment among German engineers, having reached its fourth edition. Double slide valves, or gears with independent cut-offs, receive in this edition much more attention than was formerly given to that branch, this part of the book having been entirely rewritten. Simple fixed expansion valves, the most prominent of those with variable expansion, and the best known forms of cut-off gear, are described separately and with great thoroughness of detail.

COUNTRY COUSINS; SHORT STUDIES IN THE NATURAL HISTORY OF THE UNITED STATES. By Ernest Ingersoll. Harper & Brothers, New York.

This is in no way a text book, but its twenty-one chapters afford so many breezy sketches, many of which are of practical adventure in various parts of the world. A good proportion of the matter has heretofore been published in the leading magazines, which is no poor criterion of its good character, and it is now presented in the shape of a handsome and entertaining volume.

FISHES OF THE EAST ATLANTIC COAST. By Louis O. Van Doren and Samuel C. Clarke. The Angler Publishing Company, New York.

This is a text book on the salt water fishes that are taken with hook and line from northern Maine to the Gulf of Mexico, giving the scientific and popular descriptions, their habits, and when and where and how they are caught. The illustrations are numerous, and are photo-likenesses of the fish.

Received.

ANNUAL REPORT, U. S. LIFE SAVING SERVICE, 1883. Sumner I. Kimball, General Superintendent. Government Printing Office, Washington, D. C.

BOARD OF SUPERVISING INSPECTORS OF STEAM VESSELS. Proceedings Annual Meeting; Revised Rules and Regulations. James A. Dumont, Inspector General. Government Printing Office, Washington, D. C.

JOURNAL OF ROYAL SOCIETY, NEW SOUTH WALES, 1883. A Liveridge, F.R.S., Editor. Trubner & Co., London.

SUEZ CANAL. Report on to U. S. Navy Department. By Prof. J. E. Nourse, U. S. N. Government Printing Office, Washington, D. C.

PUBLICATIONS OF THE WASHBURN OBSERVATORY OF THE UNIVERSITY OF WISCONSIN. Vol. II., 1883.

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.

Notes & Queries

HINTS TO CORRESPONDENTS.

Name and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or mail, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter**, should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) E. J. P. asks: 1. Have the satellites of Jupiter, Saturn, etc., been observed to have an atmosphere, and has aught to indicate the presence of water been noticed on any of them? A. Nothing known of the physical condition of the satellites of the other planets. 2. Has Sir W. Herschel's observation in regard to equal axial rotation and yearly revolution of Jupiter's moons been confirmed by subsequent observers, and has this been likewise observed in the case of Saturn, Uranus, and Neptune? A. Herschel's theory in regard to axial rotation of satellites has not been confirmed.

(2) W. E. M. asks if there is any efficacy in the so-called mad stone for the cure of a mad dog bite. A. The stories which have so often been told of the virtues of the "mad stone" are utterly without foundation. It is a mere popular delusion, unworthy of notice. 2. How many square feet of heating surface it takes for an automatic cut off engine of one horse power, steam pressure 500 pounds? A. 10 square feet.

(3) E. C. W. asks: Does it require more fuel to keep the boiler pressure at 60 pounds than it does at 40, when neither boiler nor engine is overworked? If no more, will it take less? A. There is more heat radiated from all parts heated by the steam at 60 pounds than at 40 pounds; also the waste products of combustion pass up the chimney at a higher temperature at 60 pounds than at 40 pounds. With ordinary engines having no automatic or variable cut off, where the regulating of the steam is done by a common governor valve, and with no particular economy in the steam spaces between the governor and the cylinder, the lower pressure is no doubt the most economical. With the latest and most improved types of automatic and adjustable cut-off, the economy of high expansion favors the higher pressure and a corresponding saving of fuel.

(4) J. D. G. asks: 1. What size steam pipe is required to take away the steam from 1,000 horse power boilers, pressure in boilers 90 pounds? A. 12 inch pipe. 2. A simple rule to calculate the condensation in steam pipes under different temperatures per square foot of pipe surface. A. The condensation in steam pipes is so variable, from the conditions of its surrounding medium, that no simple rule will give a satisfactory answer. The amount of heat escaping from the surface is the true index, but varying very much with the moisture and circulation in the air in contact with the outside of the pipe. The velocity of the steam in the pipe also has a controlling influence upon the amount of water condensed. Measuring of the water obtained from the drip pipes is the most satisfactory solution of the question. As a general rule, for a temperature of 60° one square foot of boiler or steam generating surface is required for 10 square feet of exposed pipe surface.

(5) G. R. A. asks (1) how to obtain the standard of an inch, and from where derived. A. You may obtain the standard measure of inch, foot, etc., by addressing Bureau of Weights and Measures, Washing, D. C. 2. What is the rule for finding proportion of diameter to circumference? Can an arc or a circle be squared? If not, why? A. Multiply the diameter by 3·14159265358+ for the circumference. The circle can be squared for all practical purposes.

(6) T. F. B. asks for some material for protecting steam pipes from rust. The pipes are used for greenhouse heating, and are partly exposed to frequent wetting. Am told that ordinary mineral paints interfere considerably with the radiation of heat. The material used should not prevent radiation, nor set free any noxious gases under heat. Would ultramarine blue be available? A. We know of no greenhouses in the vicinity of New York that protect their pipes for heating. Probably this arises more from neglect than a fear of defective service. In all other kinds of heating apparatus the pipes are protected from rust and for appearance. Plumbago paint, *i. e.*, ground plumbago and linseed oil (boiled) mixed thick enough to be rubbed upon the pipes with a woolen pad or wiper, so as to leave the coat thinner than with a brush, will no doubt be the best for durability, and give out the most heat. 2. Also, how to estimate the pound pressure of a water connection, supplied by an elevated cistern or reservoir; will the distance a stream of water thrown by ordinary ¾ inch hose serve to indicate the amount of pound pressure? A. The pressure from your cistern may be ascertained by dividing the height of the surface of water in cistern above the nozzle in feet by 2·239, which will give the pressure in pounds per square inch. The jet height is uncertain, from the friction in the pipe.

(7) M. M. writes: Is a condenser now of any benefit to an engine? With our present improvements with a cut-off at one-quarter stroke, with four expansions, does not that supersede the condenser? If not, why not? Can a vacuum be made by the use of the air pump that will be of any benefit to the engine? A small power will make a vacuum of fifteen pounds to the inch; a large one will do no more. Is it worth what it costs to make it? If so, how? Can exhaust steam from an improved engine be transferred into a receiver and then into a low pressure cylinder, the area of which is four times the area of the high pressure piston? Does size of the piston add anything to the power? A. With all the modern improvements of automatic cut-off and valve gear, the condenser has lost none of its benefit, but rather gained in requiring less water for condensation than in the old forms; for any economy in steam saved is economy in the work of the air pump. A fair vacuum is equal to 13 pounds per square inch on your piston. This is a large percentage on the mean pressure upon the piston, which may be as low as half the boiler pressure; as with a boiler pressure of 60 pounds and a mean piston pressure of 30 pounds your gain would be over 40 per cent, less the friction and area of the air pump. A compound engine illustrates the economy of the condenser in a remarkable manner. You will find an interesting article and illustration of the theory of the compound engine in SCIENTIFIC AMERICAN SUPPLEMENT, No. 294, and also illustrated compound engines in Nos. 138, 366, 388, 305.

(8) W. S. C. asks: 1. How many inches would have to be added to the stroke of an engine to increase it five horse power? A. This depends upon the size of the cylinder. 2. Is an engine 10x16 rated as powerful as 12x12? A. 12x12 is the more powerful. 3. Can there be anything done for a cylinder that is cut, without reboring? A. We know of nothing but reboring for a cut cylinder. 4. What are blind tubes eight inches long put into boilers for? A. Short blind tubes are parts of leaky tubes headed up and reinserted, and should not be used when new tubes can be obtained.

(9) O. S. B. asks how to obtain the skeletons of animals, large and small, also of birds. A. Use a barrel of water with two or three pounds of caustic soda in solution for disintegrating the flesh from skeletons; two or three pounds of quicklime added to the above helps the process, and bleaches. 2. Will a common hot water boiler (galvanized iron) be strong enough to generate steam for a 1½ horse power engine? A. Could not trust a hot water boiler. Not enough surface for 1½ horse engine. You require 22 square feet heating surface, and also steam room.

