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THE NEW MODEL GATLING GUN.—(See page 370.)

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OPENING OF THE NORTHEAST PASSAGE.

Another great geographical problem has been settled by the successful passage of Professor Nordenskjöld's expedition through the Arctic Sea to the north of Siberia. A telegraphic dispatch from St. Petersburg, dated May 27, states that the Governor of Yakutsk, Eastern Siberia, has received intelligence from the Vega to May 3, and a later dispatch from Irkutsk reports the safe arrival of the vessel in Behring's Straits. All the members of the expedition were well. Before this account reaches the reader the Vega will be on her way to Europe by way of the Suez Canal.

This expedition, which has thus crowned with successful accomplishment the belief of Professor Nordenskjöld that a route to Asia might be found to the north of Siberia, sailed from Gothenburg, July 4, 1878, and arrived at Port Dixon, near the mouth of the Yenisei, August 6. This part of the course had already been proved to be passable at midsummer by Professor Nordenskjöld's previous expeditions. The next important achievement was the rounding of the north cape of Asia, a feat never before accomplished, and on the 27th the expedition reached the mouth of the Lena. Here the two vessels parted company, the little steamer bearing the name of the Lena ascending that river, the Vega proceeding eastward, hoping to reach Behring's Straits before the autumn ice drifts should bar the passage. In this Professor Nordenskjöld was disappointed, for the Vega became ice bound when within forty miles of East Cape, and was obliged to spend the winter there.

It is safe to anticipate a considerable addition to our knowledge of the Siberian seas when the results of Professor Nordenskjöld's observations are made public; the plucky explorer has won a name that will rank with those of the greatest navigators; but there are grave reasons for doubting the fulfillment of his hopes of making known a practicable commercial route through the Arctic Sea from Europe to Asia. The season of open water along the Siberian coast is too brief and uncertain, and the risks are too great, to tempt many to undertake the northern passage, notwithstanding the saving in distance.

ANOTHER OBJECTION TO THE LICENSE SYSTEM.

One of the worst features of the recently defeated bill for the destruction of the American patent system was that introducing the compulsory license system or its equivalent. The unconstitutional nature of the proposed invasion of the inventor's exclusive right to control a patented invention was sufficiently exhibited in these columns last winter. The matter might be allowed to rest with the victory gained at that time, did not the opponents of inventors' rights threaten to bring it again before Congress at the earliest opportunity. In view of this fact it will pay to make a note of an objection to the license system recently urged by an English writer against a similar provision in the bill now before an English Parliamentary committee—an objection which we do not remember to have seen before. It may be useful some time.

The bill referred to contains a section which compels the patentee to grant licenses to manufacture or use his invention on such terms as the Lord Chancellor for the time being may consider fair. To this provision there can be urged no constitutional objection, as there might in this country; accordingly it is attacked solely on the score of bad policy. It is shown that it puts it entirely within the power of the Lord Chancellor to fix the value of patents of whose intrinsic value he is likely to know nothing. But worse than that, it puts it within the power of wealthy manufacturers to kill any invention that they may fear. Thus the moment a threatening improvement appears—threatening, that is, to inferior manufactures—the makers of the latter may demand a license to manufacture the new article, which they will proceed to do in the worst possible way, placing the new invention upon the market beside their own better made but intrinsically inferior products.

The public, finding the new invention inferior to the old, will be prejudiced against it, and the poor inventor will be unable to counteract the injustice. The products made in accordance with his invention may be the vilest caricatures of what he would make, yet they will bear his name and make it infamous, while he is unable to help himself. The chances are that where one inventor would willfully suppress or ask an exorbitant price for his invention or its products under the present system, a score of useful improvements or radically new additions to the world's resources would be stamped out of existence under the license system. The proposed change is as obnoxious on the score of public policy as on the score of abstract justice.

HOW COFFEE IS CLEANED.

When coffee was retailed in its natural condition, and roasted in small lots over the kitchen fire, imperfect beans and impurities were picked out by hand. With wholesale roasting more expeditious methods were necessary, and machines were invented to do the work with greater economy and dispatch. From this necessary operation, to the invention of processes for polishing and coloring inferior goods, to make them look like prime coffees, was but a step. The poorer grades of coffee were washed in colored water, and then treated to a course of polishing with powdered soapstone, which gave the beans the glossy and flinty appearance of first rate coffee and covered up all defects. The natural result was to make all honest dealers suspicious of polished coffees, though the need of machine cleaning was in no way diminished. It is possible, however, to have coffee

cleaned and polished by machinery and at the same time be honest.

By this process the coffee is put into a large cylinder capable of holding eight or nine hundred pounds, the cylinder being lined with heavy linen and provided with cleats to increase the friction, when the beans are set in motion by the rapid revolution of the cylinder. At one end of the cylinder are a number of holes to admit air, and at the other a suction fan making about two thousand revolutions a minute. The friction loosens the dust and the outer covering of the coffee, which impurities are carried away by the air current set in motion by the fan. After ten or fifteen minutes of this treatment the coffee is wet with pure water and the machine again set in motion. The coffee is thus washed, and after half an hour's scouring comes out entirely clean and much improved in appearance by the polishing it has received. Coffees which contain much loose dirt and many broken beans are subjected to a preliminary process in which the perfect beans are winnowed clean, after which they are treated as already described.

ROBERT CRAWSHAY.

Robert Crawshaw, the iron king of Merthyr Tydfil, Wales, died at Cheltenham, England, May 10. The London correspondent of the Times tells at great length the story of the foundation and wonderful development of the vast establishment which grew up under the wise management of Robert Crawshaw, his father, William Crawshaw, and his uncle, Richard Crawshaw.

The last named had already acquired a fortune in the hardware business in London, when he purchased the controlling interest in the iron works at Cyfarthfa, in the vale of Merthyr Tydfil. Soon after, by the retirement of one partner and the death of the other, Mr. Crawshaw became sole proprietor. This was about the time of the American Revolution and the beginning of England's rapid industrial development.

While Richard Crawshaw was pushing his works along, he heard that a certain Henry Cort was working a new process of puddling iron, at some small foundry near Gosport. Crawshaw went there, approved of the method, returned to Cyfarthfa, and built works both for puddling and rolling on Cort's plan, paying the patentee 10 shillings for every ton of iron turned out under his process. Among other improvements and extensions of the works, Richard Crawshaw erected a water wheel 50 feet in diameter, 80½ feet in breadth, with a weight of gudgeon of 100 tons. The magazines and scientific papers of the time described the wheel as one of the modern wonders of the world. It was made by a local engineer named Watkin George. It used 25 tons of water per minute. The remains of this giant of the past may still be seen on the Taff. Crawshaw gave this Watkin George a share in the works—a partnership in those days was more easily managed than it is now, when money is considered more than brains—to extend over a period. When George went out, some dozen years afterward, in addition to salary, he received his share of \$500,000 profits. Mr. Crawshaw took in other partners at various times, and at his death the disposition of the Cyfarthfa Works was three-eighths to Benjamin Hall, two-eighths to Joseph Bailey. Richard Crawshaw died worth £1,500,000, a fortune far short of that made by his nephew, who, besides his Cyfarthfa interests, had vast iron properties in Monmouthshire. When Richard Crawshaw died, Hall and Bailey retired, and the works came into the possession of William Crawshaw, who, with Sir Joseph Bailey, had practically managed them for several years.

Under this new iron king, who had a genius for invention, Cyfarthfa advanced with gigantic strides. In 1819 it numbered 6 blast furnaces, and in that year produced 11,000 tons of pig iron and 612,000 tons of bars. In 1821 it turned out more of these manufactures than the three kingdoms put together had done between the years 1740 and 1750, and fully half the total yield of all Great Britain so late as 1788. From 1817 to 1840, the Glamorganshire Canal, which the first Crawshaw had started, carried from Cyfarthfa 613,144 tons of puddled iron. The most important of the rolling mills was erected in 1846, designed by William Williams. Attached were 18 boiling furnaces and 20 puddling furnaces, which, in March, 1847, turned out 6,144 tons of rails, and in the same month the largest bar of iron possibly ever made. It measured 27 feet long and 6½ in diameter, and weighed 2,941 tons. In his old age, William Crawshaw retired to his seat at Caversham Park, near Reading, on the Thames, having, however, built Cyfarthfa Castle, a magnificent residence near the works. He left his son, Robert, in charge, and dying in 1867, bequeathed him all his property, which, besides other valuables in lands and gold, including Cyfarthfa, with its 11 furnaces—7 at Cyfarthfa proper and 4 at Ynysfach—7 ironstone pits, and 8 coal pits. The estimated fortune of William Crawshaw was £35,000,000. When the last great strike in the iron and coal trades of South Wales took place, Robert Crawshaw closed his works, declaring that he would close his furnaces forever sooner than submit to the dictation of his men, and they have only been partially reopened since. At one time the works employed 5,000 men.

TRIUMPHS OF MODERN ENGINEERING.

In an address on the Past, Present, and Future of Engineering before a recent meeting of the Engineering Society of the School of Mines, Columbia College, Prof. W. P. Trowbridge said it was a remarkable fact that nearly all of the great achievements in engineering had been accomplished

According to the calculation of Mr. G. T. C. Bartley, an ounce of bread wasted daily in each household in England and Wales is equal to 25,000,000 quarter loaves, the produce of 30,000 acres of wheat, and enough to feast annually 100,000 people. An ounce of meat wasted is equal to 300,000 sheep.

THE GATLING GUN.

Among the many important and valuable inventions in firearms, of which the present century has been prolific, there is none that equals the Gatling gun in originality of design, rapidity of fire, and effectiveness. The severest tests and trials, and its practical use in warfare, have indisputably established its high reputation as a most formidable death dealing weapon.

The main features of the gun may be summed up as follows: It has usually five or ten barrels, each barrel having its corresponding lock. The barrels and locks revolve together; but in addition to this action, the locks have a forward and backward motion of their own. The forward motion places the cartridges in the chambers of the barrels and closes the breech at the time of each discharge, while the backward motion extracts the empty cartridge cases after firing. The gun can be fired only when the barrels are in motion from left to right; thus as long as the gun is revolved and fed with cartridges, the several operations of loading, firing, and extracting are carried on automatically, uniformly, and continuously. The gun is supplied from feed cases (containing forty cartridges each) which fit into a hopper communicating with the chambers; as soon as one case is emptied another takes its place, and thus continuous firing is kept up at the rate of over one thousand shots per minute.

We believe the Gatling is the only firearm in the world in which the three sets of parts, namely, barrels, locks, and inner breech, all revolve. Having the barrels, locks, and inner breech to revolve simultaneously, enables the gun to be loaded and fired rapidly and continuously, while under revolution, and without producing recoil to destroy its accuracy.

That the gun is simple and durable is evidenced by the fact that one hundred thousand cartridges have been fired from it without injury to any of its parts. The Gatling guns represented in our illustration on first page are supplied with the new elevating and ranging fixture, which enables the operator to instantly elevate, depress, or traverse the gun, so as to keep it pointed at movable objects while being fired. The gun has not only been recently greatly improved, but its ammunition also, so that now its rate of fire is over 1,000 shots per minute. There are a number of these guns with the British forces in South Africa, and in several engagements with the Zulus they have done most efficient service. Lord Chelmsford in his official dispatch, dated Durban, April 10, says, in speaking of an attack made on the column sent to relieve Colonel Pearson, at Ekowe: "The Gatling gun was of considerable value at this period of the defense." The London Standard of May 7th publishes an account of the battle of Gingihlovo, from which we take the following extract: "It was no use offering mercy to the Zulus. The wounded, as our men came up, fought on to the last, firing their rifles, stabbing with their assegais, and even seizing the natives as they passed over them with their teeth, biting like dogs, so, in spite of the efforts of our officers, they were all cut down. When all was over and we counted the dead, there lay, within a radius of 500 yards, 473 Zulus. They lay in groups in some places, of from 14 to 30, dead, mowed down by the fire of the Gatling, which tells upon them more than the fire of the rifles."

The new fixture for mounting Gatling guns can be used on gun carriage, tripod, gunwale, or tops of ships, or in the bow of a small boat. Fig. 2 of the accompanying engravings shows elevation of top swivel with gun resting thereon, also lever. Fig. 3 is a plan of swivel and lever without gun.

This fixture supplies the place of the elevating screw and oscillator formerly used. It consists of fewer pieces, and is simpler than the screw and oscillator. With it the gunner has better and more instant control of his piece. The gun being well balanced on the fixture, the gunner controls the movement of the piece with his left hand, using his right to turn the crank. The gun rests with its trunnions in

the trunnion boxes, *a*, which are supported by the swivel, *A*. The caps, *a'*, of these trunnion boxes are held by an improved device, *b*, which prevents the accidental opening of the boxes, as in other styles, with keys which may fall out. The lower part of the swivel, *A*, fits the bed plate of gun carriage, tripod, etc., so that the gun and swivel can be quickly changed from carriage to tripod, or to the gunwale of a ship, or elsewhere, and be held firmly in place by the binder, *B*. To the lower part of the swivel, *A*, is pivoted the forked lever, *L*, which extends under the rear of the breech of the gun, being united with the gun by the sliding box, *D*, which is held between two lugs on the lower side of the breech by the pivot bolt, *d*. This box fits on the lever, *L*, so as to slide back when lever and breech of gun are raised, and forward when they are lowered.

Under the lower side of the lever, *L*, there is a key or wedge, *F*, which is tapered so that its lower surface is always parallel to the upper side of lever, *L*, but on sliding it forward the height of the lever, *L*, is increased, and the sliding box, *D*, is fastened. The screw, *G*, working through the side of the box, *D*, against the lever, *L*, serves as a second absolute fastening of box, *D*, on lever, *L*. On the end of the lever, *L*, is pivoted, at *e*, the handle, *E*, so that when depressed its lower part pushes the key, *F*, forward and tightens the slide, *D*. When the lever, *E*, is raised it pulls the wedge, *F*, back and loosens the slide, *D*. The handle, *E*, clasps a round lug, *f*, on the lower rear end of the wedge, *F*. The spring, *e*, serves to press the handle, *E*, downward. In operation the

shoulders of the operator, allowing him to raise or lower the gun, and as his body fits into the yoke any desired lateral motion can be given to the gun by a simple movement of the operator. The binder permits or checks lateral motion, and a screw adjusts the elevation. If in firing the correct elevation has been obtained, the screw is fastened, and the gun can be moved laterally in a horizontal line, so as to cover, at this elevation, any desired lateral distance. The operator's body being in the yoke steadies the gun, even when the binder is loose; he can work the crank with his right hand, resting his left on the yoke.

This gun is manufactured by the Gatling Gun Company, of Hartford, Conn.

NEW AGRICULTURAL INVENTIONS.

Mr. Jacob Kinstler, of Thomas Hill, Mo., has patented an improvement in plows, which consists in a plow beam pivoted to the plow stock and provided with a flanged and perforated rear end casting, that may be adjusted up or down or right or left.

An improvement in the class of fences whose panel rails are secured to posts by means of wire staples, has been patented by Mr. B. F. McCollister, of California, Mo.

Mr. Joseph W. Temby, of Dallas, Texas, has patented an improved combined wire and picket fence, which consists of two continuous wire rails having bends for receiving the pickets.

An improved device for securing cattle and horses in their stalls, has been patented by Mr. James D. Watters, of Bel Air, Md. It is not only capable of fastening or unfastening a single animal, but it is so constructed that all of the animals in the stalls may be released simultaneously. This is especially valuable in cases of fire.

Mr. Gottlieb Stettler, of North Georgetown, Ohio, has patented an improved apparatus for turning cheese. The invention is more particularly useful in making Swiss cheese, which requires turning daily.

An improved device for connecting the plow beam to the axle and tongue of a cultivator, has been patented by Mr. James M. Mitchell, of Point Peter, Ark. The improvement consists in the combination of simple devices, which cannot be clearly described without an engraving.

An improvement in that class of harrows having spiked cylinders has been patented by Mr. David I. Corker, of Amity, Oregon. The improvement relates to the use of pivoted locking bars, which will engage with or release the spikes of two cylinders simultaneously. The principal object of the invention is to free the spikes from adhering stubble.

Mr. W. V. Russell, of Elwood, Ind., has invented an improved fence, which consists of base blocks having dovetailed notches, to which are fitted uprights which support the rails. The fence also has a brace with a peculiar wire fastening.

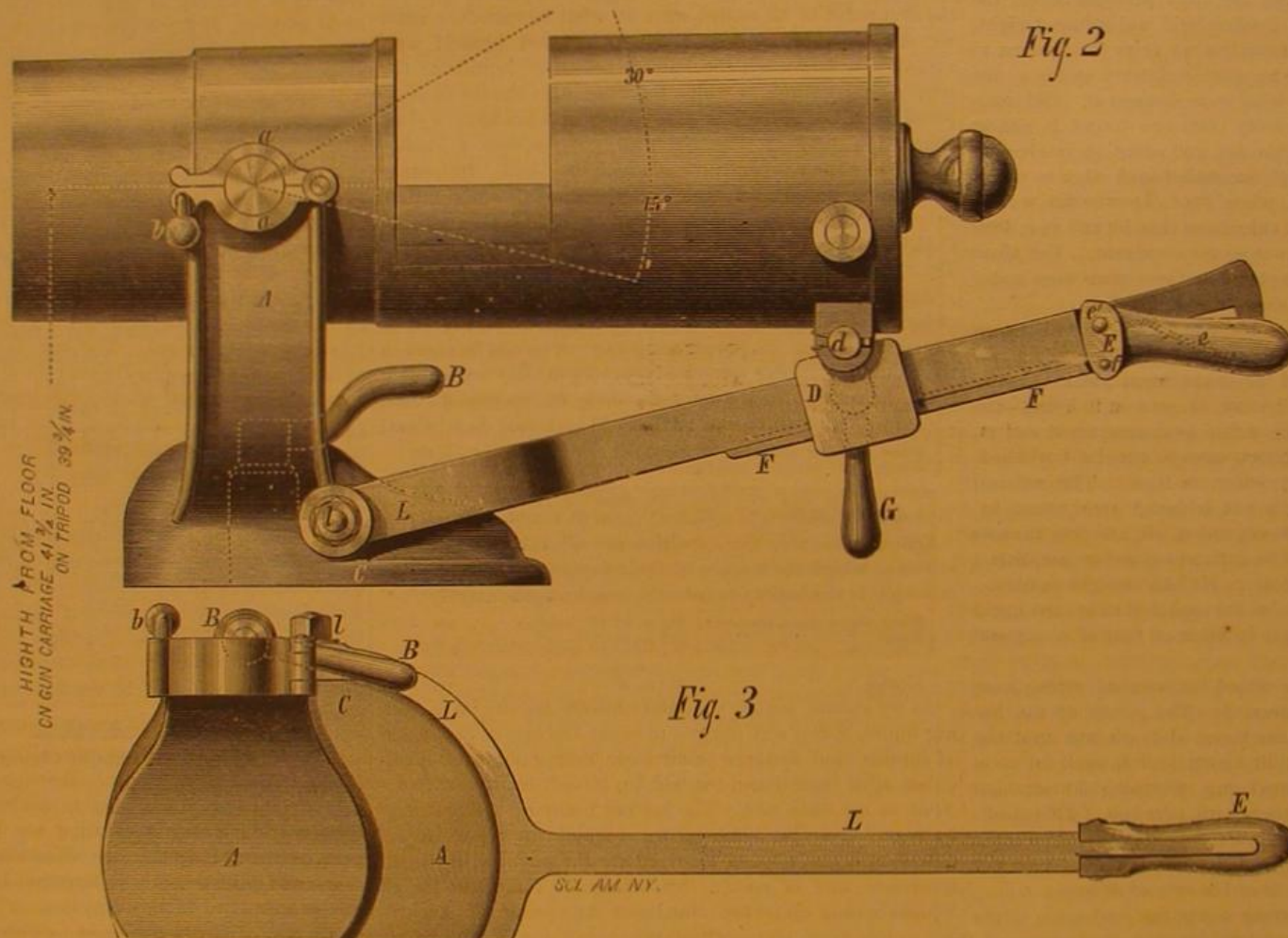
An improvement in gate shutters has been patented by Mr. Isaac A. Pool, of Escanaba, Mich. It consists in a rod pivoted at one end to the gate, and running through a sheath or gig is attached to a rope that runs over a pulley and is fixed to a weight.

Fruitfulness of a Grain of Wheat.

If, says a writer in a German contemporary, we reckon that a single grain of wheat produces fifty grains, and that these fifty will each produce fifty grains more, and so on, we find:

In the second year	2,500 grains.
" third "	125,000 "
" sixth "	15,625,000,000 "
" twelfth "	244,140,625,000,000 "

The third year's crop would give 300 men one meal, leaving enough bran to feed eight pigs for one day. The produce of the single grain in the twelfth year would suffice to supply all the inhabitants of the earth with food during their lifetime.



THE GATLING GUN.—ELEVATING AND RANGING APPARATUS.

loosening of binder, *B*, allows the gun when on the carriage a lateral sweep of 90°, by means of lever, *L*, which is grasped at *E* with the left hand while the right hand turns the crank. On tripod or gunwale the gun can be swept around the full circle, or 360°. After loosening the screw, *G*, the gun can be raised or lowered, as a pressure under the handle, *E*, loosens the box, *D*. The breech can be raised 30° and lowered 15°, total 45°. By removing the hand at any desired point the spring fastens the gun, or the handle can be pressed down.

For more absolute security when at target shooting, or when a certain aim must be retained, the screw, *G*, is fastened. Both binder, *B*, and screw, *G*, are used to secure the gun when traveling on the carriage. By means of this fixture a man may follow moving objects with an accurate fire, or also shoot from the deck or tops of a vessel when rocking at sea.

The tripod has been rendered more secure by braces, which prevent the legs from moving in until the center of the braces is raised in folding the legs together.

The elevating and ranging lever, shown on the guns in the front page engraving, are made after the model of 1879.

The gun rests in the swivel in the same manner as in Figs. 2 and 3, and the same binder is employed.

The lever is a plain one, on which slides a box fastened by a pivot bolt to the breech of the gun. Against the side of the lever in slide or box a friction shoe is fitted, which is held in its position in the box by a heel on each end. On the rear end of the lever there is a tapering handle, on which fits the socket of a yoke, which may be easily put in place or removed, and it is fastened by a taper pin. A leather strap which passes under the socket of the yoke is slung over the

NEW HAY PRESS.

The great volume of hay in its natural state renders it very difficult of transport, so that where vast quantities are required for the forage of armies or the wants of large industrial establishments, it becomes necessary to reduce its bulk very considerably. This, however, must be done judiciously, and above all uniformly; for if a certain pressure, determined by experience, be exceeded in any portion of the mass, the nutritive juices are expressed, and the hay rendered comparatively valueless. It is found that hay cannot be compressed like cotton by the application of one direct pressure, but that the consolidation must be effected by two separate operations, one for placing the particles in as close proximity as possible with a slight degree of pressure, and the other to give the final squeeze for reducing the bulk into as small a compass as may be desired. This has generally been effected by tossing the hay into cubical cases, where it is trodden down by men's feet before the final pressure is applied; but this method is open to many objections. The hay is bruised and broken by this rough treatment; no uniformity can be secured in the packing; and the plan enables unscrupulous dealers to fill in the interior of the bale with a damaged or inferior article. Besides this, the form of the bales is very inconvenient, so that they require four men to transport them from place to place.

The hay press exhibited in action by Mr. Th. Pilter, of Paris, at the Cattle and Implement Show under the auspices of the French Minister of Agriculture and Commerce, is improved by him from an American model, and patented in England and France. The hay, thrown on to a platform, is delivered continuously in small quantities up to a circular plate, and passes through two narrow slits, into which it is uniformly fed by two revolving cones, which impart to it a corkscrew motion. The hay is, in fact, roughly spun into a double threaded screw of very fine pitch, and forced onward with gentle pressure until a sufficient quantity has been collected to form a cylindrical bale of the weight desired. A pressure of about 6 cwt. to the cubic yard is then applied, giving the density which is found most desirable; a pressure of 8 cwt. to the square yard may, however, be given if required. The bale is then bound by two steel wires, crossing one another in a longitudinal direction; they are previously looped at each end, and are fastened by simply inserting in the loops a curved link like a small belt hook before it is flattened. On the pressure being relieved the mass slightly expands, stretching the wires; and the bale falls out of the press, a solid uniform cylinder, 2 feet $1\frac{1}{2}$ inches in diameter, which may be rolled along by one man. A bale weighing from 2 to $2\frac{1}{2}$ cwt. is found most convenient, and for this a power of only three horses is required.

A perspective view, engraved from a photograph of the press exhibited at Paris, is given in Fig. 1. The machine rests upon a pair of wooden carriages, similar to those of a wagon, connected by stout longitudinal frames of angle iron; it is, therefore, easily moved to wherever required for work. The main shaft extends the whole length of the frames, and is supported in bearings, one at each end of the right hand frame or that removed from the point of view in the engraving. A pulley keyed on to the end of this shaft receives motion, by a belt, from a horse gear, portable engine, or any source of power. This shaft carries three spur pinions of equal diameter, arranged quite near the bearings, two at the front end and one, not visi-

ble in the engraving, at the back; they all run loose, but are capable of being made fast by friction clutches. When none of the pinions are in gear the main shaft only revolves. When the two hindmost pinions are both made fast on the shaft, they cause the two large spur wheels of equal diameter, arranged along the center line of the machine, to revolve together. That nearest the front end is fast on the second shaft,

which, by means of a pair of miter pinions, rotates a transverse crank shaft, actuating the shakers. There are four of these shakers with rake teeth, two on each side of a central division (not shown) for keeping separate the two streams of hay fed in by the two cones. This division is made movable for permitting the wires to be inserted for binding the bales. Having described the principal parts of the appliance, we

will now proceed to give an account of the operation of compressing the hay and forming the bales. Both the large spur wheels are thrown into gear, so that the screw, nut, and head revolve together. The hay is then thrown by forks on to the platform by two men, one on each side, and is carried on by the shakers to the back plate, where it is drawn uniformly through narrow rectangular apertures by the revolving cones. The head is at first close up to the back end; but the pressure exerted by the cones, introducing the hay, forces it gradually forward; and teeth are attached to the head for preventing the hay from slipping round it. In order to cause sufficient resistance of the head on the square bar, the latter is provided with a brake

screw, which is turned as tight as experience shows to be desirable. When a sufficient quantity of hay has been fed in to form the weight of bale required, the back pinion, spur wheel, and cones are thrown out of gear, and the large spur wheel at the front end kept in gear; as the boss of this wheel forms a nut to the screw, it causes the latter to advance and drive back the head until it has given the hay the amount of compression desired. The bale is then bound by the two steel wires as described above; the double lever clutch throws out the larger spur wheel, and throws in the smaller, thus bringing back the screw; and the bale falls out, ready to be rolled away wherever required.

The operation of the machine is one of the simplest character, requiring only a power of three horses, the labor of two men, and from three to five minutes of time, according to the size of the bale.

Fig. 2 shows the method of loading the bales into railway cars; and Fig. 3 a plan of the car with the arrangement of the bales as stowed away. It will be evident that this new hay press possesses considerable advantages over those which have preceded it.—Iron.

Beautiful Black Color for Bronze.

A strong concentrated thin solution of nitrate of silver is required for this purpose. It should be mixed with an equal solution of nitrate of copper, and well shaken together. The pieces which require coloring are dipped into this solution and left for a short time. When taken out, they should be equally heated till the required black color makes its appearance.

Economy of Co-operation.

In his report as Commissioner to the Paris Exhibition Ex-Governor Howard, of Rhode Island, speaks of Switzerland as the cheapest cloth-making country in the world. This is due, he says, to the fact that Swiss factories are run largely on the co-operative plan. Mills are family concerns, and owners and operators live and work together. The hands themselves are very often property owners and have a general interest in the prosperity of the community. As the result, there is a more general spirit of contentment among the Swiss factory workers than anywhere else in the world. Wages are very low.

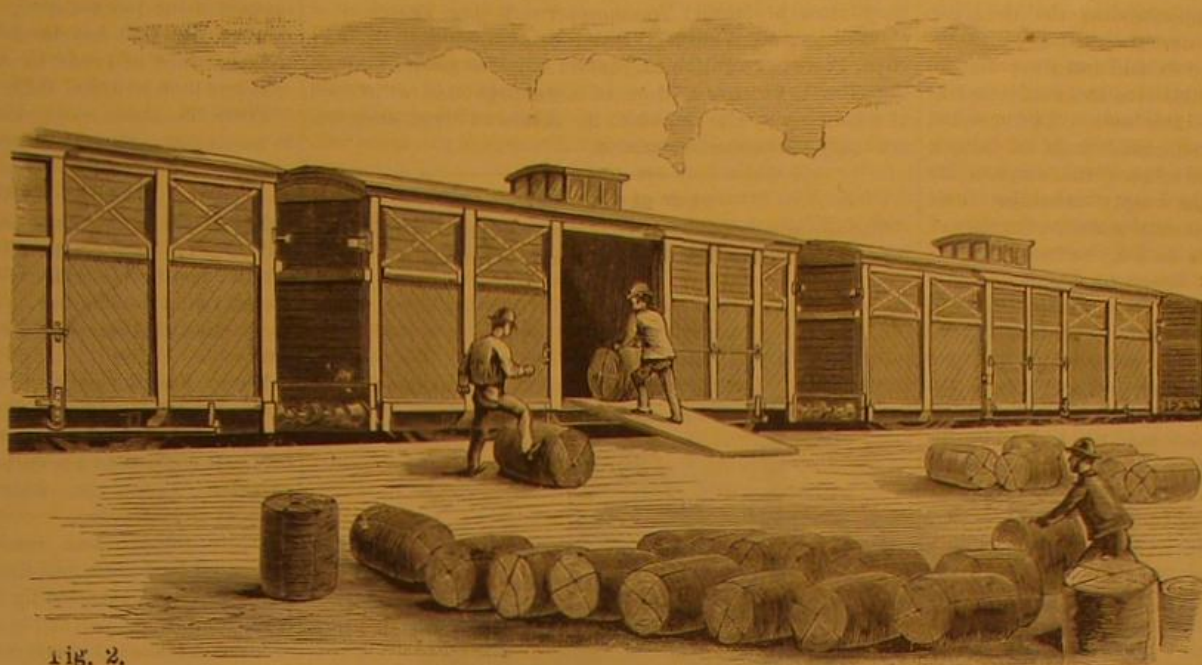


Fig. 2.

LOADING HAY CYLINDERS.

which is hollow, and forms the nut of a screw. The other is merely a ring having a flange cast on to it, which is carried by three friction rollers; it has, however, a couple of ribs, cast on the inside of the ring, which fit into notches in the circular head of the press, so that they revolve as one piece when the hay is fed in at the back end. This head is guided by two T irons bolted to the back plate and attached to a collar carrying arms at the front end. The head is also bolted to a square bar of wrought iron, which slides through the center of the screw, and passes out at the front end. When both the spur wheels are in gear, the second shaft, forming



Fig. 3.

HAY PRESS.

the nut, and its screw revolve together; but when the back wheel is stationary, the revolution of the nut causes the screw to advance, forcing the head toward the hinder end. For bringing back the screw a smaller spur wheel, the boss of which also forms a nut, is made to revolve in the contrary direction by means of an idle wheel or carrier; and the front spur pinion is thrown into gear by a double clutch at the front end. A bevel wheel cast on to the annular spur wheel at the back end (not seen in the engraving) turns the cones, which are centered in the ribbed plate, and also takes into a bevel pinion, giving motion to a short longitudinal shaft,

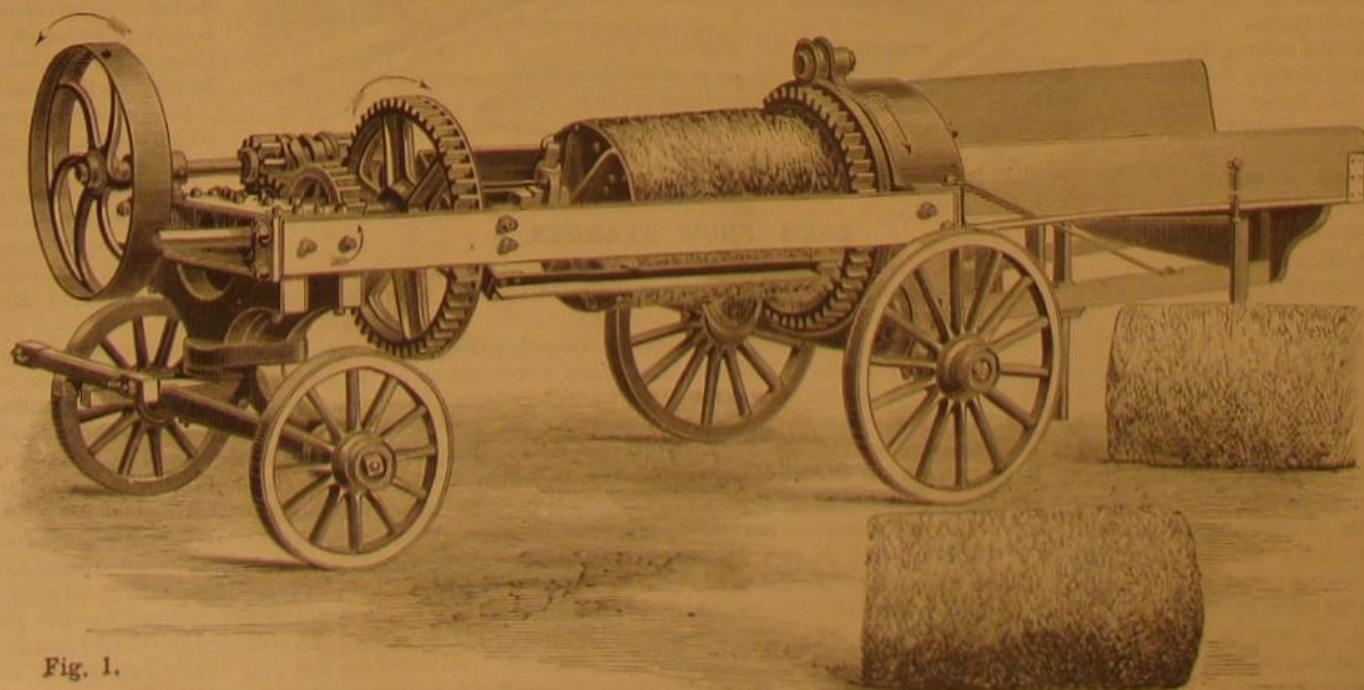


Fig. 1.

PILTER'S ROTARY HAY PRESS.

New American Industries.

The *Grocer*, in summing up the new sources of wealth in this country, and alluding to the anxiety of foreign producers at our rapid strides in producing nearly all the most important staples formerly imported, says that six years ago cream of tartar was imported from France to the extent of 6,000,000 lb. yearly, but so successfully has the manufacture of it in this country been carried on, that last year not a single pound was imported. Notwithstanding that the crude materials have at present to be imported, the price of the manufactured article has been reduced from 32 cents per pound, the rate for the French article here, to 23 and 24 cents per pound for the American production. France and England formerly sent us annually 500,000 lb. of tartaric acid, while the importation for the last fiscal year was 183 lb. England formerly monopolized our market for citric acid to the extent of 250,000 lb. annually and at the rate of \$1.30 per pound, while last year 27,018 lb. were imported and sold at the same price as the American article, 57 cents per pound. At present the lime juice from which citric acid is made has to be imported, but it could easily be produced from fruits grown in Florida, if only sufficient energy were put into the work. If the lemon and lime growers of the South can be induced to prepare the lime juice, the entire production and manufacture of citric acid will be kept in this country, saving hundreds of thousands of dollars annually and developing another great industry. Borax was formerly brought from England at the rate of from 600,000 to 1,000,000 lb. every year. Owing to the development of borax mines in Nevada, this importation has largely fallen off, and the report for the last fiscal year showed only 3,492 lb., and the price of the refined article, which is now prepared in this city, is only 8 to 9 cents per pound, when formerly it was 35 cents per pound, England being now among the buyers where she was the principal seller, both of the crude and refined product.

The production of fruit sirups has heretofore been entirely in the hands of the French. The long time required to transfer these goods from France to South America and the West Indies, where they are largely used, and the natural advantages of the country, induced our New York merchants to enter into competition with the European markets for the production of fruit sirups. The experiment has proved successful, and sirups of a far richer flavor have been produced much cheaper and have met with approval in the tropics. The success of the experiment bids fair to bring to the United States a large trade, and retain in the United States millions of dollars that has previously gone to other nations.

IMPROVED SNOW FLANGER.

We give herewith an engraving of an improved apparatus recently patented by Mr. David A. Cox, of Pine Bush, N. Y., for removing snow from the inner side of the track rail to make way for the flanges of the car wheels. This device, although quite simple, is said to be very effective. We are informed that it has been subjected to a practical test during the past winter, which has demonstrated its utility to the satisfaction of the railroad that has adopted it, as well as to the inventor.

The beam, A, of the car truck is mortised to receive the scrapers, B, which are slotted at their upper ends and held in place by a pin. The upper ends of the scrapers are pressed by the springs, C. The scrapers are flexible, and their lower ends are provided with a projection that extends nearly to the flange of the rail.

As the car progresses the snow is thrown outside of the track, and the path of the wheel flanges is readily cleared. The scraper being flexible yields to any rigid obstruction. The device may be applied to one or more of the trucks on the train, and it operates when the car is drawn in either direction.

Instead of using the slotted scraper the one shown in the foreground having a T-shaped head may be employed, but its action would be the same as that already described.

A Large Meteorite Found.

About 5 o'clock in the afternoon of May 10, a large meteor was seen to fall at the edge of a ravine near Estherville, Emmett county, Iowa, making a hole 12 feet in diameter and about 6 feet deep. S. E. Bemis writes to the *Chicago Tribune* that search parties had found numerous pieces, varying in size from 1 to 8 ounces, also four pieces about 4 lb., and one weighing 3½ lb. and 2 ounces; but the largest size was found bedded 8 feet in blue clay, and fully 14 feet from the surface. Its weight is 431 lb., and its size 2 feet long by 1½ wide, and one or so foot thick, with ragged or uneven surface. It is composed, apparently, of nearly pure metal, a piece of which has been made into a ring. It makes a very pretty ring, resembling silver somewhat, but a trifle darker in color.

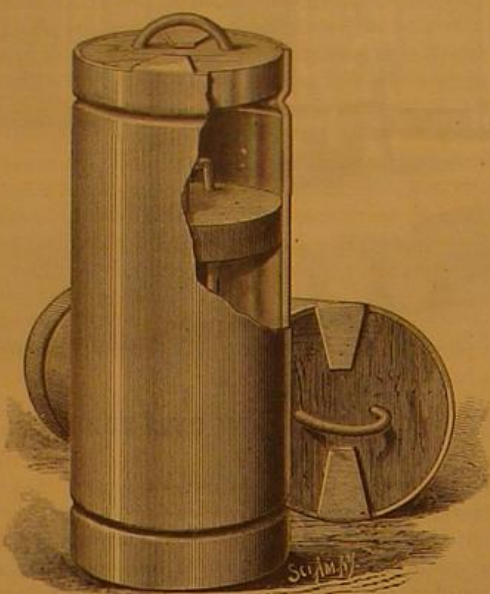
Not Pleuro-Pneumonia.

Professor Williams, of the New Veterinary College, Gayfield, Edinburgh, Scotland, has decided that the American cattle slaughtered at Liverpool were not suffering from contagious pleuro-pneumonia, as the veterinary officers of the Privy Council asserted. The lungs of such cattle having been submitted to him for examination, Professor Williams

says that in none of them were there any of the signs of contagious pleuro-pneumonia, but all presented evidences of capillary bronchitis and collapses of certain lobules of the lungs of recent origin. In none of the lungs were there any traces of pneumonia or of pleuritis. He is of the opinion that the disease originated during transit. He adds that the above mentioned portions of lungs have been examined by Dr. Hamilton, Pathologist to the Royal Infirmary and Demonstrator of Morbid Anatomy; Dr. Young, Professor of Physiology; Mr. Vaughan, Professor of Anatomy; Mr. Kit chen, Professor of Materia Medica and Therapeutics, all of the New Veterinary College of Edinburgh, and others, all of whom agree with him as to the nature of the disease and are ready to indorse his opinion.

NEW SAMPLE CASE.

The accompanying engraving shows an improved case for sampling, holding, or conveying goods of various kinds. It

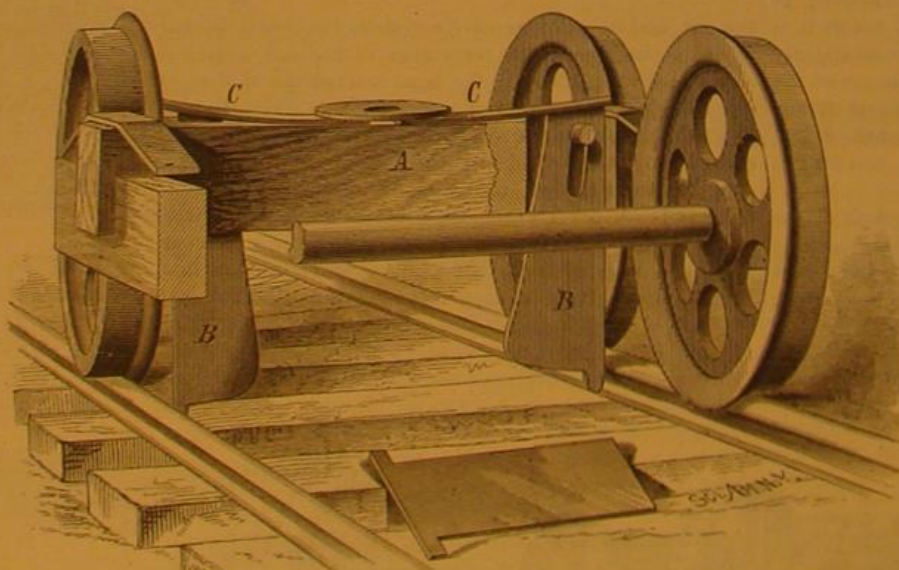


DAVIS' SAMPLE CASE.

seems especially adapted to the use of millers and others dealing in grain or flour.

It consists of a sheet metal tube having near each end indented grooves, that in reverse form ribs or shoulders on the inside of the tube, which serve as seats for the stoppers. The stoppers are of sufficient thickness to reach from the rib to the end of the tube, and are retained in place by lips formed at the end of the tube, which are bent down after the package is filled.

The tube is provided with one or more partitions or diaphragms of cork or other suitable material, which divide the package into two or more compartments, so that two or more different samples may be carried. The stoppers at the ends



COX'S SNOW FLANGER.

of the package are provided with handles to facilitate their removal.

This improved sample package was recently patented by Mr. M. R. Davis, of Jackson, Mich., from whom further information may be obtained.

Growth of the Petroleum Business in the Pennsylvania Oil Fields from June, 1872, to April, 1879.

The amount of crude petroleum produced in the month of June, 1872, was 596,130 barrels. The amount of crude oil held in stock at that time in the producing regions was 1,010,302 barrels. The number of producing wells in June, 1872, was 4,144. The average daily production per well was 3.9-10 barrels. The sales of crude on board of cars in June, 1872, were from \$3.80 to \$4.10 per barrel.

The amount of crude produced in the month of April, 1879, was 1,507,950 barrels. The amount of crude held in stock at that time was 6,666,611 barrels. The number of producing wells in April, 1879, was 10,782. The average

daily production per well was 4.6-10 barrels. The sales of crude oil certificates in June, 1872, were from 73¼ cents to 83¼ cents per barrel.

From the above exhibit the following results appear:

1. That the production of the Pennsylvania oil fields has increased about 200 per cent. 2. That the stock of crude held in the producing region has increased over 600 per cent. 3. That the number of producing wells has increased about 160 per cent. 4. That the daily average production per well has increased 0.7 per cent. 5. That the average price of crude in April, 1879, was nearly 300 per cent less than in June, 1872.

From the above results the deduction of over production is inevitable.—*Stonell's Petroleum Reporter*.

RECENT AMERICAN PATENTS.

Messrs. D. M. Hurlburt and C. R. Slocum, of Hornellsville, N. Y., have patented an improved umbrella drip cup, which consists in a collar with a flexible rim and having attached to it a flexible bag. The drippings run into the flaring portion of the collar and from thence into the flexible bag.

Messrs. Joseph Conly and Jonas B. Wise, of Sharon, Wis., have patented an improved refrigerating building for the preservation of fresh meat and other substances to be kept cool. It consists in a peculiar arrangement of double walls, partitions, slides, etc., which cannot be clearly described without an engraving.

A horn tobacco box, consisting of two similar sections connected by flanges and rivets, and provided with a sliding cover, has been patented by Mr. Hermann Arnold, of Elizabeth, N. J.

A novel toy windwheel, consisting of a spring hammer, a corrugated bell or gong, and a metallic windwheel, attached to a handle and arranged so that the rotation of the wheel will ring the gong, has been patented by Mr. Joseph L. M. Du Four, of Bound Brook, N. J.

Mr. Frank Donaldson, of New York city, has invented an improved device to be inserted in or attached to house doors for convenience of those supplying and those receiving milk. The device holds the pitcher and the money or ticket, indicates the amount of milk required, and has a small locked door which can be opened only by the milkman, who carries a funnel adapted to the apparatus, which he inserts through the door when he desires to fill the pitcher.

An improved edging tool for lathe working has been patented by Mr. Genas B. Putnam, of Thomaston, Me. The invention consists in a flat cutting blade fitted to a handle and carrying an adjustable gauge arm, to which is attached a gauge plate that acts as a guide for the knife.

An improved means for attaching urns to stoves has been patented by Mr. Cornelius Fuller, of Somerset, Mass. It consists in a horizontally bent arm hinged to one side of the stove by a vertical pin. This arm has an eye through which passes the stem portion of the urn.

Messrs. D. W. and H. Johns and Henry Embs, of New Albany, Ind., have patented an improved machine for making ax-polls. In this machine the ax-polls are made by the rolling process, the iron bar being first bent into a V-shape and the eye formed; the ends or flanges are then closed by stationary dies as the poll comes from the roll.

An improved apparatus for utilizing waste gases of distillation in refining petroleum has been patented by Mr. Henry E. Parson, of New York city. This invention is designed to utilize the gases that are formed in the process of distilling petroleum after the oil leaves the condensing coil.

An improved clothes pounder, patented by Mr. William D. Middleton, of Elkhart, Ind., consists in the combination with a conical dasher of a perforated cylinder, a piston, and a spring, arranged so that air is forced through the clothes and through the water, facilitating the cleansing of the clothes.

In picking cotton long sacks are used, which are dragged on the ground by the pickers. When filled these sacks drag heavily and are worn out rapidly. An improved cotton sack protector, which may be easily attached to or removed from the sack, and which will obviate the difficulty referred to, has been patented by Mr. David W. Bullock, of Tarborough, N. C.

Mr. James S. Brady, of Clintondale, N. Y., has patented an improvement in dampers for stoves and furnaces, by which the draught is controlled automatically. The invention depends for its action on the expansion of the stove and pipe by an increase of heat.

Mr. Theodore Beckerman, of Henry, Ill., has recently patented a windmill which has several novel features. The spokes of the wheel and the rods and stays are made of gas pipe to secure strength, lightness, and durability. The hub is of cast iron and the sails are of sheet iron or wood. It is provided with an effective automatic governing device, consisting of a weighted lever and connections, by means of which the sails may be kept full in a moderate wind and turned more or less under a varying wind pressure, so that a uniform speed will be maintained under all working conditions. The peculiar construction of the mill admits of the use of large sails without necessarily using heavy working parts.

The Hygroscopic Properties of Glycerine.

A writer in the *Pharmaceutical Journal* gives the following curious and interesting facts in regard to the behavior of glycerine in a very moist atmosphere: The moisture in the form of water collects and floats on its surface, and taking up, or dissolving, a considerable proportion of the subjacent glycerine (probably more than half its own weight) attracts more moisture, which in turn exercises its solvent power and acquires a capability of still further absorption. Thus the action goes on, not necessarily, as may be thought, in a constantly decreasing ratio as the water increases in amount, but at an almost uniform rate from week to week. The mixture of glycerine and water is not so actively hygroscopic as the glycerine alone, but the combination once effected the action continues with singular uniformity.

The author (Mr. W. Willmott) then proceeds to illustrate this by means of a table, from which he shows that although during a period of four weeks there is an increase of weight from week to week, yet there is a diminution of the increase during the second and following weeks as compared with the first; and this is owing to a lessening of the intensity of absorption by the presence of the water. All this goes on without stirring or disturbing the fluids in any way. If, however, the water be kept stirred into the glycerine instead of being allowed to remain on its surface, there will be no appreciable difference in this increase of weight between the first and following weeks. But at what point is there a pause in this process? Where does it end?

In whatever proportionate quantity water may be added to glycerine, from a single drop upward, absorption will take place in a moisture-laden atmosphere until the proportion reaches three parts by measure of the former to one of the latter. At this point the glycerine, so to speak, gives up the contest and succumbs to the influence which the water exerts in the opposite direction. In this mixture, therefore, namely, three fluid ounces of water to one of glycerine, there will be neither attraction nor evaporation, the weight scarcely varying from week to week either in one direction or the other. If now we conduct our experiments in a moderately dry atmosphere—say in the atmosphere of an ordinary room in which a fire is kept burning during the day—the action will be the same, but to obtain similar results the proportions will be widely different, and in fact almost reversed. Instead of three parts of water to one of glycerine, we shall require nearly three parts of glycerine to one of water to reach the neutral point. Where in one case there is absorption and augmentation, in the other there is evaporation and consequent loss.

It is to this hygroscopic character of glycerine and its power to absorb moisture that is due its irritating effect when rubbed on the skin in an undiluted state.

Medical Colleges—Doctors.

Barnes' Educational Monthly takes to task our medical colleges and the medical profession generally, for the imperfect manner in which the former are conducted and the lack of scientific knowledge among the latter.

While we do not indorse the sweeping assertions of the writer, that a large proportion of our doctors are incompetent to prescribe in ordinary diseases, we have no doubt but many reforms might be introduced into our medical colleges, and that our practitioners would become more skillful in their profession if they studied more into the causes of the disease they are called upon to treat; in other words, as the writer says, conduct their practice on more scientific principles.

With the exception of one college in New York, and two in other States, says the above-named monthly, any one may become a medical student without preliminary examinations in anything, moral character not excepted. Students are often graduated at the close of two years' study, and in some institutions the course of instruction is even more superficial and imperfect. Examinations for diplomas are not at all rigid, a knowledge even of chemical analysis not being required. There is not a single doctor in one of the counties in Western New York who can conduct a decent chemical analysis, or even tell whether his nitrate of bismuth does or does not contain arsenic. A doctor recently stated on examination that the proper dose of prussic acid for a child two years old was from four to six drops! As a general thing, doctors in rural places, and in some of our cities as well, stick to antiquated remedies and outrageous doses. We think our educational journals ought to stir up the young doctors to more diligent habits as students. Each one of them should have his chemical laboratory, where he daily should conduct such chemical analyses as sickness demands.

If doctors were a little more enterprising and pushing, we should know something more concerning such diseases as typhoid fever, diphtheria, scarlet fever, and measles. Call two doctors in succession to a child attacked with one of these diseases, and the probabilities are they will give you contradictory explanations, and totally different remedies. This is no recommendation to the medical profession. Because doctors are not scientific, the practice of medicine is not conducted on scientific principles, and medicine is not to-day a science. It is a practice, we admit, much to the horror of sensitive tastes. The day will be hailed with joy by a disease-cursed world when this practice is conducted on scientific principles. We laymen would like to know many things our medical advisers will not tell us, simply because they cannot.

Let us have some light on those diseases lurking unobscured in all parts of our land. It is your duty to enlighten

the world, and if you are the students you should be, some of you will bless this humanity of ours by telling exactly what will cure certain diseases, and why it will do so. You should be paid to prevent as well as cure. We would rather give you twenty-five dollars to keep us well, than ten to cure us when sick.

Milk and Lime Water in Nervous Disorders.

In a paper on "Milk with Lime Water as Food and Medicine in Nervous Disorders," presented by E. N. Chapman to the Medical Society of the State of New York, at its recent annual meeting, the author deprecates the warfare of drugs against disease which is now being waged by specialists more vigorously and systematically than ever before. Digestion and assimilation, he asserts, are ignored, and the attention is absorbed by one or more prominent symptoms in a part remote from the primary source of morbid action. Consequently the efforts of the physician to cure his patient are too often unavailing.

He states that having used, the last few years, milk with lime water almost exclusively as the diet of his patients, he has attained a success unknown to him when he depended more on medicine and less on food. To illustrate the ready assimilation, the nutritive quality and the remedial power of milk, when rendered digestible by lime, he presented notes of a number of cases treated by him, embracing a class involving the nerve centers, and that are acknowledged to be little under the command of accepted modes of treatment; such, for instance, as marasmus, anemia, paralysis, indigestion, neuralgia, chorea, dementia, and alcoholism.