(10) F. A. P.—The area of the main building of the New Orleans Exhibition is 1,378 by 905 feet, covering 33 acres, or 11 acres more than the main building at Philadelphia. There will be some extensions, but just how much space will thus be included is not yet certain. The exhibition opens December 1. The five principal buildings of the Philadelphia Exhibition covered an area of fifty acres.

(11) W. B. P. asks: What is the steadier pressure of water—taking from a pumping main or from a main from a reservoir? A. From the main from reservoir.

(12) A. R. asks if there is any way that articles of soft brass can be made hard of an iron nature. A. Brass cannot be hardened except by hammering or rolling. A composition resembling brass may be made which is hard when cast. We know of nothing but steel that can be hardened.

(13) Injectors for high lifts and long distance suction.—Referring to the inquiry of J. O. G. (32, in SCIENTIFIC AMERICAN of October 25, where the lift was 12 feet and the longitudinal suction 290 feet, we learn from Mr. A. Aller, 109 Liberty Street, this city, that the Korting injector, of which he is agent, has been applied with great success for longer suction and higher lifts than that mentioned. The Korting is one of the most effective of all the injectors, and the manufacturers make a special point of guaranteeing high lifts and heavy duties where other injectors have failed to work.

(14) J. N. asks how many feet of No. 36 silk insulated wire it would take for the secondary coil of an induction coil which will be strong as the majority of people can stand by taking the ends of the secondary coil in their hands, provided the rest of the machine is perfect and the insulation perfect. A. 200 feet of No. 36 wire will make a strong coil.

(15) F. H. asks for the process of making whiting, and also the process of making or manufacturing plaster of Paris. A. Whiting consists of chalk carefully ground, then thoroughly washed, after which it is formed into balls and dried. Plaster of Paris is ordinary gypsum (calcium sulphate) calcined so as to expel the water of crystallization, and then finely powdered. It contains 20 per cent of water.

(16) H. C. H. asks for a receipt for a finish for rubber tubing; something that is a liquid and very thin and will dry quick, glossy, and elastic, and so when stretched it will not come off, but be glossy when it comes back; something that will not be sticky after drying. A. The following is used on rubber balloons, and may prove satisfactory: Digest cold 1½ ounces India rubber cut small in 1 pint of either chloroform, sulphuric ether (washed), or carbon disulphide. This will dry as soon as laid on. Silicate of soda, or soluble glass, may be applied as a coating for rubber. It prevents the gas from coming through. The ordinary varieties of varnish will crack, and therefore cannot be used.

(17) C. McD. writes: Please inform me as to the present and probable future demand for professional chemists. In what kinds of establishments does the chemist find steady employment, and what is the nature of his work? What inducements does the profession offer as to compensation, manner of living, independence, etc.? Do you think that a young man with fair ability would probably attain reasonable success, or in other words would you advise him to adopt the profession? A. The demand for professional chemists is on the increase, but the supply is greater than the demand. In all kinds of technical establishments the services of a chemist are desirable. In iron mills and furnaces, in mines, in soap factories, mills where cloth is made and dyed, in fact everywhere that anything is produced from raw materials, the services of a chemist are needed. A chemist is generally a salaried clerk, and cannot rise, as a rule, above the figure once given him, unless by his knowledge he is successful in introducing improvements into the methods used. Then he is likely to receive an interest in the increased receipts. The average pay of an established and competent chemist is probably from $1,000 to $2.000 per annum. Success depends more upon the individual than upon the pursuit of any special branch of learning. A mechanic receiving $3.00 a day is surer of his income than any chemist can ever be, still there are chemists whose annual income exceeds $20,000, and there are millionaires to-day who were newsboys in their younger days.

(18) E. F. R. writes: 1. Suppose two bar magnets are placed one across the center of other, will the poles of either be affected or changed? If so, why? A. We think the magnets placed in the position described would not affect each other more than if placed in any other position with their poles the same distance apart. 2. Of what diameter should an electro magnet be. of straight form, being two inches in length? A. There is no fixed rule for the proportion of diameter to the length of a straight electro magnet. The core and the coil are generally adapted to the work to be done by the magnet.

(19) J. B. M. writes: I have a battery, the cups made of hard rubber: some of them have small leaks, and waste the fluid. How can the leaks be stopped? A. You can stop the leaks in your battery cells by using a cement composed of gutta percha, pitch, and shellac, equal parts melted together.

(20) A. B. G. asks: When should cod liver oil be taken—midway between meals, just before, just after, or with the meals? A. Take the cod liver oil just after the meal.

(21) J. R. F. asks what muriate of potash is, and what it is composed of. I tried to get some through one of our druggists, but failed, and they sent me something else. A. Muriate of potash is the old name for potassium chloride, or chloride of potassium, and it is composed of chlorine and potassium. It is worth in New York about $1.70 per 100 pounds, or 40 cents to 50 cents per pound pure.

(22) W. L. F. asks the best mode of brazing steel and iron. A. Steel and iron may be easily brazed with ordinary brass or copper, by cleaning the parts to be joined, covering them with borax ground in water to a thin paste, then bind the parts together with iron wire and place a piece of brass upon the joint. Heat until the brass melts, when it will flow through the joint.

(23) N. W. writes: Suppose a car let loose upon rails at the top of an incline 100 feet long, with a rise of 15 feet; and suppose at the foot of the incline it attains a speed of 20 miles an hour. How far will the acquired momentum send it on level rails (supposing the frictional resistance to be 10 pounds to the ton, and the resistance of the atmosphere to be disregarded)? Would the car go any farther if it weighed 10 tons than if it weighed one ton (resistance of atmosphere being disregarded)? A. Car would run 528 feet. The distance would be the same for a 10 ton or a 1 ton car, with a *pro rata* friction.

(24) R. S. P. asks: Will you have the kindness to give me (1) a recipe for silicate slating for blackboards, or any other good blackboard material? A. Lampblack and flour of emery mixed with spirit varnish. No more lampblack and flour of emery should be used than are sufficient to give the required abrading surface. The thinner the mixture the better. Lampblack should be first ground with a small quantity of spirit varnish or alcohol to free it from lumps. The composition should be applied to the smoothly planed surface of a board with a common paint brush. Let it become thoroughly hard and dry before it is used. Rub it down with pumice if too rough. 2. Also a recipe for the quick drying, glossy ink used with the patent shading pens. A. The following recipe is for a glossy black ink:

Powdered nutgalls	18 parts.
Iron sulphate	8 "
Gum arabic	7 "
Pure water	145 "

The galls are first boiled in 130 parts water, the iron sulphate and gum arabic dissolved in 15 parts water, and this solution then slowly added to the former.

(25) A. L. F. asks how to make a good stove polish. A. Try the following:

Blacklead pulverized	1 lb.
Turpentine	1 gill.
Water	1 gill.
Sugar	1 oz.

(26) R. C. R.—A plane that rounds or puts a bead on the edge of a board is a beading plane; a plane that only rounds the edge without the guide is a rounding plane; for a hollow or round groove, a grooving plane. There are over 80 names in the trades for planes for woodwork.

(27) G. R. writes: Two persons in the shop where I work have a dispute as to the strongest way to place a bar of square wrought iron, supported at each end and the load placed in the center. A says that it will be the strongest placed flat, while B claims that it is the strongest placed on one corner. A. A is right. The bar placed square is as 673 to 568 for a bar placed diagonally.

(28) T. H. C. & Mfg. Co. ask what material or mixture to make to fill up patterns to make them larger and heavier. On plane surfaces we use paper, but on uneven surfaces we want something of a plastic nature that will stand the wear of the sand. A. Shellac varnish and whiting brushed on in several coats will raise the surface of irregular patterns, and will last a time with careful handling. Make the mixture like thick paint, and use quickly.

(29) S. L. W. asks a receipt for a solution that will harden Bessemer steel. A. We do not know that Bessemer steel can be hardened by simply dipping in a solution. A nearly saturated solution of prussiate of potash in water might make a hard surface film. Casehardening with the same treatment as with iron is the best way to obtain a useful surface of steel.

(30) J. P. P.—Delta metal is not on sale. It can be cast, forged, and rolled. Has a tensile strength of 48,000 pounds cast, 75,000 pounds rolled, and 140,000 pounds in drawn wire per square inch. Steel can be cast in links. The inclination of the holes in blasting depends very much upon kind of rock. In crystalline rock a slanting hole is preferred.

(31) N. H. B. asks for a simple method of detecting the presence of iron in water. In paper making it is often very desirable to know whether there is any iron in solution in the water. A. Boil the water with a little nitric acid, and then add a few drops of potassium ferrocyanide; if iron be present, a blue precipitate will immediately show itself. It will be well to concentrate the solution before adding the reagent, as the amount of iron may be slight.

(32) J. F. asks how to melt rubber. A. Rubber may be melted over a water bath. To obtain it in the liquid state, it is commonly the practice to dissolve it in some suitable solvent, and then evaporate that solution to the desired consistency. An elaborate account of the rubber industries is given in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 249, 251, 252.

(33) M. S. G. asks for a solution which will take nickel off of brass or iron. A. Nickel is slowly soluble in not too dilute hydrochloric acid, more readily in hot than in cold. Hot dilute sulphuric acid dissolves it with some difficulty. Much more easily soluble in dilute nitric acid, but with concentrated nitric acid it behaves like iron.

(34) F. B. D. writes: What can I mix with common lard so that it will melt at about 150°? I have a fire alarm that works by the melting of the material, and I am unable to make more of it, so that as it is now the machine is useless. A. Try mixing common resin with your lard.

(35) A. C. writes: 1. Which battery will give the most powerful current? Also, which will maintain that current the greatest length of time—the Grove, Bunsen, Smee, or Grenet? Is it not the Grove? A. The Bunsen bichromate form of battery would probably answer your purpose best. 2. Please tell me how to make an electric motor. I don't mean one like that described in the article on "An Electrical Cabinet," in SUPPLEMENT, No. 191, but a regular motor. One which would have power enough to run a Holtz electrical machine. A. You can make an electric motor by following the directions given in SUPPLEMENT, No. 161, for a small dynamo. There is no difference between the motor and the dynamo except in the adjustment of the commutator, which you can readily arrive at by a little experiment. 3. How many cells of the most powerful of the above batteries would it take to run a Holtz machine? A. It depends on the size of the Holtz machine. Probably 4 cells would run a small machine.

(36) L. H. writes: I am making a dynamo electric machine, with field magnets 6 inches by 4½ inches by ¾ inch, wound with No. 18 silk covered magnet wire. The extreme diameter of armature to be 2 inches. I desire to use it with an incandescent lamp. What size wire should I wind the armature with if I use the original form of Siemens? If I desire to charge a secondary battery, should I wind the armature with a different size? A. Unless you place your field magnets in a shunt, we think that No 18 wire is too fine. You should use No. 16 or 14. No. 18 wire would probably be the right size for your armature. An armature for charging a secondary battery should be wound with coarse wire. 2. Will you give me an explanation of the terms "in series" and "for tension"? A. The term "in series" means connected one after the other, and the term "for tension" means substantially the same thing.

(37) E. L. P. asks how to prepare the pieces of limestone used in producing the calcium light with hydrogen and oxygen gas. What is the best quality of limestone to use, and where can it be obtained? A. The limestone is calcined, producing common lime. Common lime of good quality is generally used for cylinders of the oxyhydrogen light. Marble is often calcined and used for this purpose.

(38) J. L. G. writes: Please inform me how to recolor ivory billiard balls that have become faded. A. For the red, which is what we presume you desire, any of the following will answer: *a.* Macerate cochineal in vinegar, and boil the balls in the liquid for a few minutes. *b.* Carmine dissolved in ammonia may be used. The tint is more purple red. *c.* Immerse in a very dilute solution of stannous chloride, and afterward in a boiling solution of Brazil wood. A little fustic turns the color to scarlet. *d.* Ivory dyed as last directed is rendered cherry red by immersion in a very dilute solution of potash. *e.* Immerse in an alcoholic solution of alizarine paste. Ivory must not be boiled long in liquids, and when taken out of hot liquid should be rapidly cooled by laying in cold water.

(39) A. H. writes: 1. Have any books been written on electrical engineering, and what are they? A. Sprague's new work on Electricity is very good for a beginner. Gordon's Electric Light, Prescott on Dynamos, Kempe on Testing, and Schellen on Electric Light are all good works. 2. What course should I pursue and what works read to become an electrical engineer? A. Begin with Ganot's Physics; thoroughly post yourself in physics, particularly in electrical physics, and also in mathematics. To become a thoroughly efficient electrical engineer, you should also be a mechanical engineer.

(40) W. M. J wants a metal or a compound of metals to take a stereotype impression from type, the type being forced into the metal when it is nearly cool with a press. Have tried several compositions, but do not get perfection in every case, without injury to the face of the type. Type metal is too hard and brittle. A. We know of no metal unless it be fusible metal, made of bismuth, tin, and lead, that will answer your purpose. Fusible metal that will melt in boiling water may be made of 8 parts of bismuth, 5 parts of lead, and 3 parts of tin.

(41) F. R. writes: Will you tell me whether I am right or wrong in this: I contend that if a bullet be fired from a rifle perpendicularly in the air, when it returns to the point whence it was fired it will have the same velocity it had when it left the rifle. A. You are wrong; the bullet going up has to overcome the resistance of the air as well as the force of gravity; coming down, it is drawn by a force of gravity equal to that which the explosive at first overcame, but has then also to overcome the friction of the air. If the experiment were made in a perfect vacuum, the bullet would return with the same speed that it left the gun.

(42) J. A. H. asks: Which gets the harder lick—a hammer or a nail—when the nail is struck with a hammer? A. Both alike, except, unfortunately, your finger should happen to share with the nail in its part of the "lick."

(43) J. T. G. asks a cure for chicken cholera, roop, the gaps, etc. A. Our SUPPLEMENT Nos. have valuable papers on chicken raising, treatment of disease, etc., but the best way is to cut off the head of a sick chicken; it is time and money wasted to attempt to doctor it.

(44) A. S. asks: 1. Is there an element with which oxygen does not unite? A. Fluorine is the only element which will not combine with oxygen. 2. What are the advantages and drawbacks of high speed running engines? A. The advantage is speed. The drawbacks are wear, tear, and care, as also waste of oil.

(45) S. W. Y. says: You have stated many times that the sun is the source of all heat. Will you inform us of the great source of all cold? A. Cold is but the absence of heat; the terms are only relative, and the lowest temperature we find at the poles is comparative warmth to that which can be produced artificially.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

October 21, 1884,

AND EACH BEARING THAT DATE.