In concluding his paper, Dr. Chapman remarks that the efficacy of milk with lime water in the illustrative cases brought forward by him is equally observable in others whenever, either primarily or secondarily, the nutritive functions are much at fault. The milk (with a pinch of salt) being rendered very acceptable to the stomach by the lime, may almost always with advantage be made the prime article of diet in the sick room, however diverse the conditions. It is the most digestible and at the same time the most nourishing food that can be given. It allays gastric and intestinal irritability, offers a duly prepared chyle to the absorbents, supplies the blood with all the elements of nutrition, institutes healthful tissue changes, stimulates the secreting and excreting glands, and, in a word, provides nature with the material required to sustain herself in her contest with disease. If it be conceded that nature always accomplishes the cure whenever it is secured, and that drugs merely aid, direct, or modify her efforts to this end, it will be self-evident that the food which supplies the vital forces with all the power of resistance they possess is a matter of the first importance, and that milk acted upon by lime, provided it contains all the essential properties of other articles epitomized, and is more friendly than any or all of them, has a range of application almost as extensive as the disease itself, whatever its character and whoever the patient.

Electric Light in Hydraulic Mining.

The first electric light ever introduced in a mining claim was placed on the Deer Creek placer claim of the Excelsior Water Company at Smartsville, on the 10th of last April. A 12,000 candle power Brush machine was put in operation, and three lights of 3,000 candle power each were placed in prominent positions upon the claim. Although the night was very dark the lights shed a brilliant light around and enabled the miners to work as readily as during the day. Until this experiment the mines had to shut down during the night, but now the company expects to work both night and day. Nevada and Yuba counties have many hydraulic mining companies, and several of them have announced their desire to use the new light if the Excelsior company is thoroughly satisfied with their machine. As Mr. Law has received several telegrams from the company which state that it is working well, there can be no doubt that it will be adopted. The three lights cost the company about 10 cents per hour, and with interest, wear and tear, etc., included, the claim is lighted for 16 cents per hour. The company's daily clean-up is from \$500 to \$1,000, and by running nights also the yield of the mine can be doubled. —*Nevada Transcript*.

Sea Weeds for the Herbarium.

The recipe for pressing sea weeds for preservation used by the Rev. A. B. Hervey, of Troy, N. Y., well known as an expert in that process, is as follows: Float out each specimen by itself in salt water, in a white dish, like a washbowl. Put the paper under the plant in the water, arrange the plant on the paper and carefully draw it out. Lay the paper with the plant upon it on drying paper and spread over it a piece of white muslin. Then spread over this a layer of drying paper, then more plants, and then more cloth, drying paper, etc. Put all under a board, and weight it with forty or fifty pounds of stone or other heavy substances. The next day change the cloths and drying paper, and in one day more the plants will be dry and ready to go into the herbarium or the album for permanent preservation.

Utilization of Hop Stems.

Many attempts have been made to convert hop stems, which, at the present time, are only a nuisance to the hop growers, into some useful product; paper makers have tried to reduce them to a pulp suitable for their purpose, but with only indifferent success. The *Breiter's Guardian* states that M. Jourdeit, of France, has recently patented a process for obtaining from these stems a material suitable for the manu-

facture of cordage. The stems and runners are collected twenty-four hours after the hops have been picked, tied together in bundles about five feet in length by half a yard in diameter, and steeped in water in the same manner as hemp. Here they are allowed to remain from three to four weeks, after which they are taken out, placed on end to drain for a while, dried for twenty-four hours in the sun, and then stored in dry, well-ventilated sheds. The separation of the fibers from the woody portions of the steeped stems is readily effected by passing these between two cylindrical rollers, though the process is not quite so easy as in the case of hemp or flax, owing to their tougher structure. The fibers, as thus obtained, are of a light brown color, and from 12 to 16 inches long. They are then carded in the same manner as flax, and in this state afford a very valuable material for the manufacture of cordage and similar rough products. Another patent has been taken out in Germany, according to the *Gardener's Chronicle*, and which differs from the above. In the German process the hop stems are boiled in soap, soda, and water, well washed, and reboiled in very dilute acetic acid, again washed, dried, and combed, when they are fit for use, and can be washed like flax.

Another New Metal.

The services the spectroscope is capable of rendering to science become more and more evident daily, the latest proof of the fact being the discovery of a new metal called scandium. In some of the mines in Sweden and Norway small quantities of earthy minerals are found, called gadolinite and euxenite, composed of oxides of very rare metals. The bulk of the substance is of a rose color, arising from the presence of erbium, and is called erbine. At first it was supposed to be simply mixed with some earthy substances which rendered it impure, but not long ago M. Marignac discovered the presence of another metallic substance, which he called ytterbium, the oxide of ytterbium. However, great uncertainty existed as to the composition of these bodies, and M. Nilson undertook a series of experiments on the subject. M. Berthelot, at the last meeting of the Academy of Sciences, gave an account of what had been done so far, the result being the discovery of a new metal to which M. Nilson has given the name of scandium, to indicate that it is of Scandinavian origin. Erbine is, as before mentioned, of a brilliant rose color, while ytterbium is white. But the separation of the two substances can only be effected with extreme difficulty. The earth has to be dissolved in boiling nitric acid, and the ytterbium then precipitated by sulphuric acid; and M. Nilson found that the operation, repeated more than twenty times, did not completely separate the two bodies.

When he had obtained a comparatively pure ytterbium he commenced an examination of it, and then he found that it gave absorption bands in the spectrum unknown to any substance previously examined. After repeated trials he became convinced that he was dealing with a metal never before suspected, and he continued his researches. He is unable to say at present what may be the chemical properties of the new body, as the quantity of material at his disposal was insufficient to allow him to isolate the metal. Nor can he decide as yet as to the place the new metal is to take among the older ones, but he considers that its properties differ materially from those of erbium and ytterbium, and that it should rank between tin and thorium, as the atomic weights of these two are 118 and 234, while he calculates that of scandium at from 160 to 180.

Brain Work and Skull Growth.

The *London Medical Record* sums up as follows the results of some very interesting measurements of heads by two French physicians, Messrs. Lacassagne and Cliquet:

Having the patients, doctors, attendants, and officers of the Val de Grace at their disposal, they measured the heads of 190 doctors of medicine, 133 soldiers who had received an elementary instruction, 90 soldiers who could neither read nor write, and 91 soldiers who were prisoners. The instrument used was the same which hatters employ in measuring the heads of their customers; it is called the conformator, and gives a very correct idea of the proportions and dimensions of the heads in question. The results were in favor of the doctors; the frontal diameter was also much more considerable than that of the soldiers, etc. Nor are both halves of the head symmetrically developed: in students, the left frontal region is more developed than the right; in illiterate individuals, the right occipital region is larger than the left. The authors have derived the following conclusions from their experiments: 1. The heads of students who have worked much with their brains are much more developed than those of illiterate individuals, or such as have allowed their brains to remain inactive. 2. In students the frontal region is more developed than the occipital region, or, if there should be any difference in favor of the latter, it is very small; while in illiterate people the latter region is the largest.

MADemoiselle ADELAIDE MONTGOLFIER, a daughter of the inventor of balloons, is still alive, aged eighty-nine years. She is possessed of a large fortune, and presented the Museum of the Aeronautical Academy with a copy of the large medal executed by Houdon, and representing her father and uncle, who was associated with him in the invention of balloons. This medal was executed to commemorate that event. A movement will be got up in France for celebrating the centenary of that memorable event, which took place in June, 1783, in the vicinity of Lyons.

NEW PIPE CUTTING AND THREADING MACHINE.

The annexed engraving represents a compact, portable, and low priced machine more especially designed for cutting and threading pipe, but which may be used to good advantage in jobbing shops for cutting off round iron and for threading bolts and tapping nuts where the attachments for this kind of work are applied. The machine is contrived so that the speed, and consequently the leverage, may be changed to adapt it to light or heavy work. There are three changes of speed: the fast speed cuts one fourth, three eighths, and one half inch; the next three quarters, one, and one and a quarter inch; and the slowest speed one and a half and two inches. These changes in speed are readily made by means of a lever at the front of the machine.

The cutting and threading is done by stationary cutters and dies, while the pipe is held and revolved by a concentric chuck on the hollow mandrel of the machine. We are informed that this chuck is one of the best of its kind for gripping pipe and bars of iron. At the back end of the mandrel there is a universal chuck for centering and supporting the pipe, thus doing away with extra guides or supports. The die head has a cutting-off tool slide and self-centering jaws for steadying the pipe while it is cut off. The die starter consists of a pinion working in a rack at the bottom of the die head; the pinion being provided with a long lever which renders the operation of starting easy.

The manufacturers inform us that as the pipe revolves and the dies remain stationary only straight threads can be cut.

The machine shown in the engraving is arranged for hand power; but it is a very simple matter to apply the pulleys and arrange it to operate by means of a belt when desirable. This machine was recently patented and is manufactured by D. Saunders' Sons, Yonkers, N. Y.

A NEW CONDENSER.

The condenser, as it was constructed by James Watt, consisted of a closed compartment (the condenser proper) and of the air or condenser pump. It is built in nearly the same manner now, the difference being that the condenser and the air pump are very often not separated but connected as one.

The object of the air pump is to remove air and the water of condensation from the condenser. The warm water that results from the mixture of cold water and steam would soon fill the condenser and stop its operation but for the action of the air pump. A certain quantity of power is necessary for the operation of the pump, and this in the ordinary condenser must be furnished by the engine.

Brossard's condenser, which is shown in the engraving, does not require an air pump, and consequently does not consume any of the power of the engine. It is, in fact, entirely independent of the engine. To operate this condenser, cold water, flowing down a height of from 20 inches to 32 feet, creating a corresponding vacuum, is only necessary.

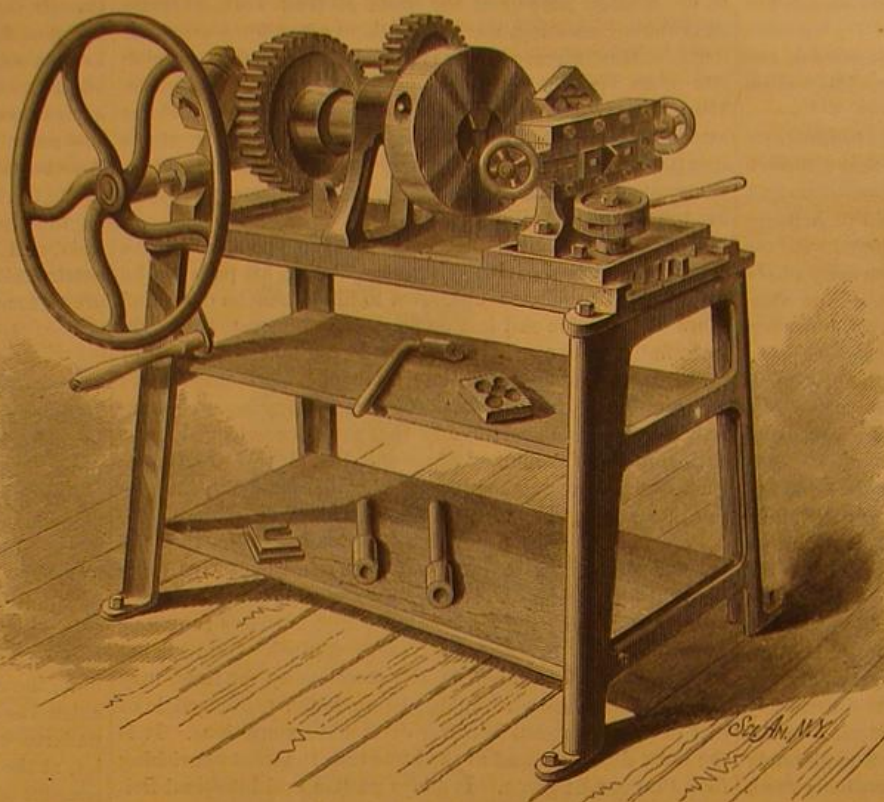
Fig. 1 is a perspective view of the apparatus. Fig. 2 is a vertical section.

The construction can be seen from the engravings. A is the pipe through which the waste steam from the cylinder passes into the condenser. To set the apparatus in operation the cock, *b*, is opened, then water will flow over the disk, *c*, into the chamber, *f*, of the condenser, whence it flows through the pipe, *g*. In the pipe, *g*, the water tends to attain a velocity proportional to the height through which it falls, but if the cock, *b*, is set so that less water can enter *c* than can flow through *g*, then the water in *g* flows slower. This produces a vacuum in the condenser, *f*. If the steam is allowed to enter the condenser it will be drawn into the vacuum, *f*, and will be condensed there by the cold walls of the condenser funnel, and by being mixed with cold water. The water of condensation also flows off through the pipe, *g*. The water that passes through the pipe, *g*, forms

a liquid funnel at *i*, into which the air that may have remained in the condenser is drawn.

As soon as the apparatus is in operation the cock, *b*, is closed, so that the water does not flow from the reservoir, *h*, but is drawn by suction from the reservoir, *k*. The best results are attained if the water is cold and quantity small.

To measure the effect of the apparatus we can assume that 39.37 inches of height through which the water falls, is equal

**SAUNDER'S SONS' PIPE CUTTING AND THREADING MACHINE.**

to 2.75 inches of quicksilver. If the vacuum is proportional to 29.8 inches of quicksilver, the rarefaction with this condenser will be proportional to 27.5 of quicksilver if the height is 32 feet. The least effect is produced with a height of 20 inches, and the vacuum is then proportional to 1.37 inch of quicksilver.—*Schweizerisches Gewerbeblatt*.

A New Cigar Ship.

A London paper reports that Mr. Winans, of Baltimore, is building in the Clyde a monster cigar ship at a cost of close on \$1,000,000. She is to be of 4,000 or 5,000 tons bur-

The Lesson of Asa Packer's Life.

Between the young mechanic from Connecticut who wandered into the Susquehanna Valley on a winter morning fifty-six years ago, with his knapsack and kit of tools, seeking work, and the distinguished citizen whose death the whole commonwealth mourns to-day, there is more than the space of half a century—there is the whole span of American possibilities; there is the whole story of an American fortune, and of the success which was due to thrift, patience, foresight, and, above all, character. The story of Judge Packer's life is better than a romance. Opportunity of no common order was his, it is true; but how many other striplings of Yankee or Pennsylvania growth who were on the road he traveled by, had the discernment to see the opportunity in the first place, the frugality and hard endurance to grasp and hold it, and the rugged truth of character that induced men to hold fast by him when disasters were threatened that overthrew lesser or less steadfast men? There is a practical value in this career, ending as it did in the possession and dispensing of a colossal fortune, that ought to send all doctrinaire theorists on the labor question to the right about. Here was a young fellow, unfriended, except by the skill of his hands as a workman, who came into the Lehigh Valley and conquered it; subdued its rugged mountain sides and its narrow river bed; laid bare its wedged in and countless wealth, and dispensed prosperity to his fellow citizens. More than this, the opposition and narrowness which he encountered in dealing with other men who stood on the level of labor he started from, was the means of turning his attention to his great educational work. The problem of the "strike," which confronts the best minds of capitalists

and laboring men to-day with its costly and menacing possibilities, was the corner stone of Lehigh University. Long shall the story be remembered of that scene on the river when the striking boatmen of the Lehigh canal with their boats were collected on the pool of the Lehigh river, above the dam at Easton, with all the uncontrolled passion and disorderly excesses that accompanied the "strike" in the coal regions. Judge Packer, himself a boatman of a few years back, in the full confidence of his kindly feelings and his knowledge of their thoughts and needs, went to them for a friendly talk on the situation. He had no fear of his life in meeting this excited crowd, although from personal experience he knew the temper of these turbulent men. They would not listen to him, but seized him and flung him into the river. Some men would have accounted it a lifelong grudge and an added reason for severity in pursuing the mob leaders to punishment for this outrage. But the perfect temper of Judge Packer viewed this "mob baptism" differently. It was an outburst of passionate ignorance, he reasoned, and his answer to the outrage was a great Free School. It would take a generation to disperse the ignorance, but the rising generation should have the benefit of all that free tuition and the wise disposal of his wealth should give it.—*Philadelphia Public Ledger* May 19.

The Ship Constitution.

The old frigate Constitution, now at Brooklyn, unloading exhibits returned from the Paris Exhibition, had her keel laid in 1794, and was launched three years later. She bombarded Tripoli in 1804, and in 1812 she captured the Guerriere, Wasp, and other vessels. It is said by naval officers that not a particle of the original wood is now in the old frigate, except the mizzenmast bits.

NEW COLORS.—Reinhold Hoffmann treats blue, green, or so-called white ultramarine at an elevated temperature, and with access of air with acids, or with salts which give off acids when heated. He thus obtains purple-red or violet color, which, on treatment in the same manner, become red.

FIG. 1.

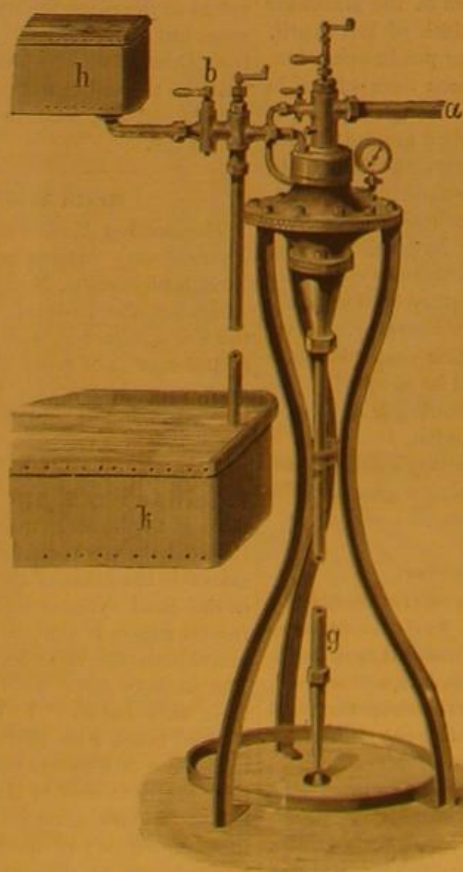
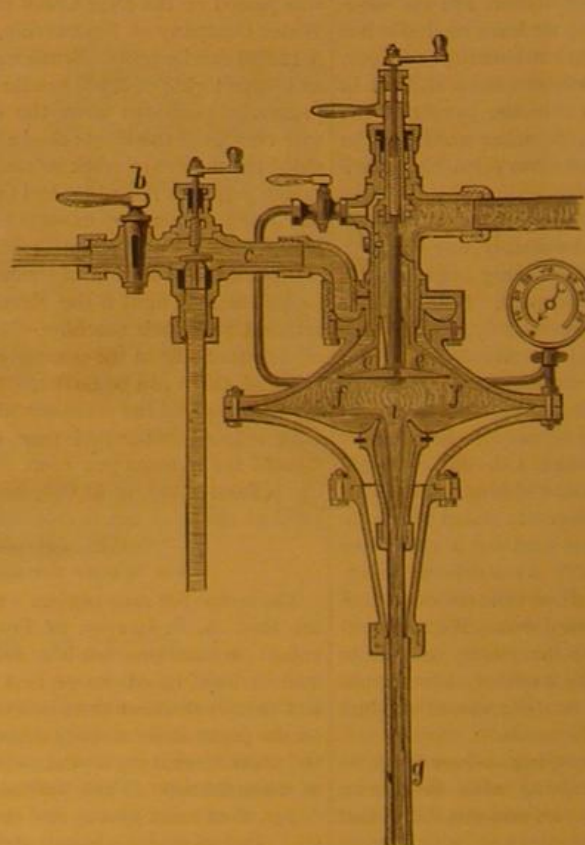


FIG. 2.

**BROSSARD'S CONDENSER.**

den, and it is believed by her owner that she will be able to cross the Atlantic in five days. This will be the third vessel of the same type that Mr. Winans has built. The other two are much smaller and are well known to all who frequent the Solent in the summer.

BABBITT METAL.—By weight 4 parts copper, 8 parts antimony, 96 parts tin.

THE CHAMELEON.

This singular reptile has long been famous for its power of changing color, a property, however, which has been greatly exaggerated, as will be presently seen. Nearly all the lizards are constitutionally torpid, though some of them are gifted with great rapidity of movement during certain seasons of the year. The chameleon, however, carries this sluggishness to an extreme, its only change being from total immobility to the slightest imaginable degree of activity. No one ever saw a chameleon even walk, as we understand that word, while running is a feat that no chameleon ever dreamed of.

When it moves along the branch upon which it is clinging the reptile first raises one foot very slowly indeed, and will sometimes remain foot in air for a considerable time, as if it had gone to sleep in the interim. It then puts the foot as slowly forward, and takes a good grasp of the branch. Having satisfied itself that it is firmly secured, it leisurely unwinds its tail, which has been tightly twisted round the branch, shifts it a little forward, coils it round again, and then rests for a while. With the same elaborate precaution, each foot is successively lifted and advanced, so that the forward movements seem but little faster than the hour hand of a watch.

The food of the chameleon consists of insects, mostly flies, but, like many other reptiles, the chameleon is able to live for some months without taking food at all. This capacity for fasting, together with the singular manner in which the reptile takes its prey, gave rise to the absurd fable that the chameleon lived only upon air. To judge by external appearance, there never was an animal less fitted than the chameleon for capturing the winged and active flies. But when we come to examine its structure, we find that it is even better fitted for this purpose than many of the more active insect-eating lizards.

The tongue is the instrument by which the fly is captured, being darted out with such singular velocity that it is hardly perceptible, and a fly seems to leap into the mouth of the reptile as if attracted by magnetism. This member is very muscular, and is furnished at the tip with a kind of viscid secretion which causes the fly to adhere to it. A lady who kept a chameleon for some time, told me that her pet died, and when they came to examine it they found that its tongue had in some strange way got down its throat, an accident which they took to be the cause of its death. Its mouth is well furnished with teeth, which are set firmly into its jaw, and enable it to bruise the insects after getting them into its mouth by means of the tongue.

The eyes have a most singular appearance, and are worked quite independently of each other, one rolling backward while the other is directed forward or upward. There is not the least spark of expression in the eye of the chameleon, which looks about as intellectual as a green pea with a dot of ink upon it.

Owing to the exceeding slowness of its movements, it has no way of escaping when once discovered. Great numbers of these creatures fall victims to enemies of every kind, and were it not that their color assimilates so well with the foliage on which they dwell, and their movements are so slow as to give no aid to the searching eye of their foes, the race would soon be extinct. The chameleon has an odd habit of puffing out its body for some unexplained reason, and inflating itself until it swells to nearly twice its usual size. In this curious state it will remain for several hours, sometimes allowing itself to collapse a little, and then reinflating its skin until it becomes as tense as a drum and looks as hollow as a balloon.

The chameleon is readily tamed, if such a word can be applied to the imperturbable nonchalance with which it behaves under every change of circumstance. It can be handled without danger, and although its teeth are strong, will not attempt to bite the hand that holds it. It is, however, rather quarrelsome with its own kind, and the only excitement under which it has been seen to labor is when it takes to fighting with a neighbor. Not that even then it hurries itself particularly or does much harm to its opponent, the combatants contenting themselves with knocking their tails together in a grave and systematic manner.

A few words on the change of color will not be out of

place. The usual color of the chameleon when in its wild state is green, from which it passes through the shades of violet, blue, and yellow, of which the green consists. In this country, however, it rarely retains the bright green hue, the color fading into yellowish gray, or the kind of tint which is known as *feuille-morte*. One of the best and most philosophical disquisitions on this phenomenon is that of Dr. Weissenbaum, published in the "Magazine of Natural History" for 1838, which, however, is too long for quotation.

It seems probable that the change of color may be directly owing to the greater or less rapidity of the circulation, which may turn the chameleon from green to yellow, just as in ourselves an emotion of the mind can tinge the cheek with scarlet, or leave it pallid and death-like. Mr. Milne Edwards thinks that it is due to two layers of pigment cells in the skin, arranged so as to be movable upon each other, and so



THE CHAMELEON.

produce the different effects. The young of the chameleon are produced from eggs, which are very spherical, white in color, and covered with a chalky and very porous shell. They are placed on the ground under leaves, and there left to hatch by the heat of the sun and the warmth produced by the decomposition of the leaves. The two sexes can be distinguished from each other by the shape of the tail, which in the male is thick and swollen at the base.

There are nearly twenty species of chameleons known to zoologists at the present day, all presenting some peculiarity of form or structure.

Hibernation of the Cotton Worm Moth.

After reviewing all the facts and evidence on the subject of the hibernation of the cotton worm, and showing that it cannot and does not survive in either the egg, larva, or the chrysalis state, Prof. C. V. Riley, in the paper recently read by him before the National Academy of Science, considers its hibernation in the parent moth state. The power of migration is proved and admitted, and the Professor has known of large fields of melons being ruined by the moth, whose proboscis enables it to puncture the rind, as far north as Racine, Wisconsin. "It is but natural, therefore," he

continues, "to conclude that the insect comes each year from some country where the cotton plant is perennial, and there are other facts which lead to this view, first put forth in 1854 by Dr. W. J. Burnett, in the Proceedings of the Boston Society of Natural History, and subsequently repeated by Prof. A. R. Grote, before the American Association for the Advancement of Science, in 1874." Prof. Riley goes on to show, however, that the conclusion is probably erroneous, and ends his paper as follows:

"My own belief now, is that the moth really survives the winter in the more southern portions of the cotton belt, as on the Sea Islands of Georgia, and in parts of Florida and Texas, and that it is from this more southern portion that it spreads this year.

"This belief, which yet lacks full confirmation, does not preclude the occasional coming of the moth from foreign, more tropical countries, or the possibility of its being brought

by favorable winds from such exterior regions; though the fact is established that it could not have come from the Bahamas since 1866.

"The question has an important practical bearing, for, on the theory of the insect's ability to remain with us, much important fall and winter work of a preventive nature may be done in destroying the moths; whereas, on the theory of its annual perishing and necessarily coming from foreign countries, no such preventive measures are left to the planter. The time employed in baiting and destroying the last brood of moths in autumn will be wasted and he must helplessly await the coming of the parent the ensuing spring, and deal as best he can with the progeny."

Sharks, Sucker Fish, and Pilot Fish.

Professor H. N. Moseley, in his "Notes by a Naturalist on the Challenger," says:

While dredging was proceeding off the Island of Sombrero, on the approach to St. Thomas, two sharks (*Carcharias brachyurus*) were caught with a hook and line. One of these had the greater portion of one of its pectoral fins bitten off, there being a clean semicircular cut surface where the jaws of another shark had closed and nipped it through.

Attached to the sharks were several "sucker fish" (*Echinis remora*), as commonly is the case. Sometimes these "suckers" drop off as the shark is hauled on board. Sometimes they remain adherent and are secured with their companion. In this case four out of six "suckers" were obtained with the two sharks. They were seen to shift their position on the sharks frequently as these struggled in the water fast hooked. The remora is a fish provided, as a means of attachment, with an oval sucker divided into a series of vacuum chambers by transverse plaits. The sucker is placed on the back of the fish's head. The animal thus constantly applies its back to the surfaces to which it attaches itself, such as the shark's skin. Hence the back being always less exposed to light is light colored, whereas the belly, which is constantly undermost and exposed, is of a dark chocolate color. The familiar distribution of color existing in most other fish is thus reversed. No doubt the object of this arrangement is to render the fish less conspicuous on the brown back of the shark. Were its belly light-colored as usual, the adherent fish would be visible from a great distance against the dark background. The result is that when the fish is seen alive it is difficult to persuade one's self at first that the sucker is not on the animal's belly, and that the dark exposed surface is not its back. The form of the fish, which has the back flattened and the belly raised and rounded, strengthens the illusion.

When the fish is preserved in spirits the color becomes of a uniform chocolate, and this curious effect is lost. When one of these fish, a foot in length, has its wet sucker applied to a table and is allowed time to lay hold, it adheres so tightly that it is impossible to pull it off by a fair vertical strain.

Fishing for sharks was a constant sport on board the ship when a halt was made to dredge anywhere within a hundred miles or so of land, in the tropics. Sharks were not met with in mid ocean.

Mr. Murray examined these sharks thus caught, and reports that they all, whether obtained in the Atlantic or Pacific

fic Ocean, belonged to one widely distributed species, excepting one other kind obtained off the coasts of Japan. The hammer-headed shark (*Zygona malleus*) was taken by us only with a net on the coasts.

The sharks were often seen attended by one or more pilot fish (*Naucrates sp.*), as well as bearing the "suckers" attached to them.

I often watched with astonishment from the deck this curious association of three so widely different fish as it glided round the ship like a single compound organism. The sharks, as a rule, were not by any means so easily caught as I had expected. Frequently they were shy and would not take a bait near the ship, though they never failed to bite if it was floated some distance astern by means of a wooden float. It is always worth while for naturalists to take what sharks they can at sea, since their stomachs may contain rare cuttle fish which may not be procured by any other means.

The sharks caught were always suspended over the screw well of the ship. It was amusing, on the first occasion on which one was got on board, sprawling and lashing about on the deck, to see two spaniels belonging to officers on board, put their bristles up and growl, ready to fly at the fish. The dogs would probably have lost their heads in its mouth if not driven back. Sometimes the sharks were bold enough and would bite at a bit of pork hung over the ship's side on the regulation shark hook, which is supplied to ships in the navy, and which is an iron crook as thick as one's little finger, and mounted on a heavy chain.

No shark was hooked during the voyage which was large enough to require such a hook. Nearly all the sharks caught and seen were very small, from five to seven feet in length. The largest obtained was, I think, one netted at San Jago, Cape Verde Island, which was four feet in length. Large sharks seem scarce. I was disappointed, and had expected to meet with much larger ones on so long a voyage. The largest shark known seems to be *Carcharodon carcharias*, of Australia. There are in the British Museum the jaws of a specimen of this species which was thirty-six feet and a half in length (Günther's "Catalogue of Fishes.") The Challenger dredged in the Pacific Ocean in deep water numerous teeth of what must be an immensely large species of this genus.

The great basking shark (*Selache maxima*), a harmless beast with very minute teeth, ranging from the Arctic seas to the coast of Portugal, has been known to attain a length of more than thirty feet. Sharks occasionally seize the patent logs, which, being of bright brass and constantly towed, twirling behind ships, no doubt appear to them like spinning baits intended for their use.

The pilot fish often mistakes a ship for a large shark, and swims for days just before the bows, which it takes for the shark's snout. After a time the fish becomes wiser and departs, no doubt thinking it has got hold of a very stupid shark, and hungrily wondering why its large companion does not seize some food and drop it some morsels. The "suckers" often make the same mistake and cling to a ship for days when they have lost their shark. I fancy that porpoises and whales, when they accompany a ship for several days, think they are attending a large whale. A humpback whale followed the Challenger for several days in the South Pacific.

RECENT MECHANICAL INVENTIONS.

Messrs. Michael Furst and William Chadwick, of Brooklyn, N. Y., have patented an improved machine for spinning hemp yarn. The improvement relates more particularly to the condenser of hemp spinning machinery, and to devices for rubbing the sliver and polishing the yarn.

An improved lathe dog, provided with a movable or adjustable arm or carrier to adapt it to hold objects at points more or less remote from the center, has been patented by Mr. B. F. Cloud, of Philadelphia, Pa.

Mr. J. D. Russell, of Lebanon, Mo., has patented an improvement in tire tighteners, which is operated by means of a cam and lifting bar, so as to expand the felly and make room for leather washers at the end of the spoke.

An improvement in bench vises has been patented by Mr. Thomas Gremmit, of Rockford, Ill. It is constructed so that it may be readily adjusted for different kinds of work, and for holding work of different shapes.

A Life Saving Bow.

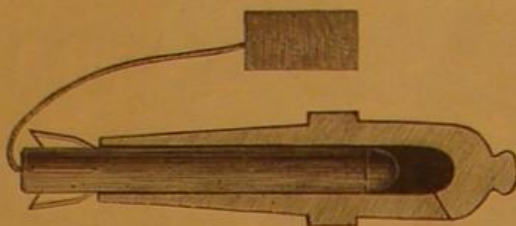
Seeing that wrecks very frequently occur within two or three hundred yards of shore, a correspondent suggests that an efficient aid to the life saving service in such cases might be found in a bow light enough to be carried in the hand and strong enough to throw an arrow with a light line to a ship in distress, or from a ship to the shore. A cord 3-16 of an inch in diameter would suffice to haul off a line strong enough to carry a cable, and much valuable time might thus be saved. To drag a heavy gun a mile or two along a sandy beach, with other heavy apparatus, involves more labor and loss of time than can well be afforded by the short crews of our life saving stations, especially when the wreck is near the shore and in danger of breaking up.

A bow carrying a light life line might be useful also at bathing stations, as at Long Branch, where accidents happen very near the shore. The cost would be small, and there would be no expense attending the practice required to make the beach attendants familiar with the use of the bow and line.

A NEW WINGED PROJECTILE.

The accompanying cut represents a new winged projectile designed by Mr. E. S. Hunt, of Boston. The Massachusetts Humane Society have recently adopted it, and have such faith in its efficiency that they have presented a gun and projectile to the Royal National Life Boat Institution, England, hoping that the authorities will consider its merits.

Two smooth bore brass guns, mere toys to look at, weighing 56 lb. and 69 lb. respectively, each 24 in. long, were used to fire the projectile, the charge of powder varying from $3\frac{1}{2}$ oz. to $4\frac{1}{2}$ oz. The projectile, the novel feature of the invention, weighed, when filled ready for firing, $12\frac{1}{2}$ lb. In form it is an elongated shell carrying a line tightly coiled within, which it pays out without the smallest risk of breaking as it travels through the air. It is placed in the gun, as it were, the wrong or heavy shot end first, and on leaving the muzzle, at once reverses, the front end becoming the



HUNT'S WINGED PROJECTILE.

rear end, the projectile, after this reversal, maintaining, in consequence of the four wings, and on the principle of the arrow, an accurate and distant range.

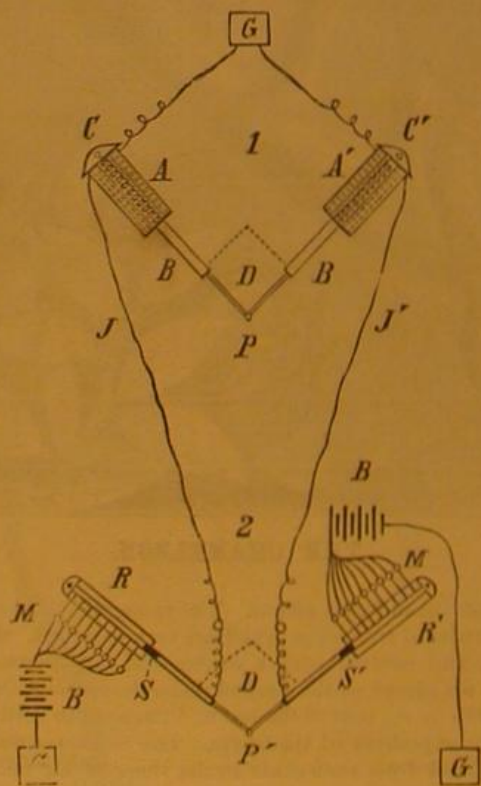
In construction the projectile is a tin tube 20 in. long, $3\frac{1}{4}$ in. in diameter, having fixed or hinged wings at one end, and a leaden shot weighing 6 lb. at the other. Within the tube is a compact coil of line $17\frac{1}{2}$ in. long, and the diameter of the tube. This line is from 200 to 400 yards in length, with a breaking strain of from 250 lb. to 400 lb. The shot is attached to the second or shore coil lying alongside the gun, so arranged that on the shock of the discharge the line runs out freely from both coils.

During a recent trial at Mr. Hunt's range, $23\frac{1}{2}$ °, an elevation which has been found by continued practice best suited to throw the line over any wreck with the smallest strain to it and the projectile, the distances obtained and measured on the official range course were 389, 448, and 507 yards, the deviation of the shot and line from the target being 43, 9, and 8 yards respectively. Three shots fired at 30° and 35° elevation, traversing a line of flight some 400 ft. in the air, ranged 478, 489, and 386 yards, with deviations of the shot and line from the target of 2, 6, and 6 yards respectively.

THE WRITING TELEGRAPH.

Prof. A. E. Dolbear, Tufts College, Mass., communicates the following description of his writing telegraph to the *New England Journal of Education*:

When a current of electricity is sent through a hollow coil



PROF. DOLBEAR'S WRITING TELEGRAPH.

of wire the latter is made a magnet, and will attract into it a short rod of iron. If the helix be held vertical, the rod of iron may be supported in the air without touching anything, through the strength of the attraction. If the iron rod be placed end to end of the coil, it will be attracted into it with a force proportional to the strength of the current of electricity in the coil. I have utilized this in making a galvanometer, the iron rod or core being supported by a spiral spring; the distance the core is drawn into the spiral is the measure in weight of the strength of the electrical current. This same device is also employed in the receiving instrument of the writing telegraph (see 1 in the diagram).

Let a be a hollow coil of wire, and b the core of soft iron

held in place by a spiral spring within the helix. At p is a marker attached by a light rod to the end of b , so that any movement made by b toward c , the bottom of the helix, would cause p to make a straight line in the same direction. Now let a current of electricity enter the helix by the wire, l , and at once b will move into the coil a certain distance; a stronger current would make it to move still further in, and a weaker one would allow the spring to push it back again; the marker then would make a straight line. At a' and b' is another fixture, precisely like the one described; they are at right angles to each other, and their common junction is at p , so that any motion made at b' will make p record the direction. When these two act conjointly, the place that p will have will depend solely upon the distance each of the cores, b and b' , is drawn into its helix, and when the helices can turn upon pivots at c and c' it is plain that the point, p , may take any position inside the space indicated by the dotted lines; that is, any kind of a figure may be drawn by p inside those limits. This instrument is called the receiver.

The transmitter (see 2 in diagram) is a separate instrument, and unlike the receiver. At r is a narrow strip of wood having a groove in it, in which s may slide. On one side of the groove are a series of wire terminals of the battery, B . The end, s , of the slide is metallic, and it is in connection with the wire, l ; and when it is thrust a little way into the groove it touches one of the wire terminals of the battery and permits a current of electricity to flow into the wire, l , and so through helix, a , drawing b in and causing p to make a short mark. If s is thrust into r still further, a stronger current is thrown on the line, l , and so on the further it is down the groove. At p' is a marker corresponding to the marker in the receiver, so it will be understood that p will duplicate the motion of p' . In like manner as in the receiver, there is a second part in the transmitter, at right angles to the first, and its slide, s' , is in connection with the marker, p' , and with the terminals of the battery, B' , so a current over the line, p , will move b' in the receiver. The other terminals of the batteries, G and G' , are in the earth. It is evident that p' may be at any point within the limits of movement of r and r' , and also that any new position will vary the current on one or both lines, l and l' ; hence any movement of p' will be duplicated by p . For writing a strip of paper moved by clockwork under the point, p , will give a facsimile of what is written at p' . A profile or portrait, or indeed any kind of marking whatever, at p' , will be duplicated by the receiver. The arrangement for varying the current from the battery, B , consists of a series of coils of wire having different resistances, as shown at $m m$.

The main part of this invention was made by me some years ago, and it is alluded to in the book on "The Telephone and Phonograph," by George B. Prescott (p. 261). A device quite similar to this has lately been invented and described by Mr. Cowper, of England. His receiver, however, consists of two electro-magnets at right angles to each other, and the varying current acts so as to twist a light needle very much as in a common galvanometer. This transmitter is identical with mine. My instrument was made and shown to a good many persons when Cowper's was first made public here.

The Regeneration of the Eye.

Galignani's *Messenger* reports some curious experiments lately undertaken by M. Philippeaux, to discover whether on completely emptying the eyes of young rabbits and guinea-pigs, the vitreous humor would be reorganized, and whether even the crystalline would be reproduced. With this view, he has been conducting his operations, always, of course, taking care not to touch the crystalline capsule, for experience has shown that in order that an organ shall regenerate, a portion of it must be left in its place. It seems that a month after the mutilation was effected, the experimentalist was able to state that the eyes, which had been emptied, were filled afresh, and that the crystalline was reconstituted. He operated on 24 animals, and in each case the mutilated eye revived. This would seem to show that the optic organ has the same capabilities as the bones; the organic process repairs an evil and reconstructs, more or less completely, that portion which has been struck off from the whole. How far similar results are obtainable with the human eye does not appear. If the same regenerating power is found to be general, a decided improvement may be possible in the treatment of certain injuries and diseases of the eye.

Close Work.

A very pretty piece of engineering was successfully completed early in May in connection with the Baltimore Water Works Tunnel, by the resident engineer, Mr. O. C. Swann. It was the union of two headings between shafts 3 and 4, the most of which was done by Thos. McCabe, contractor. Shaft No. 3 was 276 feet deep, and shaft No. 4, 300 feet, being the two deepest on the whole tunnel. The distance apart was 2,100 feet. The center line was so exact, says the *Baltimore Gazette*, that it struck a plumb line. In the level there was no apparent difference whatever, and measurement varied only one inch between the surface and the tunnel measurement. The entire tunnel, to be $6\frac{3}{4}$ miles in length, will be finished in about a year. The tunnel commences at the Great Gunpowder river and runs perfectly straight, with an internal diameter of 12 feet, to Lake Montebello, the receiving reservoir. There are 15 shafts along the length of it, varying from 2,000 to 3,000 feet apart and from 50 to 300 feet deep.

WILSON'S "HOROGRAPH," OR CLOCKWORK PEN.

Mr. Edison's remarkable electric pen has brought to mind a stillborn effort of like character dating back eighteen years. Mr. Wilson, of the firm of Messrs. Newton, Wilson & Co., London, then conceived and worked out the idea of a pen that was operated like a fretwork machine, for marking designs on work for the sewing machine. For some reason or other, but chiefly, no doubt, because of the requirement that the work had to be passed under the pen, in sewing machine fashion, nothing came of the Wilson pen invention. It passed into oblivion, to be immediately revived, however, on the mention of the discovery of Mr. Edison. Mr. Wilson now set himself to the easy task of importing into his previous pen (which, technically speaking, would be the original patent pen) the portability of the Edison electric pen. The Wilson pen is wound up by a sort of watch movement, and its running down action may be utilized on a sheet of paper anywhere. When it is wound up it does not act at all, unless there is a slight pressure of the thumb on the controlling key. It needs no battery to keep it going. The Wilson and the Edison pen have a similar needle, perforating sheets of paper with minute holes, instead of lines; the holes thus made forming writing, or drawing, or design, at the pleasure of the writer. The perforated sheet is called a stencil, and this is put upon a blank sheet of paper. It now only remains to pass an inked roller over the stencil, when a beautiful impression will be made upon the blank sheet beneath, and upon any number of blank sheets that afterward may be submitted to the process. It is said that as many as 300 perfect impressions may be printed from a single stencil in an hour, and that a single stencil will readily yield 10,000 copies.

The Pneumatic Clock.

In describing the pneumatic clocks at the Paris Exhibition the SCIENTIFIC AMERICAN gave the credit of their invention to Mr. Mayerhofer, an Austrian engineer, and the merit of perfecting them to Mr. Victor Popp. In a letter, dated March 22, Mr. Mayerhofer begs to have the entire credit restored to himself. He says that the invention was made by him in 1864, but not publicly exhibited until 1875. After many delays and disappointments he succeeded in getting from the City Council of Vienna permission to set up the system in that city, on trial for one year. The cost of this experiment made it necessary for Mr. Mayerhofer to seek financial assistance, which was gained by association with Messrs. Resh & Popp, who undertook the business part of the enterprise. The construction and management of the clocks, however, fell entirely to Mr. Mayerhofer, to whom the perfection of the system is wholly due.

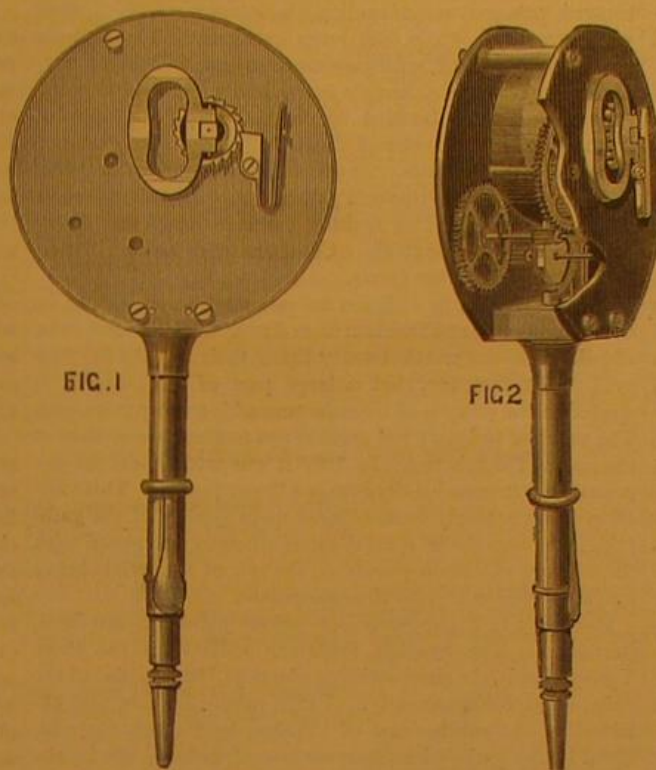
RECENT DISCOVERIES IN ASSYRIA.

In the course of the last summer Mr. Hormud Rassam, a Syrian scholar, made some very interesting discoveries at Balawat (nine miles from Nimroud), on the site of the ancient Nineveh. Mr. Rassam set out last year on the joint expense of the British Museum and the *Daily Telegraph*, and brought back with him most interesting collections.

Balawat was formerly a fortified Assyrian town, but now little more than the ruins of the walls remain. This city has had different names during the reign of Assur-nasir-pal, the father of Shalmanezar II. Although situated but a short distance from Nineveh, it was conquered by the Babylonians before the fall of the Syrians. But when Assur-nasir-pal succeeded to the throne he rebuilt the town and called it Inlur-Bel. The great soldier built a temple for the god of war in the town. These facts are inscribed on some alabaster tables found by Mr. Rassam in a chest of like material, near the portico of the destroyed temple. The inscriptions describe some special event of the obscure periods of Assyrian history.

The ruins of the temple are situated in the north of the ancient village near the ramparts. By making excavations on this spot, Mr. Rassam brought to light two large bronze plates which have singular forms engraved on them. These bronzes were immediately sent to London, where they were received with the greatest enthusiasm by the Director of the British Museum. The rust and earth which thickly covered the same were then removed, and a trial was made to dis-

cover that which had been well preserved. It was soon found that they were remnants of a rectangular door which turned on pivots. Judging from the nails that have been found, the body of the door must have been of wood, about ten centimeters thick. The designs are in high relief, and represent the combats of Shalmanezar, his victories and his triumphs, the tortures inflicted upon the prisoners, and his adoration of the gods. These new documents relate of his campaign against Babylon, and also his expedition to the Mount Araval and his triumph over Akhuni, King of Borsipa.

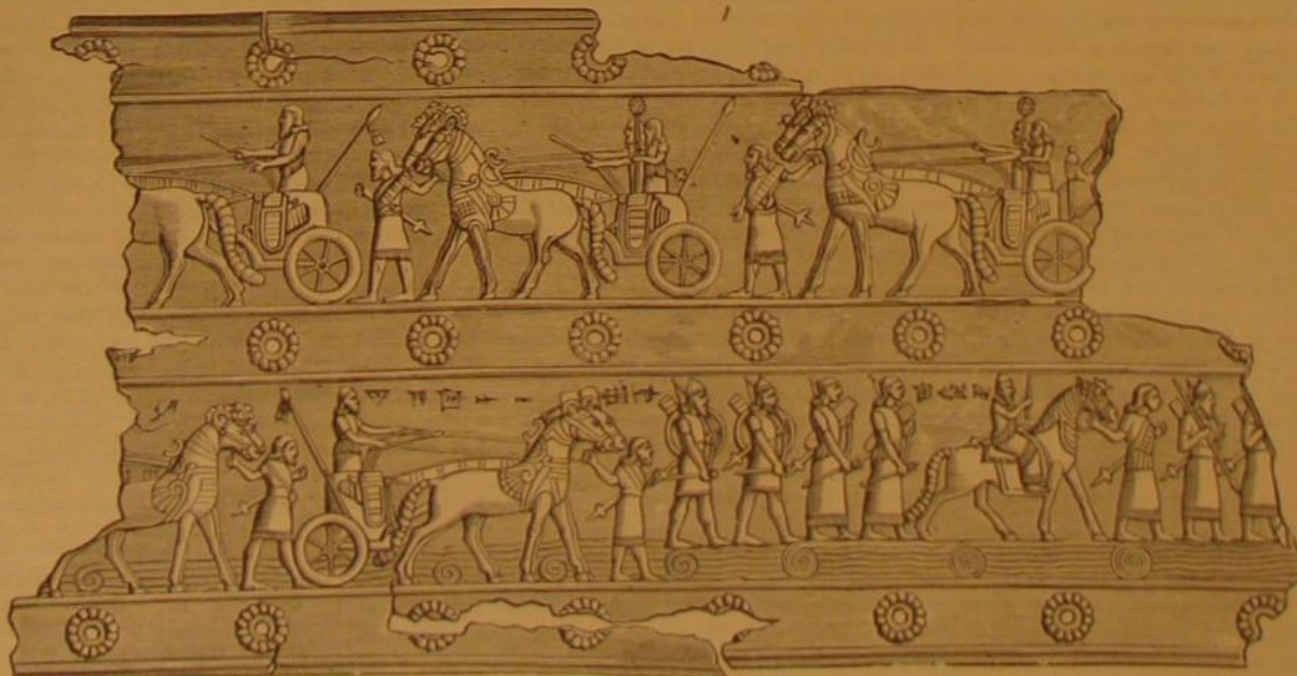


FRONT AND SECTIONAL VIEWS OF THE WILSON CLOCK PEN.

Our engraving represents one of these plates. The king is seen on the march with his army. The warriors stand on war chariots similar to those of the Homeric heroes during the siege of Troy. The horses are led by valets, and the king is represented on horseback, and wears a flowing robe and a cape. He is preceded and followed by his eunuchs. The men carrying the bows and arrows are crossing the Tigris. The other panel shows the king sacrificing before an altar. The captain of the guards is standing behind him, and the soldiers carry an ox and a ram which are to be sacrificed. The chest found by Mr. Rassam contains tablets having hieroglyphic engravings, from which the whole history of the reign of Assur-nasir-pal can be read.—*From Le Monde de la Science et de l'Industrie.*

The Latest Telephone.

At a recent meeting of the Society of Telegraph Engineers



RECENT DISCOVERIES IN ASSYRIA.

In London, an interesting feature was the disclosure made by Major Webber, R.E., to the effect that he had recently experimented with a remarkable new carbon telephone from America, which owed its power to a diaphragm of animal tissue. With this instrument, which was not further described, Major Webber was able to speak in a low tone over 70 miles of wire with perfect clearness. A part of this line consisted of underground cable, in which from 20 to 30 other circuits were busily at work without interfering with the telephonic message. The voice of this instrument was singularly full and life-like, whereas that of magneto-telephones is peculiarly thin and parrot.

Clarification of Water.

Well waters sometimes contain vegetable substances also of a peculiar kind, which render them unwholesome, even over large tracts of country. In sundry districts the decaying vegetable matters of the surface soil are observed to sink down and form an ochreous pan, or thin yellow layer, in the subsoil, which is impervious to water, and through which, therefore, the rain cannot pass. Being arrested by this pan, the rain water, while it rests upon it, dissolves a certain portion of the vegetable matter, and when collected into wells, is often dark colored, marshy in taste and smell, and unwholesome to drink. When boiled, the organic matter coagulates, and when the water cools, separates in blocks, leaving the water wholesome and nearly free from taste or smell. The same purification takes place when the water is filtered through charcoal, or when chips of oak wood are put into it. These properties of being coagulated by boiling, and by the tannin of oak wood, show that the organic matter contained in the water is of an albuminous character, or resembles white of egg. As it coagulates, it not only falls itself, but it carries other impurities along with it, and thus purifies the water—in the same way as the white of egg clarifies wines and other liquors to which it is added.

Such is the character of the waters in common use in the Landes of the Gironde around Bordeaux, and in many other sandy districts. The waters of rivers and of marshy and swampy places often contain a similar coagulable substance. Hence the waters of the Seine at Paris are clarified by introducing a morsel of alum, and the river and marshy waters of India by the use of the nuts of the *Strychnos potatorum*, of which travelers often carry a supply. One of these nuts, rubbed to powder on the side of the earthen vessel into which the water is to be poured, soon causes the impurities to subside. In Egypt the muddy water of the Nile is clarified by rubbing bitter almonds on the sides of the water vessel in the same way.

In these instances the clarification results from the iron compounds or the albuminous matter being coagulated by what is added to the water, and in coagulating, it embraces the other impurities of the water, and carries them down along with it. Salt and many saline matters have likewise the power of clearing many kinds of thick and muddy water. So long as the water contains but little dissolved matter, all its particles of mud remain a long time suspended. But the addition of almost any soluble salt, even in small proportion, will, as it were, curdle the impurities, causing them to collect together and settle. These cases, and especially that of the sandy Landes of Bordeaux, and elsewhere, throw an interesting light upon the history of the waters of Marah, as given in the fifteenth chapter of Exodus:

"So Moses brought Israel from the Red Sea, and they went out into the wilderness of Shur; and they went three days in the wilderness, and found no water. And when they came to Marah, they could not drink of the waters of Marah, for they were bitter; therefore the name of it was called Marah. And the people murmured against Moses, saying, What shall we drink? And he cried unto the Lord, and the Lord showed him a tree, which when he had cast into the waters, the waters were made sweet."—*Chemistry of Common Life, Church.*

Southern Alaska.