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

Auger bits. tool for cutting the floor lip and cutting spur of, J. Swan 307,074
Awning attachment, T. Morrison 306,851
Axle lubricator, car, D. W. Rees 306,959
Ax e, vehicle, B. F. Horton 307,754
Bag lock, A. Brendler 306,898
Ballot box, J. M. Fennerty 306,819
Banjos and other instruments, case for, A. C. Fairbanks 306,731
Battery cell, J. Zobel 306,796
Bed, folding wardrobe, A. Schieffer 306,866
Bedstead, wardrobe, C. Carleton 307,013
Bell, electric, E. W. Hazazer (r) 10,533
Bell plate and card receiver, J. G. Mattheis 306,846
Belt fastener, L. C. Gleason 306,740
Belting, metallic, F. H. C. Mey 306,766
Bench for jointing lumber, C. A. Williams 306,888
Bit. See Auger bit.
Blind attachment, window, A. J. Avery 306,994
Boiler front, N. W. Pratt 306,861
Book and wrapper or cover for the same, indestructible account, G. T. Jones 307,052
Book cover protector, Birchard & Titus 307,004
Books, frame for preserving the edges of copy, Brunet & Deveze 306,715
Boot and shoe heel, G. De Clyne 306,905
Boot jack, T. M. Carpenter 307,014
Boot or shoe, T. J. Lynch 307,059
Boot or shoe heels, knife for shaving or trimming, Reed & Gordon 306,958
Boot or shoe upper, W. P. Hobson 306,751
Boots and shoes, making seamless felted wool, Hawley & Hyson 306,747
Boots, shoes, leggins, etc., method of and device for making felt, A. A. Hawley 306,748
Bottle, dentifrice, E. R. Pettit 306,950
Bottle stopper, M. I. Dougherty 306,908
Box. See Ballot box. Letter or mail box. Paper box. Toy money box.
Box fastener, F. Karfunkelstein 307,053
Bracelet, J. Logan 303,936
Brick kiln, B. Retherford 306,960
Brick machine, N. M. Plante 306,858
Brick machine, R. Underwood 306,879
Bricks, manufacture of, W. B. Heintze 306,828
Bridle front, J. G. Eberhard 306,726
Brush, tooth, M. L. Rhein 306,776
Buildings, device for raising, D. Stout 306,973
Bundling machine, L. W. Elder 306,729
Burglar alarm, C. E. Luburg 307,058
Burglar alarm, F. M. Woods 307,076
Burner. See Gas burner. Lamp burner.
Bustle, C. E. Brown 306,899
Bustle, C. W. Higby 306,829
Button, cuff, D. Schreiber 306,780
Can. See Creaming can. Milk can. Sheet metal can.
Candy machine, F. G. Birchard 307,003
Cany, manufacture of peanut, M. G. Edson 306,727
Car buffer, R. E. Ricker 306,777
Car coupling, Clay & Safford 306,720
Car coupling, W. H. Thurmond 306,876
Car door, railway freight, E. H. Callaway 307,012
Car label holder, P. R. Sledge 306,872
Carriage lug, B. B. Hill 306,750
Carriage top, B. Simmons 307,072
Carriage top prop, C. D. Thatcher 306,874
Cartridge, electric, S. Russell 306,071
Cartridges, making compressed, W. Hebler 306,827
Caster, adjustable stove, Fuhrman & Rusche 307,036
Casting copper plates, bars, etc., apparatus for, J. Zengerle 306,990
Centrifugal machine, J. W. Palmer 306,769
Chain, drive, H. W. & F. C. Caldwell 307,011
Chair, C. R. Yandell 306,989
Churn, Beard & Bruce 306,999
Cigar tip punch and former, combined, H. J. Schuett 306,867
Circuit controlling instrument, F. Lane 306,932
Clamp for climbing ropes, rods, etc., S. C. Matteson 306,939
Clasp. See Album clasp.
Clock, alarm, W. D. Davies 307,022
Clod cutter, C. D. Edwards 306,728
Clothes reel, W. Schwendler 306,868
Clutch, C. J. Appleby 306,709
Coal picking table, I. Christ 306,900
Coal scuttle, J. Fritzinger 306,822
Cock, steam gauge, J. H. Lucas 306,937
Coke, manufacture of, J. Jameson 307,050
Copying machine, automatic, M. J. Sunderlin 307,073
Cords, machine for making and covering, A. Fornander 306,911
Cotton packer, A. M. Steele 306,971
Cotton sack holder, J. B. Robinson 306,863
Coupling. See Car coupling. Thill coupling.
Crane, C. J. Appleby 306,710, 306,711
Creaming can, W. E. Lincoln 306,935
Cultivator, J. W. Hudson 307,048
Cultivator, H. Ingersoll 306,830
Curtain fixture, window, Price & Reed 306,773
Cutter. See Clod cutter. Stalk cutter.
Die. See Screw cutting die.
Diffusing, defecating, and circulating apparatus, R. M. Sandys 306,865
Ditching machine, C. Shelmidine 306,870
Door, H. M. Hopkins 306,753
Door closing device, N. M. Stebbins 306,970
Door, protector, E. Barnes 306,806
Doors, guide track for sliding, W. R. R. Tillion 307,078
Draught bolt, F. Wirty 306,986
Draught equalizer, W. H. Baker 306,895
Drain and ventilator, cellar, M. Posz 306,859
Drawing instrument, combination, J. M. Scott 306,869
Dredger, E. C. G. Thomas 306,787
Drill. See Ratchet drill.
Dust from shavings, apparatus for separating, J. B. Mahaffey 306,938
Dust from the air, apparatus for separating, R. Howarth 306,757
Edger, gang, T. J. Neacy 306,944
Elastic fabric and weaving the same, J. Swann 306,785
Electric meter, J. F. Ray 306,957
Electric motor, J. B. Atwater 306,805
Electric switch, Waite & Bartlett 306,789
Electric wire supporter, O. M. Draper 307,025
Electrical indicator, T. A. Edison 307,031
Electrical meter, T. A. Edison 307,030
Elevating and dumping apparatus, B. K. Prater 306,860
Elevator, S. Keim 306,834
Elevator safety attachment, W. N. Willis 306,795
Elevator signal, pneumatic, J. Hunt 307,049
Elevators, automatic machine governed by electricity for controlling, Ongley & Sturtevant 307,064
End gate for covered wagons, W. Howard 306,756
Engine. See Gas engine. Steam engine.
Envelope machine, S. A. Grant 306,741
Envelope machine, G. Sickels, Jr 307,079
Envelope opener, eraser, and pencil sharpener, combined, C. S. Watson 306,882
Evaporator, A. S. Folger 306,821
Excavator, C. Howard 306,755
Explosive compounds, apparatus for making, O. B. Hardy 306,920
Extractor. See Stump extractor.
Eyeglasses or spetacles, B. M. Hanna 306,918, 306,919
Faucet ring, J. Kusler 306,841
Feed water heater for boilers, J. D. Murphy 307,061
Feeder, steam boiler, A. De Dion *et al* 306,722
Fence making machine, G. Q. Adams 306,797
Fencing, barbed metal strip, F. A. Blackmer 307,005
Fertilizer distributer, V. Magaw 306,844
Fifth wheel, vehicle, J. H. Robinson 307,069
Fire escape, J. W. Corder 307,019
Fire escape, J. T. Davis 307,023
Fire escape, W. E. Lindop 306,843
Fire escape, T. D. McKinzie 306,848
Fire escape, C. F. Shore 306,871
Fish baits, mixture for, C. F. Bates 306,896
Flanging machine, A. Wilbur 306,793, 306,794
Fly trap, N. Chase 307,016
Foot warmer, A. Ramage 306,956
Fruit jar, A. F. Wilson 306,984
Furnace. See Gas furnace. Hydrocarbon furnace.
Gas burner, self-lighting, H. H. Tallmadge 306,786
Gas engine, J. Atkinson 306,712
Gas engine, I. N. Hopkins 306,924
Gas engine, S. Lawson 306,933, 307,057
Gas furnace, Calvelage & Dodge 306,717
Gas, manufacturing, R. A. Chesebrough 306,810
Gas, process of and apparatus for obtaining illuminating, M. Herzog 306,042
Gas scrubber, G. Anderson 306,892
Gate. See End gate. Railway gate.
Gate, W. M. Grisham 306,915
Gearing, R. Campbell 306,809
Gearing, changeable speed, Bickford & Armitage 307,002
Generator. See Steam generator.
Glycerine, process of and apparatus for purifying, F. H. Houghton 306,832
Grate, fire, S. H. La Rue 306,762
Grease trap, N. P. Whiting 306,981
Grinding mill, roller, U. H. Odell 306,945
Guard. See Limb guard.
Gun, electric, S. Russell 307,070
Hame fastener, K. McLeod 307,060
Handle. See Pocket knife handle.
Harness, J. K. Alwood 306,991
Harrow, J. H. Harris 306,746
Harvester and binder, Whitney & Marsh 306,982
Harvester grain conveyer, W. F. Rundell 306,961
Harvester rake, H. E. Pridmore 307,067, 307,068
Harvesting machine, H. A. Adams 306,891
Harvesting machine, M. E. Blood 307,007
Hat block chuck, C. S. Peck 306,856
Hay press, H. V. Ward 306,881
Hay rack, Hittle & Davis 306,923
Heater. Seed Feed water heater.
Holder. See Cotton sack holder.
Hook. See Snap hook. Whiffletree hook.
Horse power and jack, combined, A. Mauck 306,847
House, sectional, F. H. Morse 306,942
Hub attaching device, Searls & Harrington 306,964
Hydrocarbon furnace, A. N. Leet 306,934
Hydrocarbon oils, apparatus for burning, H. W. Whiting 306,887
Ice cream, etc., freezer for, W. Tunstill 307,075
Incandescents, making, E. Weston 306,980
Indicator. See Electrical indicator.
Insulating electrical conductors, machine for, W. D. Grimshaw 306,744
Insulator, E. Clark 306,718, 306,719
Ivory from zylonite, etc., manufacture of artificial, J. B. Edson 307,032
Jack. See Boot jack. Lifting jack. Wagon and lifting jack.
Jar. See Fruit jar.
Journal bearing, H. H. Hewitt 306,921
Journal box, D. Jones 307,051
Kiln. See Brick kiln.
Knife. See Pocket knife.
Ladder, A. C. Stowe 306,974
Lamp, F. Saunders 306,962
Lamp, air tight electric arc, W. Baxter, Jr 306,998
Lamp brackets, hanging side, M. Hicks 307,044
Lamp burner, N. Trowbridge 306,788
Lamp, electric arc, F. M. Newton 307,062
Lamp fixture, N. Jenkins 306,926
Lamp, multiplex electric arc, R. H. Mather, 306,764, 306,845
Lamp, railway, M. Hicks 307,045
Lamp, suspension, N. Jenkins 306,927
Lamps, filament for incandescent, T. A. Edison 307,029
Lapel and scarf pin, J. T. Clarkson 306,901
Lasting tool, J. Frossard 306,736
Lathe for turning wheels, J. Du Bois 306,723
Leather dressing machine, M. Garnier 306,737
Leather splitting machine, J. T. Krebs 306,760
Letter, enameled, J. Caesar 306,808
Letter or mail box, L. Prince 306,953
Lifting jack, Mottram & Mundy 306,943
Limb guard or protector, C. Drake 307,024
Lock. See Bag lock.
Lock, G. Thumshirn 306,976
Locomotive, H. F. Shaw 306,966
Locomotive fire box, J. H. H. Penruddocke 306,857
Lubricator. See Pulley lubricator.
Lubricator, R. E. Thompson 306,975
Mail bag catcher, W. Angle 306,893
Measuring and drawing kerosene, etc., device for, E. J. Robinson 306,779
Mechanical adjustment, N. C. Stiles 306,972
Metal extracting apparatus, W. Hamilton 306,825
Metal extracting apparatus, J. L. Hornig 306,831
Meter. See Electric meter. Electrical meter.
Milk can, J. E. Johannesen 306,928
Mortising machine, J. Oppenheimer 307,065
Motor. See Electric motor. Spring motor.
Necktie, C. H. Owen 306,768
Needle grooving machine, J. Berry 307,001
Nut, cap, C. D. Thatcher 306,875
Nut lock, T. W. Lambert 306,931
Oil heating device, J. S. Klein 306,837
Oils and fats, treatment of, L. H. Friedburg 306,735
Oils, extraction of, L. H. Friedburg 306,733, 306,734
Oils, heating petroleum, M. J. Seymour 306,965
Ore, etc., apparatus for grinding and separating, J. Wood 306,987
Ore separator, magnetic, Ripley & Bridgford 306,778
Overshoe, H. O. Hooper 306,830
Overshoe, rubber, J. P. Anshutz 306,804
Overshoe, rubber, I. Piles 306,771
Paint, fire and water proof, roof, Fowler & Foss 306,912
Paper box, O. M. Hamilton 306,745
Paper box, folding, C. W. Elliott 307,034
Paper box scoring and folding machine, Glazier & Rollins 306,824
Paper stock, etc., machine for reducing logs to, S. S. Webber 306,979
Pasting machine, A. Kingsbury 306,836
Pheneto-sulpho-diazo-beta-naphthol with bisulphite compound, preparation of, A. Spiegel 306,969
Pin. See Lapel and scarf pin.
Plane, S. G. Laskey 306,763
Plane, bench, J. A. Traut 306,877
Planter check rower, corn, S. H. Garver 306,823
Planter, corn, B. Nunamacker 307,063
Plow, W. J. Ball 306,895
Plow, W. W. Speer 306,873
Plow cultivator attachment, W. R. Andrews 306,992
Plow tongue, jointed, O. Simpson 306,782
Pocket knife, G. W. Korn 306,839
Pocket knife handle, G. W. Korn 306,840
Power. See Horse power.
Press. See Hay press.
Press, G. J. Fritz 306,914
Printing apparatus, solar, E. Cope 306,721
Projectile, L. Geiger 306,739
Projectiles, making, L. Geiger 306,738
Puller. See Stump puller.
Pulley head, J. W. Porritt 306,952
Pulley lubricator, loose, W. J. Ormsby 307,066
Pulley, window sash, H. A. Wilbur 306,983
Pump, W. D. Andrews 306,798
Pump, J. D. Cowan 306,812
Pump and condensing apparatus, combined feed, J. Houpt 307,047
Pumping engines, steam actuated valve for, A. J. Blakeslee 307,006
Quartz crushing machine, C. Dandurand 306,903
Rack. See Hay rack.
Radiator valve, G. J. Wallace 306,880
Railway, cable, Eggleston & Brinkerhoff 306,909
Railway gate, automatic, J. K. Yoder 306,890
Ratchet drill, A. M. White 306,886
Razor blades, manufacture of, J. Memmott 306,849
Reel. See Clothes reel.
Refrigerator, E. B. Jewett 306,833
Refrigerators, etc., detachable leg for, J. Hammerl 307,040
Respirator A. L. Olsen 306,946
Rivet heading machine, J. H. Kressler 307,056
Rowlock, T. R. Smith 306,968
Rowlock for boats, C. W. Morris 306,941
Rubber or waterproof cloth, machine for manufacturing, McKee & Black, Jr 306,765
Sawmill, band, D. B. Hanson 306,826
Sawmill set works, J. Cook 306,811
Saw tooth, insertible, G. F. Simonds 306,967
Sawing machine, J. H. Coppock 307,018
Sawing machine, circular, R. G. Peters 306,949
Scale and register, automatic grain, M. F. Koch 306,759
Scraper, road, W. L. Freese 306,913
Scraper, wheeled, J. P. Wales 306,978
Screw cutting die, A. J. Smart 306,783
Screwdriver, J. M. Ricketts 306,862
Seaming metallic cans, machine for, Gordon & Gilbert 307,039
Seed and fertilizer distributer, J. Chapuis 307,015
Seed separator, cockle, R. B. Wilson, Jr 306,889
Sewer gas valve, automatic, F. G. Johnson 306,929
Sewing machine, A. M. Barber 306,713
Sewing machine, hand, A. M. Barber 306,996
Sewing machine plaiter, J. M. Griest 306,743
Sewing machine ruffler and shirrer attachment combined, J. M. Griest 306,742
Sewing machine ruffling and gathering attachment, J. H. Gardner 307,037
Shaft support, wagon, H. P. Fike 306,910
Shears, F. W. Kenney 306,758
Sheet iron vessel, enameled, W. F. Niedringhaus 307,077
Sheet metal can, F. A. Walsh 306,791
Shells of caps to machines, device for feeding, P. Butler 306,807
Shoe, J. Elam 307,033
Shoe upper, W. P. Hobson 306,752
Shutter, W. G. Eckstein 306,816
Signal. See Elevator signal.
Sizing compounds, composition and article of manufacture for addition to and improvement in, J. W. Wattles 306,883
Snap hook, safety, H. R. Hammond 306,917
Snow plow, railway, W. S. Buist 306,716
Snow scraper, J. H. Boardman 306,714
Spinning machine, T. Downward 306,815
Spool, thread, E. H. Conover 306,902
Spring. See Vehicle spring. Watch case spring.
Spring motor, C. L. Kidder 306,835
Stalk cutter, R. M. Pierson 306,771
Stave jointing machine, W. F. Wellman 306,885
Steam engine, D. P. Kane 306,930
Steam generator, J. N. Wingett 306,985
Steam wheel, H. Laliberty 306,842
Stone dressing machine, Pratt & Stillman 306,772
Stone, press for moulding letters from artificial, C. A. Weller 306,884
Stopper. See Bottle stopper.
Store service switch, C. L. Walker 306,790
Stove, Turner & Capewell 306,878
Stove and furnace grate, D. Brazier 307,010
Stove for railway cars, safety, C. Rowell 306,864
Stoves, ranges, and furnaces, door for, W. G. Fischer 306,732
Stump extracter, L. B. Gibson 307,038
Stump puller, D. L. Grossman 306,916
Suspenders, D. L. Durand 307,028
Suspenders, F. Kelly 307,054
Suspenders, G. E. Schellinger 306,963
Switch. See Electric switch. Store service switch.
Table. See Coal picking table.
Table, bedstead, and chair, combined, R. C. Balke 306,894
Tachygraphic apparatus, V. A. De Celada 306,904
Telegraphy, P. H. Vander Weyde 306,977
Telephone exchange appliance, J. Fearey 306,817
Telephone exchanges, trunk table for, J. Fearey 306,818
Telephone transmitter, D. Drawbaugh 307,026
Testing machine holder, A. H. Emery 306,730
Thill coupling, J. Herron 306,749
Time pieces, winding indicator for, R. Heunsch 307,043
Tipping and balancing mechanism, P. Dietrich 306,814
Tobacco, machine for making and affixing tags to plug, E. H. Peck 306,948
Toy money box, A. C. Rex 306,775
Trap. See Fly trap. Grease trap.
Trees, device for felling, P. Miller 306,850
Trimmer. See Wick trimmer.
Truck, baggage, W. L. Armentrout 306,993
Truck, car, E. L. Cleveland 307,017
Truck, harvester, S. M. Barnes 306,997
Tug, hame, C. Hostert 307,046
Type, manufacturing elastic faced, R. H. Smith 306,784
Type matrices, machine for dressing, J. G. Pavyer 306,855
Type writing machine, F. Lambert 306,761
Valve. See Sewer gas valve.
Valve gear, J. Bond, Jr 307,009
Valve, steam engine, J. Bond, Jr 307,008
Vehicle spring, C. A. Behlen 307,000
Vehicle spring, Denise & Bender 306,906
Vehicle spring, L. Pentz 306,770
Wagon and lifting jack, R. Netzly 306,854
Wagon box strap, Finch & Nattrass 306,820
Wagon, dumping, H. Hild 306,922
Wagon running gear, J. Moses 306,852, 306,853
Walls, remedy against dry rot and dampness in, A. Kothe 307,055
Watch case spring, R. J. Quigley 309,954, 306,955
Watch, stem winding, A. C. Droz 307,027
Water closet bowl, J. Milliken 306,940
Water from the earth, procuring, W. D. Andrews 306,802, 306,803
Well and pump for procuring water from the earth, W. D. Andrews 306,800
Well and reservoir for procuring water from the earth, W. D. Andrews 306,801
Well drilling apparatus, S. Wheeland 306,792
Wells, apparatus used in sinking, W. D. Andrews 306,799
Wheel. See Steam wheel.
Wheel, P. H. Cummins 307,021
Wheelbarrow, P. H. Cummins 307,020
Wheelbarrow frame, A. M. De Gray 306,813
Whiffletree, M. F. Wood 306,988
Whiffletree hook, I. Kohn 306,838
Wick trimmer, T. Redihough 395,774