William H. Dall, explorer and naturalist, describes that portion of Alaska lying east and southeast of Mount St. Elias as a region covered with dense forest, canal like arms of the sea penetrating everywhere and teeming with fish as the islands do with game. The mean annual temperature is about that of Central New York,

with a wetter and cooler summer and a very mild winter, the thermometer reaching zero only once in ten years. It is a paradise compared with the alkali flats of Utah, the burning sands of Yuma, or the monotonous and dreary prairies of the Rocky Mountain cattle region. Nor are its advantages solely relative. It has long been proved by actual experiment that potatoes and many other vegetables do well there, and grasses (if not grain) come to great perfection. In that region one never need lack food, and a small investment of capital is all that is needed to make a really comfortable home, were communication kept up regularly with the rest of the world, and protection against violence in-

sured. That it is a far better country than nine tenths of Norway and half of Prussia, Mr. Dall knows from personal experience and observation.

The mineral wealth of the region is largely problematical. That gold, silver, iron, and manganese, as well as white marble exist, there is no doubt. How well they may pay for working is to be determined hereafter. If a man knows of a good "lead" he keeps it to himself until the time shall come, if ever, when he can work it in peace of mind because the United States government has decided to protect its citizens in Alaska as well as in New York, notwithstanding the fact that both speculate in mines and form associations for developing different parts of our common country.

Precious Coral.

The precious coral of commerce is, after pearls, the handsomest and most valuable production obtained from the ocean depths. Corals are ranged by naturalists in the animal kingdom at the head of zoophytes or "animal plants." They are of two kinds—those deposited within the tissues of the animal (*sclerodermic*), and those secreted by the outer surface at the foot of the polyp (*sclerobasic*). Among the *sclerodermic* species we find such familiar forms as the "star coral" (*Astræa*); "brain coral," or "brain stone" (*Meandrina*); the "mushroom coral" (*Ctenactis*), differing from other kinds in being the secretion of a single gigantic polyp, and in not being fixed; the "madrepore" (*Madrepora*), a neatly branched kind with pointed extremities, each ending in a small cell; "sponge coral" (*Porites*), also branching, but with blunt ends and smooth surface; "organ-pipe coral" (*Tubipora*), consisting of smooth red tubes lying nearly parallel and connected by cross plates; and many others. Most of these, with other so-called corals, are to be seen in the shop of nearly every dealer in shells and natural history specimens, and are used for ornamenting chimney-pieces, drawing-room tables, cabinets, and for museum purposes. The organ-pipe coral being much cheaper in price than the more costly article, presently to be spoken of, is frequently used as its representative in cabinets of economic products. The majority of the calcareous frameworks that we designate as "coral" are white, or nearly so. At a recent meeting of the New York Academy of Sciences Dr. Newberry exhibited a beautiful specimen of a *sclerodermic* coral—a species of *Oculina*—which had a pale green tint, a color hitherto unknown in connection with the calcareous skeleton, although common with the animals themselves.

The coral which is alone used for articles of personal adornment and works of art is known as "precious coral" (*Corallium rubrum*), and is an example of the *sclerobasic* division. A *sclerobasic* coral is a true exoskeleton, and is distinguished by being smooth and solid. The polyps, having light fringed tentacles, are situated on the outside of this as a common axis, and are connected together by the fleshy *calcareous* covering the coral. The precious coral is mostly obtained in the Mediterranean, and occurs of different shades of color, the Barbary coast furnishing the dark red, Sardinia the yellow or salmon color, and the coast of Italy the rose-pink. In Europe the latter color is the most valued, while in the East the dark red is preferred. Occasionally the red coral is found white or without any coloring matter. At the Naples Maritime International Exhibition a magnificent branch of black coral from Trapani was shown, which formed a finish to the trophy of aboriginal arms and weapons exhibited from the Pacific. At Yeddo there is a black coral fishery which extends fifty miles north and south. From taking a fine polish the black is fashioned into beads and mouth-pieces for cigars. The dull white is not quite so hard, and from not polishing well is sold cheaper.

Coral presents to the fisherman the appearance of a branching shrub, of a red or rose color, compact and solid. The material has the hardness and brilliancy of agate; it polishes like gems and shines like garnet, with the tints of the ruby. The large branches are used for carving, and, as the material is durable and is well suited to give definite outlines to the sculptor's work, great labor and ingenuity are frequently expended on objects of art wrought in this material. The Chinese, Hindoos, and Cingalese have all tried their skill in carving coral, but the finest and most artistic work emanates from the Italian workshops of Naples, Genoa, and Leghorn. Much of the manufacturing process, grinding, drilling, and polishing is carried on by women. The working of beads is principally executed by the females of the Val du Bisagno, in Italy. All the operatives employed in cutting belong to about 100 families in the commune of Assio; those in piercing and rounding to about 60 families living in other parts of the valley. Every village works exclusively at beads of a fixed size.

In Genoa each manufacturer employs from ten to twenty or more women, who submit the coral to a preparatory process before it is given to the workers of Bisagno. Thirty or forty men and women are employed in their own homes in cutting coral into facets. There are also about thirty engravers of cameos and coral. In all from 5,000 to 6,000 persons gain their livelihood in the province of Genoa either by fishing for, working on, or selling coral, and this craft produces a revenue of \$400,000 per annum. Exports of coral are made from Genoa to Austria, Hungary, Poland, England, America, Aleppo, Madras, and Calcutta. Large, perfect, well-shaped beads are by far the most valuable form of coral, and these have greatly increased in estimation of late years. Many of the finest are sent to China, where they are in demand for the Mandarin's red button of rank worn on the cap. Some of the natives of India have a preference for what may be called

worm-eaten beads, and tons of these, which would not find a sale in Europe, go to the East, where they are esteemed from a superstitious belief that gods dwell in the little recesses or cavities of this coral.

Connoisseurs know that of late years coral has risen considerably in the estimation of the fair sex. A somewhat arbitrary standard of beauty has, however, been established in regard to the color. Coral, to be rare and valuable, must now be of a delicate pinkish, flesh-like hue, uniform in tint throughout, and in large pieces. The principal commercial varieties distinguished are red, sub-divided into deep crimson red, pale red, and vermillion (the latter rare), black, clear white, and dull white (the latter common). The delicate rose or flesh-colored, which is most prized, is sold at very high prices, as it is entirely a fancy article. In some countries red coral is classified by dealers into five grades: 1, froth of blood; 2, flower of blood; 3, 4, 5, blood of first, second, and third qualities. Dealers and workers in the material recognize rough tips and polished tips, fragments, roots of branches suitable for making earrings, and coral tulips for shaping into ornaments. Coral branches assume the esplanade shape and other forms.

Coral is valued, in addition to its color, according to its bulk, soundness, and freedom from flaws. Certain rare kinds, of pale tints, are worth twenty times their weight in pure gold. The fact, too, that a large part of the material is wasted in the process of manufacture adds greatly to its cost. The value of ordinary red coral is apt to fluctuate greatly at the seat of the fisheries. In 1867 it was worth only \$4 per pound, but it occasionally brings \$10 per pound. This variation arises not only from differences in quality of the gathering, but also from special circumstances connected with the markets of distant countries, the sale of the article being much smaller in Europe than elsewhere.

Coral fishery is prosecuted at various points in the Mediterranean. The Spanish fishermen collect off the Cape Verde Islands, the product being about 24,760 pounds, of the value of \$100,000 annually. Large quantities are also obtained on the south coast of Corsica, by Italians entirely. Coral is also gathered in more or less abundance along the coast of Tunis, Algiers, Morocco, and Barbary. The number of boats engaged in this fishery on the Algerian coast has averaged of late years about 300, more than two thirds of which are Italian. The product is said to amount to about 75,000 pounds. A coral bank of great richness is said to have been discovered on the coast of Japan, but no fishery of any importance has yet been begun there. The largest fisheries are in the vicinity of Sardinia, the exports from there amounting to \$300,000 in value. The coral is chiefly found in the shallow waters near Carloforte, Alghero, and the Island of Maddalena. At Alghero about 190 vessels, manned by 1,930 sailors, are employed in the fishery from March to October.

Hitherto the fishing operations have been conducted on the old primitive method of the drag net or rough dredge, formed of a cross of wood with a quantity of hemp attached to tear up the coral. The diving bell has been made use of, but it does not succeed. A few French fishermen use diving apparatus. Torre del Greco, near Naples, is the principal residence of the coral fishers, and the place from which most of the boats are fitted out for the business. The industry is annually acquiring larger importance and the fishing is being prosecuted with increased energy.

As to other corals than the precious kind, madrepores and other showy species are sometimes used for ornamental purposes. The horny axis of black flexible coral (*Plexaura crassa*) is used for canes and whips in the Bermudas, and the axis of fan coral (*Rhipidogorgia*) for skimmers in the same islands. Coral is used for building purposes in the Pacific islands, Mauritius, Seychelles, and other places. Coral rock of recent formation (*Coquina*) is employed in Florida in the manufacture of ornamental vases and earrings.

An Anecdote of Professor Agassiz.

A writer in *Harper's Magazine* tells a characteristic story of Professor Agassiz, cleverly illustrating the difference between the older school of science, which sought simply to discover and record facts, and the modern school, which seeks the law within the law by comparison of observed phenomena.

Some 35 years ago, at a meeting of a literary and scientific club discussion sprang up concerning Dr. Hitchcock's book on "Bird tracks," and plates were exhibited representing his geological discoveries. After much time had been consumed in describing the bird tracks as isolated phenomena, and in lavishing compliments on Dr. Hitchcock, a man suddenly rose who in five minutes dominated the whole assembly. He was, he said, much interested in the specimens before them, and he would add that he thought highly of Dr. Hitchcock's book as far as it accurately described the curious and interesting facts he had unearthed; but, he added, the defect in Dr. Hitchcock's volume "is this: it is dees-creep-teeve, and not com-par-a-teeve." It was evident throughout that the native language of the critic was French, and that he found some difficulty in forcing his thoughts into English words; but the writer never can forget the intense emphasis he put on the words "descriptive" and "comparative," and by this emphasis flashing into the minds of the whole company the difference between an enumeration of strange, unexplained facts, and the same facts as interpreted and put into relation with other facts more generally known. The moment he contrasted "dees-creep-teeve" with "com-par-a-teeve" one felt the vast gulf

that yawned between mere scientific observation and scientific intelligence, between eyesight and insight, between minds that doggedly perceive and describe and minds that instinctively compare and combine. The speaker vehemently expressed his astonishment that a scientist could observe such phenomena, yet feel no impulse to bring them into relation to other facts and laws scientifically established. The critic was, of course, Agassiz, then in the full possession of all his exceptional powers of body and mind.

Photography by Gas Light.

Among the various forms of artificial light which, during the past winter season, have been competing for the supremacy in photographic portraiture, common gaslight figured but little until quite recently, when Mr. P. M. Laws, of Newcastle-on-Tyne, commenced to try its capabilities. Mr. Laws' efforts in the direction of portraiture by gaslight have been noticed on more than one occasion in our columns, and his specimens have been exhibited at the meetings of the South London Photographic Society and the conditions under which they were produced explained.

It will be remembered that the light used in producing the earlier specimens was Wigham's twenty-eight jet burner, while the last we received from Mr. Laws was obtained by means of the large sized burner of sixty-eight jets, with an exposure of only twenty-five seconds for a cabinet picture, fifteen seconds having been found sufficient for a carte.

The Wigham light is not on the Argand principle, but is composed of a number of distinct jets of the ordinary description, placed so close to one another that their aggregate light forms a cone of intensely luminous white flame. In order to obviate the smoke, which would otherwise arise from the imperfect combustion of the gas issuing from so large a number of burners in so small a space, a chimney of transparent talc receives the upper part of the flame, and creates such a draught that a full and ample supply of oxygen is obtained, to secure perfect combustion as well as a more intense and whiter light. It is to be noticed that no glass chimney is required—hence there is no risk of breakage. The talc "oxidizer" (as it is called) is not liable to fracture, and, at the same time, by its transparency, possesses the advantage of not wasting any appreciable quantity of light.

The burner is made in five different sizes, ranging from twenty-eight to one hundred and eight jets, the sixty-eight jet burner occupying the midway position between those limits. This burner, by which Mr. Laws has been able to produce results with exposures very little more prolonged than with ordinary daylight, gives a light equal to 1,253 standard sperm candles on a consumption of 146 feet of canal gas per hour. It may be noted that canal gas and ordinary gas give very different results; if the latter be employed with the sixty-eight jet burner the candle power is estimated at about 1,000. The largest size—one hundred and eight jets—gives, with canal gas, an illuminating power of 2,923 candles on a consumption of 308 feet of gas per hour.

The manner in which the larger burners are constructed for lighthouse purposes, so as to give lights of varying intensity according to the state of the atmosphere, is most ingenious. Starting from the twenty-eight jet burner as a nucleus, the additional jets may be added at pleasure, in concentric rings, each ring being divided into two segments, and each separate segment being supplied from a special pipe fitted with a stopcock, so that even without "unshipping" the outer circle of jets their light may be shut off. The method of connecting the extra segments is most especially ingenious; instead of any screw arrangement, which would occupy time in fixing, besides other inconveniences, the supply pipe of each segment simply dips into a cup of mercury, fitting on to another tube from which the gas supply is obtained, the mercury rendering the joint air tight.

These burners afford the most intensely illuminating and, as far as we can judge from the color, the most actinic gas light we have ever seen. Mr. Laws' experiments prove that for practical photographic purposes the sixty-eight jet burner enables the photographer to, at any rate, eke out the feeble light of some of our winter days, if not to depend solely upon gaslight as his illuminating power. The total cost of the sixty-eight jet burner, fitted up, is but a few pounds.—*British Journal of Photography.*

A New Source of Heptane.

Abietene, a new hydro-carbon obtained by distilling the exudation of the nut pine or digger's pine of California (*Pinus sabiana*), was described six or seven years ago by W. Wenzell. The tree is notched and guttered in the winter season at a suitable distance from the ground, and the resin which comes from the wound is subsequently distilled. In a crude state the oil is sold in San Francisco under various names, and it is used for removing grease spots, etc. It is aromatic, colorless, and very liquid. Mr. T. E. Thorpe lately made a pretty thorough chemical and physical examination of this abietene, and found it to consist mainly of pure heptane—a substance the other known natural sources of which are petroleum and fossil fish oil. The occurrence of a paraffine playing the part of oil of turpentine in a tree now living is exceedingly interesting. In ordinary turpentine a paraffine-like substance has been found, but only in very small quantities. The composition of the oil of the *Pinus sabiana* probably varies at different seasons, as sometimes the nuts taste strongly of turpentine, and at other times they have hardly any of that flavor.

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Downer's Anti-Incrustation Liquid, for the removal and prevention of scale in steam boilers, is safe, effective, and economical. Fully guaranteed. Try it. 17 Peck Slip, New York.

Factory Fire Hose.—A large lot for sale cheap. W. F. Corne, Agent, 117 High St., Boston, Mass.

For Sale.—Canadian Patent for Automatic Mash Machine, successfully introduced in the U.S. A most valuable invention, capable of being successfully introduced in every brewery. A rare chance for a live man. Michael J. Stark, Buffalo, N. Y.

Millstone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 64 Nassau St., New York.

Caution.—All genuine Asbestos Liquid Paints, Roofing, Boiler Coverings, Fireproof Sheathings, Coatings, Cements, etc., bear the name of H. W. Johns, and are manufactured only by the H. W. Johns Manufacturing Co., 87 Maiden Lane, New York, who will supply samples and descriptive price list free by mail.

Yacht Engines. F. C. & A. E. Rowland, N. Haven, Ct. Eclipse Portable Engine. See illustrated adv., p. 382.

Wanted.—A good Metal Pattern Maker of considerable experience. Sargent & Co., New Haven, Conn.

Fine Taps and Dies in Cases for Jewelers, Dentists, and Machinists. Pratt & Whitney Co., Hartford, Conn.

For Stationary or Portable Engines, Circular Saw Mills, Grist Mills, and Mill Machinery, good and cheap, address the old manufacturers of Cooper Mfg. Co., Mt. Vernon, O. H. Prentiss & Co., 14 Dey St., New York. Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

"Workshop Receipts" for Manufacturers, Mechanics, and Scientific Amateurs. Illustrated. \$2, mail free. E. & F. N. Spon, 445 Broome St., New York.

For Screw Cutting Engine Lathes of 14, 15, 18, and 22 in. Swing. Address Star Tool Co., Providence, R. I.

Shaw's Noise Quieting Nozzles subdivide the steam into numerous fine streams. All parties are cautioned against purchasing from infringers. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

The Horton Lathe Chucks; prices reduced 30 per cent. Address The E. Horton & Son Co., Windsor Locks, Conn.

Lincoln's Milling Machines; 17 and 20 in. Screw Lathes. Phoenix Iron Works, Hartford, Conn.

Boilers ready for shipment. For a good Boiler send to Hilles & Jones, Wilmington, Del.

Shaw's Mercury Gauges, 5 to 50,000 lbs.; accurate, reliable, and durable. T. Shaw, 915 Ridge Ave., Phila., Pa.

New Pamphlet of "Burnham's Standard Turbine Wheel" sent free by N. F. Burnham, York, Pa.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J. Excelsior Steel Tube Cleaner, Schuykill Falls, Phila., Pa.

Vertical Burr Mill. C. K. Bullock, Phila., Pa.

A Cupola works best with forced blast from a Baker Blower. Wilbraham Bros., 238 Frankford Ave., Phila.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

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

Forsyth & Co., Manchester, N. H., and 213 Centre St., New York. Specialties.—Bolt Forging Machines, Power Hammers, Combined Hand Fire Engines and Hose Carriages, new and 2d hand machinery. Send stamp for illustrated catalogues, stating just what you want.

Linen Hose.—Sizes: 1½ in., 20c; 2 in., 25c; 2½ in., 30c per foot, subject to large discount. For price lists of all sizes, also rubber lined linen hose, address Eureka Fire Hose Company, No. 15 Barclay St., New York.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N.J.

Needle Pointed Iron, Brass, and Steel Wire for all purposes. W. Crabb, Newark, N. J.

The Lathes, Planers, Drills, and other Tools, new and second-hand, of the Wood & Light Machine Company, Worcester, are being sold out very low by the George Place Machinery Agency, 121 Chambers St., New York.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

Solid Emery Vulcanite Wheels.—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Portland Cement.—Roman & Keene's, for walks, cisterns, foundations, stables, cellars, bridges, reservoirs, breweries, etc. Remit 25 cents postage stamps for Practical Treatise on Cements. S. L. Merchant & Co., 53 Broadway, New York.

Pulverizing Mills for all hard substances and grinding purposes. Walker Bros. & Co., 23d & Wood St., Phila., Pa.

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

Messrs. Alsop & Clark Jacksonville, Fla., after using 1 bbl. of "Downer's Boiler Liquid," write thus: "Your Boiler Liquid is all that you represent it to be. Inclosed find slight draft in settlement of bill. Please ship us another bbl. at once." It stands the test of a thorough trial. A. H. Downer, proprietor, 17 Peck Slip.

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

Machine Cut Brass Gear Wheels for Models, etc. (new list). Models, experimental work, and machine work generally. D. Gilbert & Son, 213 Chester St., Phila., Pa.

Howard's Bench Vice and Schleifer's Bolt Cutters. Howard Iron Works.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of this week.

Best Power Punching Presses in the world. Highest Centennial Award. A. H. Merriman, W. Meriden, Conn.

For Sale.—By A. J. Riddle, Eufaula, Ala., seven Negatives of Andersonville Stockade Prison, taken August 17, 1864, while 35,000 men were incarcerated. Size of plates, 4¼ x 5½. Price, \$50.

Deoxidized Bronze. Patent for machine and engine journals. Philadelphia Smelting Co., Phila., Pa.

Having enlarged our capacity to 96 crucibles 100 lb. each, we are prepared to make castings of 4 tons weight. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N.Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Wanted.—The address of "manufacturers of novelties." Howard Bros. & Co., Wheeling, West Virginia.

NEW BOOKS AND PUBLICATIONS.

BETHRIESEN-EINRICHTUNGEN AUF AMERIKANISCHEN EISENBAHNEN. Von H. Bartels. Berlin: Ernst & Korn.

Contains a clear and concise description, illustrated, of the stations, freight depots, cattle yards, oil docks, water powers, coal yards, switches, turntables, signals and signal service of the American railways. The author traveled on the Pennsylvania and Western roads in 1876 and '77. The subject of which the book treats was not well known in Germany, as can be seen from the fact that this book was published upon order from the Secretary for Commerce and Manufacture. We are indebted to the Smithsonian Institution, Washington, for a copy of the work.

TABLES OF THE PRINCIPAL SPEEDS OCCURRING IN MECHANICAL ENGINEERING. By P. Keerayeff. London and New York: E. & F. N. Spon.

This little pamphlet must prove of great use to mechanical engineers and users of machinery, especially as the subject is meagerly treated in pocket engineering books.

THE NEW ENGLAND BUSINESS DIRECTORY for 1879. Boston: Sampson, Davenport & Co. 8vo. pp. 1,576. Price \$6.00.

This, the ninth issue of the New England Business Directory, will be of practical value and assistance to every man having business interests in, or connection with, those States. Its classification is such that one can find in a moment the names and post office address of every man or firm, in any business, in any town in New England. The book is well made, and contains a good map of the Eastern States.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

Correspondents whose inquiries do not appear after a reasonable time should repeat them.

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

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

(1) A. McC. asks: 1. What length and sizes of wire for primary and secondary coils would be required for an induction coil to give a ¼ inch spark for the electric pen described in No. 8 of present volume for February 22, 1879, p. 121? A. Wind over a well insulated core of No. 18 annealed wire, ¼ inch in diameter and 3½ inches long, two layers of No. 16 silk covered wire for the primary. For the secondary wind over the primary about 15 layers of No. 36 silk covered wire, insulating the separate layers as well as the primary from the secondary with two thicknesses of shellacked writing paper. You will need a condenser. 2. In "Notes and Queries," No. 32, March 22, 1879, you answer a like question from A. L. S., by saying "a coil giving an 8 inch spark will do." This is evidently a misprint; an 8 inch spark is a very powerful one. Do you mean a ¼ inch spark or an 8 inch coil? A. It was a misprint; it should read—a ¼ (one eighth) inch spark will do. 3. I have a small coil made for a medico-electric apparatus. It is 2 inches diameter by 5½ inches long and gives powerful shocks, but, though I have made for it a condenser with 350 square inches tin foil (700 in counting both surfaces) it will not give a spark more than one twentieth inch long, when used with the zinc and copper, sulphate of copper battery jar belonging to it. I have used it with a more powerful battery, before attaching the condenser, but could see no spark. The circuit breaker is a thin spring about one-fiftieth inch thick, nine-thirty-seconds inch wide, 1¼ inch long. Does it need more wire, a better, i.e. lighter spring, or more battery power? A. It is probable that the coil is not made with sufficient care to give a spark of any considerable length. The insulation must be very perfect.

(2) L. writes: 1. In making brass cocks that are used to control the flow of water in hydraulic cotton presses, can they be made solid by using a core in the mould? A. Yes. 2. If a core can be used, what should it be made of? Made of common sand they all come out full of small holes just under the scale. A. River sand 2 parts, loam 1 part, and a very small quantity of wheat flour. Mix well together and moisten preparatory to moulding, with stale beer or with water to which a little molasses has been added.

(3) F. C. J., referring to query (20), page 283, current volume, writes: It seems to me the answer should be four feet instead of three. A. Test the question practically by weighing any uniform bar of iron on two scales, or spring balances. If it was placed at 4 feet the two men would carry two thirds and a part of the other third. See answer to W. P. P. on this page.

(4) W. P. P. writes: On page 283, current volume, query (20), relating to the carrying of a 12 foot shaft by three men, two carrying it by means of a lever and the other by taking one end, you state that to distribute the weight of the shaft equally between the three men, the lever should be placed three feet from the end. Is this right? I think it should be placed 4 feet from the end, because the 4 feet one side of the lever would balance 4 feet on the other side of the lever, leaving 4 feet for the man at the other end. Am I right? A. True, 4 feet on one side of the lever balances 4 feet on the other—but this does not leave 4 feet for the other man to carry, but one end of four feet. See answer to F. C. J. on this page.

(5) H. J. P. asks if the Corliss engine which was at the Centennial was the largest ever built? A. We believe it was the largest Corliss engine which had been built up to that time.

(6) A. D. R. asks if the mercurous sulphate battery gives off poisonous fumes, or fumes that would destroy metallic apparatus. A. If pure sulphate were used the amount of anything given off would be inappreciable under ordinary circumstances. These batteries should not, however, be kept in a warm place.

(7) J. H. G. asks: How can I make an emery wheel out of a cast iron one? A. Cement to the periphery of the wheel a strip of leather, allowing the ends to overlap each other. Coat the leather with rather thick glue, and roll the wheel in emery heated to about 200° Fah.

(8) F. L. R. asks: What causes halos around the sun and moon, and what do they indicate, if anything? A. They are formed by reflection of light from minute crystals of ice floating in the atmosphere or from watery vapor. They generally indicate a change of weather.

(9) C. M. R. writes: 1. I have constructed an induction coil, 1½ inches by 1½. Nos. 26 and 36 silk covered wire used in its construction, and each layer is insulated with paraffined paper. Also a condenser containing 324 square inches of surface mica insulated. Have proved the insulation with galvanometer. The coil without condenser will yield a spark ¼ of an inch, but with condenser in primary circuit, as per drawings and description in SCIENTIFIC AMERICAN SUPPLEMENT, No. 160, Fig. 4, the spark will not pass even at half that distance, though the shock which one may receive by completing the circuit with the hand is greatly increased. Are these results such as might be expected, or should the coil yield a spark at greater distance with the condenser in, and if so, where is the fault? A. Your primary wire is too small, and your condenser must be in some way defective. See that the two parts are everywhere well insulated from each other. Possibly less condenser surface would be better; the coil should certainly yield a longer spark with than without a condenser. See reply to A. McC. on this page. 2. How is the Trouve battery constructed? A. See SCIENTIFIC AMERICAN SUPPLEMENT No. 159.

(10) J. W. W. writes: I am making a dynamo-electric machine according to drawings in SUPPLEMENT No. 161, only three times the size instead of twice. What would be a suitable number of wire to wind the magnets and armature? The machine is intended for general experimental purposes, with reference more particularly to the production of a small electric light. A. You would probably obtain good results by winding the magnets with No. 14 wire and filling the armature with No. 16.

(11) C. B. B. asks: How can I polish fancy woods? A. Apply with a woolen rubber a mixture of alcoholic shellac varnish 3 parts, boiled linseed oil 1 part. Rub the work briskly until the shellac is hard.

(12) J. A. D. writes: In No. 163 of the SCIENTIFIC AMERICAN SUPPLEMENT you describe a simple electric light. 1. How many Bunsen cells would be required and how long would the light last? A. It would require about 8 or 10 cells. 2. Would a piece of carbon from a lead pencil answer for the thin carbon rod? A. No. 3. In No. 160 SCIENTIFIC AMERICAN SUPPLEMENT is a description of an induction coil. Is there a simpler way of making a commutator. If so, please describe it, and if possible by diagram. A. See answer to W. G. S. on this page. 4. How long a piece of tin foil is needed for 40 square feet of surface if it is one foot wide? A. 40 feet.

(13) W. G. S. asks: 1. Could the commutator described in connection with the induction coil (SCIENTIFIC AMERICAN SUPPLEMENT No. 166) be made like that of Professor Hughes' induction balance (page 244 in current volume of SCIENTIFIC AMERICAN), and if so describe connections and give details of making? A. You may make one on a similar principle by connecting with each binding post a button, and driving three round headed screws into the board, so that either the middle screw or one of the outer ones may be touched by one of the buttons, and the middle and the other outer screw may be touched by the other button. Connect the middle button with one terminal of the primary coil and the two outer buttons with the other terminal and you have it. 2. What would be the price of the induction coil? A. \$35 to \$40. 3. How can I make a pair of spoons suitable for a telegraphic instrument or electric call bell? A. As you do not give the resistance of your proposed line we cannot give you a definite answer. If the bell and instrument are intended for experiment only, probably the following would do: Turn two very thin wooden spoons, 1½ inch long, ¾ inch internal diameter. Wind them with about 8 layers of No. 20 cotton covered wire. 4. Could I make a Trouve battery of a number of zinc and copper plates in the same cell, and would it be of sufficient power to be felt? A. You can make a battery in the way you propose, but you will not be able to feel the current from it without using a great number of pairs or employing an induction coil.

(14) J. A. McC. asks: 1. Is not the office of the line wire in the acoustic telephone to transmit the vibrations of the diaphragm from the transmitting to the receiving instrument? A. Yes. 2. If this be correct, would it not be better to use as light a wire as possible? A. Yes. 3. If this also be correct, would it not be better to use hard drawn wire on account of strength and lightness, instead of soft? A. No, on account of its resonance. 4. What is the durability of the diaphragm in this instrument when made of thin iron, or has it been tested? A. We see no reason why it should ever fail. 5. Is there any more danger of damage from lightning on lines of one mile and less without ground connections than there would be from a badly put up lightning rod to a house or other building? A. More danger to the operator because the line extends over a greater area. You should use a lightning arrester. 6. Can you tell me if there is any foundation in fact for the idea generally prevalent among western hunters that a breech loading shot gun will not shoot as well as a muzzle loader, everything else being equal both as regards closeness and penetration? A. We think a well made breech loader the best.

(15) J. H. W. asks for the best way to keep steam boilers through the summer that are used for heating purposes in winter. A. Fill them entirely full of water and paint the outside well.

(16) D. B. B. asks can power be obtained by air pressure in the cylinder of an engine in the same manner as from steam. A. Yes. See Mr. Haupt's report published in Nos. 176 and 177 of the SCIENTIFIC AMERICAN SUPPLEMENT.

(17) J. L. G. asks: 1. What is meant by saying an engine cuts off at ¼ or ½ stroke? A. Cutting off the steam at the time when ¼ or ½ the stroke is made. 2. How is the valve set when it cuts off at ¼ stroke and when it cuts off at ½ stroke? A. We cannot explain to you the set of the valve, as it depends upon the kind of valve and valve motion. 3. Are the fire sheets of a large fire boiler the same as the other sheets? A. Yes. 4. What is the diagram often mentioned in connection with steam engines? A. By examining the back numbers of this journal you will find descriptions and cuts of engine diagrams.

(18) D. C. H. asks for a receipt for making paste to make paper adhere to tin. A. Soften 4 parts of glue in 15 of cold water, and then moderately heat until the solution becomes quite clear. Then add 65 parts of boiling water, and agitate. In another vessel stir up 30 parts of starch paste with water enough to form a milky liquid without lumps, and into this pour the boiling glue solution with constant stirring. Continue the boiling for a few minutes, and add, after cooling somewhat, a drop or two of carbolic acid to each gallon of paste. Keep the paste in closed vessels.

(19) P. A. L. asks if bismuth is extensively used. What is its value? A. Bismuth is chiefly used for certain alloys, as Newton's and Rosse's fusible alloys, etc. The basic nitrate and the carbonate are used in medicine. Magisterium Uimuthi or blanc de ford is used as a cosmetic. Bismuth is worth about \$2.25 per pound.

(20) J. C. asks: 1. Do you know of any locomotive in Wales or England that weighs 120 tons? A. No. 2. What is the weight of the heaviest American locomotive that you know of? A. About 60 tons without tender. 3. When is a locomotive heaviest on the rail, when it is running or when it is standing? A. When running up a concave grade.

(21) B. F. M. asks: 1. Will it materially weaken ¾ inch pipe to bend it cold into coil of 20 inches internal diameter? A. No, if of good iron. 2. Can a pump be made—and how—to work boiling water coming out of boiler at about 150 lbs. pressure? I wish to take the water out at one side and pump it in again at the other. A. Place your pump a distance below the boiler, so that the water will fill the pump by gravity.

(22) J. J. B. writes: A friend of mine has in constant use three return tubular boilers side by side, two of which are connected with one smoke stack, 60 feet high; the third is connected with another smoke stack, same dimensions and height as the one referred to. The smoke stacks are of brick, and stand about seven feet apart. The first smoke stack referred to has not quite sufficient draught for two boilers, the other has more than enough for one. Will connecting the two stacks be of any benefit in running the three boilers, if so, how near the surface of the ground should the connection be made? A. Yes, if properly done. The flues of all the boilers should be brought together and then divided to lead off to the two chimneys.

(23) T. P. H. asks: 1. Will not a keel do as well as a center board in the boat of which plans are given in No. 29 of SUPPLEMENT? A. You will not be able to carry so much sail with the ordinary keel unless the boat is ballasted. 2. If so, what depth and thickness should the keel be made? A. 2 inches thick and 4½ inches deep.

(24) J. H. C. asks: Can you tell me when and where cycloidal teeth were first used for gear wheels? Who is supposed to have invented them? A. Camus, a French mathematician, describes cycloidal gearing in a work published in 1732 and translated into English about 1806. 2. Are the profiles of "involute" teeth approximate involutes, or are they but one of the curves of cycloidal profiles? A. Approximate involutes. 3. Can you refer to any work containing the history of gearing? A. There is no such work that we know of.

(25) W. R. writes: 1. Suppose two side wheel steamers of unequal size run with equal speed in still water, should the larger boat be able to beat the smaller one against a current because the current has more effect on the smaller boat? A. The one having the greatest propelling power in proportion to its weight, should be the most efficient against the current. 2. Can a boat run in shallow water (not touching bottom) as well as in deeper water, other things being equal? A. No. 3. If two unequal but similar boats stop their engines when even and going at the same speed, which will stop first? A. Other things being equal, the lightest boat.

(26) H. B. asks: 1. Through what process is paper passed that it may resist the influence of water and fire? A. For processes of waterproofing paper, consult SCIENTIFIC AMERICAN SUPPLEMENT No. 96. A saturated aqueous solution of sodium tungstate may be used to render paper unflammable. 2. What chemicals are used in the manufacture of lumber from paper? A. Usually a concentrated aqueous solution (hot) of zinc chloride.

(27) J. T. G. asks how to remove the paper patterns from scroll work. A. Moisten it and scrape it off. It is better to trace the pattern than to paste it on the work. It is a good plan to paste the pattern on a piece of veneer and preserve the whole as a pattern after sawing.

(28) P. B. C. writes: 1. I have a well, 14 rods from house, at 26 feet rise from well to house. I have common force pump, 1 1/2 inch diameter by 4 inches stroke. Will the pump force water through a 1/2 inch pipe to the house? A. Do not use less than 3/4 inch pipe. 2. Will an air chamber on the pipe help it any? A. Yes. 3. How large a windmill will it take to drive the pump? A. 8 feet.

(29) J. M. H. asks for dimensions for a pleasure skiff twenty feet long. A. 20 feet long, 3 feet 3 inches wide at bottom and 4 feet at top, and 18 inches deep, 7 inches shear forward and 4 inches aft; stern 2 feet 10 inches wide.

(30) G. L. W. asks: 1. What would be the power of a 1 engine 8 inches by 10 inches stroke, with 100 lbs. steam pressure, making 100 revolutions per minute? A. See page 367(4), current volume of the SCIENTIFIC AMERICAN. 2. What is meant by mean effective pressure? A. Average pressure on the steam side of the piston, greater than the retarding pressure on the exhaust side.

(31) "Subscriber" writes: 1. We have a line of steam pipe, one hundred and twenty-one feet long, and have some difficulty in keeping our union joints tight. Would we gain anything by putting expansion joint in the line, and if so, would one be sufficient? A. Certainly, put in an expansion joint, or else suspend the pipe so that it can expand and contract freely. 2. Will asbestos cement rust steam pipe or a boiler? A. We think not.

(32) H. F. asks: Is there any astronomical reason known why the earth, one of the smaller planets, was selected by the Almighty to be the habitation of man? A. Neither known nor possible to be known. It does not fall within the province of astronomy to discover the motives of the Almighty in ordering things as they are. Science endeavors to discover the conditions of phenomena: it has no business with the infinite why of existence.

(33) C. P. M. writes: I have made a phonograph from drawings in SCIENTIFIC AMERICAN SUPPLEMENT No. 133, but fail to make it work. I have followed directions implicitly, and I thought perhaps you might give me some light as to some essential part that I had overlooked. The needle makes the groove all right, but does not seem to make any dots if I speak into it, nor does it reproduce sound when turned back. A. It may be that your diaphragm is too thick or too heavily damped, or it may be that your mouth piece is not tight. You should also bear in mind that it is necessary to speak quite loudly and clearly to the instrument.

(34) J. J. B. H. asks for the meaning of the term "angular aperture" as applied to microscopical objectives. A. The angular breadth of the cone of light which a microscope receives from an object, and transmits to the eye, is called its angular aperture.

(35) T. E. W. writes: If a hole were made through the earth, passing through the center, and a bullet dropped into the hole, would the bullet stop at the center, or pass through nearly to the other side, oscillating to and fro, losing a little distance each time, until it finally settled at the center? I hold that it would not pass the center; that at the center the weight would be nothing, the attraction nothing (or balanced), and the velocity nothing. My friend holds that it would reach the center with enormous velocity, and be carried through to the other side. Please say which is right. A. We think your friend is right. The bullet, upon arriving at the center of the earth, would have an amount of accumulated energy (so to speak) or momentum, that would be expended by passing beyond the center against the action of gravitation, then would return again under the action of gravitation.

(36) "Student" writes: 1. I have an engine, 8 inches diameter and 12 inches stroke. Purchased it for 15 horse power, but with 100 lbs. steam and 100 revolutions per minute, I calculate 24.50 by your rule, allowing 1-5 for friction. 1. Am I correct? A. Yes; but have you sufficient boiler? It is a badly proportioned engine to get that amount of power from. 2. Have I sufficient power to run a 56 inch circular saw in heavy pine timber and 3 wood turning lathes at the same time? A. Not at proper speed. 3. Can I run a 24 inch burr corn mill and 70 saw cotton gin at once? A. We think not, to their full capacity. 4. What rate per minute must I run my saw and grist mill in order to obtain the best results? A. Consult a good millwright, as it depends upon the kind of work your mills are to do. 5. Is a 5 foot driving wheel too large for 12 inch stroke? A. No.

(37) A. B. B. writes: I have a mercurial barometer from which some of the mercury has been spilled. Will it indicate the changes in the weather correctly? A. No, it should be refilled. This you may do by inverting it, pouring in mercury, and jarring it to remove every particle of air.

(38) T. A. S. asks: 1. Would it not increase the power of an electro-magnet if, with a given battery power, I connected ground wires; connecting the pole directly with the earth by one wire, and running the current from 4 pole to another ground wire after passing around the magnet? A. No. 2. Would a magnet made of 1/2 inch iron, the poles 3 3/4 inches long, wound with Nos. 20 or 21 wire, and connected with two cells Callada battery, attract with much force at 1/4 inch from the

poles? A. No; magnetic attraction is inversely as the square of the distance.

(39) F. A. S. asks: 1. Will several magnets in close proximity, if insulated, retain each their separate power? A. No. The magnets will mutually enfeeble each other. 2. Does pointing a magnet concentrate its power at the points? A. Yes, to some extent. 3. How near the neutral line on a magnet can the coil be placed, and still have its effect in the telephone? A. The coil of a telephone should be near the end of the magnet. We do not think the telephone would work at all with the coil near the mean line of the magnet; that is if the magnet were of any considerable length.

(40) J. M. S. writes: Suppose we place 3 wheels on the axle of a locomotive secure, and let the outside wheels be twice as large as the center one, and then we raise the track for the middle wheel so that they may all have an equal bearing on the tracks. Now in traveling a certain distance of course it does not take as many revolutions of the large wheels as of the small one, but as they are all fast to the same axle, one cannot make more revolutions than the other. How is the distance gained by the small wheel, and does it slip on the track? A. As you have two large wheels and but one small one, and the same weight supposed to be resting on each, the small one must slip.

(41) G. W. E. asks: If you take two cog wheels of the same diameter, the same number of cogs etc., place one of them stationary and revolve the one around the other, how many revolutions will the movable one make passing once around the other? A. Two.

(42) E. F. writes: I would like to know if there is anything made so as to filter the water before entering boiler, and is now in successful operation, and where it can be seen or had; or is there any composition or liquid, when mixed with the water, would precipitate the sediment to the bottom as in a tank. A. If you are troubled with a lime deposit, there are various feed water heaters that will relieve your trouble, as they are arranged so as to deposit most of the lime in the heater. Various materials are used to aid in the removal of deposits, but an analysis of the water should be made before proper advice could be given.

(43) C. C. S. asks (1) whether two lubricated hard substances will wear longer together than one hard and one soft. A. Yes. 2. Would the result be the same where there is no lubricator used? A. Yes, that is, the hard surfaces would wear the longest.

(44) J. O. H. asks: Can you give me a remedy for excitability, while reading or speaking before a school? A. Force of will and practice are the best remedies. It is said that a momentary inhalation of the vapor of ether will quiet the nerves and give a feeling of confidence, but we should greatly prefer the other remedies.

(45) T. S. V. asks: How hard or how soft will cast steel require to be before it is tempered? I claim that it is tempered when it is extremely hard, or when it is annealed very soft. Am I correct? A. Tempering is reducing the hardness of a piece of steel to any degree short of the softness produced by annealing by the application of heat. The operation of hardening does not properly include tempering.

(46) J. R. B. asks: Can you give me any receipt for bending white oak save the ordinary way by steaming? Is there any composition used? A. We do not know of any composition for this purpose. Boiling the wood in water is sometimes preferred to steaming.

(47) F. P. asks how much and what size wire he should use on electro-magnet, with core 7-16 inch diameter and 2 3/4 inches long, to be operated by one or two cells Grove's battery. A. You do not mention the purpose for which you intend using the magnet. Supposing you intend it merely for experiment, we suggest winding each core with 8 or 10 layers of No. 20 wire.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. C. McL.—It is a fine sample of asbestos.

COMMUNICATIONS RECEIVED.

On a Solution of the Convict Labor Question. By D. D. S.
On Solar Circulation: Heat and Light. By E. F. D.
On Rotary Motion. By H. J. M. M.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

May 6, 1879.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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Vol. XL.—No. 25.
[NEW SERIES.]

NEW YORK, JUNE 21, 1879.

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PRACTICAL DIVISIBILITY OF THE ELECTRIC LIGHT.

Electric lighting has advanced in the last three or four years from a mere experimental stage toward the practical and useful solution of the great problem.

The desirability of the electric light has been generally admitted, and its sanitary advantages have been conceded even by its opponents, while its entire freedom from danger of every kind is not the least of its advantages. According to the opinion of several eminent experts, it can be produced on a large scale at prices which compare favorably with those of gas at its cheapest.

The daily increasing use of the electric light is an evidence in its favor. So far, however, it has been applied to the illumination of large areas, and it has been generally believed that its application to household purposes, or to other uses where it must be subdivided, is exceedingly difficult, if not altogether impossible. There are certain practical difficulties in dividing the electrical current, so as to produce a number of small lights by means of a single generator, which have baffled the ingenuity of inventors so far, and which must effectually block the progress of subdivision in this direction, unless some new principle is discovered. It

is stated that no matter how cheap the original current may be produced, the loss by division is so great that small lights must be expensive.

In the system illustrated in our engraving, Messrs. Molera & Cebrian, civil engineers, of San Francisco, Cal., have attempted the direct division of the light. They employ optical contrivances, leaving the current undisturbed and undivided, doing away with expensive electrical conductors, and dispensing with lamps or regulators at points where the lighting is to be utilized.

[Continued on page 389.]



Fig. 2.

Fig. 4.

Fig. 3.

Fig. 5.

MOLERA & CEBRIAN'S SYSTEM OF ELECTRIC LIGHTING.

Scientific American.

ESTABLISHED 1845.

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NEW YORK, SATURDAY, JUNE 21, 1879.

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Useful Notes for Masters and Officers of Screw Steamers.
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II. MINING AND METALLURGY.—Iron and Steel. Inaugural address of President Edward Williams, of the British Iron and Steel Institute. Initial processes. The Bessemer discovery. Puddling. Improved working. Steel and its uses. Remelting. The new steel making process. Steel making economies. The future of iron. Iron making furnaces. Foreign and American competition. Wasteful ingot making. Rolling machinery. Scientific training needed. Unqualified managers. Future prospects.
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X. NATURAL HISTORY.—The Quince and its Propagation. The tree creeper; certain families; wings and arms (verses.)

A PRAIRIE BOY'S EXPERIENCE.

The habit of intelligent industry is, all things considered, not only the best legacy a father can leave his sons, but one of the most enduringly valuable elements of any boy's education. Emphasis, however, is to be laid on the word "intelligent." Habitual hard work, with no other motive than compulsion, is sheer slavery; and many a parent has found his efforts to make his sons industrious thwarted and their lives spoiled, simply because he has unwisely undertaken to give them the training of slaves, not that of free spirited and interested toilers. It is not the amount of work that boys do, but the manner of their doing it that makes them like or dislike hard work.

Absolute idleness in youth is often a better preparation for successful effort in riper years, on the farm or in the workshop, than a youth of unwilling drudgery. And one cause of the eagerness of country boys to abandon farm life has been—and this the chief cause—the unwisdom of parents in making their boys feel to the full the monotony and drudgery of farm life while restricting in every way its enjoyments. When boys are given a liberal foretaste of the freedom, the wholesome joys, and the profits of country living, they will be less likely to feel that anything is better than farming. And the same laws hold in every other industrial calling.

We are led to dwell upon this aspect of parental management by a Kansas letter to the New York Tribune, in which the writer tells the story of a prairie boy's experience at the hands of a wise father. The setting of the story we have no space for. Suffice it to say that it came out of a casual encounter between a country boy and the writer, who had lost his way. While conducting the traveler to the road he had strayed from the young pioneer contrasted his father's plan of encouraging his boys in being industrious and that of a neighbor.

"Now, there is Mr. A., who lives on the quarter section adjoining ours, and he has two sons, John and Henry. John is a little older than I, and Henry a year younger. Well, the way he encourages his boys is by having them up by daylight in the morning and keeping them on a keen jump all day long. He hardly allows them time to eat their meals. Why, last summer they worked till 9 o'clock every evening, and didn't find an hour all summer in which they could go a fishing, or even in swimming. Then to pay them the old man gives them their board and his own worn out clothes, with occasionally a pair of boots or something of the kind thrown in. That is the way he teaches them to be industrious. But father's plan is entirely different. He gave me four acres of land which he had broken (this was two years ago last spring), and I was to do just what I pleased with it, and he would furnish me seed or means to obtain seed; all that he required of me was that I should attend to the garden, do the chores at the barn, and go to school in the winter.

"The first year I planted corn, and from my four acres I raised 120 bushels, which I sold for 30 cents a bushel.

"The next spring father let me have the use of his team, and I plowed my four acres and planted one and a half acres in castor beans, one half acre I put out in strawberry plants, one acre in sorghum, two rods in onions, and the remainder of the acre in sunflowers. Father laughed when I told him my plans, but he said it was my own land and I could do as I liked with it. I told him I wanted to experiment on different crops, so as to see which was the most profitable. Well, my castor beans were a good deal of trouble. I had to watch them so closely not to lose them when they cracked open. It was necessary to pick them immediately as fast as they ripened; but my little sister, seven years old, could attend to them about as well as I, and she did this faithfully on my promising her \$5 when I sold my crops in the fall. I raised twenty-two bushels of beans off of my one and a half acres, which I sold at \$1.25 a bushel, so after paying my sister \$5, I realized for them \$22.50. Father had raised considerable sorghum, and he had all of the arrangements for pressing, boiling, etc. We worked together in preparing our sorghum, and I had from my one acre two barrels of good sorghum molasses, which I sold for 35 cents a gallon, thus making \$22 from my sorghum crop. My sunflowers, which were the laughing-stock of so many, brought me enough to pay me for my trouble. I had planted and cultivated them very much as if they were corn. The flowers were splendid, many of them measuring three feet six inches in circumference, the stalks being from ten to twelve feet long and three inches in diameter. I planted them principally for the stalks, which I sold over at the next town for fuel. I had ten cords off of that part of an acre, and I realized \$15 from the sale of them. I gave the seeds to father for his poultry. He thinks they are better than corn. Those who bought the stalks say that they burn readily, and make a very hot fire.

"Last spring I planted nothing but sorghum and onions, as they had brought me the most the year previous, and I have done better than either year before. My onions were the most profitable crop of all, as I made \$12 off of my two rods. So last fall I had, after disposing of my crops, \$71.50 in cash, nearly double what I had made the year before. I spent \$20 of this on my wardrobe, \$10 at Christmas, bought three more calves at \$10 a head, and had \$11.50 left for sundries. My onions didn't do quite as well as the year before. So this year I am beginning to feel very much encouraged in being industrious. I have just bought twenty more calves. I had to pay \$12 a head for these, but they are beauties, I can tell you. If they do well they ought certainly to be worth in a

year from now \$450. I was offered \$90 to-day for my other lot. I have no trouble in finding a market for my produce; for what I cannot sell here I ship on the railroad, and, as they carry at reasonable rates, I often prefer shipping, as I get better prices in the larger towns. I shipped nearly all of my strawberries this year.

"I was fifteen years old last August, and am worth to-day \$390. To be sure my father has favored me in every way, furnishing me with seed, feed for my stock, allowing me the use of his team and farming implements, etc. But now I can afford to be more independent, and hope before long to help him, instead of his helping me. Father is making money, too. This is a fine wheat country, and he has put the most of his land into wheat. We have had fine seasons so far for our crops, and next year we may have grasshoppers or drought, or some drawback; but we have enough ahead now to stand one or two unprofitable seasons, so we don't worry. I intend to invest every year in stock, as I have found it far more profitable than anything else."

The moral of the story goes without telling.

UNKNOWN NEW YORK.

That the State survey of the Adirondack wilderness should have discovered mountains, lakes, and other geographical features as little known to the world as the mountains and lakes of Central Africa, was not surprising. It does strike one as strange, however, that the geography of the central counties of the State should be little if any better understood. Yet the State surveyors found last year that every one of the cities and towns of that region, to the number of two hundred or more, were from one to two miles out of place, on every map of the State hitherto published. And worse than that, the topographical features of that thickly settled and prosperous part of the State are sadly misrepresented on all our maps. In reviewing the work of the survey during the past year, Director Gardner remarks that "few people realize that in the central part of our State, represented on their maps as level regions, are mountains rising to such heights above the surrounding country that the eye can sweep at a glance 5,000 square miles of land and lakes, touching here and there blue horizons over sixty miles away." The deep pleasure which these broad but unvisited views inspired very naturally increased Mr. Gardner's regret that the topography should be so unknown to educated people. "In Germany," he says, "every child is taught the physical features of its native country; but in New York, neither young nor old know the aspects of those counties which they have not personally visited. In this matter, like the Indians, they know only what they have seen." This criticism he makes on the strength of a wide intercourse with the intelligent citizens of central New York, to whom he has often put questions to test their knowledge of the topography of their part of the State.

"I am led to recur to this subject," he concludes, "because of the deep impression made upon me each season by the unexpected grandeur, beauty, and variety of the landscapes seen in the prosecution of our work. Ideas of the aspects of the State derived from maps have, in my own case, proved to be so false and vague, that I find in this survey the attractive novelty of exploring an unknown region. Colorado was not a greater surprise to me than has been the structure of my native State. In the study of the origin of some of its most remarkable features lie untrodden tracts of knowledge which are yet to awaken great interest. The configuration of a part of central New York is as unique and as unknown to science as that of any part of the Rocky Mountains."

STRIKE OF PITTSBURG PUDDLERS.

By the strike of the puddlers of Pittsburgh, Pa., June 2, something like 40,000 men were thrown out of employment in that city and in Allegheny, with the prospect of stopping the work of all the men employed in the coal mines and other establishments connected with the mills. A few mills which were practically independent of puddlers, remained at work, but with small prospect of continuing long. The Herald report of that date says:

"This morning, about ten o'clock, 200 puddlers formed into a line and marched up Liberty street and Pennsylvania avenue to the steel works of Hussey, Howe & Co. They threatened the employees of this firm with unpleasant results if they did not stop work. The firm has only sixteen puddlers, although it employs 500 hands. The men would not stop work in the middle of the day, but said they would to night. The strikers then separated and went to various mills where they thought there were any 'black sheep,' or men who were disposed to work at less than regular rates, and they ordered all such men not to go to work. This is the first strike in which the iron workers have stopped the steel workers."

As usual this is not a strike of labor against capital, but rather the action of a few unscrupulous workmen who are willing to take advantage of their position to stop the wages of ten times their number of fellow workmen.

THE UTILITY OF BEES.

One of our foreign exchanges states that a great bee master, the Rev. M. Sauppe, in Lückendorf, has made the following calculation, intended to prove the eminent agricultural and economical importance of the rearing of bees:

Of each of the 17,000 hives to be met with in Saxony 10,000 bees fly out per diem—equal to 170 millions—each bee four times, equal to 680 millions, or, in 100 days, equal to

680,000 millions. Each bee, before flying homeward, visits 50 flowers, therefore the whole assemblage has visited 3,400,000 millions of flowers. If out of the ten only one flower has become fertilized, 340,000 millions of fertilized would be the result.

Supposing the reward for the fertilization of 5,000 flowers to be one German pfennig, the united bees of Saxony have obtained per annum a sum of 68 million pfennigs = 680,000 marks (\$170,000). Each hive represents in this way a value of flowers of ten dollars.

PHILANDER HIGLEY ROOTS.

Another of the pioneers in American invention and mechanical industry, Mr. P. H. Roots, of Connersville, Ind., has come to the end of a long and useful life. Mr. Roots was born in Rutland, Vermont, Nov. 17, 1813. In his fifth year his parents removed to Oxford, Ohio. His mechanical genius developed early. While still in college he experimented with rotary engines, achieving notable results for the facilities for construction at his command. About the same time he developed a plan for raising water by means of the condensation of steam, the apparatus, though imperfectly made, proving quite a success.

After completing his college course, at Miami University, Mr. Roots went into business of woolen manufacturing, with his father and two elder brothers. The crude and imperfect machinery in use at that time was very unsatisfactory to him, and much of his time was spent in constructing appliances of various kinds to save labor and do more perfectly the work that at that time was done almost entirely by hand. Many of these devices were entirely successful, and were in constant use until the woolen mill of which he was part owner was burned in 1875. Probably all of them were patentable. He early made a model for a power loom, having a positive motion for throwing the shuttle derived from the motion of the lathe itself. Several years after he invented a cam motion of a peculiar kind for working the harness of power looms. The arrangement was such that it could be easily changed to weave any regular fabric, with any number of leaves, each of which had a positive motion, and was entirely independent of the others. The plan was afterwards patented by other parties, and is in successful use in nearly all the mills in the country. He also invented a Jacquard arrangement for fancy cassimere looms, which was successfully used for many years, and probably was inferior only to the Crompton loom in point of workmanship.

He also constructed a warping mill for woolen goods, in many respects superior in its general adaptation to all kinds of work, warping, sizing, and drying perfectly in one operation. Many other devices might be mentioned, for they were, his brother says, all through the mill, and no machine was accepted as being perfect, even from the best manufactories, unless it could do all he thought it ought to do in the best manner.

Between 1856 and 1860, in connection with his brother F. M. Roots, he developed and perfected the rotary blower, so widely known throughout the mechanical world. Mr. Roots, however, was not an inventor only. His knowledge of every department of the woolen manufacture, in which he was so long engaged, was uncommonly extensive. He was also a great reader, and was widely respected for varied and extensive information. In his family and social relations Mr. Roots was greatly beloved and respected. He died Sunday, May 18, 1879.

Steam on Third Avenue.

A trial of the Angamar steam motor was made on the Third Avenue surface road, June 2. During the day several trips were made from Sixty-fifth street to Printing-house Square, in connection with one of the large open cars. The conductor said the motor could have drawn two or three cars if necessary. As it passed up and down during the busy hours of the day it attracted a great deal of attention, and caused no little fright to some spirited horses. On several occasions ladies wishing to take a car of the Third Avenue line declined, with a dubious shake of the head, the conductor's invitation to get on board. Others, however, showed no hesitation. The engineer managed the starting and stopping on signals from the conductors of the motor and the attached car with apparent ease and promptness. The motor resembles an ordinary street car in shape, but it is higher and larger. The driving machinery is under the floor. On the front platform are the small furnace and boiler. Here also the engineer sits with his hand on the lever. Hot water is pumped into the boiler at the depot, and little fire is needed to keep it at the steam generating point.

The president of the railroad company said that the company had determined to adopt some substitute for horses as soon as a satisfactory one could be found.

Centrifugal Force and Fly Wheels.

It is not always that practical men are willing to admit the value and importance of scientific knowledge as regulating the operations and accidents of a workshop. We had a valuable incident of the kind that forced itself upon our notice, says a foreign contemporary, a few days back. A large pulley or rigger, 3 feet in diameter, and very wide, was split across its rim by carelessness in unloading; at the same time it was noticed that two of the arms out of six were cracked by contraction in cooling. In order, however, to save expense it was proposed to patch the broken rim of the pulley

with wrought iron plates, which was done. "Per se" the iron plates were stronger than the original casting, but the whole weight of the patch amounted to about 15 lbs. As the pulley revolved at the rate of six hundred revolutions a minute, this unbalanced weight on the rim became by calculation as much as $7\frac{1}{2}$ cwt. radial force outwards. This scientific result was brought to the knowledge of the practical men, but they could not see why the pulley would not do very well if the patch was as strong as the rest of the rim. The pulley was accordingly run under protest, and hardly had the maximum speed been attained before the pulley flew in pieces, and might have been dangerous to life and limb. The pulley, undoubtedly, broke, as above indicated, by centrifugal force, which, by the unbalanced patch of 15 lbs., caused a breaking radial pressure outward upon the broken rim at the position of the patch of $7\frac{1}{2}$ cwt. This was quite sufficient to break the rim outward with enormous force, so that the pieces flew about the shop like fragments of a bursting shell. It will be well for machinists to remember this incident when they have occasion to repair fly-wheels.

Natural Enemies of the Electric Telegraph.

There is, apparently, no apparatus so liable to be interfered with by what we may call natural causes as the electric telegraph. Last week we saw what perils from vermin and fungus environ the subterranean wires. Fish gnaw and mollusks overweight and break the submarine conductors; while there is at least one instance of a frolicsome whale entangling himself in a deep sea cable, to its utter disorganization. It is stated that within the three years ending 1878, there have been sixty serious interruptions to telegraphic communication, in Sumatra, by elephants. In one instance, these sagacious animals, most likely fearing snares, destroyed a considerable portion of the line, hiding away the wires and insulators in a cane brake. Monkeys of all tribes and sizes, too, in that favored island, use the poles and wires as gymnasia, occasionally breaking them and carrying off the insulators; while the numerous tigers, bears, and buffaloes on the track render the watching and repair of the line a duty of great danger. In Australia, where there are no wild animals to injure the wires, which are carried great distances overland, they are said to be frequently cut down by the scarcely less wild aborigines, who manufacture from them rings, armlets, and other varieties of barbaric ornament. It has been suggested as a means of protection in this case, that the posts should be constructed of iron, when the battery could be used to astonish any native climbing them with felonious intent.

Governor's Island for the World's Fair.

The latest site proposed for the World's Fair of 1883 is Governor's Island. The island lies in New York Harbor, about half a mile south of the southern extremity of the city, and is about a mile in circumference. The proposer says:

"Here would be 'room and verge enough,' and to spare; and in the requirements it surpasses in many particulars all other suggested sites. Access to the island could be had by steamboats by means of a pier which should extend several hundred feet from, say, the north shore. Specially constructed and arranged ferryboats could ply to the island, connecting with New York at its lower part, and higher up on the North and East Rivers, and also with Brooklyn, Jersey City, etc. The pier would also afford facilities for excursions to the Exhibition by steamers from the principal river and seacoast cities and towns of the New England, Middle, and Southern States. This direct water communication would largely contribute to the success of the Fair by affording quick and non-fatiguing, as well as cheap means of travel from and to distant sections of the country. In addition there might be a bridge of boats across Buttermilk Channel connecting the island with the shore of Brooklyn."

The great objection to this site would seem to be the circumstance that the island is a fortified post of the United States, and not likely to be surrendered for the purposes intended. Besides, it would furnish no proper site for the permanent buildings to be erected by the city and State.

A Fatally Polluted Stream.

A distressing case of wholesale poisoning, through criminal ignorance or worse, has just occurred in a country school, in Vermont. The school opened Monday, May 26, and as usual the children got their water from a little brook that ran close by. The teacher noticed the bad taste of the water and forbade its use; but the caution came too late or was neglected, and in a little while seventeen of the children were prostrated with alarming illness, ten or twelve dying within a day or two, the bodies of the dead corrupting so rapidly that immediate burial was necessary. Investigation showed that a farmer had polluted the stream by the carcasses of a horse and several sheep, and the drainage of his barnyard. A medical investigation resulted in a report that diphtheria was the cause of the terrible mortality, aggravated by poisoned water. Diphtheria in a mild form had been in the vicinity, and four cases were known to exist, so that water poisoned by barnyard drainage and putrid carcasses of dead animals was just the thing to feed the disease into the development of the terrible disaster. One would think that the putrid carcasses would sufficiently account for the fatal pollution of the water.

Prejevalsky's Expedition to Lhasa.

If no mishap has befallen the Russian explorer, Colonel Prejevalsky, he is now pushing across the great sandy desert traversing the western center of the Chinese Empire, somewhere in the neighborhood of Suchau. His intention is to proceed across the marshy Tsaidam district to the Tibetan plateau; then, after joining the usual caravan route from Koko Nor to Lhasa, he will proceed as far as the latter city, which is the great object of the present expedition, and if possible make an excursion into the unknown country to the southeast, where Tibet abuts on the extreme eastern Himalayas. He proposes to return partially by the same route, but eventually to deviate toward Khotan and Kashgar. The entire journey is estimated to last two years. The expedition is fully equipped with money, firearms, and ammunition, and meteorological and astronomical instruments.

Eight Minutes Under Water.

A boy seven years of age was seen to fall from a bulkhead into the Hudson River, June 2. After considerable delay a youth named Thomas Berry came to the rescue, and the spot where the boy sank was pointed out to him. By a plucky dive and a long swim under water he succeeded in recovering the boy, who had been in the water eight minutes, and was apparently lifeless. A successful effort was made to resuscitate him, signs of returning consciousness appearing at the end of twenty minutes. The officers of the patrol of the water front pronounced this the most remarkable case of resuscitation after long submergence that had come within their knowledge, and it was put upon record as such. The happy issue should encourage hope and persistent effort in all similar cases.

The Forster-Firmin Amalgamator Co.

In the SCIENTIFIC AMERICAN of November 2, 1878, the Forster-Firmin system of amalgamating the precious metals was described and illustrated. The first annual report of the officers of the company controlling the system indicates a promising future for it. Machines are now building for use in Arizona and Idaho, and arrangements are being completed for their introduction in Colorado and California. It will be remembered that by this process the mercury is atomized by steam, compressed air, or other equivalent medium, and forced through a stream of pulverized ore. By this means, in connection with their system of washing and settling, the inventors claim to obtain all the precious metal in the ore, and also to recover nearly if not quite all the mercury used; the economy of the process being such as to make the system profitable with poor ores.

THE ISTHMIAN CANAL.

The International Canal Congress came to a decision May 28, adopting by a vote of twenty-nine to sixteen the Wyse Panama canal without locks. This, project, it will be remembered, contemplates a canal, substantially along the route of the Panama Railway, nearly 45 miles long, with a tunnel $3\frac{1}{2}$ miles in length. To this project the President of the Congress, M. de Lesseps, was committed from the start, and it was through the influence of its projector that the Congress was called. The local influence brought to bear in its favor was irresistible, the result showing a splendid victory of social over civil engineering. M. de Lesseps immediately began the formation of a company to carry out the project, announcing that a first subscription of 400,000,000 francs will be opened simultaneously all over the world about September next. It is to be an essentially popular loan, without government aid or guarantee. The amount of the first subscription, of which 10 per cent is to be paid on subscribing, will, M. de Lesseps expects, be more than covered. Mr. Nathan Appleton will be a director of the company, and will be delegated to open subscriptions in the United States.

It is also announced that M. de Lesseps intends to proceed to Panama, by way of New York, to take out the first spadeful of earth on the 1st of January, 1880. The intention is to have the canal open for commerce before the year 1900; a result we reckon to be contingent on clever financial engineering rather than on social or civil engineering, great as may be the problems thrown upon the resources of the last.

American Society of Civil Engineers.

The eleventh annual convention of the American Society of Civil Engineers will be held at Cleveland, Ohio, beginning Tuesday, June 17. From the list of topics to be considered and the names of those expected to contribute papers and take part in the discussion, it is safe to predict an enjoyable and profitable meeting. During the meeting the Society will visit Pittsburg to inspect the government works for the improvement of the river at that place.

James Orton Woodruff.

Those who were interested in the Woodruff Scientific Expedition will be pained to hear that its projector died at his residence in this city, June 4, of brain disease, brought on by the care, anxiety, and overwork connected with his great enterprise, which was temporarily abandoned May 8. Mr. Woodruff had just developed a new plan, which had been accepted by Prof. Clarke and others interested, when inflammation at the base of the brain terminated his life.

IMPROVED FINISHING PRESS.

The engraving represents an improved machine for finishing textile fabrics, invented by Mr. Houston. In machines of this kind the goods are generally passed between drums heated by steam, and are, besides being exposed to pressure and heat, subjected to a longitudinal strain in passing from one set of drums to the other. Besides that the heat to which the different portions are exposed is not equally divided, some parts being overheated and sometimes burnt, while others are not even completely dried. These disadvantages Mr. Houston claims to have overcome in his machine.

There are two large drums, A and B, through which steam circulates. P and R are toothed wheels firmly connected with the drums. They are acted upon by cam wheels, o and p, respectively, on the shaft, n. Both cam wheels may be withdrawn and replaced again in position by means of the sliding collars, M and N. H and I are friction pulleys. The shaft, n, is turned by an endless screw and toothed wheel, receiving their motion from a belt and pulley. The collars, M and N, and the cam wheels, o and p, turn the drums in opposite directions; one cam wheel only works at a time, the drum not acted upon by the cam wheel being carried along by the friction pulley. Thus the operator is enabled to change the motion of the drum as often as necessary. From the drum, A, to the drum, B, a long sheet or band of copper or steel extends, and alternately winds and unwinds round both drums, carrying the goods along. The fabric is unrolled from a cylinder, T, moved solely by the tension of the goods as they are rolled on the cylinder, B. The copper band is heated on the cylinder, A, and catches in descending the sheet of cotton, linen, etc., and rolls up along with the same on the cylinder, B. Thus the entire surface of the goods comes in contact with the heated metal, and is equally exposed to the pressure exerted by the concentric sheets of copper. The goods are in no way strained, but subjected to heat and pressure only, and all folds are effectually removed.

Very little attendance is necessary; one man can attend to several machines.—*Musée de l'Industrie.*

MILLING MACHINE.

We give a perspective view of a handy type of self-acting universal milling machine constructed by Messrs. Greenwood and Batley, of Leeds. As will be seen from our engraving, which we take from *Engineering*, the machine has a deep bed supported on two short standards, and having cast in one piece with it the upright which carries the milling headstock. This headstock has a vertical traverse of about 10 inches, and it is provided with a self-acting downward feed. On the milling spindle is a gun metal spur wheel, into which a wrought iron pinion gears, this pinion being on the same shaft as a belt pulley. The milling saddle also carries a pair of idle pulleys, and the driving belt passes round these and the pulley on the pinion shaft, in the manner shown by our illustration, the milling headstock being thus free to be moved up or down without interfering with the driving gear.

The milling saddle, which has a self-acting feed and stop motion, and the horizontal traverse of which is about two feet, moves on a slide formed on the side of the deep bed of the machine. On the saddle is mounted an accurate dividing motion, with thirteen rows of holes gearing up to 144 divisions. The dividing motion carries on its top a four jawed chuck taking in articles up to three inches in diameter, and also sufficing to hold a vise or other mountings. The machine is altogether a very handy one, suitable for a variety of work. We may add that one of these machines was exhibited by the makers at the Paris Exhibition last year.

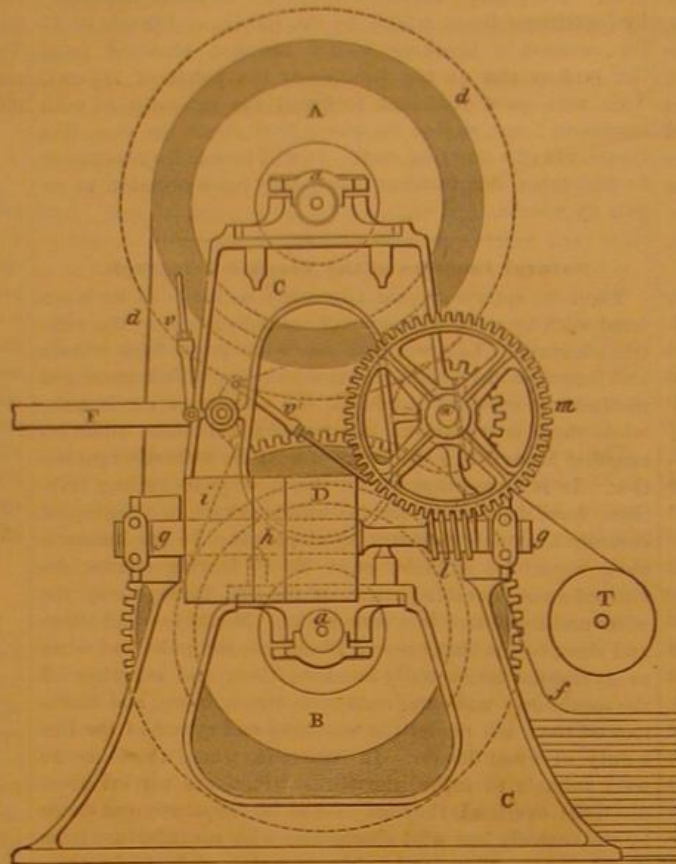
Morocco.

Philadelphia stands at the head of the morocco trade of the United States. The amount of this kind of leather made by the thirty-two firms engaged in the business is placed at \$4,000,000 annually. During the busy season 1,080 dozen goat skins are daily turned into morocco; this would require at the rate of 4,000,000 skins a year.

The trade has gone through the financial crisis and recovered therefrom, notwithstanding the heavy losses. The sales for the season now over are ahead of those for the same period last year, and have been fairly satisfactory. The demand for brush kid has been heavier during the past season than was ever before known in the history of the morocco trade. The skins used are Tampico, Cape, Curaçao, and South American, known as soft stock, and Patnas, Madras, and Cawnpore Madras, classed as hard stock. These terms are applied to the condition of the skin in the hair and before tanned. Of late years the European skins have been largely worked into

cheaper moroccos. Brush and glazed kids, bright and dull pebbles, maroons, and straight grains, both black and in fancy colors, are the designations by which most of the moroccos made are known.

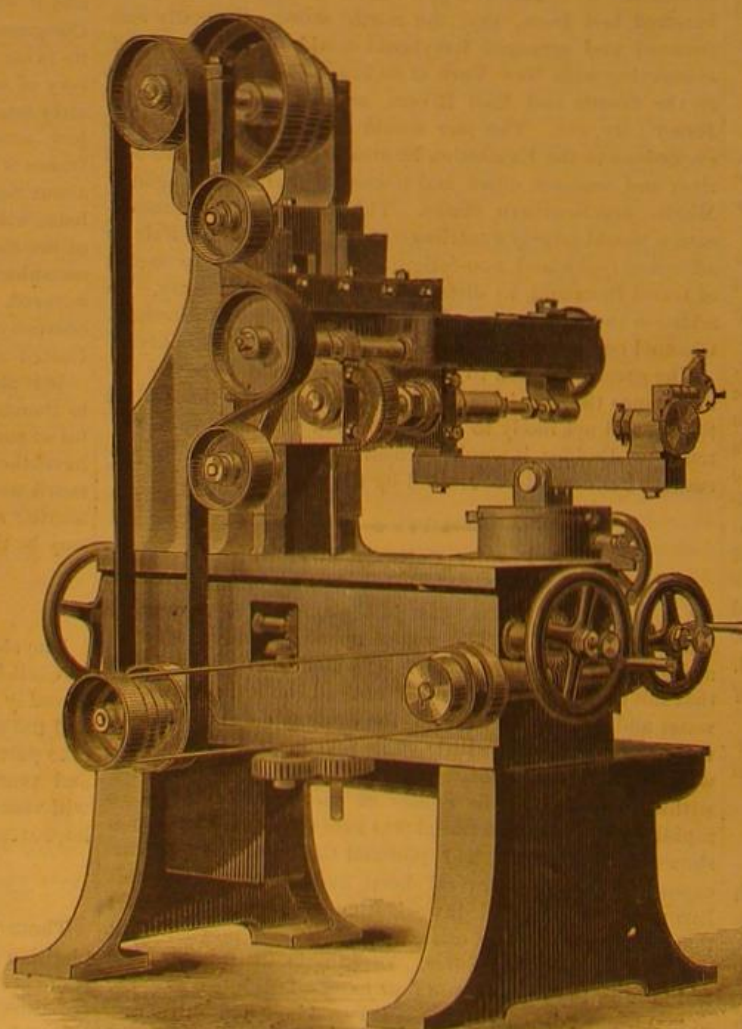
The tanning is done in the old way, and by what is known as the "bag" process, in which the skins are first sewed by hand or machine and the sumac and sumac liquor forced inside. The open tan process, by which system the skins are hung in the liquor, is being gradually adopted. Machinery is largely employed in the tanning and



THE HOUSTON ROTARY FINISHING PRESS.

finishing of moroccos, excepting on the finer grades, in which the work is still largely done by hand. With the general introduction of steam the drying of skins is greatly facilitated, and there is no such enforced dependence upon the eccentricities of the weather as was the case years ago.—*Shoe and Leather Reporter.*

CEMENT FOR COATING ACID TROUGHS.—Melt together 1 part pitch, 1 part resin, and 1 part plaster of Paris (perfectly dry).



UNIVERSAL MILLING MACHINE.

A New Wind Engine.

Mr. W. Thomson, Professor of Mechanical Engineering in the Iowa College of Agriculture, describes, in the *College Quarterly*, a new windmill, which has been recently constructed and put in use at the above institution.

From the following description any mechanic can construct a windmill on the Professor's plan, and according to his testimony it is an entire success.

Previous to the fall of 1878, the water was forced to the several departments of the college by a No. 7 Knowles pump, running on an average of four and one half hours each day. The height to which the water has to be raised in the main building is 106 feet 7 inches—the amount required here being about 6,000 gallons in twenty-four hours; the other departments require about 2,000 gallons in the same time, which has to be raised to an average height of about fifty feet. The cost by this system (coal delivered at the well for \$3.20 per ton, and firemen's wages being 61 cents per day), averaged about \$45 per month.

It is evident that a wind engine would do this work cheaper than steam, since, in raising water, there is no objection to a variable motion. From a study of the various kinds, and their construction as to efficiency and durability, says Professor Thomson, it was evident that the greatest efficiency of the acting cylinder of wind was not reached by the mills in use at the present time. We therefore concluded to construct one that would fulfill this condition as nearly as possible. Knowing the amount of work to be done, and allowing for friction in the pipe, and for waste and leakage at the different points along the line from which water is drawn, and assuming the velocity of the wind to be fourteen feet per second, and that the efficiency would not be less than thirty-three per cent of the acting cylinder of wind, it was shown by calculation that a wheel eighteen feet in diameter would do the work and furnish an ample supply as long as the above velocity was maintained. During the fall and winter this wheel was made and set in position ready for the work in the spring. The construction is as follows: The arms are eight in number, made of wood and bolted to a spider which is keyed to the crank shaft. The pieces to which the vanes are fastened are circular arcs of iron, and are fastened to the arms by being bent at the ends radially and toward the center; bolts passing through these ends and the arms, thus fastening them securely together. There

are sixty-four vanes, seven feet long, four and one half inches wide at the center end, eleven inches at the tips, and are fastened to the circular arcs by clips which are riveted to the vanes and bolted to the circular arcs. The vanes are made of iron for the following reason: In order to get from the wind the greatest amount of work, they should be curved or twisted from the center to the tips, the amount of twist depending upon the length. They are also made slightly concave on the face, in order to cause the stream of air to leave the vane at as near a right angle as possible to the direction

that it has when it first strikes it, and this curvature can be more readily given to iron than to wooden vanes. By making the clips of the proper length the desired amount of twist was given to them, the angle at the center being about 45° and at the tips 25° to the plane of rotation. That this form of vane is instrumental in taking from the wind the greater part of its living force, is evident from the fact that back of the wheel, even when a high wind prevails, there is but little motion in the air discernible. In order to make the wheel strong and rigid, it is trussed by half inch rods in front and back of the arms. The shaft is two and one-eighth inches in diameter, and has a crank forged on it with bearings on both sides of the crank. These bearings are on a large hollow cylinder, through which the connecting rod passes to the pump rod, which is made of one inch iron pipe and answers well, as it can be readily connected and disconnected when desired.

The pressure on the pump due to the height is 48 lb. per square inch; this is shown by calculation and also by a pressure gauge at the surface of the water in the spring. This gives a pressure on the crank of 336 lb., the diameter of the pump barrel being 3 inches and stroke 6 inches; the force of the wind at the assumed velocity and efficiency would be 560 lb., and the corresponding velocity of rotation is about twenty revolutions per minute; amount of water raised, twenty barrels per hour. The amount of water raised is much more than these figures would indicate. It is also evident from the performance of the wheel that a less velocity than that assumed will run it, and it is often remarked that that mill will run without wind.

If only one half of the above result was obtained, it would still pay to run the mill in connection with the steam pump; but since the first of March, the amount required has been furnished by the mill with the exception

of a few hours' run with the steam pump. The amount saved over the old system is not less than \$35 per month.

The problem of economy so far, then, has been solved and that of efficiency practically demonstrated.

Moss on Grass Lawns.

It is generally thought that a damp, undrained bottom is the cause of moss on grass lawns, but by some it is regarded as proceeding in a great measure from poverty of the soil, for where grass grows freely this parasite is rarely if ever found. To effect a riddance of this pest there is nothing equal to fresh-slaked lime and wood ashes mixed—so writes a correspondent in *Land and Water*—which, he states, not only kill it and cause it to shrivel up, but have a most beneficial result on the lawn by stimulating the natural herbage. Where this is really poor and needs assistance I would strongly recommend the use of both the above named, together with the addition of soot and finely sifted soil, which mixture is far better than guano, nitrate of soda, or other patent manures, that force too much growth for a time, only to be succeeded by increased exhaustion soon after. The first proceeding, however, to cure a mossy grass path should be to scarify it well over with an iron toothed rake, followed by a good sweeping after with partly used-up brooms, which will make way for seeds to be sown, and these should be worked in by using the rake as before. This done, the soil mentioned and the ingredients with it will then come in for affording an additional covering, under which it will germinate, and, once through, make rapid progress.

Etna in Eruption.

At the beginning of the current month great anxiety prevailed with regard to the rapid increase in the volume of lava pouring out of the craters of Mount Etna. Craters had formed on two slopes, and a double eruption was in progress. On the night of May 28 a number of brilliant balls of fire were thrown to a great height and burst aloft like rockets, emitting a fiery shower.

Later, fresh craters opened, endangering Bianca Villa, Randazzo, and Castiglione. Clouds of ashes overhung Piedmont, which was in almost total darkness. The Aci Reale and Catania Road was blocked and considerable damage had been done.

By the 2d of June a considerable portion of the bed of the Alcantara River had been covered by the lava. The damage to agriculture was already very serious. The inhabitants had been forced to abandon the village of Majo. Many large and valuable estates had been destroyed. The four main craters continued to pour forth streams of lava, while many of the smaller ones had become inactive. The stream of lava which had interrupted the road at Passa Pescaro was half a mile wide and a hundred feet deep.

IMPROVED WINDOW CORNICE.

Any one who has had occasion to change his residence knows too well that what will do for one house will not answer for another. The furniture, carpets, and fixtures need remodeling to adapt them to their new situation. Not the least among annoyances is the variation in the width of windows, necessitating a change of shades and curtains and also of cornices, the latter being usually fully as expensive as either of the other items, and incapable of being adapted to a window narrower or wider than it was originally designed for.

To obviate these difficulties as well as to enable makers and dealers in window cornices to fit any kind of window without making a cornice especially for it, Mr. James W. Campbell, of No. 9 Baxter street, New York city, has devised the extension cornice shown in the accompanying engraving.

It consists of two thin mouldings, fitted one over the other, and arranged to slide and thereby lengthen or shorten the cornice to adapt it to any window. The vertical pieces or trusses are attached one to the inner end of each sliding piece, and they are split at their upper ends, and provided with a clamping screw, by means of which the parts may be fixed after they are properly adjusted. The trusses are lined with felt or flannel, as shown in Fig. 3, to prevent marring the face of the mouldings. Fig. 1 shows the cornice closed together. In Fig. 2 it is represented as extended.

These cornices are not restricted to any particular style of moulding or finish, and their form is always symmetrical. Further information may be obtained from the patentee, whose address is given above.

THE MEXICAN EXHIBITION IN DOUBT.—The work of preparation for the proposed Mexican Exhibition has been stopped, and it is believed that the Mexican Cabinet has determined to abandon the enterprise for lack of means.

NEW COMBINATION TOOL FOR MERCHANTS.

The accompanying illustration will scarcely need explanation, as the merits and usefulness of the article will readily be seen by those who have frequently to pack or open boxes or packages of merchandise. The tool combines in very simple form a hammer pincers, and wrench. When it is used as a nail extractor a driver, which is not shown in the engraving, is used for forcing the jaws into the wood.

This tool seems to combine the advantages of the more costly implements for a similar purpose. It was recently

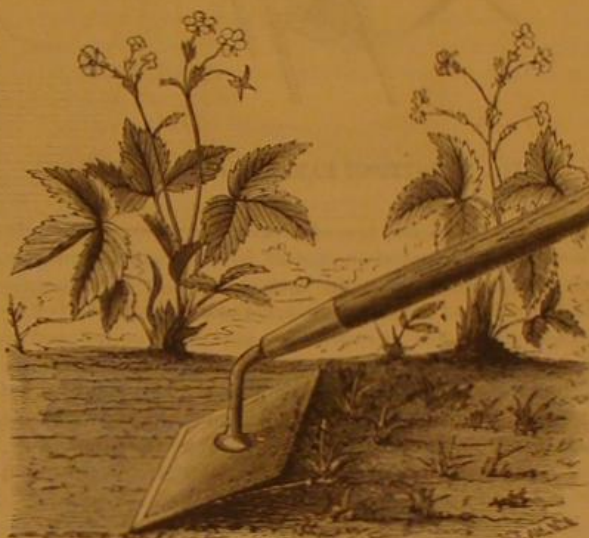


SMITH'S COMBINATION TOOL.

patented, and is being manufactured by Messrs. W. K. Smith & Co., of Kirkville, Mo.

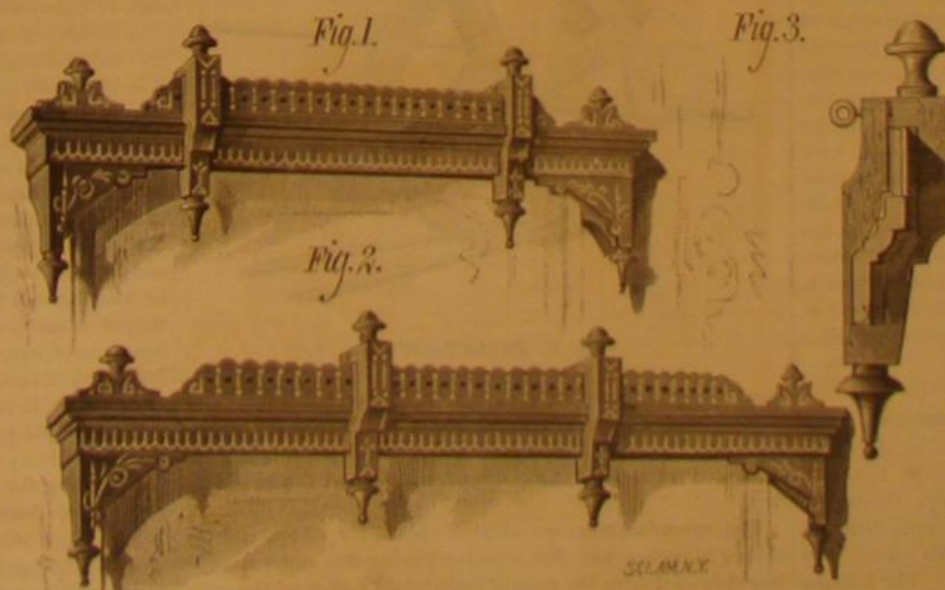
A NEW SCUFFLE HOE.

The improved implement shown in the accompanying engraving is designed to take the place of the ordinary hoe in various gardening operations, but it is more especially adapted to such work as the cultivation of the strawberry and other similar plants, and to weeding onions, etc.



MUNSON'S SCUFFLE HOE.

The implement has been used for a number of years by the inventor in his own market garden, where he has proved to his own satisfaction that the men who use it can accomplish three times the work possible with an ordinary hoe. It may be used as a subsoiler, as it will readily break up the soil to a depth of five inches without great exertion on the part of the user, and it is stated that it is not at all difficult to make, in ordinary soil, strokes of five feet. It answers an



CAMPBELL'S IMPROVED WINDOW CORNICE.

excellent purpose in weeding onions and other plants growing in drills or rows, as it completely uproots the weeds and renders unnecessary any work with the hands. As a strawberry hoe it may be pushed around and under the vines without injuring them, and by inverting the blade it forms an efficient runner cutter, and it may also be used to set runners to root.

The great advantages possessed by this implement over others of its class are that it may be used without bending the back, and much less force is required to work it.

The general appearance of the scuffle hoe is shown in the engraving. The blade is diamond-shaped, and is curved, having its convex surface uppermost. The edges are beveled or sharpened, and the curved shank which receives the handle is secured to the center of the blade.

This invention was recently patented by Mr. T. V. Munson, of Denison, Texas, from whom further information may be obtained.

ENGINEERING INVENTIONS.

Messrs. Philo A. and Ira S. Knapp, of Danbury, Conn., have invented an improved cut-off for steam engines in which the valve is arranged so that it will close the live steam port at one third, half, or two thirds of the stroke, while the exhaust port remains open to the end of the stroke.

An improved railroad gate has been patented by Messrs. Henry Hahn and Anderson L. Gaston, of Gainesville, Texas. It is intended to fill up the gaps in fences crossing the railway track. It is lowered by the passing trains from either side, and is raised as soon as the train has passed over it.

Mr. Henry Ruse, of Baltimore, Md., has patented an improvement in railway ties. In a track formed with these ties two permanent clamping lugs of any one tie project in the same direction, but are arranged upon opposite sides of the rail from the permanent lugs of the next tie. The inventor also provides a peculiar locking device, by which important advantages are secured.

An improved car coupling has been patented by Mr. Geo. W. Cushing, of Sedalia, Mo. The object of this invention is to furnish a more efficient and durable substitute for the plate springs and other devices that are now used on that class of draw hooks that require side pressure to retain them in position.

Color Blindness.

That the prevalence of color blindness among railway employees, and the consequent danger, were not overrated by us in our early articles on this subject, continues to receive abundant confirmation. Dr. Keyser, of Philadelphia, according to the *Railway Review*, has examined the eyes of the train hands of three Philadelphia railways, and finds that three and one half per cent are color blind. These cannot discern the difference between colors; and in addition there are eight and one half per cent who can distinguish colors, but cannot distinguish shades of the same color apart. There are thus twelve per cent who have not that quickness and accuracy of perception of colors which should be considered absolutely necessary in the railway service, as long as signaling is done by means of colored lights. It is fair to presume that general investigation would show about the same results.

A Great Russian Telescope Projected.

At a meeting of the Naval Institute in Washington, May 29, Professor Newcomb stated that he has received letters from Otto Struve, Director of the Pulkowa Observatory, announcing that the Russian Government has voted 250,000 rubles for the construction of the largest telescope that can be advantageously made, including the building in which to mount it. The object glass is intended to be between thirty inches and three feet in diameter, if the glass makers find it practicable to cast a disk of this size of the necessary evenness and purity.

It has not yet been decided who shall undertake the most difficult part of the work, the grinding of the glass; and before deciding it Struve intends to visit this country in order to examine the Washington and other great telescopes made by Alvan Clark & Sons. He will probably arrive here for this purpose some time during the summer. Should his examination prove satisfactory he will be ready to open negotiations with the Clarks for the work if he is sure it will be done enough better to warrant the risk of sending the glass twice across the Atlantic.

Molecular Oscillations.

M. Raoul Pictet, of Geneva, one of the two chemists who not long ago were so brilliantly successful in liquefying hydrogen, has recently been engaged in researches which deal with some of the most delicate problems in molecular physics. He has endeavored to determine the length of the molecular oscillations of a body subjected to the action of heat. No explanation is given as to the method of calculation employed, but M. Pictet arrives at the remarkable result that the product of the length of molecular oscillation by the temperature of fusion is constant in all solid substances. He adds that the higher the

temperature, the shorter are the oscillations. Here are some of the figures: Selenium, 3.7, lead, 3.3, zinc, 3.5, silver, 3.8, copper, 3.4, gold, 3.4, iron, 3.3, platinum, 3.6. These numbers are evidently near enough together to warrant the statement that the law of constancy is here verified with conditions of exactness comparable to those which Dulong and Petit declared satisfactory in their researches on specific heats.

RECENT MECHANICAL INVENTIONS.

A machine for laying bands or stripes of color around broom handles, which does its work rapidly and neatly, has been patented by Mr. Solomon Lang, of Schenectady, N. Y. The machine is fitted to carry two handles and two sets of striping brushes, which act alternately, so that while one handle is being striped the other may be removed and replaced by another.

Messrs. A. H. Simms, of Nixburg, and J. L. Porter, of Rockport, Ala., have patented an improved rope measuring machine. It consists in the arrangement of a measuring wheel provided with an alarm device for indicating its revolutions, and in a semicircular receptacle for containing the rope to be measured.

Mr. John G. Meeker, of Danbury, Conn., has patented an improved machine for filling and hardening hat bodies and other fabrics. The invention consists in forming ribs of hempen rope upon the opposite working faces of the filling roll and apron of a machine for fitting and hardening hat bodies.

American Hardware in British Colonies.

The *Ironmonger* continues to lecture the English manufacturers for their apathy in not bestirring themselves to prevent the introduction of American manufactures into the British colonies.

There would appear to be much reason, says the editor, for fearing that English manufacturers are not even yet fully alive to the extent and nature of the competition they have to meet and fight. Through our own columns, for instance, attention has repeatedly been called to the subject, and we have been careful to give, from time to time, the latest and most authentic information obtainable. It has been shown more than once that our colonists in Australia, New Zealand, the Cape, and elsewhere are rapidly developing an amount of business in American hardware which was not even contemplated half a dozen years ago. They are well and attentively served by the manufacturers of the United States, and appear to be disposed to transfer to them many of their commissions. They tell us directly, or indirectly, that they are more thoroughly satisfied by their new providers than by our own traders, and we cannot blame them, therefore, if they continue to divert their favors into transatlantic channels. They would, and do, prefer to have English made goods of all kinds, but they find that the patterns, finish, and packing of the Americans are frequently so superior that they are literally compelled to cease doing business with us. In not a few instances they still send their orders to England, but they specify American goods, and decline to be put off with any others. They are, as our correspondent tells us, often charged nothing for packages, and have everything so carefully wrapped up or boxed, marked, and labeled, that they find far less trouble in retailing the goods than those sent to them from this country. We have before remarked that there is not the slightest reason why this state of things should continue. We are able to compete successfully with the whole of the outside world, either as regards quality, quantity, or price, and it ought not to be publicly stated that we do not do so. We have every advantage on our side, and it is nothing less than a notorious scandal if we neglect our opportunities any longer. As a nation we are compelled to manufacture, and inasmuch as we produce immensely in excess of our internal consuming powers we must continue to export the surplus. It is, therefore, not merely our interest, but an absolute necessity, that we should consult the tastes and requirements of our customers, and by the exercise of enterprise, tact, and progressive tendencies, keep ourselves in that foremost position we have so long held. The time for apathy, indifference, and adherence to obsolete patterns or practices has gone by, never to return. The recognition and full appreciation of these facts ought to be sufficient to put our manufacturers and merchants on their mettle to such an extent as to render the continuance and repetition of these complaints impossible and unnecessary.

Copper and Iron Lightning Conductors.

What should be the relative sectional areas of lightning rods in order that neither metal should be more liable to fusion by the passage of an electrical discharge through it than the other? Mr. R. S. Brough (whose recent death in India we regret to announce) has answered this question in the May number of the *Philosophical Magazine*. The relation usually given—viz., that an iron rod should have four times the sectional area of the copper rod—is based on the fact that copper conducts electricity six times as well as iron, while the melting point of iron is about 50 per cent higher than that of copper, and $\frac{6}{1.5} = 4$. This simple treatment is incomplete,

because it neglects the following important factors: (1) The influence of the rise of temperature in increasing the electrical resistance of the metal; (2) the difference between the specific heats of the copper and iron; and (3) the fact that

the iron rod being made several times more massive than the copper rod, it will require a proportionally greater quantity of heat to increase its temperature. Taking these considerations into account, Mr. Brough finds that the sectional area of an iron rod should be to the sectional area of a copper rod in the ratio of 8 to 3. For the same efficiency iron rods are therefore cheaper than copper rods.

PREVENTIVE FOR SLIPPING BELTS.

Mechanical engineers and users of machinery know only too well that all belts slip more or less, thereby occasioning a loss of both power and motion as well as the wearing of the belt. Several remedies have been suggested and tried such as the application of rosin and other adhesive substances to the belt or pulley, but none of them, so far as we are aware, with the exception of the device shown in the accompanying engraving, have proved of any practical value. In fact the application of adhesive substances is

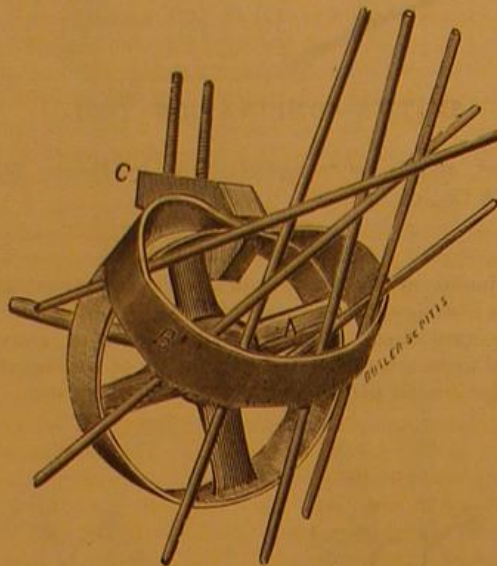


Fig. 1.—SUTTON'S PATENT PULLEY COVER.

productive of a direct loss of power, and injury to the belt. To secure the required amount of friction by tightening the belt brings greater pressure and consequent friction upon the journals and increases the strain and wear on the belt.

The pulley cover shown in the engravings is designed to obviate all of these difficulties and greatly increase the transmitting capacity of both belt and pulley. It is simply a flat endless band of elastic rubber and canvas, made about one inch to the foot shorter than the circumference of the pulley, with the inside face unvulcanized. It is stretched around the pulley and cemented fast.

The manner of applying the cover is shown in the engravings. After cleaning the pulley the cover is clamped to the upper part of the pulley by means of an ordinary hand screw, then a number of rods are inserted in the cover and placed against the rim of the pulley, as shown in Fig. 1. Three or more men, taking one rod in each hand, stretch the covering outward and place it on the pulley, as shown in Fig. 2; then all of the rods but one are removed, and the

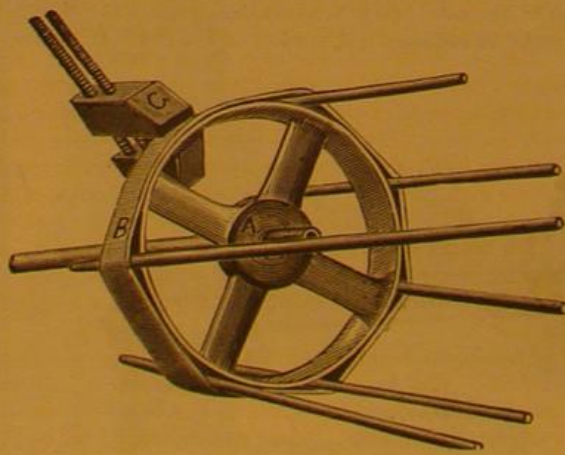


Fig. 2.—PULLEY COVER.

hand screw is taken off; cement is placed between the cover and the pulley as the remaining rod is rolled around the pulley under the cover. When all sides of the pulley have been cemented the rod is removed, and the cement is allowed to dry.

The manufacturers assert that this cover effects a great saving in power, and that a pulley having this cover applied has at least double the capacity of a plain pulley of the same dimensions.

Further particulars may be obtained from Joseph Woodward, room 11, 55 Liberty street, New York (P. O. box 3419).

The Nature of Plastic Substances.

At a recent meeting of the Philadelphia Academy of Natural Sciences, Dr. Koenig referred to a statement made by him some time ago when speaking of the composition of the so-called mountain soap of California, that the plastic

components thereof are not crystallized substances. As this was contrary to the opinion held by certain authorities on such matters, he had been led to give the subject further consideration, and he was now prepared to sustain his original assertion, although it was at first based simply upon analogy. He believed that in the inorganic, as in the organic kingdom, no plastic substance is crystallized. The substances pholerite and necrite, which have indeed the same quantitative and qualitative composition as the plastic kaolinite, are indeed crystalline, but these are simply cases of polymerism. In the course of his investigations on the nature of clays he had studied the sediment thrown down by slightly turbid river water. If portions of this substance be again dissolved and the redeposit examined under microscope, it will be found to present the appearance of starch. The granules are transparent, and may be examined by polarized light, when it will be found that they are not at all crystallized. Further investigations of the subject are promised.

Emigration to the United States.

Probably from its comparative nearness, and the social and personal freedom it promises, as well as from the fact that so many of the working classes have "some friend or brother there," emigration to the Transatlantic Republic has always been much in excess of that to our own colonies, even to the adjacent Dominion. But for some years there has been a great commercial depression in the United States as in the United Kingdom, and during the past quinquennial period as much slackness in emigration as in everything else. The turn of the tide has, however, come at last, and it is doubtless a sign that a decided improvement has set in over the water. Both from the Clyde and Mersey, as well as from other less important havens, flocks of emigrants are leaving these shores. Nearly 11,000 persons left Liverpool to go into voluntary exile last month, of whom 8,931 were bound to the United States, 1,723 to British North America, and only 48 to Australia, 6,015 altogether over those of March, and 4,090 over the corresponding month of last year; while during the present May there is every prospect of numbers leaving several thousands in excess of the corresponding month for many years past. Of the April emigrants, 5,348 were English, 1,546 Irish, and only 58 Scotch.—*Iron*.

Phosphorescent Photographs.

To Mr. Woodbury's inventive ingenuity we owe this plan, which has been tested, and is a practical success. The method he employs is known as the "dusting-on" process. It consists in coating a plate with a preparation of dextrine, honey, and bichromate of ammonia, which, exposed under a negative, becomes hardened, where it is subjected to the action of light, through the transparent parts of the negative, remaining tacky where it is protected from the action of light by the denser parts of the negative. After exposure under a negative, the film, as it will be seen, is tacky in the lights of the picture, but hard and dry where light has acted on the shadows. The lights are therefore adhesive and tacky, retaining any fine powder which is dusted in or rubbed into the moist surface. At this point comes in the essential novelty. The powder to be used must be a phosphorescent substance. One of the best known and available is sulphide of calcium. A powder of this substance is applied to the image formed on the adhesive film, and sticks to it in due gradation of the tackiness, as regulated by the action of light which passed through the negative. An image of sulphide of calcium is thus formed, which, the powder being nearly white, is scarcely visible by daylight, but if the image be submitted for a time to sunlight, or bright daylight, or brilliant artificial light, and then taken into the dark, presents a luminous picture, somewhat startling, indeed, in the case of a portrait.

A variety of substances possess this phosphorescent quality: sulphides of barium, calcium, and strontium displaying it in the most marked degree; fluorspar, carbonate of lime, pearls, diamonds, phosphate of lime, arseniate of lime, and other substances, all showing in their degree this capacity of absorbing light and radiating it in the dark. The Bologna stone, consisting of sulphide of barium, displays this property in a marked degree. The old Italian cobbler to whom tradition assigns the discovery of the property of this stone, and its use to astonish his friends and neighbors, prepared it by heating red hot with charcoal a piece of sulphate of baryta, found plentifully in the neighborhood of Bologna. Sulphate of baryta made into a firm paste with gum, or with flour and water, and calcined, will produce the substance. It should be kept sealed in a stoppered bottle.

The phosphorescent property has been utilized in America for the production of luminous clock and watch faces, which readily show the hour in the dark. Professor Morton, in the *SCIENTIFIC AMERICAN*, points out the possibility of superseding gas or other incandescent substances as means of illumination by having the walls of a room treated with a phosphorescent substance, which might absorb sufficient light during the day to serve for illumination at night. Dr. Phipson points out that a whitewashed cottage exposed during the day to strong sunlight sometimes shines at night with a brilliant phosphorescent light; pure lime or a mixture of lime and nitrate of lime possessing the property in question. The substance used in preparing luminous clock faces is sulphide of calcium, sometimes known as Canton's phosphorus, Canton having prepared it by heating a mixture of three parts of calcined oyster shells with one part of sulphur to an intense heat for an hour. It may also be formed by heating

gypsum with charcoal. The most refrangible or actinic rays are most active in producing this phosphorescence, or fluorescence.

Mr. Woodbury, so far as we know, is the first to give this property a practical purpose in photography. He applies the sulphide of calcium in powder to the image formed by light on a surface possessing an elective degree of tackiness, and the image being so formed and submitted to the action of sunlight, or even a good artificial light, presents a luminous picture in the dark. Used with judgment, such portraits may be found very interesting, while, perhaps, nothing could be more ghastly than the unexpected presentment of such a portrait of a deceased friend.

To those of our readers who may desire to study the question of phosphorescence generally in connection with this subject, we cannot recommend any better assistance than the very interesting work on "Phosphorescence, or the Emission of Light by Minerals, Plants, and Man," issued by Dr. Phipson a few years ago.—*Photographic News*.

PRACTICAL DIVISIBILITY OF THE ELECTRIC LIGHT.

[Continued from first page.]

A single electric lamp placed near the current generator supplies light for a building or a street. This lamp is surrounded by a system of lenses and reflectors forming a chamber of light, as represented in Figs. 2 and 3. These lenses concentrate the whole of the light into as many beams of parallel rays as there are faces in the chamber. In this form the light may be projected through long distances. The intensity of the light when not condensed is inversely proportional to the square of the distance from the source of light, but when the light is projected in parallel rays and is prevented from radiating, its intensity remains unchanged, except perhaps a small loss by the absorption of the atmosphere.

From every face of the chamber of light a box or pipe projects, which incloses the light beam. These pipes are laid along the streets, as seen at T in the larger engraving, and they are placed along the walls and floors of the building.

At every side street a smaller pipe branches out of the main one, and at their junction there is a reflector, which, by its size and position, will divert into the side street any desired percentage of the entire light. By means of this device every street in a city may be provided with one or more pipes carrying a certain amount of light that is always controllable by merely changing the position of the reflectors. This arrangement may be compared to valves and water gates of a system of water distribution.

Service pipes lead from the street pipes to the lamp posts and to the buildings, and at the intersection of the service pipes with the street mains there is a reflector, the size of which will determine and control the amount of light supplied by the service pipe.

The larger engraving shows, at T, the street main pipe and light beam, A. B is a reflector or totally refracting prism, which sends a portion of the main beam of light into the service pipe, B C, which, in the present case, supplies both the street lamp and the building. Another reflector or prism, b, bends a portion of the supply beam upward into the lamp post; this vertical beam strikes a reflector of suitable shape, which diffuses the light as may be required, the manner of diffusion depending of course on the form of the reflector.

The horizontal light beam, B C, reaches the vertical supply pipe, C F, laid along the wall of the building, and the reflector at the juncture of these two pipes bends the beam upward.

At D, E, F, there are other reflectors, each of which, according to their size and position, will bend horizontally the amount of light required for each floor. These smaller beams are projected through pipes laid along the floor joists. The horizontal beam, D d, is partly intersected by a reflector at f, which bends downward a portion of the beam which enters the room below through a diffusing lens (shown in detail in Figs. 4 and 5), called by the inventors a secondary lens, which sheds the light in any predetermined direction, according to the shape and curvature of the lens. The remaining portion of the beam passes on to illuminate other rooms, including the hall above, which receives its portion from a reflector at d.

The arrangement just described is duplicated on the other floors and modified to conform to the varying requirements of the different stories.

When it is desired to distribute light to rooms not in line with the main pipes, a double reflector may be used to divide the principal beam into two lateral ones, which will illuminate two or more adjoining rooms.

It will thus be seen that all of the rooms in a building may be illuminated by a single beam, and that the light may be divided without material loss. The reflector, B, controls the supply of light for the entire building, and the amount of light may be regulated or it may be shut off altogether by moving the reflector. In like manner the reflectors, D E, will control the light for their respective floors. If they are stationary the percentage of light for each floor will be constant, but if either of them is arranged to slide into and out of the light tube, it will vary the amount of light supplied to the corresponding floor at the expense of the other floor. The light in any of the rooms may be increased or diminished in a similar way. The reflectors are sometimes arranged to slide laterally, so as to increase the light or decrease it to a mere glimmer, or even shut it off altogether

without affecting the light supply of the other rooms. In the left hand rooms there are at m m' m'' cords or handles connected by cords or wires to the prisms or reflectors, which, being pulled or turned more or less, will slide the prisms or reflectors; in this way the light may be perfectly controlled with less effort than is required to turn a gas key.