TRADE MARKS.

Medicinal liquor or tonic for the removal of the effects of over-indulgence in drink, I. Ellenberg 11,583
Oil, olive, H. L. Routh & Sons 11,587
Ointment for external use, Penn Remedy Company 11,585
Pianos, I. N. Camp 11,582
Refrigerators, Baldwin Manufacturing Company 11,581
Thermometers, H. Weinhagen 11,588
Wines and brandies, Kohler & Frohling 11,584
Wooden ware, certain, Prewitt, Spurr & Company 11,586

DESIGNS.

Advertising card, F. E. Housh 15,469
Badge, L. Souther 15,481
Badge, W. D. Stinson 15,478
Cross, G. Wagner 15,482
Exhibiting stand, H. B. Sommer 15,480
Fringe, J. Zebley 15,483
Hair pin, J. D. Oppenheimer 15,475
Knitting machine frame, Nye & Tredick 15,474
Lamp chimney, E. Kaye 15,470
Leather, ornamentation of, E. H. P. Mehl 15,472, 15,473
Overcoats, ornamentation of boys', H. J. Schloss 15,479
Stove, cooking, H. C. Bascom *et al* 15,468
Type, printing, J. K. Rogers 15,476, 15,477
Upholstery band, H. C. Lees 15,471

A printed copy of the specification and drawing of any patent in the foregoing 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., 361 Broadway, New York. 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.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the forse going list, at a cost of $40 each. For full instruction address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

A FEW CHOICE TECHNICAL BOOKS.

RECENTLY PUBLISHED.

Davis.—A Practical Treatise on the Manufacture of Bricks, Tiles, Terra-Cotta, Drain Tiles, Sewer Pipe, Fire Clays, Fire Bricks, Roofing, Flooring, and Art Tiles, &c. &c. Including full detailed descriptions of the most modern Machines, Tools, Kilns, and Kiln Roofs used. Illustrated by 228 engravings and six plates. 8vo. 472 pages, ... $5.00

Dawidowsky-Brannt.—A Practical Treatise on the Raw Materials and Fabrication of Glue, Gelatine, Gelatine Veneers and Foils, Isinglass, Cements, Pastes, Mucilages, etc. Including a description of the most recent American processes. 35 engravings. 12mo, $2.50

Wahl.—Galvanoplastic Manipulations. A Practical Guide for the Gold and Silver Electroplater. Comprising the Electro-Deposition of all Metals by means of the Battery and the Dynamo-Electric Machine, as well as the most approved processes of Deposition by simple immersion. Illustrated by 189 engravings. 656 pages. 8vo, ... $7.50

Andres.—A Practical Treatise on the Fabrication of Volatile and Fat Varnishes, Lacquers, Siccatives, and Sealing Waxes. Illustrated. 12mo, . . . $2.50

Hoffer-Brannt.—A Practical Treatise on Caoutchouc and Gutta-Percha, comprising the properties of the Raw Materials, and the Manner of Mixing and Working Them. Illustrated. 12mo, . . . $2.50

Davies.—A Treatise on Earthy and other Minerals, and Mining. Illustrated by 76 engravings. 336 pages. 12mo, ... $5.00

Ross—The Blowpipe in Chemistry, Mineralogy, and Geology, containing all known methods of Anhydrous Analysis, many Working Examples, and Instructions for Making Apparatus. With 120 Illustrations. 12mo, ... $1.50

Kerl.—The Assayer's Manual. An Abridged Treatise on the Docimastic Examination of Ores and Furnace and other Artificial Products. Illustrated by 65 engravings. 8vo, ... $3.00

READY SHORTLY.

Davis.—The Manufacture of Leather. Being a Description of all the Processes for the Tanning, Currying, and Finishing of Leather, with special reference to the best American Practice. Illustrated by 302 engravings. 8vo. 800 pages, ... $10.00

Walton.—Coal-Mining Described and Illustrated. 24 large and elaborate plates. Quarto, . . . $5.00

☞ *The above or any of our Books sent free of Postage, at the publication prices, to any address in the world.*

☞ Our new and enlarged Catalogue, 96 pages 8vo, and our other catalogues, the whole covering every branch of science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish us with his address.

HENRY CAREY BAIRD & CO.,
Industrial Publishers, Booksellers, and Importers,
810 WALNUT STREET, PHILADELPHIA, PA.

SIMPLE MECHANICS.

How to Make and Mend; *easy forms and plain directions for doing nearly*

2,000 COMMON THINGS.

Active business men wanted to show samples and take orders. Write for description to **FORDS, HOWARD & HULBERT, 27 Park Place, New York.**

JUST PUBLISHED, PRICE $2.00

STEEL AND IRON

COMPRISING THE PRACTICE AND THEORY OF THE SEVERAL METHODS PURSUED IN THEIR MANUFACTURE AND OF THEIR TREATMENT IN THE ROLLING MILLS, THE FORGE, AND THE FOUNDRY.

BY

W. H. GREENWOOD,

F.C.S., ASSOC. M.I.C.E., M.I.M.E.,
ASSOCIATE OF THE ROYAL SCHOOL OF MINES.

WITH 97 DIAGRAMS FROM ORIGINAL WORKING DRAWINGS.

1 vol. 12mo. Price, $2.00.

"It is a thorough and exhaustive treatise, beginning with the ore, and bringing it up step by step in all the different directions and through all the different processes along which and by means of which the pure metal is prepared for the different purposes of the special manufacture. . . . The style is clear, correct, luminous, and the illustrations are what illustrations are not always—real helps to the understanding of the subject matter."—*N. Y. Herald.*

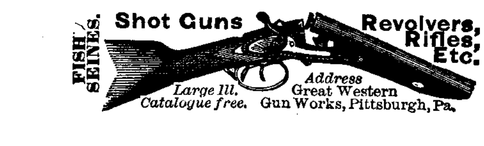
Sent by mail, prepaid, on receipt of price.

NOW READY Cassell & Company's Complete descriptive Catalogue of Technical Publications, Illustrated and Fine Art Books, Juvenile and Educational Works, which will be forwarded free to any address on application. **SENT FREE**

Our Publications are For Sale by all Booksellers.