The secondary lenses, which are shown in detail in Figs. 4 and 5, are made movable, and a set of two or more of them is supplied to every room. These lenses are moved by the cord, P, which is connected with one of the handles, m. By moving the handle either of the lenses may be brought into line with the beam of light. These lenses will diverge the light more or less according to their curvature, so as to illuminate a part or all of the floor, or the entire floor and as much of the walls as may seem desirable.

The lenses, in addition to the sliding motion, have a swinging motion, by means of which the light may be projected in any required direction, rendering it unnecessary to place the table exactly under the lens. The inventors state that these lenses will answer for all household purposes, and that by means of lenses of different kinds a very wide range may be given to this system of lighting; for example, if a condensing lens is employed the light will be concentrated at a single point, so that it may be used to advantage by the microscopist. If no lens is employed the beam of parallel rays may be used in the magic lantern and in other apparatus for projection. It may also be employed in philosophical experiments, in medical examinations, and surgical operations. There are many branches of industry, now requiring daylight, which could be conducted in the night by means of the condensed light.

Another advantage in this system is that the color of the light, as well as its intensity, may be readily modified by means of colored glass slides. This is especially convenient in photography, where lights of different colors and of differing actinic power are required. This feature will also render the light valuable in treating ophthalmic diseases at home and in hospitals. There are many uses to which this system of lighting seems adapted, which, for want of space, cannot be mentioned.

As to economical advantages it will be noticed that regulators or lamps are entirely dispensed with, and that attendance is consequently not required.

Another important feature is that a large generator of electricity may be employed, thereby greatly reducing the cost of the production of the electrical current. The loss consequent upon the use of electrical conductors is entirely avoided, as the single lamp needed is located near the generator, permitting of the use of a short and thick conductor having practically no electrical resistance.

A great advantage in having only a single lamp for a large system is that a vacuum may be maintained in the chamber of light without difficulty, thereby preventing the rapid combustion of the carbon, which always occurs when the electric arc is maintained in air. The cost of the carbons, as well as the labor of replacing them, which, in the ordinary electric regulators, is something considerable, is entirely avoided.

Besides being adapted to the illumination of large and small areas, this system of lighting appears peculiarly suited to certain applications for which other lights are totally unfit; for example, mines may be safely illuminated without fear of explosion and without increasing the temperature or vitiating the air. In warehouses, storerooms, powder works and magazines, chemical factories, and the like, this system can be used with perfect safety. It is also adapted to the illumination of railroad tunnels and similar places.

Messrs. Molera & Cebrian exhibit some very flattering figures based upon an expenditure of twenty horse power, which, as we have already learned, is not sufficient to obtain the most advantageous results. They claim that they are able to produce by their system 195 lights per horse power giving a light equivalent to 1,958 candles, and that the cost of lighting is less than one twentieth the cost of gas.

The lamp used in connection with this system is so clearly represented in the engraving as to require little explanation. Fig. 2 is a perspective view, and Fig. 3 is a vertical section.

Chamber G, before referred to as the chamber of light, is surrounded on the sides and top by lenses, L. At the bottom there is a concave reflector, H, and at the center two carbon rods converge. These rods are supported by pistons or floats in inclined tubes, J, which are connected at their lower ends by a horizontal tube communicating with the spring acted bellows or cylinder, K. The tension of the spring that draws the top of the bellows down, may be changed by revolving the small windlass, S.

The top of the bellows is iron, and above it is supported an electro-magnet, which is in the electrical circuit. The carbons pass between conducting surfaces, and are also in the electrical circuit. The tubes, J, as well as the horizontal tube and the bellows, are filled with a suitable liquid. As the current passes from one carbon point to another the core of the electro-magnet becomes magnetized and attracts the head of the bellows with more or less force, maintaining a uniform light by governing the distance between the carbons by displacing the liquid in the tubes and throwing the pistons or floats up or down, according to the strength of the current.

Should the current cease the spring draws down the head of the bellows and the points of the carbons touch. When the current is too strong, the top of the bellows is attracted upward, and the carbons separate.

Rats in Brazil.

Mr. Orville A. Derby contributes to the *Rio News* some interesting information on the plague of rats in Brazil. From time to time in all parts of Brazil the plantations are subject to the depredations of armies of rats that issue from the forests and consume everything edible that comes in their way. During a recent excursion in the province of Paraná Mr. Derby found an almost universal lack of corn throughout the province, due to such invasion of rats, by which almost the entire crop of last year had been destroyed. This invasion, or plague as it is called, is said to occur at intervals of about thirty years, and to be simultaneous with the drying of the *taquara*, or bamboo, which everywhere abounds in the Brazilian forests. The popular explanation is that every cane of bamboo sprouts with a grub, the germ of a rat, within it, and that when the bamboo ripens and dies the germ becomes a fully developed rat and comes out to prey on the plantations.

An educated and observant Englishman, Mr. Herbert H. Mercer, who has resided a number of years in the province and had an opportunity of studying the phenomenon, furnished Mr. Derby the following rational and curious explanation: The bamboo arrives at maturity, flowers, and seeds at intervals of several years, which doubtless vary with the different species. The period for the species most abundant in Paraná is thirty years. The process, instead of being simultaneous, occupies about five years, a few of the canes going to seed the first year, an increased number the second, and so on progressively, till finally the remaining and larger portion of the canes seed at the same time. Each cane bears about a peck of edible seed, resembling rice, which is very fat and nourishing, and is often eaten by the Indians. The quantity produced is enormous, and large areas are often covered to a depth of five or six inches. After seeding the cane dies, breaks off at the root, and falls to the ground, the process of decay being hastened by the borings of larvae which live upon the bamboo and appear to be particularly abundant at seeding time. These larvae have doubtless given rise to the story of the grub developing into a rat. New canes spring up from the seed, but require seven or eight years to become fit for use, and thirty to reach maturity.

With this sudden and constantly increasing supply of nourishing food for a period of five years, the rats and mice, both of native and imported species, increase extraordinarily in numbers. The fecundity of these animals is well known, and the result after four or five years of an unusual and constantly increasing supply of excellent food and in the absence of enemies of equal fecundity, can readily be imagined. The last of the crop of seed being mature and fallen to the ground, the first rain causes it to decay in the space of a very few days. The rats, suddenly deprived of food, commence to migrate, invading the plantations and houses and consuming everything that does not happen to be repugnant to the not very fastidious palate of a famishing rodent. If this happens at the time of corn planting, the seed is consumed as fast as it can be put into the ground. Mr. Mercer, who plants annually about fifty acres of corn, replanted six times last year, and finally gave up in despair. The mandioca is dug up; the rice crop, if it happens to be newly sown or in seed, is consumed, as is also everything in the houses in the way of provisions and leather, if not carefully guarded in tin trunks.

A Permanent Exhibition in Boston.

It is reported that the New England Manufacturers' and Mechanics' Institute is completing the erection of a suitable building for the permanent exhibition of the industrial products of New England, with stated fairs and special exhibitions. The proposition is to make each exhibitor pay a small rental for the space occupied, and to distribute the interest in the undertaking as widely as possible throughout New England, the shares being put at twenty-five dollars, and no one man allowed to take over four shares. A fair will be held as soon as a place and funds are secured, and thereafter annually, beginning the first Wednesday of September.

When America was Named.

The Lenox Library, in this city, is very rich in old books, many of them relating to the discovery of America. Among these is the "Cosmographie Introductio" of Hylacomylus, printed in 1507, in which the name of America was first suggested for this continent. "Hylacomylus" was the Hellenized form of the name of Martin Waltzmüller, a professor in the gymnasium of St. Die, in Lorraine. In this "Cosmographie Introductio," on the fifteenth leaf, appears the suggestion which named the continent, of which the following is a translation: "But now that those regions have been more extensively described and another fourth part has been discovered by Americus (as will appear in the sequel) I do not see why it should not be named America, that is the land of Americus, after its discoverer, Americus; a man of sagacious mind, since both Europe and Asia took their names from women." The popularity of this early geography led to the immediate adoption of its author's suggestion, and the new continent was called America by other writers.

CURE FOR HICCUGH.—Under this title Dr. Grellet, of Vichy, states that he has never failed in immediately relieving hiccough, *i. e.*, not dependent upon any appreciable morbid condition, by administering a lump of sugar imbibed with vinegar.—*Revue Médicale*.

A Careless Meteor.

In the northwest corner of Emmett county, in the township of the same name, State of Iowa, bordering Minnesota State line, a meteor of unusually large dimensions recently fell. A correspondent of one of our Western contemporaries, who has visited the place, thus describes the meteor and the scene attending its descent:

It was about 5 o'clock in the afternoon that a terrible, indescribable noise was heard, scaring the cattle and terrifying the inhabitants for twenty miles about. There was a line of yellow-reddish smoke-colored haze, inside of which was an infernal rumble, as, at the rate of fifty miles a second, this strange, howling monster, or wonder, came to ward the earth with a roar and a crash that fairly shook the earth.

Before it struck there was an explosion terrible, to hear and suggestive of the final dissolution of all things, and then, with a shock and a thud, something struck. Men ran to the spot to find that, at a point within thirty feet of the county line, the sod had been torn as though ripped by lightning, and that a hole was left in proof that something had gone in there out of the way. Chunks of sod were thrown forty rods away from the hole, which, on being dug into to the depth of fifteen feet, ten feet of which distance was in solid blue clay, revealed a lump of metal resembling iron mixed with silver. The hole was dug larger, and by means of chains the mineral was taken out and found to weigh 431 lb. It is two feet long and about sixteen inches square, if a ragged chunk can be called square. Another chunk, weighing 32 lb., fell not far distant, plowing up the sod within twelve rods of the school house near the residence of John Barber. Another piece, weighing 156 lb., was found bedded five feet in blue clay.

There is trouble here over the find. One man, who owns the land, declares that the property is his, while the man who first found it says it is his by right of discovery. The same is the case in each instance. Suits at law have been entered by the owner of the soil against the men who dug them out, and who have hidden their treasure where the officers of the law, as yet, cannot find them.

These are the facts. Now what is the thing that fell, and where did it come from? S. N. R.

To this the editor of the *La Crosse Democrat* replies that it was undoubtedly a meteor, or a fragment of a comet thrown out by explosion; and following its orbit perhaps for thousands of years, till, losing its momentum, it came within the atmosphere of the earth, and was then, cooling as it whirled through space, attracted to the earth, and, rushing with terrible speed, drove itself into the soil, as above described. The material of which meteors is composed is known as meteoric iron, a useless, burned metal, resembling cinder of iron, but utterly useless, except as a curiosity.

Simple Treatment for Sciatica.

Dr. Ebrard, of Nîmes, states that he has for many years treated all his cases of sciatica and neuralgic pains with an improvised electric apparatus, consisting merely of a flatiron and vinegar, two things that will be found in every house. The iron is heated until sufficiently hot to vaporize the vinegar, and is then covered with some woolen fabric, which is moistened with vinegar, and the apparatus is applied at once to the painful spot. The application may be repeated two or three times a day. As a rule, the pain disappears in 24 hours, and recovery ensues at once.—*Jour. de Méd., etc., de Bruxelles.*

IMPROVED ROAD PLANE.

We give herewith an engraving of a simple and easily operated implement for planing, leveling, and smoothing roadways, boulevards, etc.; removing the earth or gravel from the high to the low places, filling them, and carrying the remaining earth toward the center of the road.

It consists of a curved blade suspended diagonally from the under side of a rectangular frame supported at the rear on wheels, and at the front pivoted to a coupler or reach, one end of which is connected with the planer frame by an elevating and depressing screw, while the opposite end, when the implement is in use, is supported on the axle of the front wheels of an ordinary wagon. In connection with the right hand hind wheel there is a screw, by which the ends of the planer blade may be raised or lowered, so that if it is desired it may scrape hard in the drain at the road or track side, passing the dirt under the blade, and spreading it before it gets to the opposite end of the blade.

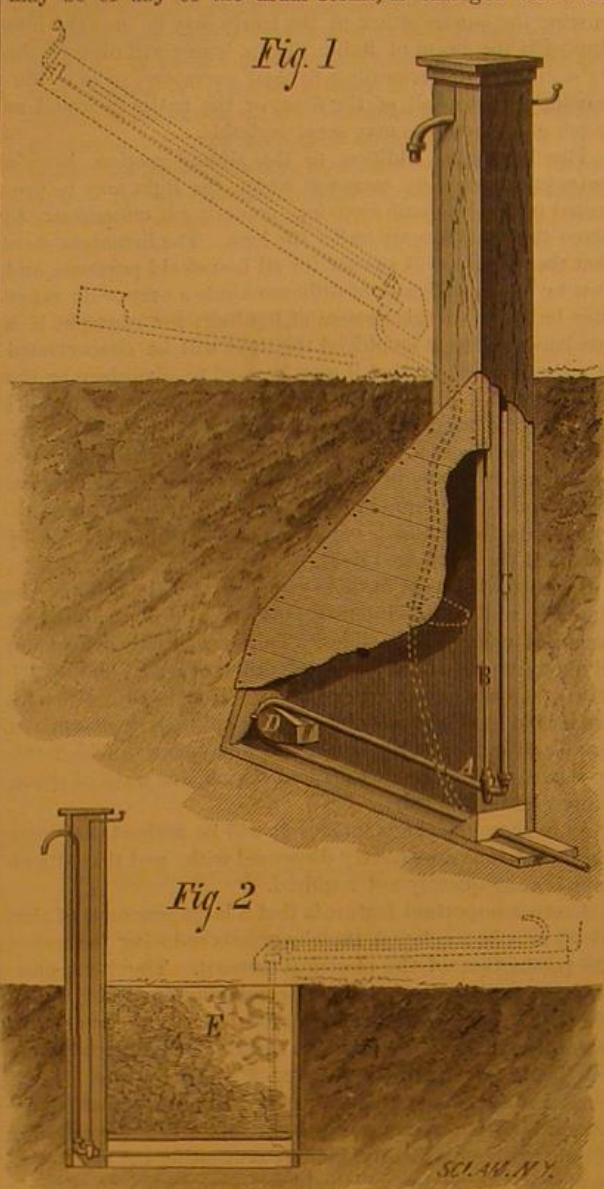
This implement was recently patented by J. P. Lafetra, of Shrewsbury, N. J.

IMPROVED HYDRANT.

The great difficulty in removing, replacing, repairing, or changing the ground faucets or valves of hydrants as ordinarily constructed, has led to the improvement which is shown in our engraving, and which was recently patented by Messrs. Benson & Rose, of Detroit, Mich.

The invention consists essentially in a box or casing of novel form, and in an arrangement of the water pipes, which permits of the examination or repair of the faucet or pipe.

The box or casing (Fig. 1), the upper portion of which may be of any of the usual forms, is enlarged below the

**BENSON & ROSE'S HYDRANT.**

ground and made in approximately triangular form, one side being vertical and a continuation of the upper portion. This peculiar form provides for the accomplishment of the main object of the invention, which is the arrangement of the water pipe, C, so that it may be raised to permit of the examination and repair of the faucet, A. The water pipe, C, is carried along the lower horizontal portion of the casing to the angle, where it is bent double and carried back nearly to the vertical side, where it is bent at a right angle and carried vertically to the top of the casing, where it terminates in the usual bibb or nozzle.

At the point where the pipe is bent double it is provided with a semi-elliptical block, D, attached to it in any suitable

the faucet or valve, D, is desired, the cover and side of the box are removed, and the carrier piece, by which the pipes and valve rod are supported, is raised vertically until its lower end clears the enlarged portion of the casing. It is then inclined, as indicated in dotted lines. The pipe is sufficiently flexible to admit of straightening it out. The valve, A, may then be inspected or repaired, and the whole may afterward be readily replaced.

Fig. 2 shows a modification of the device already described. The box, instead of being triangular, is square and the pipe is straight. The pipe is raised up in the manner indicated in the engraving, when it is desired to examine the valve. To prevent freezing, the box is filled with straw, tan bark, or earth. This is readily removed with a small hoe when occasion requires.

Further information concerning this invention may be obtained from Messrs. Benson & Rose, No. 539 Mallett St., Detroit, Mich.

RECENT AMERICAN PATENTS.

Mr. Jacob J. Boyer, of Hebron, Neb., has patented an improved bag fastener, which consists of a metal chain having a split ring for connecting the chain to the bag, and provided with a number of rings and with a hook for engaging the rings when the bag is fastened.

Messrs. L. B. Schaefer and H. Hennings, of Baltimore, Md., have patented an improved scholar's companion, which consists in an arrangement of a receptacle for containing various small articles, and two crossed straps for securing the books, an arm strap being provided for convenience in carrying.

An improved stand for ice pitchers has been patented by Mr. Thomas Leach, of Taunton, Mass. It consists mainly in an annular seat adapted to receive the base of any kind of pitcher. This seat is hinged to a segmental support which admits of tilting the pitcher.

Mr. John Askwith, of Chicago, Ill., has patented an improvement in cans, which consists in feet formed of a cup and stem, the object being to prevent any oil or other liquid that may be upon the bottom of the can from spreading to the lower end of the feet.

An improved switch board, which is so arranged that a message may be transmitted on any two wires simultaneously, and which admits of working either wire separately and independently, has been patented by Messrs. W. E. & J. W. Busby, of Shamong, N. J.

An improved boot strap, which consists of a metallic strap or ear provided with a loop for the finger, and a plate with projecting points which pass through the boot leg and are bent down to secure the strap to the boot, has been patented by Mr. William Smith, of Eaton Rapids, Mich.

A neat and easily arranged clothes horse that can be fixed to the wall of a room and adjusted to receive a larger or smaller quantity of clothing, has been patented by Mr. Thomas W. Green, of Philadelphia, Pa.

An improvement in bakers' ovens has been patented by Mr. George Brake, of Lansing, Mich. The sides, ends, and roof of the oven are of brick, and the bottom, which is of stone or some refractory composition, is supported on central arches over an end fireplace and on projections or recesses at the ends and sides.

Mr. Frederic Jensen, of Seattle, Washington Ter., has devised an improved convertible chair, which may be used as a bed. It is so contrived that the supports for the bed are out of sight when the device is used as a chair.

An improved hold-back for vehicles, patented by Mr. Hermon F. Morse, of East Foxborough, Mass., consists of a flat steel spring, fixed to the shaft by the shank of the breeching hook with its free end bearing against the open end of the hook.

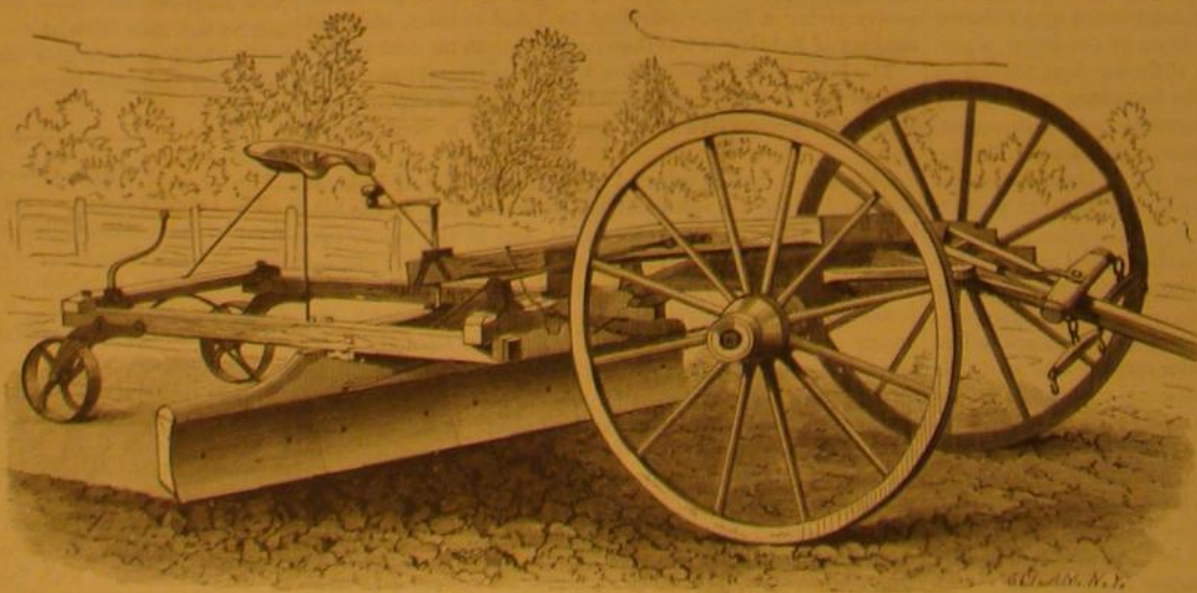
An improved attachment for organs, pianos, melodeons, and other keyboard instruments, by which any one, though wholly unacquainted with music, can play music of any kind, has been patented by Mr. E. F. O'Neill, of Storm Lake, Iowa.

Mr. James K. P. Pine, of Troy, N. Y., has patented an improved check rein guide, which supports the check rein so as to prevent the hurting of the horse's head at the front or rear, and it admits of the use of an overhead check rein.

An improved apparatus for steaming printed fabrics has been patented by Mr. James Smith, of Thornliebank, North Britain. For the fixation of the colors on printed goods, such as calico, it is necessary to subject

them to the action of steam. The invention referred to pertains to an improved apparatus for carrying such fabrics into and through the steam-filled chamber.

A chocolate breakfast powder, consisting of sugar coated with chocolate, and in granulated form, has been patented by Mr. J. G. Finke, of New York city.

**LAFETRA'S ROAD PLANE.**

way for preventing the pipe from being broken or flattened when it is bent. The faucet, A, is provided with a valve rod, B, which extends to the top of the casing and terminates in a crank or handle.

The top as well as a portion of the side of the upper portion of the casing is made removable, so that when access to

SOME INTERESTING ECHINODERMATA.

Not the least remarkable among the animals belonging to the class of Echinodermata, or urchin skinned animals (so termed on account of the numerous spines and anchors protruding from their skin), are the holothuridae. A property peculiar to the majority of holothuridae consists in the capability of ejecting their entire entrails on being excited or scared.

On account of their extreme excitability they are little adapted for collection and preparation for museums. Dried they look like a piece of old leather, while, if placed in alcohol, they cannot be distinguished from an old bologna sausage. Says Brehm: "The only manner in which I could succeed in retaining them in a nearly natural attitude, with the feelers spread, was to replace the salt water in which they were kept, gradually by sweet water. Even if the tentacles had been kept withdrawn for days, they would, in that case, stretch them out gradually and die. A colored picture, painted from nature, will be of better service for illustrating the form and structure of the animal than an individual preserved in any manner."

Some species of this family are much esteemed by the Chinese and the inhabitants of the Malay Archipelago as an article of food. Tre-pang, as it is called, is of considerable importance as an article of trade. The Chinese ascribe to it aphrodisiac properties; many Europeans eat it on account of its ready digestibility. Like the edible birds' nests they have no peculiar taste, being merely formed of animal protoplasm.

The holothuridae just mentioned are supplied with special breathing organs—a sort of water lung, consisting of a numerously branched tube traversing nearly the entire length of the animal, into which also end the alimentary channel and the digestive sac. The animals are enabled to inhale and exhale water by means of this lung, some four or five rapid inhalations being followed by a vehement expulsion of the water inhaled. The lungs, as well as all other vascular organs, may be ejected, but they are reproduced in eight to twelve days.

The holothuridae which are without lungs also lack the sucking disks, and form a distinct group. Their organs of respiration consist merely of a ring encircling the oesophagus, to which are attached a row of blubbers and the tentacles. In this respect they resemble the young of other families of holothuridae. Even when grown up, the lungless holothuridae use, like the larvae of those possessing lungs, the tentacles as organs of motion.

The most important species of this class of animals is the anchored holothuridae or synaptæ, which is illustrated by the accompanying engraving, which represents two of these curious animals as drawn from nature at the Naples aquarium.

The entire surface of the skin is provided with characteristic two-armed calcareous anchors, the shafts of which pass through a perforated plate and end in small circular knobs by which they are held in position. These anchors are large enough to be noticed with the naked eye. Of the two species illustrated, one, *Synapta inharrens*, shown in the engraving in two thirds of its natural size, is found along the northwestern coast of France. The other, *S. Besseli*, is an inhabitant of the southern seas; in appearance it is similar to the *S. inharrens*, and we have therefore only represented the anchors, as they are especially well developed in the latter species. Another European species, so far found exclusively in the neighborhood of Trieste, has become celebrated on account of being the seat of a parasitic snail, the nature of which was determined chiefly by Johannes Müller.

Besides the capability of expectorating and reproducing their entrails, the synaptæ possess another means of mutilating themselves, and this is so habitually done that an unmutilated animal is rarely met with. Baur says with respect thereto: "The mutilation as practiced by synaptæ consists in the separation of entire sections of the body by means of violent muscular contractions. The sections separated move about for some time, but die ultimately. They are unable to reproduce the forepart with mouth and tentacles. Every headpiece, however, may reproduce the sections separated, but this is not generally the case until almost the entire

body, up to the calcareous ring surrounding the oesophagus, has disappeared. The capability of reproduction is destroyed when this ring is severed from the mouth by a small incision. It seems, however, as if the calcareous ring only served as a protection to a band of very fine nervous threads which are cut by the same operation."

Some synaptæ of southern seas become so large as to be taken for sea snakes. Semper relates having caught a *Synapta Besseli* off Bohol Island measuring over six feet in length. Their motions are very slow. Curled up they rest between stones and in the sand, and move, when disturbed, slowly forward by progressive contractions of the body aided by the tentacles. The anchors are certainly never used for locomotion. If they have been hooked into a body they invariably break off as soon as the animal moves. Although the anchors are movable they have no connection whatever with the nervous or muscular system, and consequently cannot be controlled by the animal.

The synaptæ climb only when roughly touched; ordinarily

tance in determining the stage of development attained by allied species. The larva gradually develops into the chrysalis, which has the shape of a barrel. It is flattened at the top, round at the bottom, and encircled by four rings. Within this inclosure the synapta acquires its ultimate form, the tentacles become visible, the vesicles attached to the calcareous ring are being formed, the longitudinal muscles are developed. Finally the cover of the barrel opens, and the tentacles at once protrude and become more elongated. Gradually the walls of the barrel unite with the skin proper of the synapta, forming its exterior covering. They are now about 0.05 inch long, and the calcareous circular bodies are still attached to them, but are ultimately lost.

Habits of Wild Animals at Night.

A reporter of the New York Sun had an opportunity recently of visiting a menagerie at night, and he thus tells what he saw and what the animals did on being disturbed of their night's rest. He commences by describing the monkeys, which, he says, were clustered together on the floor in the corners of the cage. The attendant, who showed the reporter about in the dim light of a couple of gas burners, scratched the cage with his cane, and instantly a dozen whitish spots appeared on the surfaces of each of the clusters. These were the faces of the monkeys. They were held perfectly still for a short time, but when another gas jet was lighted nearer the cage several monkeys broke away from their companions to leap from perch to perch and squeal like bats. Dr. Starr, the attendant, said that the monkeys sometimes roosted like chickens on their perches, but such a peculiarity was not observed in any of the cages. Mr. McClean, a very trustworthy keeper, says they often indulge their propensity for fun by pulling each other's tails and pinching each other at dead of night, when the whole cage will set up a chatter. Monkeys never snore, but there is always heard a sniffling sound, the premonitory symptom of consumption, of which they generally die on account of the coldness and changes of a northern climate. In separating into different clusters to sleep each species seeks to keep by itself as much as possible.

Dr. Starr said the pelican usually squatted on the floor of his cage like a duck in its coop, but it was found roosting on the edge of a water tank in its cage. Its big webbed toes are furnished with long, sharp, curving claws, and clutched the metal covered edge with a firm hold. Its beak, nearly a foot in length, rested along its back. When a keeper's hand was thrust warily between the bars, the long beak, as it seemed, with a single motion, moved viciously from its back and struck a bar of the cage against which the hand had rested. After that it stood up on guard, showing its big brown legs, and awkwardly brandishing its beak. The snakes lay motionless, most of them being in a cluster. The ostrich lifted itself from a squatting position on the floor of its cage when the visitors approached, looked out of one eye inquiringly, and tetered its long neck up and down, as if it were balancing its body with it on its two ungainly legs. The kangaroo lay a long time without moving. At last, aroused by the conversation of its midnight guests, it suddenly lifted its head, and with its tail gave a thump or two on the side of its cage. Its tail is very long, thick, and powerful, and when it is attacked in close quarters it is said to whirl about and use it like a club. After a short time it sat upon its haunches, and began to yawn and scratch its sides with its short forelegs, like a monkey. The front of the mandrill baboon's cage was closed with a horizontal shutter. When this was being removed the creature's paw missed a keeper's hand only by half an inch. It stood on all-fours, about three feet high, and glared through the bars with its gray, sunken eyes, throwing a queer expression of cool contempt into its blue cheeks and bright carmine nose. It would occasionally thrust out its chin, decked with a short, sandy beard; but it is said to be very treacherous, and when it is angry it has been known to put forth strength equal to that of two men. It took a chew of what a keeper said was tobacco, rolled it about in its mouth, and appeared to enjoy it. Dr. Starr said that it could smoke, but that it was not allowed to have matches. The capibara, a kind of hairless



INTERESTING ECHINODERMATA.

they pass between stones and plants without adhering to them, and in a new species, *S. glabra* (three feet long), recently discovered, these organs were so deeply embedded into the skin that they were at first considered anchorless.

We are at present pretty well informed as regards the different stages of development of holothuridae.

The microscopically small larvae may be easily caught with a fine net on the surface of the sea during quiet weather. The later stages may be procured with a dragnet.

The larvae present an appearance decidedly different from that of the adult animal, being built very symmetrically, and having the form of a flatboat, the fore and aft ends of which are bent over to form a partial deck with curved edges, lined with very fine hair, by the aid of which the minute animal is enabled to swim, conical end forward. The most important inner organ is the digestive canal. We notice in the larvae a few bags, which ultimately form the main body.

From another rudimentary organ the vascular system is developed. There are two circular masses of lime near the anus, which disappear in the adult, but which are of impor-

South American hog, scrambled up when it heard a noise, and ran to its trough, over which it stood looking expectantly at those who had disturbed it. The little sun bear was rolled up in a black ball in a corner of its cage, while the first sight of the grizzly in another apartment of the same cage showed it swaying noiselessly to and fro. The striped hyena was roaming about in its cage. A ridge of coarse hair arose along its back when it was disturbed, and it retired to the rear of the cage to glare at its visitors. It kept up a low but unceasing growl. It retains the wild instincts of its ancestors, and the keepers say that this low growl can be heard nearly all night. It howls a prediction of a storm several hours before the storm comes.

Savage hisses were heard from two black leopards before the visitors arrived at their cage. When a neighboring gas jet was lighted their glistening teeth and red gums came into view. Their upper lips were drawn back as they crouched on the floor, and their short ears were laid back until it seemed as if there was no room for any brains in their serpent-like skulls. They are the fiercest of all the beasts in the menagerie, and so wild that when they are changed to a new cage they will not eat for several days. A large spotted hyena was found growling in the dark, and twisting uneasily on its back with his clumsy feet in the air. He weighs 250 lb. He immediately got up, and retiring to the back of the cage, glared menacingly. A wildcat sprang to the rear of its cage when it was approached, and crouched as if for a spring. A moment afterward it sat up looking as innocent and unconcerned as a house cat after it has eaten a canary. It killed three of its brothers last summer. A jaguar glanced carelessly at the midnight party as they passed its cage, but otherwise affected to disregard them. Two lions, born in Central Park two years and a half ago, lifted their nozzles from their front paws, stretched out in front of them, and showed their fine large fronts, while they blinked lazily at a newly lighted gas jet. Showmen like lions, on the whole, much better than tigers, because they are not so treacherous; but they say that a bad lion is worse than a tiger. Before approaching within reach of a lion, a keeper always tries its disposition by coaxing words and by offers to pet it. If it holds down its head to be scratched, it is considered to be in a safe mood to handle. The rhinoceros sleeps with a hoarse snore, and resembles a huge over-fat hog as its body spreads out over the bottom of the cage. The one in Barnum's menagerie is said to weigh 7,900 lb. All of the framework of the wagon on which its cage rests is made of steel. It is said that it would be the most dangerous animal in the menagerie if it should escape in an angry mood. Though usually very sluggish, it is terribly quick in action when angry, and there is practically no limit to its strength.

The four or five baby elephants stood in a row, fastidiously selecting choice spears of hay with their restless trunks, while Emperor and his huge mates lay sprawled out on their sides, their upper sides being rounded up into formidable mounds of flesh. The effect of the light was to make several of them lurch backward and forward sideways, and finally sit up on their haunches in their clumsy, broken-jointed fashion. The sea lion sleeps on its platform and not in the water. The giraffe usually holds its long neck nearly erect, with its legs doubled under him like a horse.

Keepers in a menagerie divide their charges into six classes—hay animals, cat animals, monkeys, elephants, birds, and fishes. If a keeper of the cat animals is killed, or if he leaves his situation, the management look about for an experienced man to take his place. If they cannot find any, they promote one of the oldest and trustiest hay animal keepers to the vacant position. The cat animals comprise everything of a naturally savage nature, including the lions. The hay animals include deer, giraffes, and the like. In the elephant class are included rhinoceroses and hippopotami. It requires a particularly steady and trustworthy man to care for the "cats," which can never be handled or changed from cage to cage without precautions, no matter how tame they may seem to be.

NATURAL HISTORY NOTES.

The Peripatus.—In Mr. Moseley's recent work, "Notes by a Naturalist on the Challenger Expedition," the author gives the following description of the *Peripatus capensis* found at the Cape of Good Hope. This curious creature is believed to be a nearly related representative of the ancestor of all air-breathing arthropods—i. e., of all insects, spiders, and myriapods. Before Mr. Moseley collected, examined, and dissected specimens at the Cape, nothing was known of its development. The animal has the appearance of a black caterpillar, the largest specimens being more than three inches in length, but the majority smaller. A pair of simple horn-like antennae project from the head, which is provided with a single pair of small, simple eyes. Beneath the head is the mouth, provided with tumid lips, and within with a double pair of horny jaws. The animal has seventeen pairs of short conical feet, provided each with a pair of hooked claws. The skin is soft and flexible, and not provided with any chitinous rings. The animal breathes air by means of tracheal tubes, like those of insects. The sexes are distinct; the males are much smaller and fewer in number than the females. The animal is provided with large glands, which secrete a clear viscid fluid, that it has the power of ejecting from two papillae, placed one on either side of the mouth. When touched or irritated the animal discharges this fluid with great force and rapidity, and in fine thread-like jets. These jets form a sort of network in front of the animal, looking like a spider's web with dew on it. The viscid substance (which is not irri-

tant when placed on the tongue) is exceedingly tenacious, like bird-lime, and when the author put some on a slip of glass some flies approaching it were at once caught and held fast. This slime is used not only as a means of offense, but to catch insects on which the animal feeds. The animals live in or under dead wood, are nocturnal in their habits, and their gait is exactly like that of a caterpillar.

That the *Peripatus* is a very ancient form is proved by its wide and very peculiar distribution. Species of the genus occur at the Cape of Good Hope, in Australia, in New Zealand, in Chili, in the Isthmus of Panama, and in West Indies. If its horny jaws were only larger, Mr. Moseley thinks they would no doubt be found fossil in strata as old as the old red sandstone at least.

The Hibernation of Swallows.—It was an old and popular superstition that swallows, late in autumn, hide themselves in holes in the earth, in marshes, or under water; and it also used to be asserted that great lumps or numbers of the birds were frequently fished up, fixed to one another by their claws and beaks, and that these when laid in a warm place quickly revived, although they before seemed dead. Curiously enough, Dr. Elliott Coues, in his work on "The Birds of the Colorado Valley," published by the government, revives this old question as to the hibernation of swallows. He does not indeed affirm his positive belief in their passing the winter, as alleged, buried in mud at the bottom of ponds and rivers, but he declares that the occurrence of this phenomenon rests on as good evidence as many other things which are accepted as facts in natural history, and that his mind, at any rate, is open to conviction. He says: "I see no reason why a swallow should not stay a while in the mud in a state of suspended animation, or greatly lowered degree of vital activity. The thing is physically and physiologically feasible, and is in strict analogy with observed phenomena in the cases of many other animals; and it is not more marvelous than catalepsy, trance, and several other conditions of life, the rationale of which is still obscure." In reviving this old question, which we supposed had for ever been set at rest long ago, Dr. Coues has done all in his power to furnish the means for its solution, in the shape of an elaborate bibliography of the subject, extending over nearly a dozen pages.

The Germination of Mushroom Spores.—It has been generally supposed, and in fact it is asserted in all works on the subject, that the spores of the common edible mushroom cannot be made to germinate until they have passed through the body of a horse or some other graminivorous animal. Mr. W. G. Smith, an eminent authority, denies this, however. He says, in the current number of the *Gardener's Chronicle*, that "it is a mistake to suppose that the mushroom spores will not germinate until they have passed through the stomach of a graminivorous animal, for I have several times seen the spores germinating upon clean glass. I first noticed the fact by accident, after I had left a number of freshly fallen spores under the microscope all night. On looking at the slide in the morning nearly every spore had germinated. But then the spores were perfectly fresh and alive. My observations lead me to think that spores very soon die in unsuitable dry air or when they fall upon any unsuitable matrix. Many other fungus spores will germinate upon glass, it being always remembered that for this purpose the spores must be perfectly fresh from the hymenium of the parent fungus. Fungus spores will grow freely upon damp blotting paper; they cannot be seen when upon this material, but they can be easily transferred (by mere contact) to a damp glass slide. Several dung-borne agarics (as they are often termed), including the mushroom, are not uncommon on the sea sands, in positions where graminivorous animals rarely disport themselves."

A Rival of the Shellac-producing Insect.—The *Colonies and India* states that an American explorer has recently discovered in the little known district of Yucatan, bordering on British Honduras, a valuable insect, possessing properties which ought to make it a rival of the cochineal and shellac-producing insects. This is the *Neen*, or *Niin*, a species of *Coccus*, which feeds on the mango tree and similar plants, and exists in enormous quantities in Central America. It is of considerable size, of a yellowish brown color, and emits a peculiar oily odor, containing as it does a large quantity of fatty oil, or rather grease. This grease is used by the natives for various purposes, being highly prized as a medicinal oil for external application, and it is also employed for mixing paints. It can be made to change its condition very considerably by different processes. When exposed to great heat the lighter oils evaporate, leaving a tough, flexible mass, resembling half softened wax, but unaffected by heat or cold, and which may be used as a lacquer or varnish. When burnt this material produces a thick semi-fluid mass, somewhat resembling a solution of India rubber, which after a few days becomes hard and solid. As a cement this substance will be invaluable, and it might also be used for waterproofing purposes.

Electrical Eels.—According to the *Popular Science Review*, M. Fritsch, after an examination of a fresh specimen of *Gymnotus electricus*, concludes that this fish is allied to the silurids rather than to the eels, and hence the term "electrical eel," by which it has hitherto been popularly known, is a misnomer. He founds this opinion especially upon the structure of the brain, which has the olfactory tubercles small and the cerebellum very large, as in the silurids; whereas in the true eels these parts present exactly the opposite character. Further, in the *Gymnotus*, as in the silurids, the maxillaries are rudimentary, and the margin of the up-

per jaw is formed by the intermaxillaries; in the murenoids, on the contrary, the maxillaries form part of this margin and bear teeth. The structure of the opercula constitutes another agreement with the silurids. From consideration of these and other characters M. Fritsch is inclined to place the *Gymnotus* close to the malapterinini, which also include an electrical species.

The Ivory Nut Palm.—A writer in a recent number of *Science Gossip* states that in 1843 Mr. William Purdie was dispatched to New Granada to collect plants for the Royal Gardens, Kew. He was specially instructed to find a few special plants, one of which was the ivory nut palm. In his account of this Mr. Purdie says: "In a journey of 600 miles, from Santa Martha to Ocana, in New Granada, at the village of Semana, seventeen leagues from hence, and near the great river Magdalena, I entered the mountains, and saw for the first time the ivory nut palm (*Phytelephas macrocarpa*), called *Tagua* by the natives. The habit of this palm is to have little or no stem, what there is is decumbent; it is not a robust tree. Old plants have from fifteen to twenty primary leaves, which when fully grown measure nearly twenty feet in length, of a delicate green color, very graceful, and similar to those of the date palm. The male and female flowers are borne on separate plants. The male flowers are produced generally in six clusters from the bases of the leaves and on short footstalks. The clusters are compact and form a nearly globose head, which, on account of the style-like projections resembling the rigid hair of a negro, is not inaptly called *Cabeza del negro* (negro's head). These heads lie close to the ground, each cluster containing four or five seeds. The seed contains at first a clear insipid liquid, which afterward becomes milky and sweet, and ultimately hardens and becomes the "vegetable ivory" of commerce. Each of these nuts is about the size of a green walnut, and is covered with a yellow, sweet, oily pulp, which is collected and sold under the name of *Pepo del Tagua*. A spoonful of the latter with a little sugar and water makes the celebrated *Chiche de Tagua*, said to be the most delicious beverage of the country.

The stem of the male plant is larger and more erect than that of the female, and the singularity of its inflorescence is only equaled by its beauty. The fragrance is most powerful and delicious, exceeding that of any other plant, and so diffusive that the air for many yards becomes alive with myriads of insects. Mr. Purdie states that he had to carry some of these blossoms twelve miles, and though he killed a number of the annoying insects that followed him, yet the next day a great many still hovered about the flowers, having come all the way from the woods where the latter grew.

Propagation of Rock Fish.—(*Roccus lineatus*.)

A notable achievement in fish culture is reported by the *Baltimore Sun*, namely, the successful hatching of several hundred rock fish or striped bass, as they are more commonly known in this market. The credit is due to Major T. B. Ferguson, of the United States Fish Commission, who thinks it one of the most important gains of fish culture, since the rock fish is good at all seasons and is one of our leading sources of sea food. Hitherto the spawning time of this fish has not been known. The young rock fish now at Druid Hill Park hatching house are the produce of three ripe rock fish taken May 6th at Dr. Capehart's fishing shore, "Avoca," on Albemarle Sound, N. C., near the mouth of the Roanoke river. From these three fish nearly two bushels of eggs, estimated at three millions, were taken and impregnated, but the proper preparation had not been made for their treatment, and the result was not as prolific as could have been desired. Indeed, although the fish commissioners have been long bent on finding out the habits of the striped bass, the capture of these ripe fish was a surprise. They were taken and spawned by Wm. Hamlen, of Baltimore, who resides on Federal Hill, and has been in the employment of the Maryland Fish Commission for several years. Mr. Hamlen was fortunate also in hatching the first smelt, under Major Ferguson, in the Raritan river, and last season he was successful in securing herring eggs, from which 500,000 fish were hatched at Avoca, on Albemarle Sound, and brought to Washington and Baltimore for distribution.

The striped bass hatching was in connection with United States fish hatching work under the superintendence of Major Ferguson, who has thus been instrumental in achieving success first with smelt, then with herring, and now with the striped bass. The eggs of the ripe rock fish are green, opaque, and smaller than the eggs of shad. After impregnation they become fifty per cent larger than shad eggs, and their specific gravity is lighter. They are almost perfectly transparent, and have only a small speck. They have a large umbilical sac, a quarter of an inch long, and almost invisible. In water at the temperature of which shad eggs will hatch in four or five days, rock fish eggs will hatch in thirty-six or forty-eight hours.

The Obelisk.

Mr. Dixon has partially gained his suit against the underwriters for the salvage of the Cleopatra and the obelisk when cast away off the Spanish coast, and *Iron* says the result gives general satisfaction. It is also satisfactory to find that the "Needle" itself has been successfully coated with an indurating solution which it is hoped will protect it for many years from the action of the sulphurous acid that the sea coal fires of the metropolis discharge into the atmosphere to the detriment of most descriptions of stone. The monolith had been greatly injured on the surface from exposure to atmospheric influence in Egypt, especially since it was

thrown down; and it also, owing to the disorganized condition of its exterior, received further injury during its transit to this country. The effect of the silicious wash, we are told, has surpassed expectation, and is only to be compared to the restoration of an old painting. The obelisk first received a thorough cleaning, it was then coated with the solution, and now appears as if just chiseled from the rock, showing its original colors, the quartz and feldspar glittering in the sunlight. The intaglio also comes out much more distinctly than before.

The Metric System.

During the last Congress much evidence was collected with reference to the compulsory adoption of the metric system in this country. Among the papers was the following able report by the Quartermaster General:

"In reply to the reference of the resolution of the House of Representatives, in regard to the objections which may exist to making the use of the metric system of weights and measures obligatory, first, in all government transactions, and second, in all transactions between individuals, and the length of preliminary notice desirable before such metric law goes into operation in the United States, I have the honor to say that if the law makes the use of the metric system obligatory in all government transactions it can be adopted by officers of the Quartermaster's Department as soon as notified by general orders.

"Such an order can be distributed to every military post within the space of one month from the time of its publication, and, if the telegraph be used, within one week.

"The objections thereto which at once occur to me are:

"1. It will very considerably increase the labor of computation, for, in practice, all sellers to the United States will make their deliveries in accordance with the English measures now in general use, and the officers, using the ordinary scales for weight, and the yard, foot, and inch, and bushel, gallon, quart, and pint for measures, will first ascertain the quantities and sizes in the present weights and measures, and then, by the use of tables to be distributed, will reduce them to metric quantities in their statement of their vouchers, receipts, and accounts, which will, it appears to me, be a perfectly useless labor.

"2. This reduction, involving additional calculations and transfers from one set of units to another, unfamiliar, and much less convenient, will infallibly be the source of many mistakes, to the loss of the disbursing officer of the Treasury, or of the person who sells supplies to the United States.

"3. It will be necessary, in order to make the operation of such a law really successful, to throw away all the bay scales and other platform scales whose beams are now divided according to the American standard of units of weight, and all the rules and measures divided according to the yard, foot, and inch, and all the weights, pounds, ounces, or grains, of avoirdupois, troy, and apothecaries' weight, and to purchase, distribute, and substitute new scales and new weights according to the metric system. These changes will be expensive. The trouble and labor I do not speak of, as such labor will, in case of the passage of a law, simply be the duty of all officers and employees of the United States.

"4. If the metric system is made obligatory in government transactions and not in transactions between individuals, then continual confusion and misunderstanding will be caused by the use of one standard by the government and another by the people. All packages are put up by merchants, manufacturers, and producers in accordance with the actual legal standards, pounds, ounces, grains, yards, feet, inches. The transactions of the United States, large as they are, are insignificant compared with those of private trade. Manufacturers and consumers and the people will not change their customs at the call of the officers of the United States.

"In regard to making the metric system obligatory in transactions between individuals:

"I do not believe that this is within the power of Congress. It will be looked upon by the people as an arbitrary and unjust interference with their private business and individual rights, and I do not think they will submit to it. It will inflict, if it can be enforced, a great loss upon many, especially upon manufacturers and mechanics whose shops are filled with costly tools, standard gauges, dies, and machines, all constructed upon the basis of the foot and inch.

"Every geared lathe in the United States depends upon a screw of a certain number of threads to the inch, and all the screws it produces are gauged in pitch and diameter by the inch.

"The meter is not commensurate with the inch, foot, or yard; all reductions are approximate only. The law of July 27, 1866, makes the use of the metric system permissive, legal, but not obligatory, and establishes for the reduction of meters to inches, and the reverse, the ratio of one meter to thirty-nine and thirty-seven hundredths inches, which is not absolutely correct. To alter all this machinery, to change all these machines, gauges, dies, screws, and other parts of engines, will be the work of years—will cost millions of dollars.

"The metric system is not a convenient one for common use. Its measures are not of convenient length. The yard, half the stature of a man, is of convenient length to handle, to use, to apply. It, and the goods measured by it, can be halved, quartered, subdivided into eighths, sixteenths, thirty-seconds, sixty-fourths, etc.; or it can be with equal facility divided into tenths, hundredths, thousandths. Half a meter is no dimension: half a centimeter is an unknown quantity; but half a yard, half a foot, half an inch, half a bushel, one fourth of a bushel, of a quart, of a pint, etc., are recognized. If half a liter, of a deciliter, or a quarter, eighth, or sixteenth of these quantities is provided for, then the metric decimal system is abandoned at once.

"In calculation the metric system applies admirably to money and accounts of money; but even here the government has been obliged to abandon for the convenience of the people the true, strict, decimal system, and to coin half a dollar, half an eagle, the quarter of a dollar, etc.

"In the use of weights and measures, however, there are not so great advantages in the decimal system. The unit is too large, and the numbers produced and used in the calcu-

millionth of the Paris quadrant, is not what it professes to be and was enacted to be) cannot be found in the French metric system.

"1. The unit of length: The meter is 3 280 990 feet, or 39 370 79 inches.

"2. The unit of area: The are is 119 603 32 square yards.

"3. The unit of liquid measure: The liter is 0 264 186 35 + gallon, or 1 056 745 4 + quart, or 2 113 490 8 + pints.

"4. The unit of space: The stère is 1 308 764 + cubic yard, or 35 386 636 + cubic feet.

"5. The unit of weight is: The gramme = 15 432 348 74 + grains troy.

"6. The unit of roads is: The kilometer = 1,000 meters = 0 621 38 + mile.

"7. The unit of land measure for farms and city lots is: The hectare = 2 471 14 + acres.

"8. The commercial unit of weight is: The kilogramme = 1,000 grammes = 2 204 621 25 + pounds avoirdupois.

"What will our farmers, citizens, merchants, tradesmen, and mechanics do with these figures? And will they submit to being obliged to reduce acres, feet, inches, pounds, and ounces by multiplying or dividing by the above figures? "I think that to make the French metric system obligatory between individuals in this country will be an impolitic and arbitrary interference with the rights, interests, and habits and customs of the people."

Self-Reliance.

There is no one element in a man's character that contributes more to his success in life, wisely says the *United States Economist*, than confidence or self-reliance in his own ability. A faint-hearted man is unstable, and will never excel. Faith in the endeavor to will and to execute is as important in a successful business career as is the keystone to the arch. A man possessed of a bold, daring, and resolute will may be modest in revealing his powers, but will be determined in performing what he conceives to be right. To men with this never-dying faith there is no such word as defeat, and when obstacles present themselves in their path, it only results in their putting forth a greater effort to accomplish their purpose.

Toll, trial, disaster, gloom, and danger may environ and threaten to overthrow the most cherished plans, yet over and above all hinderances a heroic soul will triumph and win fame and honor. The discouragements that would retard the irresolute only discover the weak places to the brave, and, strengthening these, they renew the conflict with increased vigor. Timidity creates cowards and never wins success. It is a strong and abiding faith in one's own ability to perform that overcomes difficulties that others thought could not be surmounted.

In all the pursuits of life we find that those who achieve honor and distinction are strong and self-reliant in their own powers, exercise faith in their own ability, and carry out plans conceived in their own brain. Morse had faith in telegraphic wires, and Field in submarine cables, and to-day, in consequence thereof, the lightning is harnessed to convey the news of the world in every part of the habitable globe within the compass of a few hours. Two young men in 1862 commenced a banking business in Wall street in a small office. They had faith in their own ability and also that of the United States to pay its great war debt. To-day they are the leading bankers in government securities on this continent, their daily sales running into the millions, and their name and credit take high rank in all the financial centers of the world. Not many years ago Edison occupied an humble position as a telegraph operator; to-day his name and fame are world-wide as associated with some of the grandest discoveries of ancient or modern times. Astor, Stewart, and Vanderbilt furnish examples in the large fortunes

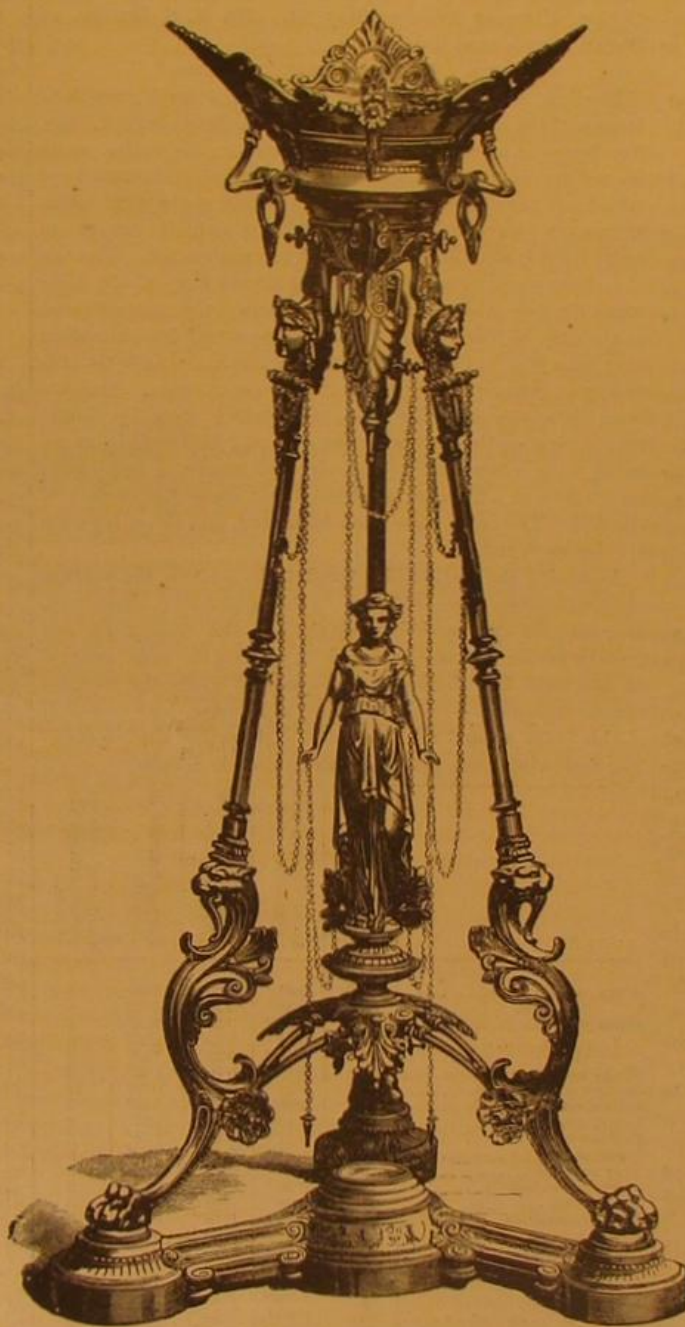
they created as to what well-directed energy and determination can accomplish in business pursuits, while the eventful life of the late Judge Packer is another striking illustration of the high position that can be attained by reliance and perseverance in the individual man, backed by a liberal endowment of common sense. In the ever-widening paths of commerce and the ever-increasing monetary circles there open up before the young men of the nation rare opportunities to win wealth and fortune. In agricultural, mining, industrial, and mercantile pursuits like avenues to attain distinction are presented. But fortune will not come by chance nor distinction by hazard; both must be won by strong, heroic endeavor. Backbone is vital in the achievement of lofty aims, and nerve and grit are essential requisites in the battle of life. A man, to triumph, must have faith in his enterprise and reliance in his ability.

FLOWER STAND.*

The engraving on this page represents an elegant bronze flower stand designed and manufactured by Mr. M. Semey, of Paris, France. A base like the lower portion of the stand is also used as the base for a candelabrum.

The judicious use made of the antique in this composition gives it interest.

* The Workshop: Willmer & Rogers, News Company, agents, 31 Beekman street, New York city.



BRONZE FLOWER STAND.

lations of the engineers are tedious to write and are beyond the limits of ready apprehension.

"The ciphers and figures 0 000 000 73 convey no idea to a mind trained in the English and American system, and yet such combinations are common in French works of science and mechanics.

"The true scientific natural basis of the metric system has been abandoned. The meter was intended and enacted to be the ten millionth of the quadrant of the terrestrial meridian of Paris. In the progress of geodesy and science, it is ascertained that the standard meter bears no (exact) relation to that quadrant, and, though it is probably very nearly the ten millionth of the quadrant of the meridian in which New York lies, it is not probable that it is the ten millionth of either of the three other quadrants of that meridian, or of any quadrant of any other meridian.

"The fact is, that the meter is quite as arbitrary and unscientific a standard as the foot, or yard. It is of less convenient length than either of them, and its compulsory adoption would derange the titles and records of every farm and of every city and village lot in the United States; would put every merchant, farmer, manufacturer, and mechanic to an unnecessary expense and trouble, and all, it seems to me, for the sake of indulging a fancy only, and a baseless fancy, of closet philosophers and mathematicians for a scientific basis of measures and weights which (as the meter is not a ten

Medical Uses of Linseed Oil.

At the last meeting of the American Dermatological Association Dr. Sherwell read a paper on "The Use of Linseed and Oil as Therapeutic Agents in Diseases of the Skin." Every dermatologist, he said, had seen the necessity of introducing fats into the system, and hitherto almost the only available hydrocarbon had been cod liver oil. This disagreed with many patients, and was also open to a number of other objections; while, in the more palatable form of the commercial emulsions now frequently employed, he did not consider it reliable. A more assimilable fat was therefore desirable, and he thought he had discovered it in the flaxseed. He had been induced to try its use by observing the beneficial effects of linseed cake upon cattle and horses, both in making their coats sleek and improving their general condition; and his experience had shown that the agent was of equal service to the human economy. He was in the habit of employing it in a threefold administration:

1. If the patient were a male and had sound teeth, the seed itself was the best form in which to take it. The man could carry about ten ounces of this in his pockets, and would probably consume a teacupful in the course of a day. The ordinary domestic linseed was small and dark in color, and contained only about 20 per cent of oil; while that from Bombay or Calcutta (which was the kind recommended) was larger, lighter in color, and contained about 30 per cent of oil.

2. In the case of women or children the ground seed, mixed with milk in the form of a porridge, was more desirable, and was unpalatable to very few persons.

3. In certain cases it could be given in the form of bread, although he did not consider this method quite so efficient as the others. The bread could be made by mixing linseed meal with flour in any proportion desired. This had been suggested to him by Dr. Piffard. (A loaf containing 60 per cent of the meal was here presented to the association, and was tasted by one or two of the members.)

When linseed was eaten, a natural emulsification was performed with the recent oil found in the stomach, and it had been established by chemists that a recent oil was much more active than one which had been long exposed to oxidation. The hulls also served to stimulate the peristaltic action of the intestines. He believed that it had specific virtues in dry and scaly diseases of the skin, such as pityriasis rubra, ichthyosis, and dry eczema, both on account of its special action upon the sebaceous secretion and its effect in improving the general condition of the patient.

Dr. Sherwell then gave in detail four cases of great obstinacy and severity, in which its curative influence was most happily shown. Two of them were cases of pityriasis rubra, one of pemphigus foliatus, and one of pemphigus vulgaris. He had also employed it with most marked benefit in four cases of ichthyosis, and had cured a large number of cases of chronic eczema with it. The seed was given internally in one of the forms above mentioned, and the oil applied externally. The lubricating effect of the latter was most admirable, and it had the advantage over most other oils of not becoming rancid when exposed to degraded epithelium. In eczema he was in the habit of wrapping the parts affected in a number of folds of linen saturated with it. He believed that flaxseed was a specific remedy for the sebaceous glands, increasing their secretions when it was diminished, and restoring it to its natural character when it had been altered by disease.

Dr. Van Harlingen stated that he had used linseed only in one case, and that was in the form of the oil internally; but he thought there was no beneficial result from it. This, he said, might possibly have been due to the fact that he used the ordinary domestic oil, and not that made from Bombay linseed.

Dr. Piffard said he had used the linseed oil internally, and he thought it was better than cod liver oil in many respects. Cod liver oil itself was fattening, while the iodine which it contained was just the reverse of this; and he thought this might explain why it was that it was impossible to fatten some persons on cod liver oil. The linseed, he believed, contained no starch, and it was, therefore, especially useful in diabetic patients with skin trouble, as well as affording an agreeable change of diet to them. The taste of this bread was not agreeable to many individuals at first; but it was, at all events, much more agreeable than cod liver oil.

Dr. White remarked that the so-called breads for diabetics invariably contained a certain amount of starch, and, therefore, if linseed was really free from starch, it was an important point to remember.

Brick Making on the Hudson.

The New York Tribune gives a detailed report of the brick industry on the Hudson, with the names of the principal firms engaged in the business, the capacity of the works, the output last year, the present supply, and the number of hands employed. It appears that between Tarrytown and Albany there are upward of 150 brickyards, varying in productive capacity from 20,000 to 140,000 bricks a day in the working season. Most of these are on the west bank of the river, which furnishes an inexhaustible supply of proper material. The sand is usually found at the surface, and the clay a few feet below, although the latter is frequently obtained at the surface and the sand at another point near at hand. The tempering machines and brick presses are now nearly all run by steam power; but the material is still carted by horses, and all other parts of the labor are performed by hand. The wages paid last year ranged

from 60 cents to \$3 a day, according to skill and ability to perform, "boss" burners getting the highest wages and boys the lower rate; the whole averaging about \$1.25 a day. The leading establishments—seventy or more in number—have a daily capacity of more than 4,000,000 bricks. Various other small brick firms exist on the river, of which trustworthy data could not be obtained, and doubtless not far short of 400,000,000 bricks are made here in a single season, by about 4,000 men and boys; an average of 100,000 each. The great brick center is Haverstraw Bay, where about forty separate manufacturers are established, including the largest on the river. Haverstraw and vicinity are especially adapted for the work, and their bricks usually lead the market, although various other makers claim to produce an article equally good. In burning this immense quantity of brick it is estimated that 40,000 cords of wood have been consumed, the labor of cutting and hauling which is not easily realized. Cordts & Hutton, of this city, claimed to have burned last season the largest kiln ever burned above the Highlands; it contained 2,250,000 bricks.

The Torrey Botanical Club.

The regular monthly meeting of the Torrey Botanical Club was held in the "Herbarium Room," at Columbia College, Tuesday evening, May 13. Mr. N. S. Britton, of Staten Island, read a paper on

"THE ANNUAL GROWTH OF TREES."

Finding nothing on record as to the annual growth of trees and the number of years that must elapse before a sapling becomes a tree of ordinary dimensions, the author made numerous observations during the past winter, the results of which are here recorded. Three separate notes were taken from each individual tree examined: (1) as to its age, (2) as to its height, and (3) as to its trunk circumference. The age was determined either from actual knowledge of the time when the tree was planted, or by counting the annual rings in the case of felled trees; the latter means of determination may be a year or two in error in some cases, owing to the difficulty in counting where the rings were obscure. Heights were determined in the case of standing trees by simple geometrical methods; and in the case of felled trees by measuring with a tape line. The circumferences of the trunks were taken at a distance of about 3 feet above the surface of the soil. The notes were then tabulated, and those for each species averaged.

Assuming the section of a trunk to be a circle, the average circumferences were reduced to corresponding diameters. Dividing the average height by the age, the average vertical growth per annum was obtained. Applying the same method to ascertain the diameter, the quotient gives the average annual increase in trunk thickness at its base, and one half of this is the annual thickness of the rings for that species. The following table gives a summary of the results:

Trees.	Average age.	Average increase in diameter.	Average increase in ring thickness.	Average increase in height.	Number of trees on which average was taken.
Abies excelsa	32.6	0.61"	0.30"	1.73'	3
" balsamea	30	0.38"	0.19"	1.56'	2
Pinus strobus	27	0.51"	0.25"	1.32'	1
" rigida	32.6	0.31"	0.15"	1.17'	5
" mitis	38	0.45"	0.23"	1.18'	5
Thuja occidentalis	28	0.32"	0.16"	1.15'	12
Juniperus Virginiana	59.7	0.21"	0.10"	0.88'	12
Salix alba	32	1.06"	0.53"	1.62'	3
Liriodendron	38	0.45"	0.22"	1.57'	1
Juglans nigra	26	0.41"	0.20"	1.35'	2
Quercus alba	47.3	0.35"	0.18"	0.88'	6
Acer rubrum	28.4	0.45"	0.23"	1.51'	5
Carya tomentosa	70.4	0.30"	0.10"	0.95'	5
Betula alba	34	0.18"	0.09"	1.22'	3
Fagus ferruginea	44.8	0.36"	0.18"	0.78'	5
Ulmus Americana	38	0.52"	0.26"	1.51'	2
Castanea vesca	52.3	0.51"	0.25"	0.96'	7
Sassafras	27.1	0.23"	0.12"	0.96'	8
Catalpa	32	0.55"	0.28"	1.39'	5
Alnus incana	31	0.59"	0.29"	1.46'	11
Apple	23	0.65"	0.32"	1.33'	6
Cherry	29	0.54"	0.27"	1.40'	7

The notes were all taken near New Dorp, Staten Island, over an area of, say, three square miles, so that differences due to soil and rainfall must be small, and need not be taken into consideration. The average rates of growth given in this table do not of course apply to the trees at every period of their existence, since all trees grow much more rapidly in a vertical direction when young; the annual increase in diameter is more constant, but there is a slight decrease in ring thickness as they grow older, especially noticeable in old trees, and where much crowding has taken place.

In the discussion which followed attention was called to the fact that although the chestnut is usually considered a rapid grower, yet according to Mr. Britton's table it was surpassed in this respect by most other trees. In explanation of this, Mr. Wright, of Staten Island, remarked that according to his own observations the chestnut was of slower growth near the sea coast than inland.

A large number of plants, both wild and cultivated, were as usual exhibited by different members, and among them a magnificent clump of *Helonias dioica*, which was brought in by the Vice-President, Mr. Addison Brown. Mr. Wright exhibited a very interesting sprout of the peach tree in which the flowers were perfectly white and smaller than those of the normal form. Mr. Wright stated that the fruit borne by the tree was also white. Prof. A. Wood exhibited a specimen of the long lost but recently rediscovered *Shortia galactiifolia*. Mr. Leggett exhibited a profliferous specimen of *Hepatica triloba*, in which the flowering stalks arose from the bracts at the summit of the main stem.

The Largest Orchard in the World.

The Rural Home is inclined to think the very profitable orchard owned and cultivated by Mr. Robert McKinstry, of Hudson, N. Y., is the largest in the world. If there is a larger we should be happy to hear of it.

The orchard is situated on the east bank of the Hudson river, on high, rolling table land, and contains more than 24,000 apple trees, 1,700 pears, 4,000 cherries, 500 peaches, 200 plums, 200 crabs, 1,500 vines, 6,000 currants, and 200 chestnuts. The varieties grown are: Rhode Island greenings, 7,000; Baldwins, 6,000; King of Tompkins County, 4,000; Astrachans, 800; Northern Spy, 500; Wagener, 500; Gravenstein, 400; Cranberry Pippins, 200; Ben Davis, 200; Dutchess of Oldenburg, 200; with Jonathans, Hubbardstons, Cayugas, Vanderveers, Pearmaines, Peck's Pleasants, 20 ounce Pippins, Russets, and others in less number.

The pears are Bartlett, B. d'Anjou, Sheldon, Seckel, and Lawrence chiefly. Of cherries there are twenty-eight varieties. The orchard is intersected by roads over six miles in length for the passage of wagons, and is bounded by a continuous row of apple trees set ten feet apart for four miles and a half. The apple crop of last year was 30,000 barrels. Twenty-four men and fourteen horses are employed hauling out the crop or in plowing.

The success of this orchard has not been achieved, nor is it maintained, without the closest supervision and most industrious work. The oldest trees are about twenty years old. The soil is dry, rolling gravel, with some limestone; the trees are planted twenty feet apart, and do not by any means seem to be crowded. The ground is plowed several times in the year and kept fallow; except when thought advisable it is seeded to clover. Suckers and sprouts are removed as soon as seen; the borers are watched and followed with vigor. Wires are used to reach them in their burrows, and the damaged bark is removed with chisels.

Peter B. Laweon.

Peter B. Laweon, chief engineer and superintendent of the West Point foundry, died May 14, at Cold Spring, on the Hudson. He was born at Low Point, Dutchess county, in 1810, and, having but few advantages of early education, was apprenticed to the West Point Foundry Association, then located in this city. At the age of twenty-one he was appointed by Mr. William Kemble, the proprietor, to the position of foreman of the machine shop, and the wisdom of the selection was verified by fifty-three years of active service, not only under his first patron, but the succeeding administrations of Mr. Gouverneur Kemble, Captain Robert J. Parrott, and the present firm of Paulding, Kemble & Co. As an inventor his patents have the merit of universal adaptation. To use his own expression, "I have never invented anything until the necessity arrived." His "slotter" for heavy iron work arose from the continual breakage of the best machinery in the building of the Collins line of steamships, and it is now in use all over the world. In steam engineering he was also eminently successful, he being the constructor of the engines of the United States steam frigate Missouri (burned at Gibraltar), the United States frigate Merrimac (afterward the terrible ram of Hampton Roads), the pumping engines at the Brooklyn Navy Yard, and many others. He was the first to discover that the windage of a rifled cannon ball could be annulled by a band of soft metal on the projectile, to be expanded into and cut by the rifling of the rim by the same explosion that propelled the missile. This patent expanded into the well known shot of his friend Captain Robert J. Parrott, used with such terrible effect during the late war. He was fine in personal appearance, possessed of great executive ability, and kind and genial in his disposition.—*New York Herald*.

Independent Silk Weavers.

The Times' report of the industrial condition and prospect of Paterson, N. J. (now more favorable than the city has ever known before) states that the greatest expansion has been in the silk industry; new mills are going up all the time, and during the darkest days of the "hard times" the erection of silk mills scarcely stopped, until now they employ nearly twice as many hands as they did six years ago. Besides, the system of manufacturing in the homes of the workmen has attained wonderful proportions within a few years. When the hard times came, and weaving fell off, many of the weavers began to manufacture in a very small way for themselves; as they succeeded, others tried it, and to-day there are not less than 500 looms owned by practical weavers, and operated under their immediate supervision in rooms, garrets, sheds, and every place where a loom can be worked. Whole families thus find employment in their own homes; the men do the most difficult part, the women and children assist, and all feel that they are working for themselves. The profits of the trade are said to be small, for the largest as well as the smallest manufacturers, but the business is unmistakably prosperous, and many of the great mills have worked overtime for many months.

Notwithstanding the development of vast mills and other huge manufacturing establishments, incident to the use of steam and the accumulation of capital, the opportunities for independent production by individual workers are more numerous and more profitable to-day than ever before—for workers with small capital, we mean. No able worker who really wishes to be his own master, and is willing to work, need lack for chances. The man who will let himself become the "slave of capital" is usually incompetent of self direction and real independence.

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.

The best results are obtained by the Imp. Eureka Turbine Wheel and Barber's Pat. Pulverizing Mills. Send for descriptive pamphlets to Barber & Son, Allentown, Pa.

National Steam Pump; best and cheapest. Send for prices. National Iron Works, New Brunswick, N. J.

Emerson's Patent Inserted Toothed \$100 Gold Premium Solid Saws are superseding all others. Send your full address for our Sawyer's Own Book (free). See illustrated adv. p. 381. Emerson, Smith & Co., Beaver Falls, Pa.

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

To accommodate our friends and customers in different sections of the country we take this method of notifying them that our goods can be procured of the following: Philadelphia branch, 416 Arch St.; San Francisco branch, 5 First St.; C. W. Trainer & Co., 150 Oliver St., Boston, Mass.; E. & T. Fairbanks & Co., St. Johnsbury, Vt.; E. G. Marvin, 86 Main St., Buffalo, N. Y.; F. H. Wilson, 37 Light St., Baltimore, Md.; W. M. Bird & Co., Charleston, S. C.; A. P. Lufkin, Galveston, Texas; Semple & Birge Manufacturing Company, St. Louis, Mo.; T. S. & A. J. Kirwood, 171 Lake St., Chicago, Ill.; Parker, Wise & Co., Cincinnati, Ohio; S. W. Hempstead & Co., Columbus, Ohio; Moore & Kerriek, Indianapolis, Ind.; C. A. Parker & Co., New Orleans, La. H. W. Johns Manufacturing Company, sole manufacturers of genuine Asbestos Liquid Paints, Roofing, Boiler Covering, etc., etc., 57 Maiden Lane, New York.

For Sale.—9 pieces 2 7-16 turned shaft, 11 feet long; coupled; good as new. Frisbie & Co., New Haven, Ct.

American Fruit Drier Mfg. Co., Chambersburg, Pa.

Cheap.—Nearly New Vertical Tubular Boiler, 30 x 60 inches. Box 121, Salisbury, Md.

Downer's Anti-Incrustation Liquid.—J. W. Hamburger, Wholesale Furniture Manufacturer, Hester and Elizabeth Sts., New York, says: "Your Boiler Liquid is a success. I am using hard well water, but your Liquid prevents the formation of scale, and my tubes are clean. I shall continue to use it, and heartily recommend it to others." A. H. Downer, 17 Peck Slip, New York.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Factory Fire Hose.—A large lot for sale cheap. W. F. Corne, Agent, 117 High St., Boston, Mass.

For Sale.—Canadian Patent for Automatic Mash Machine, successfully introduced in the U. S. A most valuable invention, capable of being successfully introduced in every brewery. A rare chance for a live man. Michael J. Stark, Buffalo, N. Y.

Wanted.—A good Metal Pattern Maker of considerable experience. Sargent & Co., New Haven, Conn.

For Stationary or Portable Engines, Circular Saw Mills, Grist Mills, and Mill Machinery, good and cheap, address the old manufacturers of Cooper Mfg. Co., Mt. Vernon, O.

H. Prentiss & Co., 14 Dey St., New York, Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

"Workshop Receipts" for Manufacturers, Mechanics, and Scientific Amateurs. Illustrated. \$2, mail free. E. & F. N. Spon, 445 Broome St., New York.

For Screw Cutting Engine Lathes of 14, 15, 18, and 22 in. Swing. Address Star Tool Co., Providence, R. I.

The Horton Lathe Chucks; prices reduced 30 per cent. Address The E. Horton & Son Co., Windsor Locks, Conn.

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Boilers ready for shipment. For a good Boiler send to Hilles & Jones, Wilmington, Del.

Shaw's Mercury Gauges, 5 to 50,000 lbs.; accurate, reliable, and durable. T. Shaw, 915 Ridge Ave., Phila., Pa.

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Eagle Anvils, 9 cents per pound. Fully warranted.

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Eclipse Portable Engine. See illustrated adv., p. 392.

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Linen Hose.—Sizes: 1 1/2 in., 2 in., 2 1/2 in., 3 in., 3 1/2 in., 4 in., 4 1/2 in., 5 in., 5 1/2 in., 6 in., 6 1/2 in., 7 in., 7 1/2 in., 8 in., 8 1/2 in., 9 in., 9 1/2 in., 10 in., 10 1/2 in., 11 in., 11 1/2 in., 12 in., 12 1/2 in., 13 in., 13 1/2 in., 14 in., 14 1/2 in., 15 in., 15 1/2 in., 16 in., 16 1/2 in., 17 in., 17 1/2 in., 18 in., 18 1/2 in., 19 in., 19 1/2 in., 20 in., 20 1/2 in., 21 in., 21 1/2 in., 22 in., 22 1/2 in., 23 in., 23 1/2 in., 24 in., 24 1/2 in., 25 in., 25 1/2 in., 26 in., 26 1/2 in., 27 in., 27 1/2 in., 28 in., 28 1/2 in., 29 in., 29 1/2 in., 30 in., 30 1/2 in., 31 in., 31 1/2 in., 32 in., 32 1/2 in., 33 in., 33 1/2 in., 34 in., 34 1/2 in., 35 in., 35 1/2 in., 36 in., 36 1/2 in., 37 in., 37 1/2 in., 38 in., 38 1/2 in., 39 in., 39 1/2 in., 40 in., 40 1/2 in., 41 in., 41 1/2 in., 42 in., 42 1/2 in., 43 in., 43 1/2 in., 44 in., 44 1/2 in., 45 in., 45 1/2 in., 46 in., 46 1/2 in., 47 in., 47 1/2 in., 48 in., 48 1/2 in., 49 in., 49 1/2 in., 50 in., 50 1/2 in., 51 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tion with a gas or water pipe; if possible it should be at a brass section of the pipe rather than an iron or lead, and it should be soldered when possible. The surface should be thoroughly brightened and the wire given ten or twenty turns around the pipe. In cases where a gas or water connection cannot be reached, a very good ground can in many cases be made by driving a rod of iron five or six feet into the ground; this will generally work well if the wire is soldered to it. A sheet of zinc or galvanized iron of say 10 square feet surface will answer every purpose if the soil is not too dry. It should be set in a vertical position. I have a galvanized sheet iron ground which has worked well for six years. In sections of country where the soil is shallow a greater surface will be necessary to make up for the lack of depth. I have made good grounds by soldering a number of old oyster cans to a wire, and by burying iron turnings and filings in a trench. A failure of any of these methods should not discourage, as it often happens that a change of a few feet in the location will find success.

(27) G. W. L. asks how to enamel paper tubes and packages to contain butter, lard, etc., and similar substances. A. A sirupy alcoholic solution of bleached shellac mixed with terra alba or other opaque harmless earth has been employed for similar purposes.

(28) H. M. J. asks how phosphor bronze can. A. See p. 411 (30), vol. 39, SCIENTIFIC AMERICAN.

(29) R. & T. write in answer to W. M. M., query No. 23, page 303, current volume of SCIENTIFIC AMERICAN: It is necessary for a practical man to have the mill stone before him and to know what quality and quantity of work is required of the same, also to see the grain to be ground; because of the many different circumstances controlling the millstone, it is impossible to lay down any fixed rule for a stone, as we are governed solely by conditions, and as such, milling is not a science but an art, and must, therefore, be handled to suit circumstances and conditions.

(30) D. J. W. asks for a receipt for making a blue writing ink that can be made in small quantities, say 1/2 gallon, of these qualities: color bright blue, will not settle or thicken on exposure to the air, and flows freely. A. Copier's blue, also known by the name of indulin, dissolved in water in the ratio of 20 parts to 1,000 of water, forms a writing ink of a good color, which it retains when treated with chemical agents. It does not corrode steel pens. Anything added to ink to prevent evaporation also tends to prevent it drying when written with. Replace the water lost by evaporation occasionally.

(31) W. H. H. asks: 1. Will ordinary coal lose a part of its weight by being exposed to the air and sun? A. Yes, if it contains much moisture and sulphides. 2. If it does, what per cent of its weight will it lose? A. It depends upon the amount of moisture, sulphides, etc., present in the coal, and the conditions, time, etc., of exposure.

(32) H. L. writes: I have a good deal of trouble with my lard, which I work every day in the hot weather: it gets sour very often. Can you suggest anything that will keep lard sweet? A. In hot climates a small quantity of calcium sulphite is sometimes used, a few grains to the ounce.

(33) D. W. C. writes: In your issue of March 29, page 203, W. M. M. asked: "In laying off a millstone in furrows, what draught is given; what amount of the space of a stone is given to furrows and what to grinding surface?" The draught of the furrows of millstones should be in proportion to their diameters, that is, to give stones of different diameters equal draughts, the distance of their furrows from the center must be in direct proportions to their diameters. A stone four feet in diameter, the draught of the leading furrows should be two inches from the center of the stone, and all other small furrows should be parallel to the leading furrows; the whole surface of the face of the stone should be given to furrows, to form edges; because the principle of grinding is that of shears clipping; the furrows serving as edges to cut the grain; therefore, it is plain that the more cutting edges the stone has, the faster it will grind. The best dress that I have put on a stone is laid off in this form: divide the face of the stone into sixteen leading furrows; then divide the sections of the stone into as many straw furrows as possible. These straw furrows should be very narrow, and be made parallel with the leading furrows.

(34) C. M. D. writes: Please inform G. M. A., in "Answers to Correspondents," that he can get a very good and durable coat of brown on his gun, by allowing it to get covered with salt spray and letting it rust for a day or two, after which he must rub off the loose rust and give the barrel a couple of coats of oil.

(35) S. B. G. asks: 1. Should a violin be left in tune when laid away? A. Yes. 2. At what angle to the axis of the wheel should the wings of a wind power be set? A. The mean angle should be from 15° to 17° from the plane of rotation of the wheel. 3. If a small log be split into halves or quarters it will spring outward, and appears as though the heart side is longer than the bark side. What is the cause of it? Does the wood of the bark side contract, or does the wood of the heart side lengthen? A. The moisture sap wood probably contracts most on exposure to the air.

(36) J. H. asks: 1. What kind of wax or varnish is used in etching on steel with nitric acid? A. Beeswax or paraffin. 2. What parts of a locomotive are called the journals? A. The cylindrical parts of the axles, which revolve in the boxes. 3. A friend of mine has been disputing with me about governors; he says that they are all self-regulating, while I claim that the engineer has to judge from the speed of the balls. A. All governors are intended to be automatic or self-regulating.

(37) W. S. W. asks: 1. Can a young man get enough knowledge of locomotive engineering by hard study, to materially lessen the time required on an engine as fireman? If so, what time would it require and what books would you recommend? A. Yes. "Bourne's Hand Book of the Steam Engine," and "Furney on Locomotives," and "Reynolds' Locomotive En-

gine Driving." 2. How long should a young man, who has a taste for the business, fire a locomotive before being qualified for promotion to engineer? A. It depends upon his intelligence, application, and observation. 3. What traits of character are required in order to become a good locomotive engineer? A. System; habits of close observation; readiness of resource; a cool head, and great presence of mind. 4. Is there any difference in the power of two locomotives of equal weight, one having 4 and the other 6 drivers, the drivers to be of the same diameter? A. No, if friction is not considered. 5. What is about the average weight of American locomotives? A. 35 to 35 tons.

(38) C. B. asks: 1. Have any vessels been constructed to go under water? A. Yes; Fulton constructed one, and in the early years of the late war there were at least two successfully operated in New York harbor. 2. Have any electrical engines of one horse power or more been invented? A. Yes, there have been many made of small power. You will find descriptions of both of them in the back numbers of the SCIENTIFIC AMERICAN.

(39) B. F. asks: Does it take any more power to force a column of water through 1,000 feet of pipe on an inclined plane and raise it 70 feet than it does to force a column through 70 feet perpendicularly? A. Yes, by the amount of friction of the increased length of pipe required.

(40) J. D. asks: What size wire cable was in use at the hauling off the steamship *Americus* into deep water at the time she was stranded on Long Branch Beach, and also what power engines were in use on her to get her off? A. No wire rope used, but four 18 inch hemp cables, with blocks and falls from the cables to the drum of the ship's hoisting engines.

(43) M. O. D. asks: 1. Do you know of any materials that are preferable to infusorial earth and wrought iron turnings for use in a vessel for filtering drinking water? Will it answer to mix them together in one mass? A. Well burned granular charcoal is in many cases preferable to iron in such a filter. You will find an excellent article on the purification of drinking water on p. 414 et seq., Science Record for 1874. See also p. 346, vol. 39, SCIENTIFIC AMERICAN. For the purification of water containing much organic matter, Dr. Crookes recommends the addition in the proportion of from one to two parts of the following mixture to every 1,000 parts of the water: Permanganate of lime, 1 part; sulphate of alumina, 10 parts; fine pipe clay, 30 parts; intimately mix. After settling for 15 minutes the water can be drawn off from the sediment without filtering. 2. Is there any objection to a brass vessel fitted inside? A. Yes, wood is preferable. 3. Are tinned iron wire screens objectionable; how fine should the mesh be? A. Stout cotton cloth will be found more serviceable, and is less objectionable. 4. Will the same filtering materials answer for boiler feed water? If thoroughly cleaned once a day how long a time will the filtering materials last? A. It would depend much upon the water.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

L. S. S.—21. A green trap rock, contains pyrite, quartz, and garnet. 22. Similar to No. 21 with serpentine. This sample contains traces of gold.—J. C.—Apatite, calcium phosphate, containing more or less calcium chloride and fluoride.—E. H. A.—Fossiliferous limestone.—C. I.—Arsenical pyrites in talcose slate. It contains traces of gold.—J. R.—No. 1. Chiefly hornblende and calcite containing graphite (plumbago). No. 2. To get the value of mineral specimens you should address some dealer in minerals.—E. E. C.—The bead is composed chiefly of lead. It contains a trace of silver.

COMMUNICATIONS RECEIVED.

On the Whirlpool. By T. P. R.
On Consumption. By R. R. G.
On the Anatomy of an Elephant. By A. J. H.
On the Destruction of Insects. By F. L. J.
Removing Stains. By J. C. W.

[OFFICIAL.]

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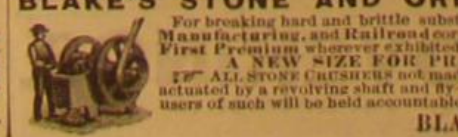
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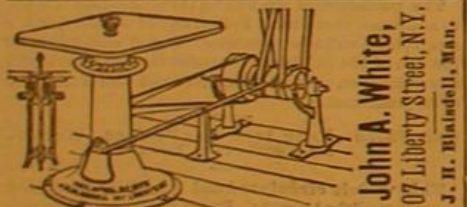


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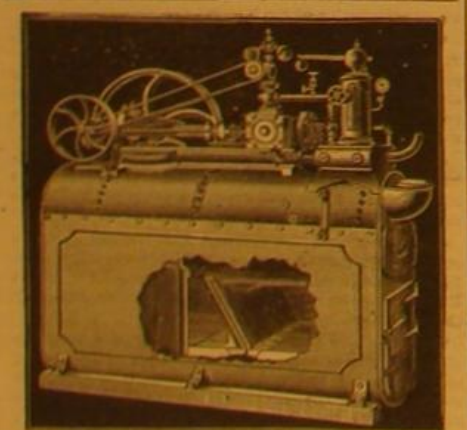
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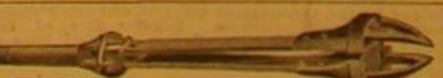
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Vol. XL.—No. 26.
[NEW SERIES.]

NEW YORK, JUNE 28, 1879.

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A NEW SWITCH CONTROLLER.

The frequently recurring accidents caused by misplaced switches have suggested a field for invention, to which—especially since several notable accidents due entirely to this cause—inventors have turned their attention, and with considerable activity have produced devices for avoiding these accidents. Perhaps the simplest of these devices is the switch controller shown in the accompanying engravings, and recently patented by Mr. Henry Greenway, of Brooklyn, N. Y.

In this apparatus the entire management of the switches is placed in the hands of the engineer, who controls them by means of a simple lever in the cab of the engine. So far as the fittings of the engine are concerned they are of the simplest character. A lever in the cab, which is provided with a curved rack and detent much like the reversing lever of the engine, is connected by a rod with a lever at the upper end of a short vertical shaft, journaled in suitable boxes in the cross piece of the pilot truck. To the lower end of the vertical shaft is secured a lever, A, whose forward end is tapered and somewhat rounded, while its rear end is shorter and thicker. This lever the inventor calls a rudder.

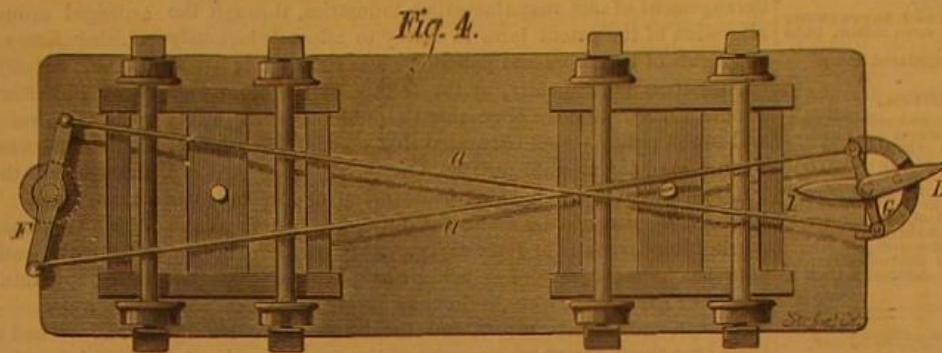
The track, the arrangement of which is also very simple, is shown in plan in Fig. 2. E E are the branch rails, and

E' E' the rails of the main track. The movable switch rails, D D', are pivoted at the frog and connected so that they move together. Between the switch rails there are two levers, B C, which are pivoted to the tie beams and jointed together. The lever, B, is connected with the movable switch rails, and

termines the direction to be taken by the locomotive by moving the switch rails to the right or left through the levers, C B. The tender is fitted with a contrivance similar to that on the engine, so that when the engine runs with the tender ahead, the switch may be operated equally as well. The

arrangement of the levers, rods, and the rudder is shown in the inverted plan view, Fig. 4. F is a lever at the forward end of the tender, which is connected with the rudder lever, G, by two rods, a. In this case the rudder has a movable portion, H, and a fixed portion, I. It will be seen that the entire control of the switch is in the hands of the engineer, who has more anxiety as to the safety of his engine and train than any one else could have. It is the belief of the inventor that switch tenders under the existing systems have either too much or too little to do. Having too much, he is liable to become confused; having too little, he is liable to become negligent. In all motors, with the exception of the locomotive, the power of guiding has been

vested in the driver or pilot. Mr. Greenway has attempted to give locomotive engineers the same power, so that there should be no mistakes as to the direction to be taken by the engine. Mr. Greenway has a very pretty working steam model for exhibiting his invention at his office, No. 34 Park Row, room 30, New York city.



GREENWAY'S SWITCH CONTROLLER.

the lever, C, extends into a notched buffer block placed on one of the ties midway between the rails of the main track. At this point in the lever, C, a stud stands up high enough to be engaged by the rudder, A, as the pilot truck of the locomotive approaches the switch. Moving the rudder, A, one way or the other by means of the lever in the cab, de-

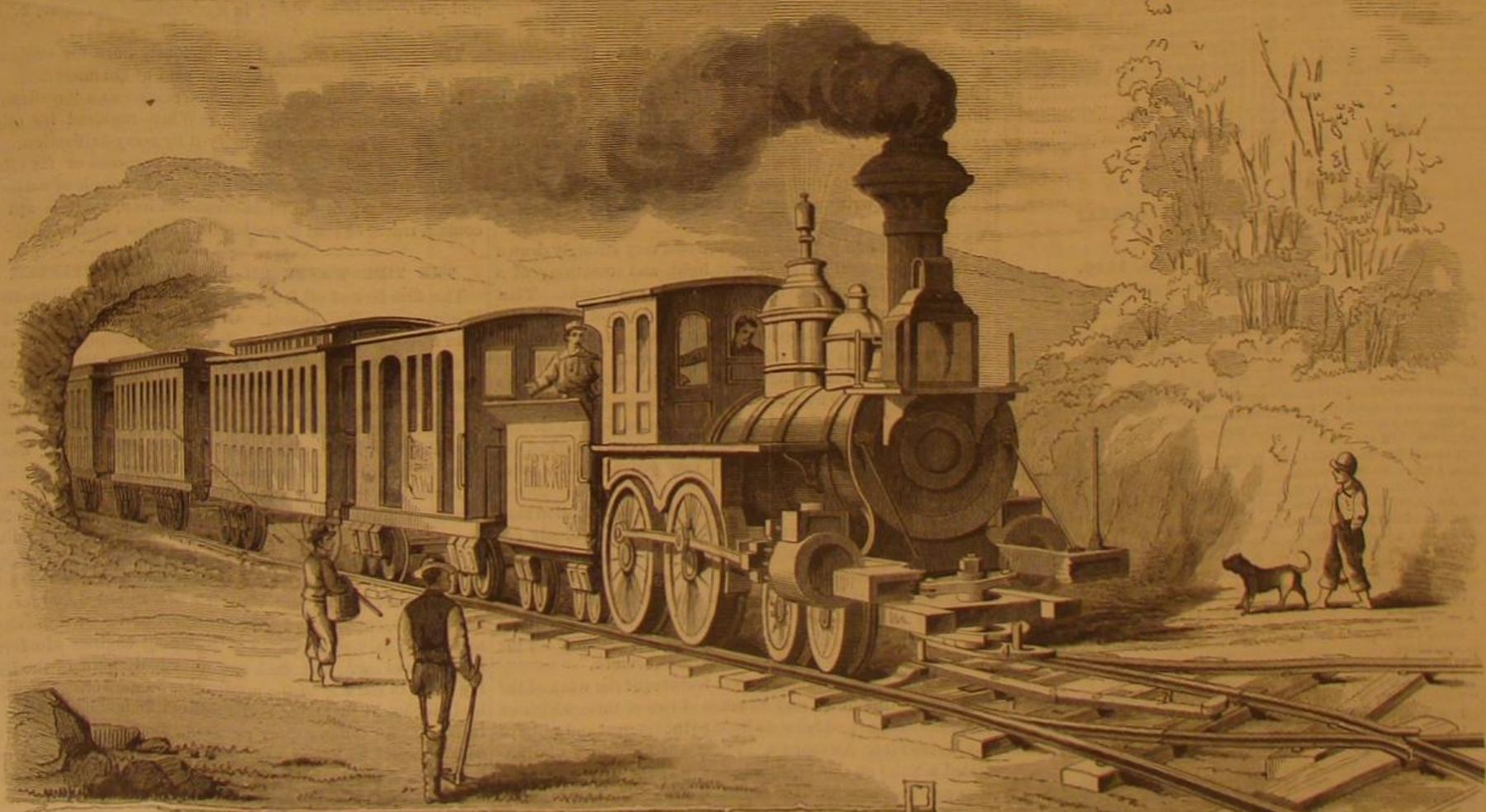


Fig. 2.

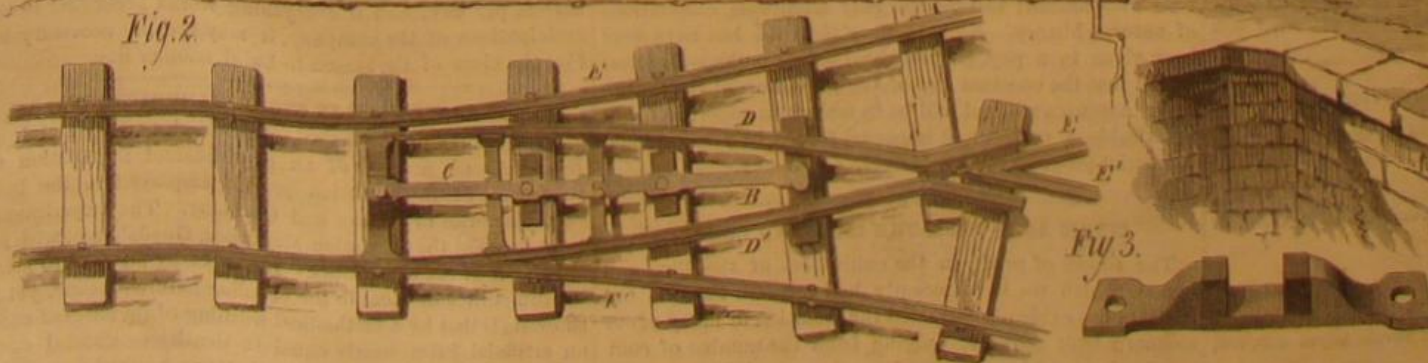


Fig. 3.

GREENWAY'S SWITCH CONTROLLER.

Scientific American.

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NEW YORK, SATURDAY, JUNE 28, 1879.

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- VI. MISCELLANEOUS.—Dyed Cocoons.
Porosity of Stone.
Disastrous Earthquake in Persia.

SIX MONTHS OF SCIENTIFIC PROGRESS.

The scientific and industrial record of another half year is completed with this issue of the SCIENTIFIC AMERICAN. It is believed that no scientific enterprise of popular interest, no notable occurrence, no great industrial undertaking, no important discovery or invention—in short, nothing pertaining to the world's best thought and action during the past six months has failed of timely notice in these pages, while in character and number the illustrations which have given instruction as well as pleasure to our readers are such as to compare favorably not only with those of the preceding volumes of the SCIENTIFIC AMERICAN, but those of any other popular journal ever published.

When Volume XL. was begun there still prevailed in many quarters no little doubt and misgiving with regard to the immediate industrial future. The confidence expressed by the SCIENTIFIC AMERICAN in the continued improvement in American industrial affairs has been happily justified, and there is every reason to believe that the prediction that the country was entering upon an era of unexampled prosperity will but feebly express the ultimate fact. The threatened derangement of our manufacturing industries, through the alteration of the patent laws in a way to affect injuriously the rights of inventors and patentees, was fortunately averted, we trust permanently, by the failure of the obnoxious Senate bill 300; and we hope that the public sense of justice and sound policy which frustrated that scheme will prevent a renewal of the attempt next winter.

The steady improvement in the American export trade has been almost as marked a feature of our recent history as the marked improvement in domestic trade. Particularly noticeable has been the outspoken acknowledgment of the superiority of many American products by English and European statesmen and manufacturers, and the frank admission by them that the industrial supremacy of the world lies in the near future with America.

Among the notable improvements in the arts brought forward recently, mention may be made of Barff's process of obtaining a protective coating to iron, Holloway's utilization of the sulphides in ores as fuel, and the new composition for the lining of Bessemer converters, making possible the use therein of phosphorus bearing ores.

The completion of the Sutro Tunnel, the progress on the tunnel of St. Gothard, and the completion of the Joseph H. Mining Adit, are perhaps the most notable achievements in engineering that will occur to our readers. The meeting of the International Inter-oceanic Canal Congress at Paris promises to mark an important date in the history of man's victories over nature, but its significance can be determined better a dozen years hence.

In pure science there is nothing more important than the investigations of Prof. Crookes with regard to the behavior of electrified molecules in vacuo. His observations are certainly curious, his methods are extremely delicate and skillful, and the results obtained are wonderfully suggestive. What more may come of them the future only can determine.

Among the more important inventions our readers will recall Cowper's writing telegraph and Edison's loud speaking electro-chemical telephone.

Six months ago popular attention was very strongly drawn to the development of the electric light, and something of a panic prevailed among the holders of gas stocks. That flurry has blown over. The electric light has not fulfilled its promises, and Mr. Edison's assertion that his latest lamp is a complete success falls on indifferent ears. The world is not so eager for the change as it appeared, and on all sides the disposition is to await developments patiently. Possibly after all the "light of the future," suggested by the SCIENTIFIC AMERICAN several years ago, and recently worked out practically by Molera and Cebrian, may prove the final solution of the problem.

Among the false lights of the immediate past mention may be made of the extremely confident but suddenly extinguished pretensions of the Hosmer and Gary motors. Instead of revolutionizing the industries of the world by force self-generated, they have dropped out of sight with the thousand other motors of the impossible sort. To which class we may properly add also Mr. Keeley's machine for the utilization of "inter-molecular etheric substance."

In this hasty glance at the salient features of the work of the past six months notice may be taken of two or three which we are confident have added not a little to the interest and value of the SCIENTIFIC AMERICAN. These are the series of illustrated articles on our leading industries; the papers on amateur mechanics, with their practical suggestions and numerous illustrations; and the specially admirable illustrations of natural history. Nothing finer than the last have ever been given in a popular periodical. It is perhaps needless to add that the constant aim of the publishers of the SCIENTIFIC AMERICAN is and will be to make this paper, so far as practicable, a perfect and impartial record of scientific and industrial progress the world over.

CITRIC ACID—FROM THE LIME AND LEMON.

The source of profit in the cultivation of the lime and lemon, which we have recently had occasion to point out (p. 339), has evidently attracted the attention of many of our southern fruit growers, judging from the number of communications and inquiries we have since received respecting the industry.

For the benefit of those interested in the matter we give

the following outlines of the process for obtaining the citric acid from these fruits:

After removing the seeds and peel, the fruit is subjected to strong pressure—a good cider press answers very well on a small scale. The expressed juice is then evaporated in copper or leaden pans (porcelain enameled iron vessels would be less objectionable) at a temperature not exceeding 150° Fah. until it has a density of about 1.23, when it is a dark, thin sirupy liquid containing from 27 to 32 per cent of citric acid.

An instrument termed a *citrometer* is sometimes used to measure the amount of citric acid in the fluid, but the method cannot be relied on, owing to the variable amount of saccharine and other matters present and to the fact that a small portion of the acid is almost invariably decomposed during the concentration. The concentrated juice usually comes into market in casks containing about one hundred gallons.

To obtain the citric acid from the juice it is first clarified by filtration, heated to about 200° Fah. in a lead lined vat, by means of steam circulating in a coil of leaden pipe arranged around the inner side of the vessel. Powdered whiting (lime carbonate, chalk) is then gradually added until the acid is fully saturated, a point readily determined by its ceasing to effervesce. The whiting must be added in small quantities, suitable to the amount of liquor under treatment, and the mixture kept constantly agitated by machinery until the whole of the acid present is converted into insoluble calcium citrate. The mixture is then allowed to settle, after which the supernatant liquid is drawn off and the residue repeatedly washed with warm water, by decantation, the agitating apparatus being set in motion after each addition of fresh water.

The washed citrate is then transferred to a similar vessel, where it is agitated with hot dilute sulphuric acid in the proportion of about 9½ parts of strong acid diluted with six times its weight of water, to every 10 parts of whiting previously used. By this treatment the calcium citrate is decomposed, sulphate of lime and free citric acid being formed. The mixture is drawn off into a settling tank in which the heavy sulphate subsides, while the clear solution of citric acid is drawn off into lead lined vacuum pans, where it is concentrated by steam heat. The concentrated solution of citric acid is then passed through canvas bag filters usually containing a small quantity of boneblack, previously freed from phosphate of lime by dilute hydrochloric acid. The filtrate runs into crystallizing pans placed beneath, in which it stands until the crystals cease to form.

The mother liquors are run back into the crystallizing pan, and the crystals are dried in a centrifugal machine, or by other suitable means.

The article thus obtained is sufficiently pure for ordinary purposes, and represents the citric acid of commerce.

It is largely used by the dye calico printer as a "resistant" for iron and alumina mordants. When required for other purposes it is necessary to purify it by recrystallization.

Citric acid to be used for medicinal purposes or for effervescing drinks, etc., should be prepared in vessels of earthenware, porcelain, or porcelain-enameled iron, as it is apt to contain traces of lead if prepared in leaden vessels.

THE TIDE WATER OIL PIPE LINE COMPLETED.

The first flow of oil from the Bradford oil district reached Williamsport, Pa., June 4. Only a few trifling leaks have been discovered in the entire length of the pipe, or over a hundred miles. The line starts at Williamsport and runs slightly north of west over the mountains into Potter county and on to Coryville, or Frisbie, the initial point, in McKean. It passes over a high range of mountains near the village of Waterville, at the forks of Pine creek, where great difficulties were overcome in laying the pipe.

There are tanks at Coryville and a pumping station. The next pumping station is at a point about four miles from Coudersport, where tanks have been put up and buildings erected for the engine, etc. The distance from Coryville to pump station No. 2 is 23¼ miles; from there to Williamsport is 77½, and the oil when raised 1,200 feet at the summit, runs down to Williamsport of its own gravity, as the fall is 2,100 feet. The pumping engines are forty horse power each, and each has an equal share of the lifting to do in the way of the application of power. The pipe is six inches in diameter, and required 28,000 barrels of oil to fill it. At Williamsport receiving tanks holding nearly 60,000 barrels had been provided, and seventy oil cars were in readiness to transport the first flow of oil over the Reading railroad. The capacity of the pipe line is about 6,000 barrels per day, and if everything works according to the anticipations of the company, it may become necessary before the close of the season to build another line.

IMPROVEMENT IN SUGAR MANUFACTURE.

A sugar planter and manufacturer sends to the *Martinique Bienpublic* an account of an experimental application to sugar cane of the diffusion process employed in the beet sugar factories of France and Germany. The experiments were made at the plantation Moncepos, Guadaloupe, with an apparatus of six macerators. It was badly adapted to meet the difficulties incident to the peculiar nature of cane, yet it showed (1) that by a methodical washing of the slices of cane an artificial juice nearly equal in density to natural cane juice could be obtained; and (2) that one hour of systematic maceration is sufficient to completely exhaust the cane fiber of the sugar with it contains.

The yield of sugar in these experiments was from 12½ to 13 per cent of the weight of the cane, in white sugar.

A comparison of the diffusion process, imperfectly carried out, with other processes, shows as follows:

Extraction by rollers, as still practiced on a great number of plantations, obtains:

Raw sugar, crystallized	65
(or 65-180, equal to 30 per cent of total sugar contained in cane.)	
Sugar in the state of molasses	25
Sugar lost in the bagasse	90
	180

By perfected roller mills:

Sugar obtained, crystallized	108
(or 108-180, equal to 60 per cent of the total sugar contained in the cane.)	
Sugar in the state of molasses	32
Sugar lost in the bagasse	40
	180

By the diffusion process:

Sugar obtained white, crystallized	130
(or 130-180, equal to 72 per cent of the total sugar contained in the cane.)	
Sugar in the state of molasses	40
Losses	10
	180

The advantages realized by diffusion can therefore be summed up as follows:

Over the perfected presses, 72-60, equal to 12 per cent; over the not perfected presses 72-36, equal to 36 per cent. We shall therefore obtain a surplus of 12 to 36 per cent upon the total weight of sugar in the cane; or in other words, the production will be increased one fifth of the sugar obtained in the first case, and in the second case it will be doubled.

The molasses will be of a better quality, being less colored and of a more agreeable taste.

THE BREWERS' CONVENTION.

The nineteenth annual convention of the United States Brewers' Association began in St. Louis, Mo., June 4. This association represents 2,830 breweries, of which New York has 405, Pennsylvania 383, Wisconsin 248, California 213, and Ohio 207.

The sale of beer for the year ending June 30, 1878, was the largest ever known, being 9,473,361 barrels, which was 313,685 barrels more than the next largest in any fiscal year, that ending June 30, 1876. The figures for the first nine months of the present year indicate that fully 10,000,000 barrels will be sold. Of this the breweries of New York produce about a third.

The export trade in American beer is rapidly increasing, a committee report giving the figures as follows:

EXPORT OF BEER OF DOMESTIC PRODUCE.

	In Bottles.	Value.	In Casks.	Value.
1870	1,076	\$2,250	66,467	\$23,759
1874	2,897	5,945	99,135	33,357
1878	76,475	108,279	119,579	38,918

Meantime there has been a remarkable falling off in the importation of beer, as will be seen by the following table:

IMPORTATION OF FOREIGN BEERS INTO THE UNITED STATES.