CASSELL & COMPANY, Limited,
739 & 741 Broadway, New York.

CARDS 20 Hidden Name 10 cts. 6 packs 50c., your name hidden by hand holding flowers on each. **50 New Imported Embossed Chromos 15c** 4 packs 50 cts. (not embossed edge as on t oseadvertised for 10c. but each flower &c. completely embossed) **New '85 Sample Book,** Illustrated Premium List &c. sent **FREE** with each order. **CAPITOL CARD CO., Hartford, Conn.**



DROP FORGINGS BILLINGS & SPENCER CO. HARTFORD, CONN. U.S.A.

RUBBER BACK SQUARE PACKING.

BEST IN THE WORLD.

For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.

B represents that part of the packing which, when in use, is in contact with the Piston Rod.
A, the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.
This Packing is made in lengths of about 20 feet, and of all sizes from ¼ to 2 inches square.

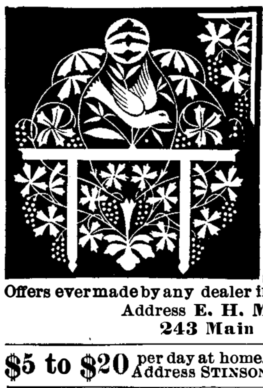
NEW YORK BELTING & PACKING CO.,

JOHN H. CHEEVER, Treas. **Nos. 13 & 15 PARK ROW, Opp. ASTOR HOUSE, NEW YORK.**
JOHN D. CHEEVER, Dep'y Treas. Branches: 308 CHESTNUT ST., Philadelphia, Pa. 164 MADISON ST., Chicago, Ill.

A BOX OF FUN!

To any reader of this paper who will send 24 cents in stamps to pay postage, we will send FREE our New Agents' Sample Book of Cards with price list of a hundred styles and large premium list. We will also mail you a box of goods that would cost more than $1 at retail. Justee what this box contains: 1 pack Bustle cards, (comic) 1 pack Mind Your Business cards, 1 pack Caution cards, 1 pack Flirtation cards, 1 pack Acquaintance cards, 1 pack Escort cards, the game of Komical Konversation, 100 choice Quotations for Autograph Albums, the wonderful Age Tablet, $600.00 in Confederate Money (facsimile), the Great Triple Prize Puzzle, the game of Fortune, (very laughable) 1 Fortune Telling Tablet, 11 games for parties, 1 Deaf and Dumb Alphabet, 1 Morse Telegraph Alphabet, 1 sheet of Parlor Magic full of wonder fun and mystery. Write at once. Send one cent stamps if you can.
U. S. CARD CO., CENTERBROOK, CONN.

Dyspepsia I CURED MYSELF MY REMEDY FREE **Dyspepsia**
JOHN H. McALVIN, Lowell, Mass.; 14 y'rs Tax Collector



JUST OUT.

For 10 cts. I will send this Graceful Bracket Design, size 14x15 ins., over 300 new and beautiful miniature designs, and my New Illustrated Catalogue of Scroll Saws and Material, Athletic, and Theatrical Goods, Games, Novelties, Dog and Cat Collars, etc. Or I will send my complete Catalogue for two 2 cent stamps. Best Premium Offers ever made by any dealer in these goods.

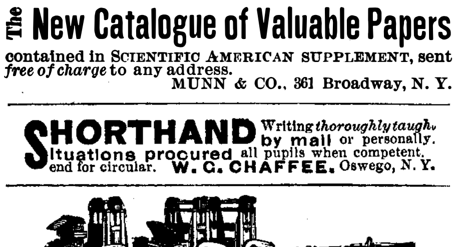
Address **E. H. MOODY,**
243 Main St., Hartford, Conn.

$5 to $20 per day at home. Samples worth $5 free. Address STINSON & Co., Portland, Maine.

PAPERS UPON INDUSTRIAL CHEMistry.—By Dr. Albert R. Leeds. *Soap Analysis.*—What it is necessary to determine in the analysis of soap. Former methods of analysis. A new scheme proposed which has been found to give accurate and rapid results, which reduces the performance of the analysis to a few consecutive operations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **374**. Price 10 cents. To be had at this office and from all newsdealers.

The New Catalogue of Valuable Papers contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent *free of charge* to any address.
MUNN & CO., 361 Broadway, N. Y.

SHORTHAND Writing *thoroughly taught* by mail or personally. **Situations procured** all pupils when competent. Send for circular. **W. C. CHAFFEE,** Oswego, N. Y.



WITHERBY, RUGG & RICHARDSON. Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

PERFECT

NEWSPAPER FILE

The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper.
Address

MUNN & CO.,
Publishers SCIENTIFIC AMERICAN

PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had *thirty-eight years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
361 Broadway, New York.
BRANCH OFFICE.—Corner of F and 7th Streets, Washington, D. C.

PATENTS NEGOTIATED ABROAD.

THE AMERICAN AND FOREIGN INDUSTRIAL ASSOCIATION of New York undertakes the sale of Patents in Europe. Is connected with the "Joint Stock Association" of London, and has Agents in Paris, Brussels and Berlin. For further particulars, address HENRY A. HERBERT, President, 155 Temple Court, New York.

Holland Agency.—A Dutch firm, trading in technical manufactures with the Continent, are open to represent some further sedate articles, by preference specialties. Address, with particulars, **S. M. Y.,** care of Nygh & Van Ditmar's General Advertising Offices, Rotterdam.

LOVE COURTSHIP and MARRIAGE. Wonderful secrets, revelations and discoveries for married or single, securing health, wealth and happiness to all. This handsome book of 160 pages, mailed for only 10 cents by the Union Publishing Co., Newark, N. J.

Just Published.

REVISED AND CHEAPER EDITION.

RULES, TABLES, AND DATA:

By DANIEL KINNEAR CLARK.

A MANUAL FOR MECHANICAL ENGINEERS.

Based on the most Recent Investigations.

Of constant use in calculations and estimates relating to Strength of Materials and of Elementary Constructions; Labor; Heat and its Applications; Steam and its Properties; Combustion and Fuels; Steam Boilers; Steam Engines; Hot Air Engines; Gas Engines; Flow of Air and of Water; Air Machines; Hydraulic Machines; Mill Gearing; Friction and Resistance of Machinery, etc.; Weights; Measures; Specific Gravity and the Weight of Bodies; Weight of Metals, etc. Third edition; 1,012 pages; 8vo, cloth. $5.00.
Copies sent free, by mail, on receipt of price.
D. VAN NOSTRAND, Publisher,
23 Murray and 27 Warren Sts., New York.

THE PAYNE AUTOMATIC ENGINE Gives more power from same amount of fuel and water than any engine

made, and 50 per cent more power than rated at. All engines warranted. All sizes and styles, 2 to 250 horse power. Send for prices and catalogue A 4.
B. W. PAYNE & SONS,
P. O. Box 1207. Elmira, N. Y.

FARLEY'S REFERENCE—DIRECTORY OF THE

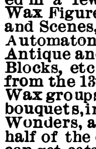
MACHINISTS

IRON, STEEL, AND METAL WORKING TRADES
OF THE UNITED STATES.
A. C. FARLEY & CO., Publishers, Philadelphia.

WANTED.

A Business Man capable and willing to manage, and lay out the necessary money, to travel and advertise in a liberal way, and provide buildings for the largest, best organized, and attractive Museum and Panopticum in Europe, and which has been carried on profitably in one building in an Imperial Residence for the last eight years, and is arranged so that it can be moved in a few hours. The museum contains hundreds of Wax Figures in groups, representing different Pictures and Scenes, Figures and Persons, a hundred Mechanical Automaton Figures and Animals, a large collection of Antique and Modern Guns, original Beheading Swords, Blocks, etc; the Inquisition Horrors in Wax and Iron from the 13th till the 19th century; Mechanical Moving Wax groups and figures; Singing and Moving Birds on bouquets, in cages, and free; Mechanical Electrical Comic Wonders, and Illusion, etc., etc. To a responsible person half of the entire receipts will be given. Parties wishing can get catalogue and address of owner by addressing **"Antique," P. O. Box 773, New York.**

LE PAGE'S LIQUID GLUE.