	Gallons.	Value.
1875	2,167,251	\$1,742,120
1876	1,490,150	1,161,467
1877	974,277	758,850
1878	767,709	592,707

THE AUSTRALIAN EXHIBITIONS.

A bill has been passed by Congress authorizing the President to appoint Commissioners to represent the United States at the International Exhibitions at Sydney and Melbourne, Australia, and appropriating \$20,000 for such representation at either or both of them. As the Sydney Exhibition opens in August next this action comes too late to accomplish much there. It is to be hoped that a more generous appropriation may be made for the Melbourne Exhibition, to be held between October 1, 1880, and May 31, 1881. The Australian exhibits at the Centennial Fair were among its most interesting features; and sound commercial policy as well as courtesy warrants something like a corresponding effort to have the United States becomingly presented to the Australians.

THE NEW STEAMSHIP ARIZONA.

The largest merchant steamer afloat, next to the Great Eastern, is the new steamship Arizona, of the Williams & Guion Line, plying between New York and Liverpool. The Arizona was built by Elder & Co., of Glasgow, and is of exceedingly fine model.

She is 465 feet in length, 46 feet beam, 37½ feet depth of hold, and close upon 6,000 tons burden. Her engines are the latest improvement on the compound principle, there being one high and two low pressure cylinders of an indicated horse power of 7,000. She is propelled with a four bladed screw, 23 feet in diameter, with a pitch of 23 feet. The steam is generated by seven double ended boilers, and the consumption of coal is estimated at about one hundred tons per day for full steaming purposes. There are on the main deck five powerful steam winches, with double gearing steam capstan for working the anchor, etc. She is steered from the bridge by steam, and in case of accident is fitted up with the usual manual steering gear in a wheel house, protected by a strong iron turtle back deck. There are also steam pumps and a powerful engine, by which any quantity of water can be brought to any part of the ship in a few seconds. The appointments for the convenience and comfort of passengers are superior, stateroom accommodations particularly.

INSECTS AS MEDICINE.

According to our medical exchanges the latest sensation in the way of a materia medica is the *Blatta Orientalis*, or in less scientific language, the cockroach, which comes this time, as it did once before, from Russia. Bogomolow is the name of the person who has investigated it. The beetle, dried and powdered, is given in doses of four and a half grains in Bright's disease, chronic or acute. But it appears that this is not the only thing that the insect is good for, since Unterberger and Kochler are said to have used it with great success in various forms of dropsy.

Kirby and Spence point out the fact that many insects emit very powerful odors, and some produce extraordinary effects upon the human frame, and for this reason, say they, it is an idea not altogether to be rejected that these animals may concentrate into a smaller compass the properties and virtues of the plants upon which they feed, and thus afford medicines more powerful in operation than the plants themselves.

Setting aside the preliminary observation in regard to "powerful odor," such a notion can scarcely have reference to the cockroach, the favorite food of which is the bedbug, or, such pabulum failing, almost anything from a minced pie down to an old boot. What particular medicinal alkaloid the insect's digestive apparatus can eliminate from such a mixed diet it would be difficult to determine. The homœopathic pharmacist, however, has long been accustomed to obtain the concentrated strength of some such active principle by triturating the *blatta* down to its ultimate molecule with sugar of milk. By reference to a homœopathic work on symptomatology we find that "provings" show that this insect, when administered to the healthy subject, causes laziness, which certainly is an extraordinary effect to be produced by so agile a beetle. A high potency of the bedbug is obtained by means of the same manipulation, although the resulting trituration is better known to the followers of the school just mentioned as *Cimex lectularius*. In this comminuted form the bug is found beneficial in fevers of various sorts. But this same delectable insect has also found favor in another practice, used in *puris naturalibus*, and five or six of the bugs being administered for a dose as a cure for chills; and it has likewise enjoyed some notoriety as an emmenagogue. Another insect, not usually mentioned in polite society, also enters into the homœopathic list of remedies, and this is the head louse (*Pediculus capitis*). "Provings" show that this insect has a remarkable cerebral tendency (as we might suppose), and hence its use is indicated in various forms of severe headache, accompanied by nausea and vertigo.

It is curious to look back at the list of *materia medica* of olden times, when, with vipers, toads, etc., insects held a prominent place, and were administered with as much confidence in their remedial effects as is now bestowed on the vegetable and mineral medicines of the present practice. In those days powdered silkworms were esteemed as invaluable remedies for vertigo and convulsions; earwigs were given to strengthen the nerves; and five gnats were equivalent, as a purge, to three grains of calomel. Bees dried and pulverized were believed to cure the falling out of the hair (*Alopecia*), and were also administered internally to promote urine; and for the latter purpose the triturated insects are now used by the homœopaths. These insects, say they, are similar in their action to cantharides, and often succeed when the latter fail. "Still," says the editor of *Hull's Jahr*, "we have often seen them fail in our own and others' hands, when they seemed fully indicated." Again, in the olden time, powdered scorpions were regarded as an infallible panacea for stone and gravel; and fly water was none the less esteemed as a collyrium in various affections of the eye. The tick was good for erysipelas, and the wasp, from its direct action on the mucous lining of the kidneys and on the neck of the bladder, was a most invaluable diuretic. The ladybird (*Coccinella*) was esteemed as a sovereign remedy for colic and measles, and crushed upon an aching tooth was long regarded as a specific for toothache. The same insect (*Coccinella septempunctata*) is now official in the homœopathic pharmacopœia, and in the form of a trituration is supposed to be useful in swelling of the gums and toothache accompanied by dull headache. Gerbi, a learned Italian professor, assures us that if a finger be once imbued with the juices of a little insect rejoicing in the sesquipedalian name of *Rhinobatus antidontalgicus*, it will thereafter retain its power of curing the toothache for a whole year.

In former days ants were celebrated as specifics against leprosy and deafness, as well as for their aphrodisiac virtues; distilled with spirits of wine they formed the *Aqua Magnanimitatis* of ancient medicine, a liquor which was believed to give vigor and animation to the whole bodily frame. The same extract of ants was also considered efficacious in strengthening the memory and increasing the power of loving, and it likewise prevented paralysis and cured ringing in the ears, etc. The chrysalides of ants were said to be diuretic, and they have been used in dropsy. A preparation called "spirit of ants" (*Spts. Formicarum*) is official in the German pharmacopœia, and was formerly much used internally as a stimulant, just as ammonia is usually employed; but formic acid, which is the active agent in the preparation, is not now regarded with favor by the medical faculty, and is little used.

The cockchafer (*Melolontha*) of Europe was once highly esteemed as a remedy for the bite of a mad dog and the plague. Dioscorides is authority for the statement that a plaster of spiders applied to the temples will keep off ague; however

this may be, it is certain that these insects are occasionally used as an internal remedy, in pill form, for a like purpose in some of the Southern States. Triturations and tinctures of one or two species of spiders (especially the *Epeira diadema*) are official in the homœopathic pharmacopœia. Speaking of spiders reminds us that one species (*Tegenaria medicinalis*) has been largely employed in the United States instead of the Spanish fly.

The cochineal insect (*Coccus cacti*) was formerly regarded as a stimulant, antispasmodic and diuretic, and still enters into an old fashioned prescription for whooping cough; but its remedial virtues are so doubtful that it has dropped from the rank of a medicine to that of a mere coloring agent for medicinal preparations. In this capacity, however, it retains something of its lost prestige, for the deeper the tint of the preparation colored with it the stronger the medicine in the imagination of the average patron of the drug store. A similar insect is the kermes (*Coccus Ilícis*), indigenous to the basin of the Mediterranean, official in the French Codex, and used for the same purposes as the foregoing.

The only insects that have really managed to hold their own in the struggle for existence in the good graces of the regular practitioner, are the blistering beetles (*Cantharis*, *Mylabris*, etc.). These are still extensively used, both as external and internal remedies. In Europe we believe that the Spanish fly (*Cantharis vesicatoria*) is, with one exception, the only species used; but in the United States, although this same species is almost universally employed, yet several of our American blistering beetles have often been substituted for it with perfect success; these being the striped (*Lytta vittata*), the ash colored (*L. cinerea*), the black (*L. atrata*), and the margined blister beetles (*L. marginata*). In China the *Mylabris cichorii* has long been employed, and seems also to have been considered the most powerful vesicator among the ancients, who, however, appear to have been likewise acquainted with the golden cetonias (*Cetonia aurata*) and some others mentioned by Pliny. A species of *Mylabris*, very abundant in Bengal, Bahar, and Oude, has been found equally as efficient as the common Spanish fly; and, in other parts of India, the giant cantharis (*C. gigas*) and the violet colored cantharis (*C. violacea*) are used, as is the red headed blister beetle (*C. ruficeps*) in Java and Sumatra. In Brazil the species used is the *C. atomaria*; in Arabia, the *C. Syriaca*; and in some parts of Europe the *Mylabris trimaculata* is employed. The use of one of the blister beetles, the *Meloe proscarabæus*, was long ago recommended as an antidote to hydrophobia, and a pamphlet on the subject was communicated to the Entomological Society of France by M. Férrière in 1856; more recently, we have seen it stated that this is a favorite remedy of the Arabs for the same disorder, the beetles employed being *Meloe tucius* and *Mylabris tenebrosa*, and the dose being a piece the size of a grain of wheat given to the patient in a piece of meat. Prepared as a trituration, the Spanish fly is used in homœopathic practice for a like purpose.

Such, then, are a few of the singular remedies that the *ars medica* has from time to time made use of. And now the question arises, Will these insect remedies ever come in vogue again? Will they ever partially replace the many roots, herbs, and barks which, in one form or another, make up our present materia medica? Perhaps so; who knows? A well known medical author writes thus: "There exists a fashion in medicine, as in other affairs of life, regulated by the caprice and supported by the authority of a few leading practitioners, which has been frequently the occasion of dismissing from practice valuable medicines and of substituting others less certain in their effects and more questionable in their nature. As years and fashions revolve, so have these neglected remedies, each in its turn, risen again into favor and notice, while old recipes, like old almanacs, are abandoned until the period may arrive that will once more adapt them to the spirit and fashion of the times." So, then, it may be that the coming cockroach is but the precursor of the "innumerable caravan" of bedbugs, cockchafer, ants, *pediculi*, and others, that are again moving to the front to assert their right to heal man, instead of being a pest to him. And it may be, too, that, based on this practice, a new "pathy" shall arise to supplant one or more of those now in existence, and which shall be called entomopathy. As we before remarked, who knows?

American Elevators in Europe.

We have seen a recent letter from Mr. Petrus Regout, owner of the celebrated glass manufactory at Maastricht, Holland, who states that he has lately put up in his establishment an American elevator, made by Volney W. Mason & Co., of Providence, R. I., which gives entire satisfaction. According to Herr Regout, they subjected the safety devices of the elevator to the following severe test: The platform, which of itself weighed 480 kilos, was loaded with a special weight of 500 kilos more, and the lifting rope was then suddenly cut; but the platform did not fall, being firmly held up by the safety racks. M. Selig & Co., Berlin, the well known engineers, have taken the agency for Messrs. Mason & Co.'s elevators, and are now introducing them in Germany. The above is one of the first practical trials they have had.

Snow and Frost in June.

Severe frost was experienced along the northern tier of States toward the close of the first week in June, and the 6th snow fell at North Troy, Vermont, and at Sandwich, New Hampshire.

The eruption of Mount Etna has nearly subsided.

THE KRUPP ELECTRIC LAMP.

Herr von Krupp, of Essen, has recently patented an invention for "Improvements in Electric Light Apparatus." The main object of the invention is to regulate automatically the position of the carbons of an electric lamp "in a simpler manner than heretofore, without abandoning the generally acknowledged conditions on which the precision of motion of the single parts depends." The invention includes the application of a brake appliance for the automatic regulation of the distance between the two carbon points. A fan or fly revolves in quicksilver, or other liquid, for the purpose of regulating the motion of the carbon holder, this part of the apparatus being designed as a substitute for clock-work. A magnetic coil with iron casing and iron bottom is employed in connection with the motion of the brake appliance.

Fig. 1, in the engraving, which we take from *Engineering*, is a side elevation, and Fig. 2 a front elevation of the lamp, in which A is the holder for the upper positive carbon, and B the holder for the lower negative carbon. The upper holder, A, is suspended from the disk or pulley, C, by means of a jointed chain or wire, the lower holder, B, being similarly attached to a disk or pulley, D, the latter disk being just half the size of the former. The chains or wires are so passed round the pulleys that when the holder, A, descends a certain distance by its weight, the other holder, B, ascends to half the distance. Accordingly the electric arc formed between the carbon points occupies a fixed position. As the weight of the upper holder, A, must not be too small, because its motion would then be easily influenced by dust and dirt, it is necessary to have an appliance for retarding and regulating its course or travel. For this purpose a fly or fan, E, is applied, which revolves in mercury or other liquid. On the spindle of this fly there is a pinion, F, which gears with a tooth wheel, G, on the spindle, X, of the chain pulleys, C and D. In order that the fly, E, by the insertion of a fresh carbon should not have to revolve backward, the toothed wheel, G, is fitted with a pawl wheel, H.

The setting and regulating of the proper distance between the carbon points is effected in the following manner: On the same spindle, X, as the pulleys, C and D, and tooth wheel, G, there is a disk, I, as shown in the separate view, Fig. 3. Fig. 4 is a separate view of a brake of a peculiar form acting on this disk, I. The brake consists of two parts, K and M, which are jointed together at L. The lower part, M, can turn on the spindle, X, and has a hole, M', in which is inserted a small peg, N, Figs. 1 and 2. The peg, N, has much play in the hole, and the backward motion of the brake is limited thereby. O is a brake block on the upper part, K, of the brake; P is the keeper for an electro-magnetic coil, Q. This keeper is by a brass rod suspended from the other end of the part, K.

When the lamp is in action the keeper, P, is drawn into the coil, Q, whereby the brake block, O is pressed against the disk, I, turning the latter in its further movement downward, that is, so far as the set screw, R, Fig. 1, will allow. Thus, the upper carbon point will be raised, and the lower carbon point lowered, and the electric arc then makes its appearance. The carbon points now gradually consume away, the current becomes weaker, and its effect on the electro-magnet, Q, is lessened. The brake, K, supported by the spring, S—the action of which can be suitably regulated in proportion to the strength of the current by means of the lever, U, and set screw, V—and by the weight of the carbon holder, moves slowly back. The brake disk, I, is thereby enabled to turn forward, and the carbon points can approach each other. When this movement has proceeded as far as the brake disk, I, moved back before, then the lower part of the brake comes to bear against the peg, N. By the further weakening of the current, the brake will now turn in its joint at L, the brake block, O, releases the disk, I, and the carbon points move toward each other, whereby the current is strengthened and the brake is again applied to the disk, I, either simply to hold it when the carbon points are in their right position, or to pull it back when the carbon points are too close together. When inserting new carbons, the brake is fixed by the set

screw, W, and the work is arrested thereby. The electro-magnetic coil, Q, rests on the bed plate, T, of the lamp, and is surrounded by an iron casing, whereby its power of attraction for the keeper is increased.

The fixed position of the arc provides for keeping the light in the center of a concave reflector. Where this is not required, the lamp may be simplified by leaving out the moving parts for the lower carbon holder, making it fixed instead of movable. The lamp thus devised has been employed by Herr von Krupp in portions of his great factory at Essen, in Germany, and the results have been so satisfactory that the light is being extended to other parts of the establishment.

Oil Wells and their Products.

Recent statistics show that there are now 10,882 wells producing oil in the State of Pennsylvania, and they pour out

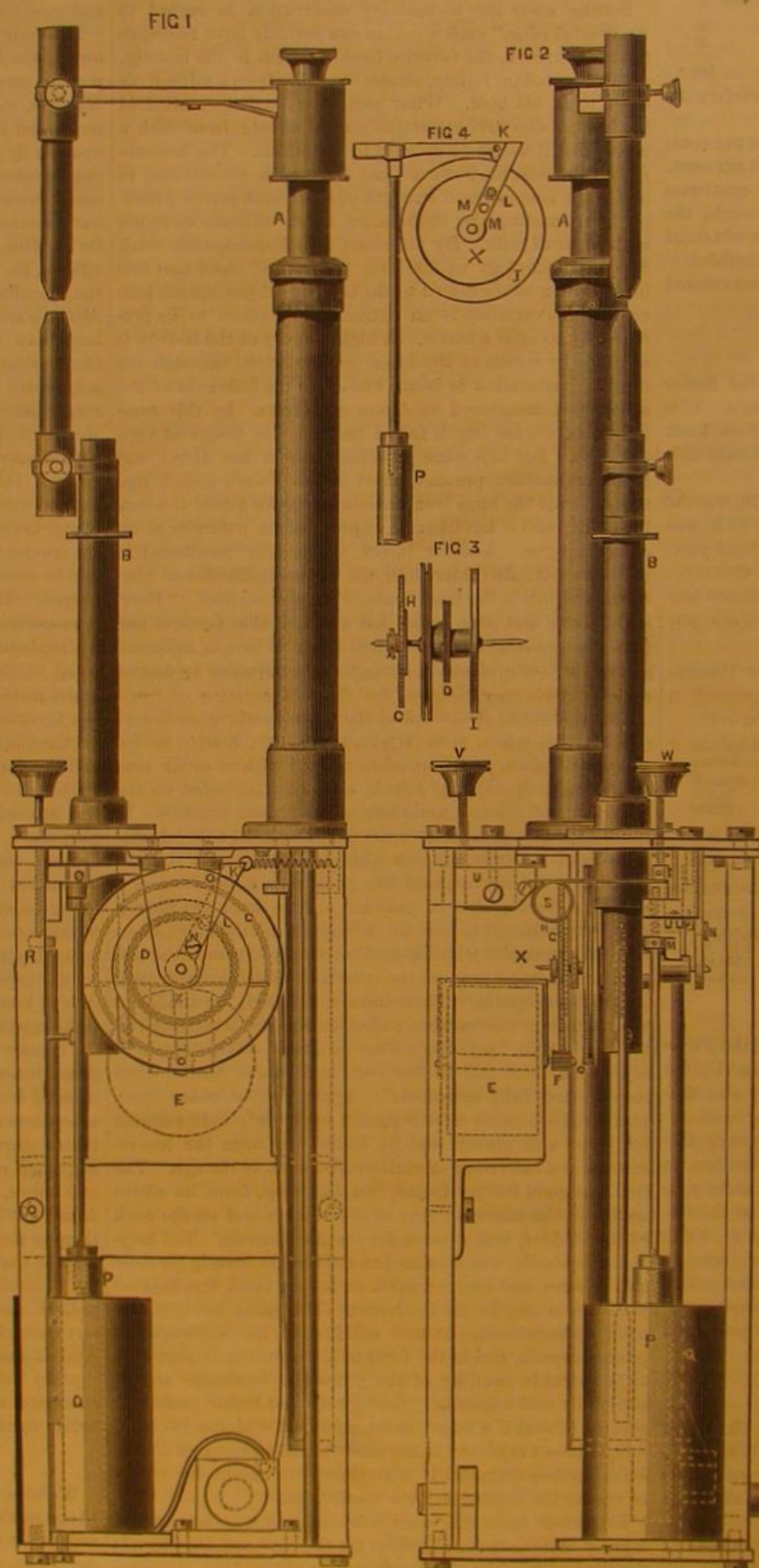
chestnut. This patient had not walked for nearly two years, and had gone through the whole list of rheumatic remedies. While treating a horse with the infusion of horsechestnut he found the swelling to rapidly disappear from his hands. He then applied the remedy to other joints, and received the same benefit. This is certainly an improvement on the practice of carrying a horsechestnut in one's pocket as a prophylactic of the same complaint.

Ancient Memphis.

A traveler in the East gives the following interesting account of his visit to the remains of ancient Memphis, founded by the first known Egyptian king—Menes. "But what did we see of this wonderful city? Only a succession of mounds," says the writer; "a few pieces of ancient statues; and far down below the present level, with its face in the water, a magnificent figure of a woman in Egyptian dress, with noble features and finely-modeled form, almost perfect, although probably 4,000 years old. As a matter of course, we lingered and looked as long as we thought sentiment required, then pushed on to the remarkable ruins of the cemetery, which was connected with this city, or I should say, magnificent city of the dead—to the very confines of which Memphis extended. It is now but a little more than a vast mountain of sand, being just on the precincts of the African desert. There are so many tombs everywhere peeping out, and so large a number of pyramids—eighty-one in all, scattered about—that the interest is keenly excited at once; and at every step some new developments take place. When we remember that old Memphis was seventeen miles in circuit, and was occupied with villas, gardens, and sacred groves, we can realize more than in any other way the wondrousness of the scene which remains to us to-day. After passing the largest pyramid, considered the oldest monument of antiquity in the world, we descended rapidly to the one little house of refuge standing in the midst of the sand, dismounted and lunched—thus securing a good resting season, and after about an hour, started out with our guides to the two special points of interest here, the Mausoleum of the Sacred Bull, and the tomb of the Priest Tih, the latter built about 3050 B. C. These were uncovered in 1860 by the Egyptian authorities, who, first noticing mounds in the sand bearing the appearance of heads, appointed a commission, and, after a labor of sixteen months, an avenue of sphinxes, 600 feet long, was laid open, the pedestals or statues being perfect in all cases. This was paved and led to the Mausoleum of the Sacred Bull, where these objects of worship had been entombed for several dynasties. There were found three separate chambers of temples, the latest where dates were found—650 B. C.—being the only one now open. One cannot help feeling an interest in every detail of such a place. There are the long avenues, broad and high, hewn in the solid rock, while all along the sides are deep recesses where are now standing the sarcophagi of the bulls. Twenty-five perfect ones stand in one archive, each weighing forty tons, and many of them fully engraved with figures, representing life, death, and immortality. But it is no more wonderful to see them where they are than to understand how they were put there. One which was presented to the French had been abandoned when moved some little distance, as too heavy to be taken away. They are thirteen feet long, eleven feet high, and seven feet deep, and, although many of the covers have been removed, nothing was found in any of them. Above the sarcophagi are inscriptions relating to their burial, and in whose reign they died. Many tablets were found upon the walls, which were placed there as offerings to the god; these, however, were all allowed to be taken to Paris."

A Tribute to Cyrus H. McCormick.

The Academy of Sciences of the French Institute have elected Mr. Cyrus H. McCormick as correspondent of the Academy in the Department of Rural Economy. This is a recognition of his services in the invention and manufacture of harvesting machinery, and his official connection with the recent Exhibition at Paris.



KRUPP'S ELECTRIC LAMP.

altogether about 50,000 barrels of oil daily. The product this spring has been 25 per cent greater than last year and about three times as great as the yield three years ago. One thousand eight hundred and eleven new wells were opened during the past year, and there appears to be no danger of exhaustion of the supply. This vast product adds immensely to the country's industries, and the transportation of it affords large revenues to the carriers.

Infusion of Horsechestnut in Rheumatism.

Dr. W. S. Drake reports in the *St. Louis Medical and Surgical Journal* that he had an inveterate case of chronic rheumatism cured by the patient bathing in an infusion of horse-

NEW SHOP SAW.

The machine represented by the annexed engraving is an improved shop saw which combines all the necessary adjustments for cutting right and left hand angles and slitting at any bevel. The gauges for these purposes are light, simple, and easily handled. The saw mandrel is of steel, 25 inches in length, has long bearings, is hung in a swinging frame—hinged on the counter shaft—giving a uniform and good length belt.

The swinging frame is raised and lowered, by a worm working into a worm pinion, on a shaft carrying two gears that mesh into both sides of the upper end of the swinging frame, thereby securing accurate and positive movement of the saw up and down. The top is hinged at the rear end and may be raised to a perpendicular position. It has a loose throat piece that may be removed for the admission of different sized saws, dados, or other tools. The mandrel is fitted at the end opposite the saw to receive a boring bit, and the frame is calculated to receive a boring table. All the adjustment necessary is provided in the arrangement for lowering and raising the saw. A good boring machine is, in this manner, provided at a very slight cost; in fact, the purchaser can bolt a plank on the side of the frame and provide himself a boring table without additional cost.

This saw is very simple, convenient, and strong without being bulky. It is plain but substantial, and withal it has all the conveniences required in a shop saw at a very reasonable cost. It is manufactured only by the Battle Creek Machinery Company, of Battle Creek, Mich., whose reputation for good work is a guarantee of excellence.

Telephone in Church.

A telephone has been placed in the Congregational church at Mansfield, Ohio, the wires leading to the houses of several aged and invalid persons. A contemporary in describing it says it surmounts a floral decoration on the table in front of the open platform, where it is hardly seen. The speaker pays no attention whatever to it, yet every word uttered in the auditorium is easily heard in the rooms of the dwellings which the wires reach. The first message from the minister was from Scripture: "The word is nigh unto thee;" "His word runneth very swiftly."

A NEW INVALID BED.

The invalid bed shown in the engraving is the invention of Mr. Wm. S. Groff, of Frederick, Md. It is intended for hospitals and private families, and has been very highly recommended by eminent physicians and persons who have used it. It seems especially adapted to cases of paralysis, fractures of the lower limbs, and to persons who are obliged to keep a recumbent position.

It will be seen by reference to the engraving that the bed bottom is made in several sections. The head section may be raised or lowered, and it is held in any desired position by the curved ratchet bar, which engages a pin projecting from the inner side of the bed rail. The middle part of the head section is made in two pieces, which may be drawn out laterally to admit of ventilation and also to afford a means of treating bed sores. The middle section of the bed is made in two parts, which are removable to admit of the use of an adjustable bed pan without changing the position of the patient. The foot section of the bed is divided longitudinally to give a separate support for each leg, and it may be raised or lowered at pleasure, being held in position by folding legs.

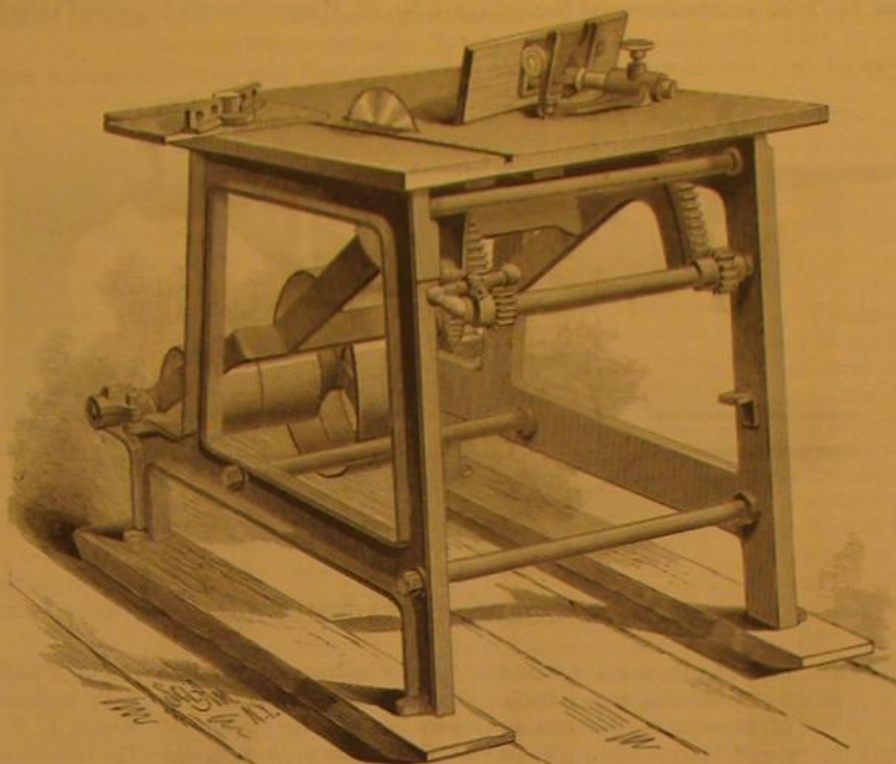
Above the foot section a bar is supported by two bent rods, and is itself provided with a track and ways for the rollers that support a stirrup intended to receive a strap for supporting one or both of the legs.

The inventor also provides a pulley to be attached to the footboard of the bed to suspend the leg by means of a cord and counterweight. The pulley has a locking device for retaining the leg in any desired position. A table, not shown in the engraving, is attached to the bed for supporting food, dishes, etc., and for holding books, papers, and writing materials. This table is adjustable, and may be readily attached to the bed or removed. The bed is arranged for the comfort of the patient and for the convenience of the attendant or nurse. Its advantages will be readily admitted by those who have occasion to use an article of this charac-

ter. Further particulars may be obtained from Wm. Boulton, Jr., Frederick, Md.

Volcanic Eruptions.

In seeking an explanation of the phenomena which Herr Siemens witnessed during a visit to Vesuvius in 1878, the author has been led to some general studies in vulcanology, which have far more than local interest. At the time of his visit, says a writer in the *Nineteenth Century*, steam, or other vapor, was being ejected in explosive puffs from the cone in the center of the great crater. Assuming that steam or



PRESTON'S DIMENSION SAW.

gas may be suddenly generated at great depths, it might fairly be expected that its ejection would be accompanied by the outflow of much lava, and that after each explosion sufficient time must be given for the accumulation of fresh lava in the chimney of the volcano before the next expulsion could occur. It may be suggested, indeed, that as water at a very high temperature is dissociated into its components, the magma or molten rock beneath the volcano might contain an explosive mixture of oxygen and hydrogen gases; then on any considerable diminution of pressure these gases would recombine and again form water. It is, however, highly improbable that, under the enormous pressure to which the magma must be subjected, anything like dissociation should occur; for the author's own experiments have shown that a mixture of oxygen and hydrogen, when subjected to a very high pressure, will explode. Dismissing, then, the idea of dissociation, the author is driven to the conclusion that hydrogen gas, or it may be combustible



GROFF'S INVALID BED.

compounds of hydrogen, rise from below, and, mingling with atmospheric oxygen, form an explosive mixture which is burned in the upper part of the volcanic chimney. From the large quantity of steam generated by the explosions, it is probable that hydrogen is the principal combustible constituent of the gases, but it is not easy to decide whether the hydrogen exists in a free state, or combined with sulphur, carbon, and other elements.

Prevention Better than Cure.

The following extract is from an address by the venerable Dr. Samuel D. Gross, recently delivered at the dedication services at the unveiling of the McDowell monument, in Danville, Ky. These words have a practical ring, and were addressed to the young men of the Kentucky Medical Society, who were present in large numbers:

The great question of the day is, not this operation or that—not ovariotomy, or lithotomy, or a hip joint amputation, which has reflected so much glory upon Kentucky medicine—but preventive medicine, the hygiene of our persons, our dwellings, our streets—in a word,

our surroundings, whatever and wherever they may be, whether in city, town, hamlet, or country, and the establishment of efficient town and State boards of health, through whose agency we shall be the better able to prevent the origin and fatal effects of what are known as the zymotic diseases, which carry so much woe and sorrow into our families, and often sweep like a hurricane over the earth, destroying millions of human lives in an incredibly short time. The day has arrived when the people must be roused to a deeper and more earnest sense of the people's welfare, and suitable measures adopted for the protection as well as for the better development of their physical, moral, and intellectual powers. This is the great problem of the day, the question which you, as representatives of the rising generation of physicians, should urge, in season and out of season, upon the attention of your fellow citizens—the question which, above and beyond all others, should engage your most serious thoughts, and elicit your most earnest co-operation.

Collodio-Bromide with Gum Guaiacum.

In a note in a recent number of the official journal of the Photographic Society of Great Britain Captain Abney says: "The members of the Society are invited to try a modification of the ordinary washed emulsion process, as it is believed that it is valuable in more ways than one. The modification consists in adding to the washed emulsion one sixth part of alcohol which has been saturated with gum guaiacum. The plate is coated in the ordinary manner, and the film takes a greenish-blue tint when dry. The drying may be done 'spontaneously,' or it may be accelerated by the warmth of a drying room or box; but the temperature should not exceed 120°, since the gum then fuses and the film repels the developer. Those plague spots that refuse to develop have not been found to be present except in one or two plates, and the fact of their presence has been recognized before placing them in the dark slides, since they remain of the ordinary color of the bromide while the surrounding portions are colored, as stated above. It is something to be able to see the spots before development, and on this account alone the addition of this gum is valuable.

To develop, the plate is flooded with alcohol, and then washed and treated with the alkaline or ferrous oxalate developer in the usual manner. The film, being very porous through the removal of the gum, readily takes any amount of density, and it is amenable to intensification with pyrogalllic acid and silver nitrate. If a phantom image be developed first by a weak developer it may be built up as the operator may choose. The film has no tendency whatever to leave the plate; even the most horny film becomes glued to the surface, and, as before stated, easily permeable to the developing solutions. The gum acts as a preservative, as will be seen by the simple experiment of dissolving it in alcohol and pouring the solution over a clean plate. On evaporation of the alcohol a hard, transparent film is left.

The keeping qualities of these plates between exposure and development have yet to be tested. If they keep as well after exposure as they do before they will be very useful plates for the tourist. The writer appeals to photographers to try the process, in the hope that it may lead by experiment to the introduction of a really good preservative which may be applied to the plate with the emulsion itself.

"Gum ammoniacum has been already used by Mr. Stillman, but its comparative insolubility is a great drawback to its use as a preservative. Gum guaiacum combines with bromide; hence it is efficient on this score."

AMATEUR MECHANICS.

EASILY MADE SLIDE REST.

While the most of the work to be done on the foot lathe may be accomplished as expeditiously and quite as well without a slide rest as with it, yet there are some operations that are greatly facilitated by means of this tool. Boring, for example, a very difficult thing to do with hand tools, may be done quickly and accurately by using a slide rest. In gear cutting—which will be described in a subsequent article—a slide rest is essential.

In the case of this tool, as well as others previously described, the purchase of a well made article is recommended. Yet, if one has time and feels so inclined, he may make a really efficient slide rest with no other tools than his lathe and ordinary turning tools. Figs. 1 to 3 inclusive represent a slide rest that may be made in this way, Fig. 1 being a perspective view, and Figs. 2 and 3 respectively longitudinal and transverse sections of the tool carriage.

The T-shaped casting, A, has a longitudinal slot, which is made T-shaped in cross section to receive the head of the bolt that confines it in position upon the plate fitted to the lathe bed. The vertical ears at opposite ends of the casting are bored to receive the ends of the rods, B, upon which the tool carriage, C, slides.

The first operation in making the slide rest is to make one side of the casting, C, perfectly plane. It is then chucked in the lathe with the plane side next the face plate. Three holes are bored through it, two for the rods, B, and a smaller one for the screw, G. It is then chucked on an angle plate, so that the holes for the rods, B, are equally distant from the center line of the lathe, and the hole for the rod, D, is bored very carefully to insure the parallelism of its sides. The casting, A, is now placed upon a plane surface, and the casting, C, is clamped to the ear at one of its ends, and adjusted so that a line drawn through the center of the holes is exactly parallel with the bottom of the casting. The casting, C, is used in this manner as a template for drilling both of the ears for the reception of the rods, B. It will be necessary to exercise great care in drilling these holes, as it is of vital importance to have the rods, B, perfectly parallel.

The casting, C, may now be tapped to receive the screw, G, and the tool carrying bar, D, may be fitted to its place, and turned down and threaded to receive the internally threaded boss of the wheel, E. This boss is fitted to the base of the casting, C, and is grooved circumferentially to receive a split ring, F, the latter being drilled to receive the ends of three screws that project through the casting into it and prevent the boss of the wheel, E, from moving lengthwise of the hole, while the arrangement permits of the free rotation of the wheel. The bar, D, has a head which is drilled vertically to receive the tool post, and is provided with a heavy feather at the top, which is received by the slot formed by sawing into the upper portion of the casting, C. To render the bearing of the bar, D, somewhat adjustable, two screws pass through the casting above the feather. The tool post is of the usual description, having a loose collar above the head of the bar, D, and a nut below it. The mortise for receiving the tool extends a little below the loose collar, so that when the tool is clamped the post and ring will also be clamped. A slot is cut through the bottom of the casting, C, into each of the guide rod holes to permit of adjustment in case of wear by means of the screws which pass transversely through the slot. The ends of the rods, B, are fastened by a similar device. The screw, G, is prevented from end motion by a shoulder on the outside of the ear at the crank end, and a collar on the inside. The rods, B and D, may be made of steel or of cold rolled iron; the latter will be true enough without turning. The casting may be either of brass or iron; a good quality of iron will perhaps prove the most satisfactory. The slots may be cut with the saws described in a former article. The tools to be used with the slide rest have also been previously described.

In Fig. 4 is represented a boring device which will be readily understood without special description. The casting, A, is fitted to the tool rest socket and provided with a sliding

bar, B, which is like the bar, D, in the slide rest above described, excepting that its back end is rounded and provided with a pin which slides in the slotted arm attached to the tail spindle of the lathe by which it is moved, instead of having a moving device of its own. With this tool, boring and some kinds of outside turning may be done. It is less expensive than the slide rest and answers a good purpose.

M.

A Paraffin from a Pine.

At a meeting of the London Chemical Society in April, a paper was read by Mr. T. E. Thorpe on "Heptane from *Pinus sabiana*." The author remarked that in the *Pharmaceutical Journal* of March 30, 1872, Mr. W. Wenzell described,

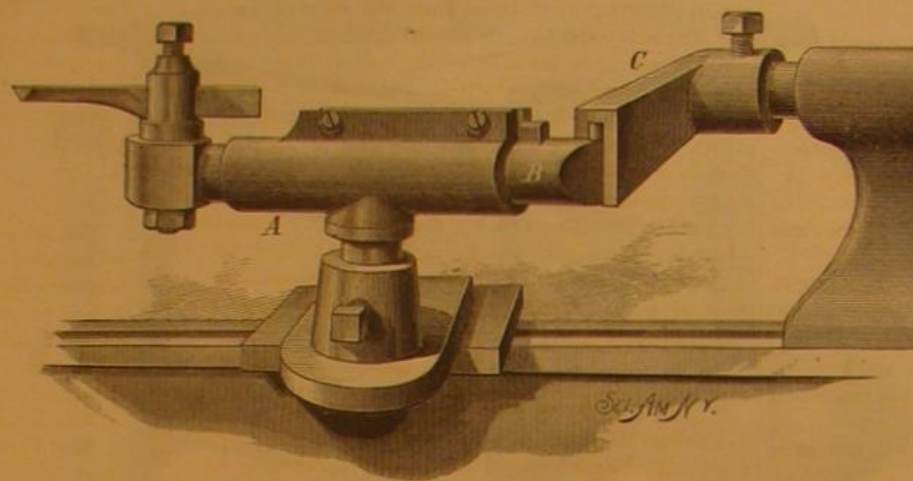


Fig. 4.—BORING ATTACHMENT.

under the name of "abietene," a new hydrocarbon obtained by distilling the exudation of the *Pinus sabiana*, a tree indigenous to California, and known locally as the "nut pine" or "digger pine." To procure the exudation, the tree, during winter, is notched and guttered at a convenient height from the ground. The resin on distillation yields a liquid hydrocarbon. The crude oil is met with in San Francisco as an article of commerce, under the names of "abietene," "erasing," etc., as a substitute for benzoline in removing grease spots, etc. It is a nearly colorless mobile liquid of a powerful aromatic smell, resembling that of oil of oranges.

Wenzell contrasts its character with those of terebene from *Pinus sylvestris*. Abietene has a specific gravity of 0.694,

smell is due. The pure oil has the composition of heptane, containing 83.85 per cent carbon and 16.03 per cent hydrogen. The author has compared the heptane obtained from *P. sabiana* with the heptane from petroleum, and that obtained by treating azelaic acid with baryta. The specific gravity of the heptane from petroleum is .7301, that from azelaic acid is .700. These heptanes are believed by Schorlemmer to be identical. The author is at present engaged in an investigation of this point. It is very remarkable that a paraffin should be found in such a state of purity in a plant.

MISCELLANEOUS INVENTIONS.

Mr. A. P. Peabody, of Holden, Mo., has patented an improved animal trap for catching rats, mice, and other small animals. It is automatic in its operation and very simple in its construction.

An improved instrument for cleaning combs after they have been used for combing the hair, has been patented by Mr. Samuel E. Hibbert, of Lowell, Mass. It consists of a spindle united to two disks, between which are stretched twisted or crimped wires.

Mr. Thomas Cunningham, of Nashville, Tenn., has patented an improved mail bag fastener, which consists in a fork to which the rope is attached after being reeved through the mouth of the bag so as to have a looped end, which, when the bag is to be closed, is drawn tightly and doubled over the fork, so as to be held firmly in place.

An improved farm gate has been patented by Mr. L. C. Pope, of Paola, Kansas. This gate is constructed so that it may be conveniently opened and closed by a person on horseback or in a vehicle. The gates are supported by rollers which

run upon rocking rails.

An improved fire-wood drag saw has been patented by Messrs. T. B. Fagan and M. W. Henry, of Van Wert, O. The invention relates to a frame and the manner of hanging the saw therein, so that the sawing is done more rapidly and with less exertion than with the ordinary hand saw.

Mr. L. O. Winans, of Newburg, N. Y., has patented an improved plaiting machine, which consists of a rectangular frame or box made of a single piece of tin, having in the top parallel slots, and having the edges at the slots bent downward so as to form a lip under each slot. The plaits are formed by forcing the goods down through the slots with a flat blade.

Mr. Enoch Lord, of Portland, Me., has patented an improvement in reclining chairs, which consists in bent and pivoted bars, and catch bars pivoted to the back and arranged so that a person sitting in the chair can raise both catches with one hand and adjust the chair back at any desired angle.

Messrs. Alfred E. and William E. Feroe, of Madalin, N. Y., have patented an improvement in processes and apparatus for fining fermented liquors. In this process the yeast is separated from the ale and lager beer in a very short time, and the flavor and the appearance of the liquors are improved.

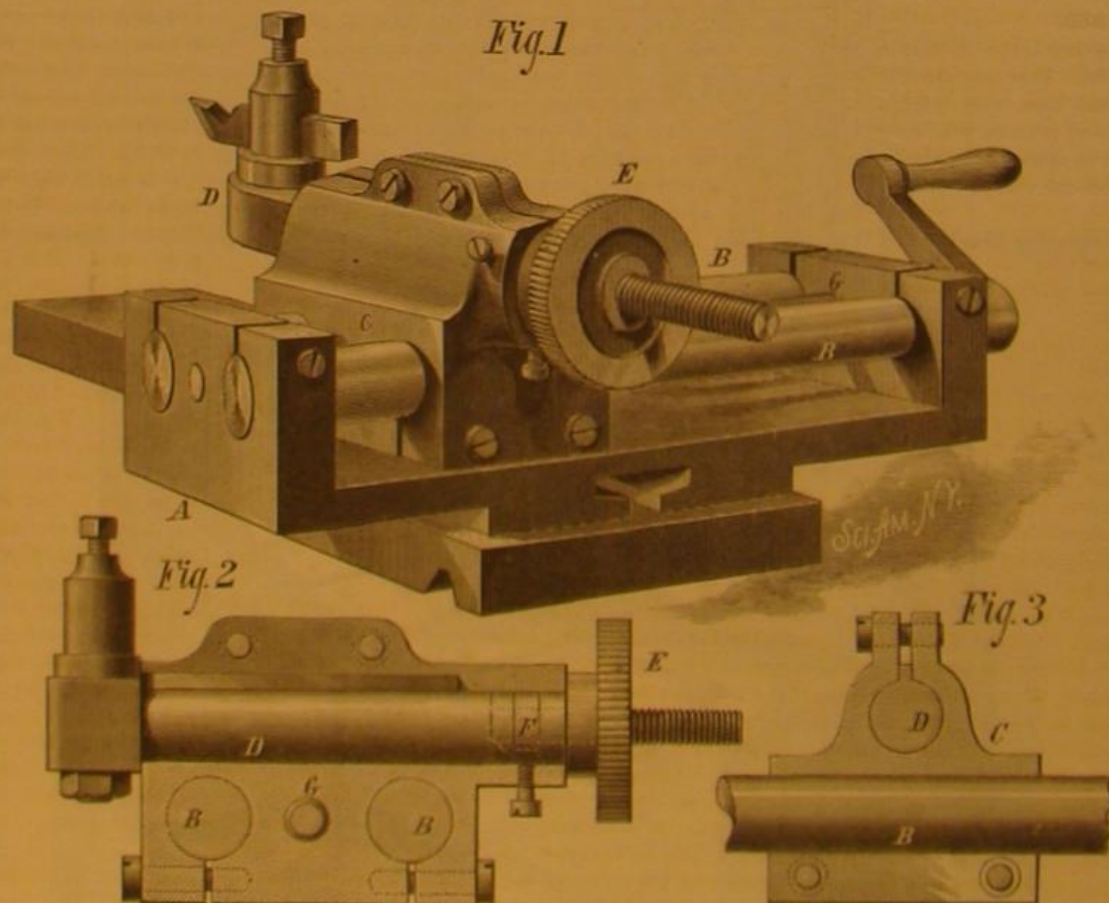
Messrs. Alanson Cary, of New York city, and T. S. Blair, of Pittsburg, Pa., have patented an improved metallic fence post, the design of which is to arrange the materials of which it is composed so that pressure against the post will always be opposed by the tensile strength of the materials, thus making the post very light but strong.

An improvement in milk coolers, patented by Mr. John White, of Lisbon, N. Y., cools the milk by a current of water and retains it at a

proper temperature. It consists in a double vessel having hinged double leaves or covers through which the water circulates.

An improvement in wrenches for making screw connections between pipes, couplings, etc., has been patented by Messrs. J. G. and O. G. Johnson, of Girardville, Pa. The wrench jaws are pivoted to the handle, and they are held together by straps.

A tap, consisting of a grooved tapered body, threaded through a portion of its length, and provided with an internally threaded ring, for confining cutters in the grooves, has been patented by Messrs. L. D. Castle and J. W. Strong, of Bridgeport, Conn.



EASILY MADE SLIDE REST.

boils at 101°, dissolves but a small quantity of hydrochloric acid gas, and is but little attacked by cold nitric acid. From a consideration of the general properties and behavior of this hydrocarbon, the author of the present paper (Mr. Thorpe) concluded that it was likely to be a paraffin. The occurrence of a paraffin playing the part of oil of turpentine in the vegetable kingdom was a thing hitherto unheard of, the only natural sources of this hydrocarbon (heptane) being petroleum and fish oil. The author therefore obtained from Mr. Wenzell two gallons of the abietene, and subjected it to a most exhaustive chemical and physical examination, the details of which are given in the paper. The crude oil is slightly contaminated with a resinoid matter to which its

RECENT MECHANICAL INVENTIONS.

A machine for felting or hardening hat bodies, in which the opposite working faces of the apron and felting roll are provided with rope ribs, has been patented by Mr. J. G. Meeker, of Danbury, Conn.

An improved fastener for window shutters and blinds, which will fasten itself when the blind is swung open, and may be readily unfastened without reaching out of the window, has been patented by Mr. N. P. F. Rosenberg, of New York city.

An improved rolling shade for greenhouses, consisting of a number of slats hinged together, and placed on the outside of the greenhouse roof, so that it may be readily rolled up or let down over the glass by means of mechanism inside the house, has been patented by Mr. Leon Lefebvre, of New York city.

Mr. Jonathan Lefler, of Meyerstown, Pa., has patented a nut for securing the bolts of railroad rails or parts of machinery, which, when applied, is locked and prevented from turning backward. It is also capable of tightening itself, so as to take up shrinkage and prevent rattling.

Mr. William T. Doremus, of New York city, has patented an improvement in the oscillating chair for which letters patent No. 161,671 were granted to him April 6, 1875. In the improved form the degree of elasticity of the rubber springs may be readily regulated, so that the tilt of the chair may be adjusted.

An improved clutch, intended for use in connection with the rim of a pulley, hoisting drum, or coupling device, has been patented by Mr. Patrick Fleming, of Fair Haven, Conn. It consists in a hub fitted with radial arms, which are thrown in and out by a wedge-acting sleeve connected with the hub.

An improvement in the class of churns whose box or body is suspended by rods or chains, so that it may be oscillated, has been patented by Mr. Joel T. Hart, of Greenwood, Mo. The improvement consists in the combination of a treadle lever with the suspended churn box.

An improved percussion trap for throwing glass balls has been patented by Mr. Wm. H. Plumb, of Paterson, N. J. In this device a ball-supporting cap is attached to the end of a piston rod, which is thrown up by the successive discharges of cartridges in a revolving cylinder.

Mr. Pardon C. McCune, of Mount Etna, Iowa, has devised an improvement in horse powers which consists in applying a balance wheel to the shaft from which the power is taken, and driving the same by means of cranks and connecting rods from the master wheel of the horse power.

An improved carpet stretcher, actuated by a spring and lever, has been patented by Mr. L. A. Winn, of Carthage, N. Y. This invention consists simply of a bow spring, lever, and link, the spring having at one end a claw for engaging the carpet, and at the other a toe, which is inserted under the edge of the base board.

An improvement in locomotive smoke stacks, consisting in an arrangement of spark and cluder deflectors and a shield for preventing the back draught from exhaust steam and currents of air, has been patented by Mr. John R. Fish, of Grand Rapids, Mich. It is intended to prevent the ejection of sparks and cinders and deliver them back to the stack.

A steam valve, constructed so that the old and worn out seat may be removed and replaced without breaking the pipe joint, has been patented by Mr. Charles A. Bevans, of New Haven, Conn. After unscrewing the guide of the valve stem and removing a nut that retains the valve seat, the latter may be readily withdrawn.

Artificial Ice.

The Boston *Journal of Chemistry* believes that one of the remarkable triumphs of science and art as developed in this progressive age is seen in the devices for producing artificial ice in large quantities. It is claimed, and not without reason, that, so perfect has the apparatus become, ice can be formed on the shores of any of our northern lakes and rivers at less cost than that necessary to the cutting and storing of natural ice in winter. One of these interesting devices in operation on the shore of the St. John's River, Florida, last winter, afforded the writer ample facilities for observing its work from day to day, and testing its capabilities. It was of the class in which ammonia is the agent employed to produce refrigeration, and well known as the arctic machine. It was found capable of "turning out" ten tons of ice daily, in the form of blocks about two and a half feet long and ten inches in thickness. The congelation was perfect, and the product met with a ready sale at the hotels and private residences, not only in Jacksonville, but at all the points on the St. John's River. The price of Northern ice in Florida previous to the introduction of the machine was from ten to fifteen dollars a ton in moderate quantities; the artificial ice is sold at five dollars, and thus a powerful and successful competitor to the ice companies sprang up at the door of their depositories. The dealers resisted and ridiculed the "machine" for a considerable time, but in the end it triumphed, and prices were reduced. The actual cost of manufacturing ice in Florida is not far from seventy cents a ton, and this includes the storing and delivery. It must be known, however, that fuel in Florida costs almost nothing. The ice company have only to haul the waste lumber from a steam sawmill, fifty rods away, to be used as fuel, and it is supplied gratuitously.

The principle upon which the machine acts is the same as that which every housekeeper adopts in freezing creams in summer. When solids are changed to liquids, a large amount

of heat is absorbed, and surrounding objects must supply it; if the liquid is volatilized, or changed to a gaseous body, still larger supplies of heat are demanded. Thus, if caustic ammonia, which in its natural condition is a gaseous or aeriform body, is subjected to powerful pressure it changes to a liquid, and in doing so is forced to give up a large amount of latent heat. If it is relieved of pressure it again becomes aeriform, and as it demands a large amount of heat it seizes it from all bodies in contact. If water is in contact it is robbed of its latent heat and becomes frozen, and thus ice is formed.

In the arctic machine about fifty pounds of liquid ammonia are stored in a very strong iron cylinder, and this is connected with a coil of pipes immersed in a tank of strong brine; into this brine galvanized iron cans holding pure water are placed, and these cans are of the size of the blocks of ice which are formed. The liquid ammonia is allowed to flow through these coils, and it gradually becomes gaseous, and in becoming so abstracts from the water so much heat that it speedily freezes. A powerful steam pump forces the gaseous ammonia back into the iron cylinder again, thus liberating great heat, which is disposed of by cold water dropping upon coils of pipes through which the ammonia passes on its way to the condenser. The process is a continuous one, and if the pumps and coils do not leak there is no loss, and the operation may go on so long as the machinery lasts. The apparatus and the scientific principles upon which it acts are very interesting, and we are convinced that at present there is no hindrance to securing abundant supplies of ice, at cheap cost, in any tropical country where fuel is abundant and of low cost.

Iron Industries of Leeds.

The machine trade of Leeds is at the present moment, like most other English industries, in a state of depression. The productive power of the various foundries and machine shops, however, is greater than ever; and when the tide of prosperity turns once more in their favor, the canopy of smoke will settle with all its old density over the woolen metropolis, and the furnaces will blaze, and the hammers and anvils will clang, with all their ancient force. It is marvelous to observe to what a position the iron industries of Leeds have risen in such a short space of time, yielding large and rapid fortunes to the leading men engaged in them, and almost elbowing the staple trade of the town into a condition of secondary importance. It is one of the traditions of the district that iron works existed in Leeds and the neighborhood in the time of the Roman occupation, and the monks of Kirkstall are credited with having added iron working to their other pursuits; but it was not until the Murrys, the Fairbairns, the Kitsons, and other artificers in iron entered upon the scene that Leeds came properly under the rule of Vulcan. These men not only enriched themselves, but enriched the town, developing to the general profit of the community the valuable mineral resources of the district, and giving the world the advantage of their many mechanical discoveries. It was never dreamed at the beginning of the present century that such a possibility of development existed within the boundaries of Ralph Thoresby's native town. There were in 1871, 99 collieries existing in the Leeds district alone; the total number for Yorkshire being 423. In the same year there were in the Leeds and Bradford district 13 iron foundries, containing 247 puddling furnaces, and 59 rolling mills. The great industrial activity and immense resources which these figures represent are in wonderful contrast to the picture which could be drawn of the condition of things half a century ago; and whether England is destined to retain its industrial pre-eminence or not, the history of the men who were mainly instrumental in building up the nation's industrial greatness will always remain among the most attractive and most instructive evidences of a progress that is as yet probably the mightiest achievement of human effort.—*London Society*.

Country Schools.

A writer in *Barnes' Educational Monthly* discusses intelligently the importance of common schools and the difficulties encountered by teachers in inducing regular attendance and the maintaining of uniformity of text books. Another difficulty, complains the writer, arises from a mania among a certain class of farmers for acquiring all the land that joins theirs. Indeed it becomes a species of insanity, and from it men seldom recover. This is the way it works: So soon as a man, by scrimping and scraping, has saved a few hundred dollars, he bargains for the farm adjoining his, and makes the first payment, giving a mortgage for the balance. Now, for years he must scrimp and scrape even more closely, to pay off that mortgage. No sooner is this accomplished than the process is repeated; and so on, till death ends his work.

Meanwhile, his family is denied every comfort, his wife is a slave, and his children are growing up little better than heathens. Not that the father means to be unkind or neglectful, but he is "so poor"—land poor, always with a mortgage hanging over him, always with big interest and big taxes to pay. His home cannot have books and pictures, for these cost money, and he has none to spare; nor flowers, and the thousand dainty devices which make home attractive, because the overworked mother has no time nor heart for such things; and so the eternal grind, grind, grind, of their life goes on, without a particle of brightness to illumine it.

Now for the effect upon our public schools. Such a man frequently becomes the heaviest tax payer in the district. Through the renters upon his various farms he often controls votes enough to turn the scale in the district election. Now, he has himself and a colleague like unto him elected directors. Do you need to be told what such a board will do? Poor school-houses—for why should he care more for the school-house than for his home?—no apparatus, short terms of school; the cheapest of cheap teachers—one who will work twenty-six days for a month, "same as farm hands"—become the rule. Or, if this man does not reach the dignity of school director, he still has a controlling influence in district affairs, and that influence is all in favor of a penny-wise, pound-foolish policy.

The effect upon his own children is no less disastrous. They do not attend school regularly, because they are kept out to work whenever a possible five cents can be made thereby. They are seldom supplied with necessary books, for these cost money, and the money must go to lift the mortgage. They have no enthusiasm for study, for the atmosphere of their home smothers it. And the great danger is that these children will grow up to curse the world with multiplied copies of their father.

American Products in England.

The *Agricultural Gazette*, published in London and devoted, as its title implies, to the farming interests of Great Britain, suggests that he would be a bold man who should venture to deny that American competition is the great nightmare of every English producer. Not merely in the abundant surplus of "prairies bounded by the setting sun," but also in many minor articles (to the perfection of which human skill and labor enters), the toe of America galls Britannia's heel.

English bacon curers, cheese dairymen, and butter makers have long been dolefully complaining that their ordinary make is driven out of the shops by importations from beyond the Atlantic. A London builder recently stirred half the Black Country to wrath by stating in the *Times* that his customers preferred American locks. One day it is the vision of fleets entering Liverpool with cargoes of fresh meat and live cattle, which drives a section of Englishmen half wild. The next, the Kentish fruit growers see with horror the demand for the finest Blenheim oranges and Ribston pippins encroached on by "Baldwins." While those most self-satisfied of all Britons (the breeders and turfites of Newmarket and Epsom) have just had a wholesome pill to swallow in witnessing the triumphs over the best English and French horses of Papoose and of Parole.

It is impossible that this well-nigh universal success of our closest rival can be accidental. There must be a reason—some motive, universal there, but less active here—which brings our cousin Jonathan in so often as a winner. Defeat should be healthful, if its causes be discreetly examined. It cannot be merely soil and climate which work this miracle. For, into some of the American triumphs soil and climate do not enter. Nor can it be always the extra burden of taxation here which turns the scale against us. Because, in several of the wins recorded, the labor (which is the most expensive factor in the production) costs more there than the same would cost here.

It is not of the least use, as British farmers unwisely prefer to do, grumbling at the Legislature for not doing something in this case to redress the balance and to bring back good times. It is quite plain that some at least of the causes of our defeat are, to no small extent, inherent in ourselves; in our ways of conceiving and of carrying out our work.

The American thinks nothing too small not to be worth looking into, and the ingenuity and thoroughness with which every secret of nature is probed and is recorded are beyond all praise. We, on the contrary, are so satisfied that the methods we inherit are not only the best now, but the best ever to be discovered, that we do not care to do more than to inquire "what is the old way." Indeed not a few farmers resent as an insult the suggestion that they have anything to learn. To follow a precedent is the Englishman's one idea. Yet, as the problem offered to farmers is continually changing (for new items have constantly to be taken into account, and as relative values are continually being altered) the way to solve this problem successfully is by no means to go on copying the old figures. If cheese and butter are to pay the maker, they must now be the best of their kind, because, whatever may have been the case once, customers now have a choice, and they choose the best; having once had the best they will not take inferior. If cattle are to pay the vendor, these, too, must be of the best. And it is only common sense to say there ought not to be so many middlemen to claim a share out of the final price.

Shad in Arkansas.

Seven years ago a lot of little shad were placed in the Ouchita river, which rises in Arkansas, flows into Louisiana, and empties into the Red river in the latter State. Nothing was seen of them for a long while, and most people had forgotten the experiment, when two years ago two or three stray shad, the first that had ever been known in that region, were caught. Last year between thirty and forty were taken, and this spring they have been caught in immense quantities in Arkansas, in the vicinity of Hot Springs. This shows that there is no reason why the fish should not be domesticated in the far South, and the New Orleans papers call upon the people along the rivers in that region to stock them with young shad.

The Treatment of Neuralgia.

Aconite is an old remedy in neuralgia, which has, however, not altogether realized the expectations which were formed of its value. The power which it often lacks has been lately claimed for its alkaloid by Professor Gubler, who announced that aconitia is almost infallible in trigeminal neuralgia. This substance was long banished from the materia medica for internal use, but it has been employed occasionally since the discovery of a crystallized form by Gréhaud and Duquesnel in 1871. Its value in neuralgia has lately been investigated by the New York Committee on Neurotics, of which Dr. E. C. Seguin is the chairman. The dose of all forms of aconitia is about the same, the initial dose being about half a milligramme ($\frac{1}{16}$ grain) twice or thrice a day. Gubler states that the dose of amorphous aconitia may be gradually raised to half a centigramme, but Duquesnel's preparation has to be given with greater caution. There are, however, differences in susceptibility, and some persons cannot bear a larger dose than $\frac{1}{100}$ of a grain; while one case was met with in which $\frac{1}{4}$ of a grain every three hours was tolerated.

From a trial of the treatment in a series of cases, the committee conclude that, on the average, distinct physiological and therapeutical effects may be obtained by giving $\frac{1}{100}$ of a grain three times a day. Of six cases of severe trigeminal neuralgia, one, probably a reflex neuralgia from a decayed tooth, was not at all benefited. Three cases of epileptiform neuralgia were slightly or only temporarily relieved. Two cases were cured. One of these had existed for seven years, with an interruption of seven months, procured by resection of the affected nerve. The results thus afford a partial support to M. Gubler's assertion.

The value of ammoniacal sulphate of copper in the treatment of the same affection has been asserted by M. Féréol in a recent communication to the Académie de Médecine. He states that in cases in which every treatment has failed, even the administration of gelseminum and of aconitia, a cure or remarkable relief may be obtained to the most severe symptoms by this drug. Among the examples he gave of its use was the following: Trifacial neuralgia of two months' duration, with absolute (?) insomnia, was unrelieved by the extraction of teeth, quinine, bromide, aconitia, or tincture of gelseminum, hypodermic injections of morphia, or arsenic. From the first day of the administration of the ammonia sulphate of copper there was a notable remission in the symptoms and cessation of the insomnia. In one case the dose was pushed to eight grains without any other accident than nausea. It has the drawback of occasioning a persistent metallic taste in the mouth. Only one case of intolerance was met with; in that a grain and a half of sulphate of copper occasioned violent vomiting.—*Lancet*.

Chinese Physicians.

According to the *National Medical Review*, when the Chinese physician examines the pulse, he places the arm of his patient on a cushion; then he applies the index, the middle and ring fingers on the anterior face of the wrist in such a way that the index finger may be nearest the arm, and the ring finger nearest the hand. The physician then elevates and depresses each finger, alternately, with more or less force, like one playing on an organ. They examine, also, during a limited number of respirations, each of the nine pulses, which are formed, according to their doctrine, on each hand, and they deduce from these their prognosis, at once, without hesitation; make their prescriptions, and attend to administering their medicines on the spot; receive the fee and retire, not to return unless again summoned.

The Chinese physicians imagine a multitude of odd connections between the viscera of the human body and the elements, the seasons of the year, the stars, colors, etc. The heart, they say, is analogous to fire, to the planet Mars, to summer, to spring, and to southern climes. It comes from the liver, begets the spleen and the stomach, is antipathic with the kidney, and receives no injurious influence from its contact with the lungs.

During the springtime the pulse is like a tense cord; in summer it is more developed and becomes exuberant; in autumn it appears as if floating; in winter it is rather quiet.

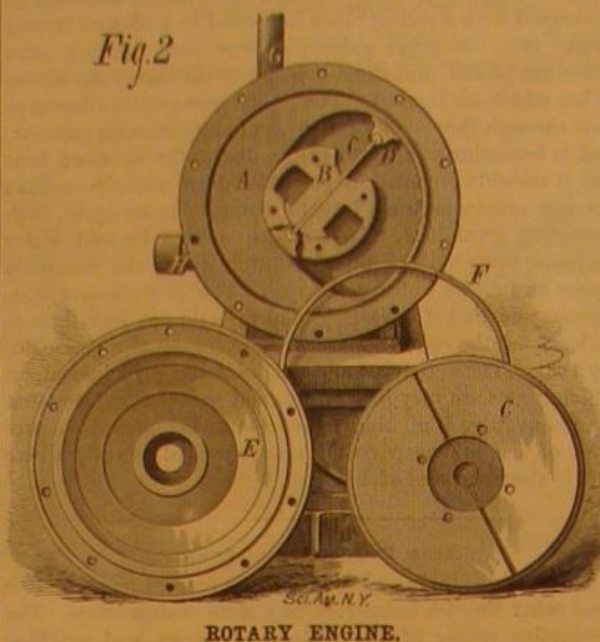
They think that the spirits and the blood, both vehicles of heat and humidity, run through all parts of the body in twenty-four hours. This daily circulation, they say, commences in the lungs at 3 o'clock in the morning, and ceases next day at the same place and at the same instant. The knowledge of the canals through which this is effected constitutes, in the eyes of Chinese physicians, the fullness of anatomical knowledge.

They count six canals which pass directly from above downward, and an equal number which return from below upward; eight canals run transversely, and fifteen obliquely.

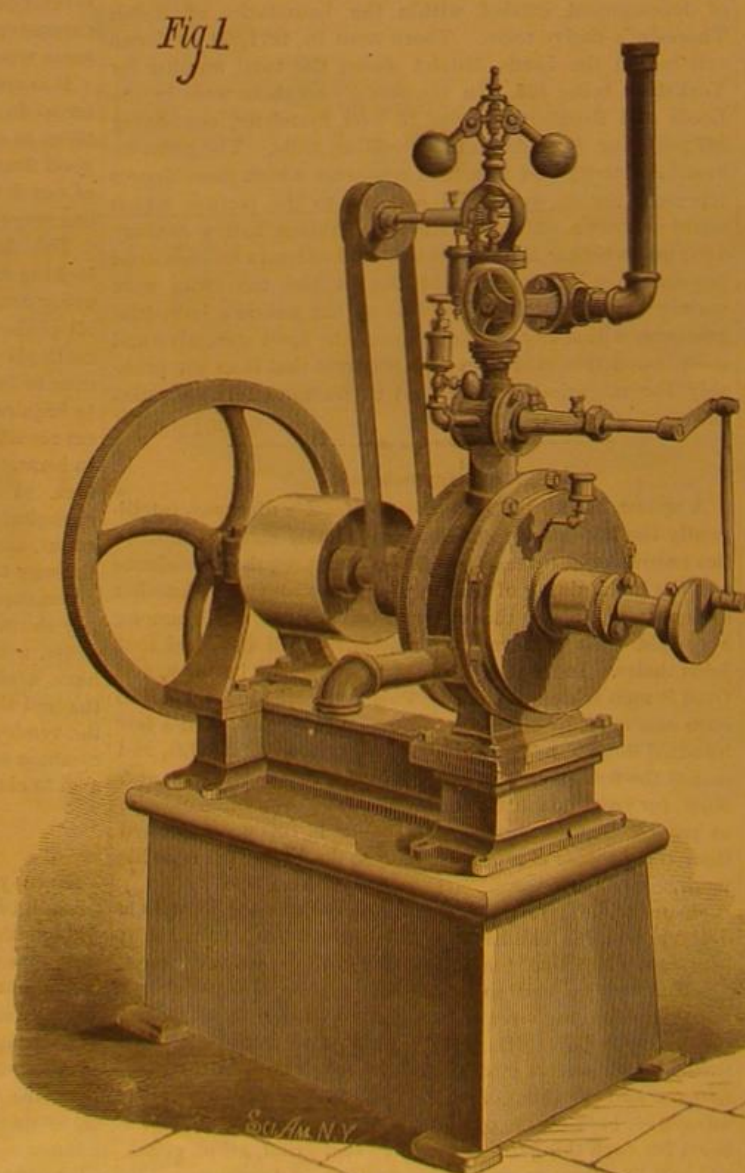
A NEW ROTARY ENGINE.

The construction of rotary steam engines has received the attention of many of the best engineers and mechanics, with results that have usually proved anything but satisfactory. However, it is claimed by the manufacturers of the engine shown in the accompanying engraving that, after having several of them in use at their own factory and in various other places, they are satisfied that it is practical and that it must for many uses supersede the reciprocating engines.

The case, A, contains cams and abutments, and the cylinder, B, has attached to it the heads, C C, which rotate with



it when the engine is in motion. The blade, D, is provided with packing saddles or shoes at each end. The cylinder has packing rings, F, and the outside heads, E, are recessed to admit the cylinder heads, C, and are bolted to the case in the ordinary way. The cylinder, B, and the rotating heads, C C, are slotted for the accommodation of the blades, D. Steam being admitted at the steam port, G, forces the extended end of the blade around to the exhaust port, H; before reaching this point, however, the blade passes up the cam, and is shifted endways through the cylinder, B, so that when the upper end of the blade, D, reaches a position in front of the port, G, the expanded steam is exhausted through the pipe, H, and the motion is continued as before, the blade passing around the inside circle of the case, A, and up through the cylinder, B, as it moves forward. The packing rings are placed in a suitable groove in the case, and are pressed against the cylinder heads by means of steam which is admitted through a small passage extending from the steam port to the back of the rings. The saddles at the

**NOTEMAN'S ROTARY ENGINE.**

ends of the blades are attached to the blades by means of a knuckle joint which allows them to adjust themselves to any angle of the wearing surface of the case; the pressure when at work, always keeps them packed against the case, so that the wear of the saddles or case is taken up and a perfect steam joint always maintained. The cut off, as shown in Fig. 1, is a novel feature in this rotary engine; as the steam is exhausted but twice to a revolution, it is perfectly practical, and may be set to cut off the steam at a third or half the stroke, as may be desirable, thus utilizing the expansive force of the steam. One notable point in this engine is the absence of springs or any kind of soft packing. The manufacturers state the joints are so well protected that there is no possibility of the escape of steam until it has done its work.

This engine is the invention of Mr. Alonzo Noteman, of Toledo, Ohio, and it is manufactured exclusively by Messrs. D. E. Saltonstall & Co., of the same place.

Legal Practice in London.

In the legal profession in England there are three distinct and well defined branches of practice; and the boundary lines of the several spheres of enterprise may not be overstepped. The solicitor transacts ordinary business, and advises his client, both as to the avoidance and the redress of grievances. He asserts the rights of the layman who intrusts his interests to his keeping, and avenges the wrongs inflicted upon him by others, so far as these functions can be performed with the aid of the ordinary appliances which the law affords. When matters become more complicated than the simple remedies will suffice to cure, the solicitor seeks the aid of counsel. The client cannot go directly to the latter to the prejudice of the general practitioner at law; nor can counsel transact ordinary business for laymen, however willing they may be to pay his fees or secure his services. An opinion may of course be obtained on the most trivial subject, but the case must be submitted through a solicitor, or counsel cannot entertain it, so that the wider professional interests are duly protected. There is a still more exclusive class of practitioners, who act solely as consultants and leaders—the Queen's counsel—who are prohibited from appearing in most cases before the courts without a junior. By this simple but effective organization of labor, any unseemly conflict of aims and interest is prevented, and the public benefit, not less than the profession, by the arrangement made and carried out.—*Lancet*.

New Pigment Process for Enlargements.

The *Association Belge de Photographie* publishes a pigment process by Dr. Van Monckhoven, which is especially adapted to solar enlargements. He dissolves wax in benzene, charges a small quantity of cotton with the solution, and applies the latter to a light piece of plate glass. The plate is then provided with a coating of collodion or varnish, and then immersed in water for thirty minutes. It is then taken out and placed flat upon a table, where it is coated with a mixture consisting of a colored pigment, gelatine, and bichromate of potassium, which having become firm, the plate is allowed to dry in the dark. In place of this (in addition to this) Monckhoven usually takes pigment paper, sensitized in the usual manner by dipping in a solution of bichromate of potassium, places it upon the collodionized surface of the plate—previously moistened with water—rubs it down in order to obtain perfect adhesion, and finally leaves it to dry. The plate is then exposed in the solar camera (enlarging apparatus) by allowing the picture rays to act, through the plate, upon the film treated with bichromate. The exposure is regulated by the assistance of the photometer. The plate is subsequently immersed in warm water of 30° for fifteen minutes, then in water of 60°, after which the sheet (paper) is detached, and the picture developed in the usual manner. It is then fixed, and a piece of white gelatine paper is finally affixed to the picture by means of the roller. When this has become perfectly dry, the picture is detached. If white gelatine paper be used, which is very brilliant (glossy), the picture will retain its smooth appearance even if it is mounted on cardboard. If, on the other hand, dull looking gelatine paper be employed, the picture will have the appearance of any ordinary print obtained by single transfer. Relative to this process, Monckhoven declares the exposure of the pigment film as adhering to the plate to be essentially new. The following advantages are claimed:

1. The net-like appearance of the pictures and the spontaneous insolubility of the chromo-gelatine will be avoided.
2. A perfect evenness (uniformity) of the paper, and a greater durability of the same, are obtained.
3. All drawbacks of the single transfer process, as imperfect adhesion, air bubbles, and other casualties well known to persons using the pigment process, are successfully avoided.
4. The resulting prints remain perfect, and the pictures are clear and sharp beyond comparison.

Spiders and Ants—Island of St. Thomas.

A large ground spider (*Lycosa*) is very abundant in the island, inhabiting a hole in the ground about six inches in depth and from half an inch to an inch in diameter, and with a right angled turn at the bottom to form a resting chamber for the spider. Some negro boys dug the spiders out for me. They said that their bite was poisonous, and that they fed on lizards, leaving their holes at night to search for them.

The boys soon grubbed one out with a knife, a great heavy venomous-looking brute about three inches across. It bit savagely at my forceps. The holes of these spiders were so common that on one tolerably clear patch of about an acre in extent they were dotted over the entire area at about one or two feet distance from one another. I noticed the holes at once, and was astonished when the boys told me they were spiders' holes.

A species of white ant (*Termite*) is very common, which makes large globular nests as much as two feet in diameter, and which are perched high up in the fork of a tree. The nests are made of a hard brown comb. From the bottom of the tree covered galleries, about half an inch in breadth, lead up on the surface of the bark to the nest, looking like long narrow brown streaks upon the trunk of the tree. The galleries usually follow a somewhat irregular course up the trunk to the nest, reminding one of the curious deviations which are always to be seen in foot-paths cut out by people walking across fields, in their endeavors to go straight from one point to another. The galleries, or rather tubular ways, for they have bottoms to them, are made of the same tough brown substance as the nests, and are cemented firmly to the bark. Though they are so broad in order to allow numerous ants to pass and repass, they are only high enough for the ants to walk under. I broke one of these galleries, and a number of soldier termites came out and began biting my hands, hardly making themselves felt, but as brave as if they had a sting. I had to break a considerable length of the gallery before I got to any of the working termites, as they had retired from the scene of danger.

A species of peripatus is found in St. Thomas, but I did not succeed in meeting with any. An agouti, a species of rodent (*Dasyprocta*) occurs in the island, and Mr. Wyman told me that it was common in the gullies near his sugar plantation.—H. N. Mosley, "Notes by a Naturalist."

THE CYCLODES.

The cyclodes are so called on account of their teeth, the crown of which is rounded, and which reminds of the sharp and cutting teeth of other reptiles that belong to the same class. The cyclodes have a large round trunk, which diminishes regularly from the neck to the extremity of the tail. The tail and body form one piece. The snout is blunt and the tongue is flat, is covered with scales, and has the shape of a lance, with an incision at the end. The eyes are oval and oblique, and are behind the mouth. The neck is very short and narrow. The body is covered with smooth scales arranged like a coat of mail. The claws are small in proportion to the size of the body. The fingers are short, plump, and nearly cylindrical. Three species of cyclodes are found in New Holland—the cyclode of Casnarina, the black and yellow cyclode, and the cyclode of Boddaert.

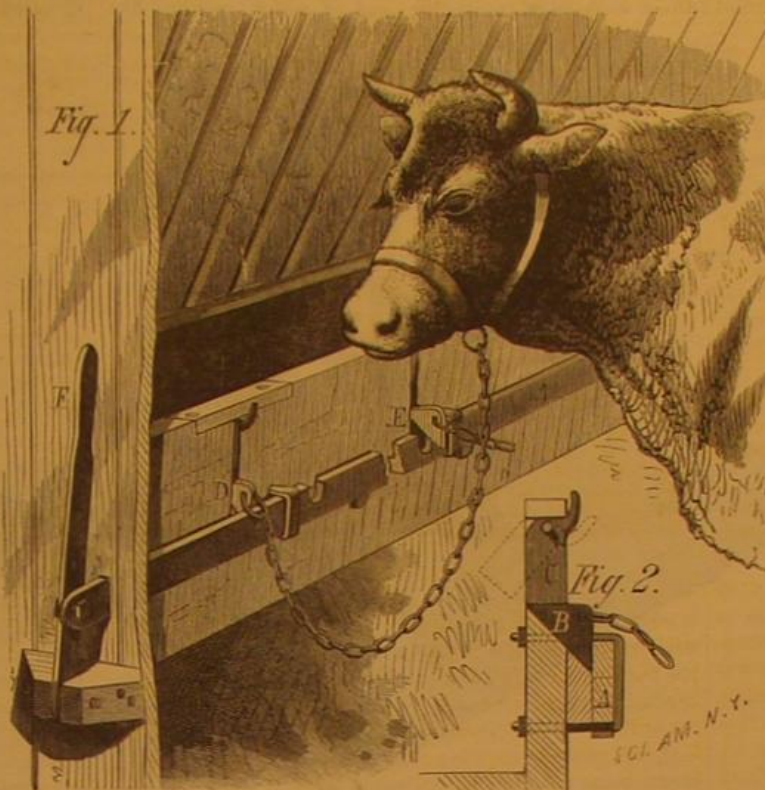
The giant skink, or the cyclode of Boddaert, is shown in the engraving. It has a more elongated head than the other two species. The upper part of the body is marked with transverse alternating fawn colored and brown stripes. Sometimes these stripes pass down the sides, when the brown or black ones are covered with large yellow spots. Back of the eyes there is a dark stripe which extends as far as the shoulders. In some of the animals the top of the head is reddish, while in others it has a black border. This species attains a length of about fifteen inches.

Like most of the skink family it is very slow in its movements and will lie for hours perfectly immovable, and generally prefers warm and obscure places. While walking the belly drags along the earth, for the legs are short and too feeble to support the body. It lives on pulpy fruit, small animals, and young birds.—La Nature.

FASTENING AND RELEASING DEVICE FOR CATTLE STALLS.

The practical value of inventions of the class represented in the accompanying engraving can scarcely be overestimated. The frequency of fires and accidents which imperil cattle and horses imprisoned in stalls, has rendered something of this nature an absolute necessity, and its convenience in every day use is worthy of consideration.

The front board of the troughs, or the head walls of a series of stalls, are all arranged in line, and a horizontal continuous bar, A, extends through all of the stalls, and is supported by staples or keepers, and provided with a stop pin

**WATTERS' FASTENING AND RELEASING DEVICE.**

which limits its motion. In the head wall, or in the front of the trough in each stall, there is a vertical recess having an inclined bottom running out into the stall. In the upper part of this recess is pivoted a gravity catch or detent, C, which extends downward into the recess just far enough to leave a triangular chamber for receiving the triangular bit, B, which is attached to the end of a chain or rope about the animal's neck. This arrangement is clearly shown in Fig. 2. It will be noticed that the bar, A, extends along in front of the recess which contains the bit, B, and in conjunction with the gravity catch retains the bit.

In the bar, A, there are notches corresponding in position with the recesses in the troughs, and at one end of the bar there is a lever, F, by which it may be moved longitudinally.

There are two ways of releasing the animals. If only a portion are to be released, or if it is desired to release them separately, it may be done by throwing up the gravity catch as shown in dotted lines in Fig. 2. When it is desired to

This device has met with the approval of farmers' clubs and farmers who have examined and tested it. Further information may be obtained from Mr. James D. Watters, of Bel Air, Md.

Experiments in Cross-Breeding Plants.

Professor W. J. Beal, desirous of testing the accuracy of some of the statements in Darwin's work, "The Effects of Cross and Self Fertilization of Plants," has been making some experiments, the results of which he records in the *American Journal of Science and Arts*. His first experiments were with Indian corn. Yellow dent corn was obtained from two men in different parts of Michigan. In one case the corn had been kept ten years or more on the same farm, and in the other instance fifteen years or more on the same farm. In both cases the corn was much alike. The two lots were planted in alternate rows in a plat by itself. The tops of one set of rows were all cut off, thus securing a perfect cross on those stalks. Seed from this cross was saved and planted to compare with corn not so crossed. The yield from the crossed seed exceeded the yield of that not crossed, as 153 exceeds 100.

The next experiment was with black wax beans, a variety much cultivated for the purpose of supplying an early crop, and a kind that may be eaten, pod and all, while young. Eight rows were planted, alternately old and crossed stock, and fifteen beans planted in each of the rows. This was on May 31, 1878. On the 22d of July the pods on the two lots of plants were about alike in size, but those fit for cooking numbered 108 on the old stock, and 353 on the crossed; a difference of over three to one in favor of the crossed stock. On August 9th the pods fit for cooking, or past that condition, were 883 on the old stalk and 1,048 on the crossed. On or before the 16th of September all were harvested. The total number of pods was found to be, on the old stock 818 and on the crossed stock 1,859. The beans of the old stock weighed 29.77 ounces, while those of the crossed stock weighed 70.33 ounces, or nearly in the proportion of 100 to 236. Six lots of fifty beans each were taken at random from the old stock, weighed, and the average for fifty found to be 269½ grains. A like experiment with the crossed stock gave an average of 213½ grains. The average weight of an equal number of beans from each stock was nearly as 100 to 79 in favor of the old stock.

Poisonous Properties of Laburnum.

The laburnum (*L. vulgare*), a small ornamental leguminous tree very common in our gardens under the name of "golden chain," is quite a favorite with both young and old on account of its being an early bloomer, as well as because its flowers are very pretty.

A writer in the *Gardener's Chronicle* calls attention to the fact that the seeds of this plant act so violently as an emetic that they are justly deemed poisonous, but it seems very little known that all the parts of this tree—leaves, flower pods, and even the bark and roots—are highly dangerous and contain the *cytisin* discovered by Husemann and Marne in 1864.

A dose of 0.03 of a gramme injected under the skin is sufficient to cause the instantaneous death of a dog or a cat. Dr. Christison was the first who observed the fatal poisoning of a man by *cytisin*, and more than a hundred cases of poisoning by this alkaloid, of which the majority were fatal, have been recorded in medical literature. Children particularly, who had eaten of the pods or seeds of laburnum (ten seeds kill a child), but also adults who by mistake had taken flowers of this plant instead of false acacia to prepare a tea, were dangerously affected. The symptoms of this kind of poisoning are not at all characteristic, and unfortunately no antidote is as yet known for it.

Japanese Cement.

Mix the best powdered rice with a little cold water, then gradually add boiling water until a proper consistence is acquired, being careful to keep it well stirred all the time; lastly, it must be boiled for one minute in a clean saucepan. This glue is beautifully white and almost transparent, for which reason it is well adapted for fancy paper work, which requires a strong and colorless cement.

**CYCLODE OF BODDAERT, AT THE JARDIN DES PLANTES, PARIS.**

loosen all of the animals as quickly as possible, as in a case of fire, the bar, A, is moved longitudinally by means of the lever, F, bringing the notches in the bar opposite the bits, B, as shown at E (Fig. 1), permitting all of the animals to escape simultaneously.

The Steamship Scotia.

Many of our people, from having frequently crossed the Atlantic in the steamship Scotia, the last side-wheel steamer built for the Cunard Company, will be glad to know what has become of their favorite vessel. A foreign contemporary gives the following account of her.

"Few would recognize in the large twin screw steamer which left the Mersey lately, the once famous Cunard liner Scotia, the last of the great paddle steamers built for the Atlantic trade, and which, under the command of the late Captain Judkins, was for years looked upon as the fastest and favorite vessel on the line between Liverpool and New York. The Scotia was built in 1862, when, with the exception of the Great Eastern, she was probably the largest mail steamer afloat, being about 400 feet long over all, 47 feet 8 inches beam, and 4,050 tons builder's measurement, and fitted with a pair of side lever engines of 1,000 horse power. The introduction of screw steamers fitted with compound engines for the Atlantic and other ocean voyages has, of late years, entirely superseded the paddle steamers, and a few years back the Scotia was withdrawn from the Cunard Company's sailing list, and was subsequently purchased by the Telegraph Construction and Maintenance Company to be employed in their cable-laying operations. Extensive alterations were made by Messrs. Laird Brothers, at Birkenhead Ironworks. The Scotia has been stripped of her masts, funnels, machinery, paddle wheels and paddle boxes, deckhouses, etc.; she has also been raised by the addition of a spar deck, and altered about the after end to prepare her for twin screws, and has been fitted with new compound engines, and also provided with three immense cylindrical tanks in which to stow the electric cable, as well as with most elaborate and approved steam machinery for paying out and hauling in, also steam capstan, steam steering gear, winches, etc. The new engines are two distinct sets, on the compound system, with inverted cylinders, 38 inches, and 66 inches diameter, and 3 feet 9 inches stroke, supplied with steam at 75 lb. pressure from three double-ended cylindrical boilers, and are calculated to drive the vessel at a speed of about 11½ knots an hour.

THE ELECTRIC PEN.

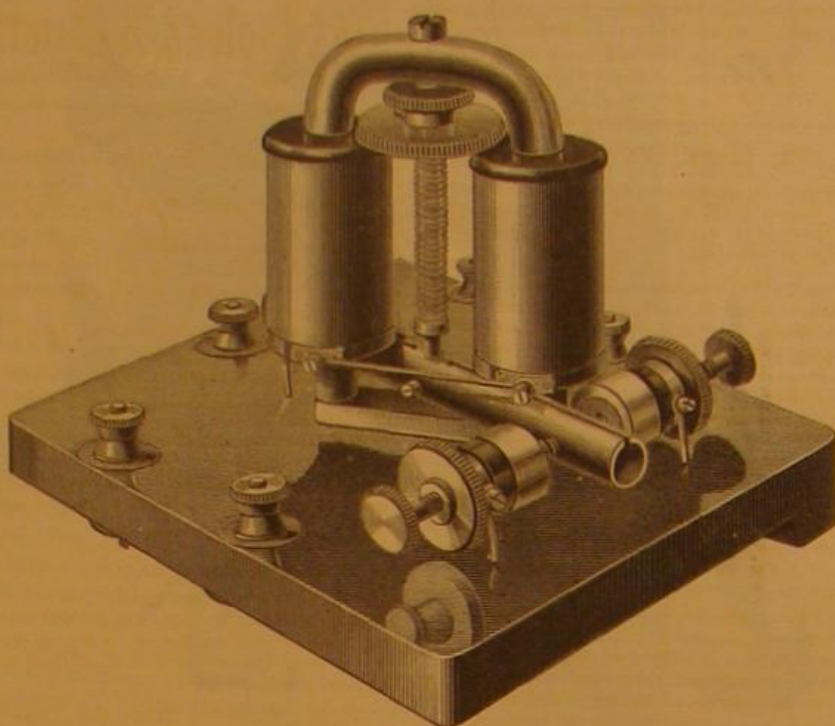
Our engraving, which we take from *La Nature*, represents a new electric pen devised by Messrs. Bellet & Haliez d'Arros, who deserve credit for having remedied several imperfections which existed in the first instruments made on this principle.

This pen was suggested by the familiar experiment of piercing a card by the passage of an electric spark from a Leyden jar. The spark of an electric machine or an induction coil passing between metallic points or between a point and a conducting body is capable of piercing a card, and will, of course, much easier puncture a sheet of paper. When the sheet of paper rests upon a metallic plate and the surface is traversed by the electric pen, the plate and the pen being connected with the poles of an induction coil, a line may be produced by a series of very fine perforations, which will vary in number in a given space with the rapidity of the discharges and the rate of the movement of the pen. The principle of the pen is very simple, but before the practical utilization of it was reached, many difficulties had to be surmounted. Among these we may mention the tendency of the sparks to burst forth, when the pen is within a short distance of the paper, puncturing the paper in all directions, making it impossible to draw a clear line from the start. The operator was also liable to severe shocks. Another difficulty was the distance between the successive perforations. These imperfections have been overcome by Messrs. Bellet & Arros, by reducing the strength of the secondary current, so that it has only sufficient power to pierce the paper, and will not, therefore, give a perceptible shock. The paper which is to form the stencil is dipped in a solution of salt and dried; this operation prevents too many sparks from issuing from the pen, and insures an absolutely true and clear line. The interrupter is of novel form and is operated by the magnetized core of the induction coil. The apparatus forms a desk of me-

dium dimensions. At one side of the desk there is a plunging bichromate battery; the induction coil is placed in the middle and is connected by one of its wires with the lead of an ordinary lead pencil, which serves the double purpose of making a visible mark on the paper and of conducting the current. The metallic plate which supports the paper is also connected with the coil and is secured to the desk top. When it is desired to take an impression from the stencil it is placed over a sheet of paper, and rolled with printer's ink reduced with a little printer's varnish or with castor oil.

A NEW SOUNDER.

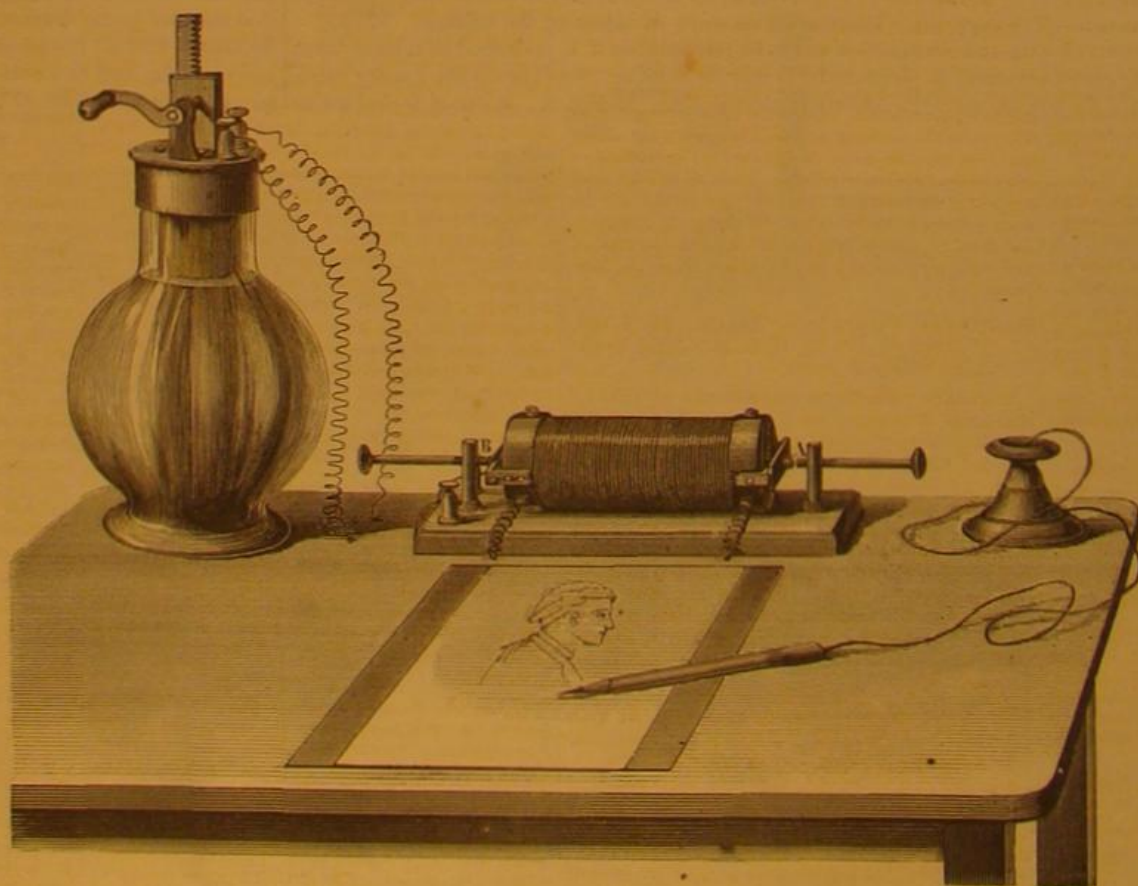
The accompanying illustration represents a sounder for direct working or translation, and of which over one hun-

**A NEW FORM OF SOUNDER.**

dred have been constructed for the telegraph lines in India.

It differs from an ordinary sounder in the arrangement of the armature, which is supported by a vertical spiral spring. This spring serves to restore the position of the armature when the current ceases, as well as to relieve the lower bearing of nearly all friction. The prolongation of the armature acts as the beam, and plays between the two stops shown in the engraving.

To insure very good insulation for damp climates, the coils are rendered solid by repeated immersions in a compound of resin and beeswax (for hot climates, ten parts of resin and

**NEW ELECTRIC PEN.**

one of wax answers well). The range of the instrument is shown by its working without fresh adjustment, either with one Daniell's cell through 6,000 ohms or with 20 through 0. When very delicately adjusted, one Daniell's cell through 31,000 ohms is just able to work the instrument if the stops be extremely close together. —G. Dubern, in *Journal of the Society of Telegraph Engineers*.

NEW AGRICULTURAL INVENTIONS.

An improvement in the class of churns having a reciprocating dasher which is operated by a spring motor, has been patented by Mr. W. L. Allegru, of Hebbardsville, Ky. This improvement relates to the construction of the churn cover, which is composed of two separate disks, the lower one being designed for gathering the butter.

An improved churn dasher, constructed so as to give the milk a continuous rotary motion as the dasher is moved up and down, has been patented by Mr. Seth K. Warren, of Louisville, Ky. The invention consists in wings eccentrically pivoted to arms attached to the dasher handle.

A cultivator that is constructed so that its teeth may be elevated or depressed at will, so that it may be hauled or drawn over the road on its own wheels, has been patented by Mr. Wm. Jones, of Mill Point, N. Y. It will cultivate or make a furrow close to a fence or hedge.

An improved machine for stacking and rickling hay and straw has been patented by Mr. B. E. Jones, of Boonville, Mo. The invention consists in a combination of devices which cannot be readily described without an engraving.

Mr. A. W. Meyer, of Labadie, Mo., has devised an improved straw elevator for thrashers and separators, which consists in the combination of a fan blower, a pivoted screen held in a horizontal position by a weighted arm, and a conductor spout, with a stacker having cross slots in its floor.

An improved sulky scraper, constructed so that it may be readily adjusted to the various positions required for collecting, carrying, and dumping the load by the driver from his seat, has been patented by Mr. William C. Marr, of Onawa, Ia.

Mr. James M. Matthews, of Knoxville, Tenn., has patented an improved plow, which has a semicircular iron beam upon which the mould board is made adjustable.

Mr. Sam. T. Ferguson, of Minneapolis, Minn., has patented an improvement in horse rakes, which consists in a yielding or flexible lever, which may be held by the hand of the driver, and which may be readily changed to a rigid lock lever which will hold the teeth of the rake to the ground without the aid of the driver.

The Fur on the Tongue.

The nature of the fur on the tongue has been the subject of a study by Henry T. Butlin, F.R.C.S., and the results of his investigation are given in a paper read at a recent meeting of the Royal Society. The author finds that tongue fur consists chiefly of (1) debris of food and bubbles of mucus and saliva, (2) epithelium, (3) masses which at first appear to consist of granular matter, but which are the glæa of certain forms of schistomycetous fungi. In order to ascertain the true nature of the glæa, and to obtain it in a purer form, it was cultivated upon a warm stage. Several fungi were discovered, but only two of these were present in every instance, *Micrococcus* and *Bacillus subtilis*, and as the glæa produced artificially was similar to that existing naturally in the tongue fur, it is believed the fur is composed essentially of these two fungi.

Micrococcus developed freely and abundantly, forming large masses of yellow or brownish yellow color. *Bacillus* did not develop, but existed in greater or less abundance in all the cases examined. It appeared to be identical with the *Leptothrix buccalis* described by Robin. Although it did not develop under artificial conditions, it is probable that development takes place freely upon the surface of the tongue. Its habitual occurrence there, and the presence of spore-bearing filaments, favor this view. Besides these fungi there were present in more or less abundance, *Bacterium termo*, *Sarcina ventriculi*, *Spirochæta plicatilis*, and a larger form of *Spirillum* or *Vibrio*. The first of these fungi existed in some of the furs, and twice developed with great rapidity. The second was frequently present, and generally developed quickly, forming large masses of a yellow or yellowish brown color. The *Spirochæta* occurred in only two or three of the specimens examined.

The slime between and around the teeth was found to consist of the same fungi as the tongue fur, but the rods of *Bacillus* were longer, probably owing to fewer disturbances.

AN OLD CONCERN RE-ESTABLISHED.

Horsace Waters & Son, dealers in musical instruments in this city, made an assignment not long ago to secure their creditors. Mr. Waters, Jr., after thirty years' experience, hopes, by enterprise, economy, and fair dealing, to re-establish his business and to retain his old customers. To this end, he has opened a store No. 40 East 14th St., and acts as agent for a number of leading musical instrument manufacturers.

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.

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Walrus Leather, Solid Walrus Wheels; Wood Wheels covered with walrus leather for polishing. Greene, Tweed & Co., 18 Park Place, New York.

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799½ in., 800 in., 800½ in., 801 in., 801½ in., 802 in., 802½ in., 803 in., 803½ in., 804 in., 804½ in., 805 in., 805½ in., 806 in., 806½ in., 807 in., 807½ in., 808 in., 808½ in., 809 in., 809½

1-3 ounce of pure hydrochloric acid, and let the precipitate subside. Wash this (silver chloride) several times, by decantation, with hot water. Dissolve $\frac{1}{4}$ lb. of potassium cyanide in soft water; add this gradually (warm) to the precipitate until the latter is completely dissolved, and dilute the solution to one gallon. Dip the articles (brass or copper) to be silvered in strong hot potash solution, rinse in water, scour with a brush and fine pumice, rinse again and dip in the cyanide bath. If a dark deposit is obtained, add more water to the bath; if it coats slowly, add more silver chloride. As the silver is gradually abstracted more of the chloride must be added. If properly silvered the work will admit of polishing. A trace of grease or dirt on the work will spoil the deposit. Cyanide of potassium is very poisonous, and care should therefore be taken to avoid introducing it, through cuts or otherwise, into the system.

(16) T. A. writes: I am thinking of getting a condensing steam engine, and have been told that this kind of engine takes some 20 to 30 times more water (for condensing purposes) than would a non-condensing engine. Could I use two wells for this purpose, by running the condensed steam (water) to the second well, and then the next day use this same water for condensing purposes again; and then running it to the first well again, and so back and forth, using the same water over and over again day after day; and if so how much water would be actually lost or evaporated each day, say in a 12 hours' run with 30 horse power engine? A. Your mode of using two wells will answer if they are of sufficient capacity to give time for one to cool off while using water from the other. The water should, in cooling, be reduced in temperature about 40 degrees. If your boiler and engine are tight, the loss would probably not exceed 5 per cent. But is a condensing engine necessary in your case, and if so, why?

(17) O. E. writes: I want to make an electro-magnet capable of lifting 1 ounce $\frac{1}{4}$ of an inch. 1. What size and length of wire and core ought I to use? A. Make the cores $\frac{1}{4}$ inch long, $\frac{1}{4}$ inch in diameter, wind them with 6 or 8 layers of No. 20 covered wire. 2. What battery and conducting wire will be best, circuit about 15 feet? A. If for continued use, use two or three cells of gravity battery. If used occasionally, one cell of Grenet or Bunsen would do. For conducting wire use No. 16. 3. How should I fasten the wire to the core? A. The wire is not fastened to the core. For method of making magnets and full particulars as to proportions, resistance, etc., see SCIENTIFIC AMERICAN SUPPLEMENT No. 182, article on Electro-Magnets, illustrated by over 50 cuts.

(18) E. C. B. writes: In a recent query, C. R. H. asks if it is possible for a number of persons to move a table by electricity by placing their hands upon it, without pressing upon it? You simply answer "no." Now I would like an explanation. I have been one of seven who moved a table in this way, it going around the room in a circle. We placed the legs in saucers. Time to start about twenty minutes. If it is not the electric current, what is it? A. Muscle generally, sometimes muscle combined with a vacuum formed in the palms of the hands of some of the table movers.

(19) H. G. A. S. asks: Will you be kind enough to tell me what about is the total strain on a 7 $\frac{1}{2}$ octave piano? A. A 7 $\frac{1}{2}$ octave large concert grand, of Steinway & Sons' make, bears a total strain of 66,000 lb. Parlor grands of the same make average 30,000 lb. strain each; and upright pianos, having also three strings to each note, from 20,000 to 25,000 lb., according to size; the square grand pianos, 7 $\frac{1}{2}$ octave, being partly 3 stringed to each note, about 20,000 lb.; 7 octave square pianos, two strings to each note, about 16,000 lb. each. 2. Some thorough work on tuning and temperament? A. The only standard work, in which tuning and temperament are most scientifically treated, which we know of as translated into the English language, is "Professor Helmholtz's Tone Sensations."

(20) C. R. N. writes: 1. If there be a small aperture in a steam boiler, say one half inch in diameter, will the steam exert a greater force to displace a plug driven into it having a square end than if the end were sharp and tapering; if so why? A. No, the pressure acts upon the total area of the opening. 2. Which has the greatest power with an equal force applied, a crank or an eccentric, the throw being equal? A. An eccentric is simply a crank.

(21) E. A. W. asks: 1. Can a circular saw be made to revolve so rapidly that it will not cut? A. No. 2. Which is the better conductor, a rapidly revolving saw or one at rest, or, in other words, will lightning strike one sooner than the other? A. We think there would be no difference. 3. Which will run easier, a wheel with boxing much too large for spindle, or one having boxing that fits the spindle neatly? A. Well fitted boxes best; the shaft is then always in proper line. With slack boxes it generally would be out of line.

(22) J. T. E. asks: 1. What is the striking force of a pile hammer falling twenty-two feet, weight nineteen cwt? A. 35 $\frac{1}{2}$ tons. 2. What will prevent water from foaming in steam boilers? What causes it to foam? A. There are many causes for foaming, and different remedies are accordingly required. Often a little oil forced into the boiler will check the foaming temporarily.

(23) J. H. B. asks: 1. Can a current water wheel be made that can be used successfully for running a flouring mill, and if so what is the plan for such a wheel? A. Yes. 2. Can the motion of machinery propelled by such a wheel be governed, and how? A. By a proper mill wheel governor. 3. What should the quantity and velocity of a current of water be to produce a 25 horse power? A. Consult a good millwright or engineer as to the special conditions of your case.

(24) E. M. asks (1) if it would be advisable to have small pump exhaust into boiler chimney. A. It would be a mere question of convenience. 2. Why is a siphon indispensable to a steam gauge? A. To interpose between the steam and the diaphragm of the gauge a short column of water, which prevents the heat of the steam from affecting the gauge.

(25) A. L. G. asks if expansion joints can be used with success in a line of steam pipe one hun-

dred and twenty feet long. We have a great deal of trouble in keeping our unions tight; the steam is used for heating purposes, one line of piping 120 feet, one line of waste pipe 120 feet long, which enters a steam trap. A. Yes, with entire success, if you put in enough of them and it is properly done.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

C. A. J.—It is chalcocite or copper glance, with malachite—a valuable ore of copper if found in sufficient quantity. The per cent of copper in it can only be determined by a quantitative analysis. A. S.—The so-called ore consists chiefly of iron sulphide, bronze powder or Dutch gold leaf (brass), sheet metal clippings, and mercury. Evidently an attempted imposition. E. J. L.—The gravel consists chiefly of quartz and mica. Some of this may prove auriferous. No name.—The specimen contains much silica, iron, and lime. It may prove useful for the manufacture of bricks, cheap pottery, etc. E. B. S.—Quartz pebbles.—W. M. B.—The object is a fossil one of the extremities of the internal bone or shell of a *Belemnite*, a cephalopod which was very abundant during the Cretaceous Period, to which the green sand of your State belongs. The animal was allied to and much like the cuttle fishes and squids of the present day. The portion you send is what the scientists call the *phragmocone*, and was divided into deeply concave air chambers (which you may see by holding a specimen up to the light), and these were connected with each other by a tube. It was originally exceedingly delicate, and owes its preservation in its present hard state to the infiltration of calcareous spar.

COMMUNICATIONS RECEIVED.

On a Mathematical Discovery. By J. C. M.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

May 20, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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THE

Hancock Inspirator.

STRONG TESTIMONY.

DUNNELL MANUFACTURING CO.,
PAWTUCKET, R. I., May 12th, 1879.

To the HANCOCK INSPIRATOR CO.,
52 Central Wharf, Boston:

Gentlemen: In reply to yours of the 8th, inquiring how the No. 45 Inspirator, purchased of you a month ago, is working, will say it gives entire satisfaction. The one we purchased of you, two and a half years ago, is still doing good service, and is as good as new; they are draughting water 18 feet, and trailing it 25 feet. We regard them as much more economical than any of the injectors.
Very respectfully,
J. A. MONCRIEF,
Engineer for Dunnell Mfg. Co.

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Hancock Inspirator Co.,
52 CENTRAL WHARF,
BOSTON, MASS.

TOOL DEPOT. SMALL TOOLS, LATHES &c.
FOR MACHINISTS, CARPENTERS, AMATEURS &c.
EVERY BRANCH OF MECHANICAL TRADE SEND FOR
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Is in use in thousands of families in the United States, South America, Canada, Europe, and Australia. A test of it will establish its merit in any household. It will accomplish what no other washer has ever done. It cleanses thoroughly and bleaches perfectly, without rubbing or injuring the most delicate fabrics, even to lace curtains. Retail Price, \$3.50.

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In States east of the Missouri and Mississippi Rivers, also in Kansas and Nebraska, we will deliver at your nearest railway express office, CHARGES PREPAID, Sample Washer for \$3.50.

Cash must accompany all orders. Remit by Post Office Order or Registered Letter, at our risk. We insure the safe delivery of all Washers ordered as above. Money may also be sent by Draft on New York. Address: HANCOCK INSPIRATOR CO., 50 Barclay Street, New York. When you order mention this paper.

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PLANING, MATCHING, MOLDING, MORTISING,
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LIGHT DRAUGHT, FAST, STERN
Wheel Steam Yachts. These yachts are 34 feet long, 8 feet 2 inches beam; draught, 16 inches; speed, 7 miles an hour. Designed under direction of Col. F. W. Farquhar, U. S. A., by M. Meigs, U. S. Civil Engineer, U. S. Works, Rock Island, Ill. With working drawings, dimensions, and particulars of vessel, engine, boiler, and wheel, furnished by the author. The serviceable character of these boats, their simplicity of construction, roominess, and light draught render them very desirable, especially for shallow waters. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 179. Price 10 cents. To be had at this office and of all news-dealers.

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