UNEQUALLED FOR **CEMENTING** WOOD, GLASS, CHINA, PAPER, LEATHER, &c. AWARDED **GOLD MEDAL**, LONDON, 1883. Used by Mason & Hamlin Organ & Piano Co., Pullman Palace Car Co., &c. Mf'd only by the **RUSSIA CEMENT CO. GLOUCESTER, MASS. SOLD EVERYWHERE.** Sample Tin Cans sent by Mail, 25c.

Syracuse Malleable Iron Works

WATER.

Cities, Towns, and Manufactories

Supplied by GREEN & SHAW

PATENT TUBE AND GANG WELL SYSTEM.

Wm. D. Andrews & Bro., 233 Broadway, N. Y.

Infringers of above patents will be prosecuted.

A. A. GRIFFING IRON CO
STEAM HEATING Apparatus
SOLE MANUFACTURERS
BUNDY STEAM RADIATOR
750 COMMUNIPAW AVE. JERSEY CITY, N.J.

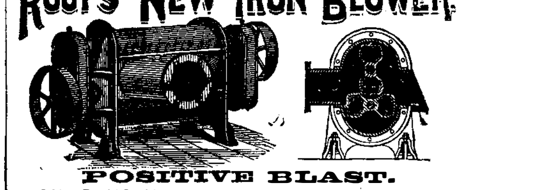
See illus. article in SCIENTIFIC AMERICAN Sept. 13, 1884.

WATCHMAKERS.

Before buying, see the Whitcomb Lathe and the Webster Foot Wheel, made by the AMERICAN WATCH TOOL CO., Waltham, Mass. CATALOGUES FREE.

REID'S LIGHTNING BRACE Specially designed for Light Boring, Screw Driving, Etc. Agents wanted.
NICKEL PLATED, WITH TWO BITS, ROSEWOOD TRIMMINGS, $2.75 POST-PAID. **A. H. REID 1636 BARKER ST., PHILAD'A.**

ROOT'S NEW IRON BLOWER.



POSITIVE BLAST.

IRON REVOLVERS, PERFECTLY BALANCED,

Has Fewer Parts than any other Blower.

P. H. & F. M. ROOTS, Manufacturers,
CONNERSVILLE, IND.

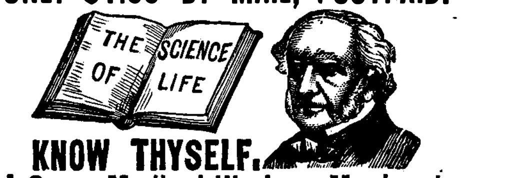
S. S. TOWNSEND, Gen. Agt., 22 Cortland St., 9 Dey St.,
COOKE & CO., Selling Agts., 22 Cortland Street,
JAS. BEGGS & CO., Selling Agts. 9 Dey Street,
NEW YORK.
SEND FOR PRICED CATALOGUE.

APPARATUS FOR ELECTRICAL MEASurements.—Illustrations and description of the various interesting apparatus for measuring electricity that were shown at the Munich Exhibition, including Wiedemann's bifilar galvanometer; Wiedemann's galvanometer for strong currents; Zenger's differential photometer; Von Beetz's solenoid; apparatus for demonstrating the principle of the Gramme machine; Van Rysselberghe's thermometrograph; Von Beetz's chronograph; and Harlacher's apparatus for studying deep currents. Illustrated with seventeen engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **421**. Price 10 cents. To be had at this office and from all newsdealers.

VIGOR For Men. Quick, sure, safe. Book free. Civiale Agency, 160 Fulton St., New York.

OPIUM & WHISKY HABITS cured with Double Chloride of Gold. We challenge investigation. 10,000 Cures. Books free. The **LESLIE E. KEELEY CO.** DWIGHT, ILL.

ONLY $1.00 BY MAIL, POSTPAID.



KNOW THYSELF.

A Great Medical Work on Manhood.

Exhausted Vitality, Nervous and Physical Debility, Premature Decline in Man and the untold miseries flesh is heir to. A book for every man, young, middle-aged, and old. It contains 125 prescriptions for all acute and chronic diseases, each one of which is invaluable—so found by the author, whose experience for 23 years is such as probably never before fell to the lot of any physician. Three hundred pages, bound in beautiful French muslin, embossed covers, full gilt, guaranteed to be a finer work in every sense—mechanical, literary, and professional—than any other work sold in this country for $2.50, or the money will be refunded in every instance. Price only $1.00 by mail, postpaid. Illustrative sample, 6 cents. Send now. Gold medal awarded the author by the National Medical Association, to the officers of which he refers.

Address the Peabody Medical Institute, or Dr. W. H. Parker, No. 4 Bulfinch Street, Boston, Mass., who may be consulted on all diseases requiring skill and experience. Chronic and obstinate diseases that have baffled the skill of all other physicians a specialty. Such treated successfully without an instance of failure. Consultation from 9 A. M. to 6 P. M. Sundays from 11 A. M. to 1 P. M. **Be sure of the No. 4.**

FOREIGN PATENTS.

Their Cost Reduced.

The expenses attending the procuring of patents in most foreign countries having been considerably reduced, the obstacle of cost is no longer in the way of a large proportion of our inventors patenting their inventions abroad.

CANADA.—The cost of a patent in Canada is even less than the cost of a United States patent, and the former includes the Provinces of Ontario, Quebec, New Brunswick, Nova Scotia, British Columbia, and Manitoba.

The number of our patentees who avail themselves of the cheap and easy method now offered for obtaining patents in Canada is very large, and is steadily increasing.

ENGLAND.—The new English law, which went into force on Jan. 1st, enables parties to secure patents in Great Britain on very moderate terms. A British patent includes England, Scotland, Wales, Ireland, and the Channel Islands. Great Britain is the acknowledged financial and commercial center of the world, and her goods are sent to every quarter of the globe. A good invention is likely to realize as much for the patentee in England as his United States patent produces for him at home, and the small cost now renders it possible for almost every patentee in this country to secure a patent in Great Britain, where his rights are as well protected as in the United States.

OTHER COUNTRIES.—Patents are also obtained on very reasonable terms in France, Belgium, Germany Austria, Russia, Italy, Spain (the latter includes Cuba and all the other Spanish Colonies), Brazil, British India, Australia, and the other British Colonies

An experience of THIRTY-EIGHT years has enabled the publishers of THE SCIENTIFIC AMERICAN to establish competent and trustworthy agencies in all the principal foreign countries, and it has always been their aim to have the business of their clients promptly and properly done and their interests faithfully guarded.

A pamphlet containing a synopsis of the patent laws of all countries, including the cost for each, and other information useful to persons contemplating the procuring of patents abroad, may be had on application to this office.

MUNN & CO., Editors and Proprietors of THE SCIENTIFIC AMERICAN, cordially invite all persons desiring any information relative to patents, or the registry of trade-marks, in this country or abroad, to call at their offices, 361 Broadway. Examination of inventions, consultation, and advice free. Inquiries by mail promptly answered.

Address, **MUNN & CO.,**
Publishers and Patent Solicitors,
361 Broadway, New York.
Branch Office, cor. F and 7th Streets, opposite Patent Office Washington, D. C.

PROSPECTUS OF THE Scientific American FOR 1884.

The Most Popular Scientific Paper in the World.

Only $3.20 a Year, including postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly Every number contains sixteen pages of useful information, and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry. Electricity, Telegraphy. Photography, Architecture. Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in the SCIENTIFIC AMERICAN a popular *resume* of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars and twenty cents** by the publishers; six months, $1.60; three months, $1.00.

Clubs.—One extra copy of the SCIENTIFIC AMERICAN will be supplied gratis *for every club of five subscribers* at $3.20 each; additional copies at same proportionate rate.

One copy of the SCIENTIFIC AMERICAN and one copy of the SCIENTIFIC AMERICAN SUPPLEMENT will be sent for one year, postage prepaid, to any subscriber in the United States or Canada on receipt of *seven dollars* by the publishers.

The safest way to remit is by Postal Order. Draft, or Express. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO., 361 Broadway New York.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain. India, Australia, and all other British colonies; to France, Austria, Belgium, Germany Russia, and all other European States; Japan, Brazil Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, one year; $9, gold for both SCIENTIFIC AMERICAN and SUPPLEMENT for one year. This includes postage, which we pay. Remit by postal order or draft to order of
MUNN & CO., 361 Broadway, New York.

PRINTING INKS.
THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts. Phila., and 47 Rose St., opp. Duane St., N. Y