# SCIENTIFIC AMERICAN

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## A FEW NOVELTIES.

The device represented in Fig. 1 in the engraving is an improved automatic liquid weigher, invented by Mr. Lewis N. Watts, of Indianapolis, Ind. The scales in connection with the weighted elbow lever, A, are placed in the proper relative position to the faucet of the barrel, so that the receptacle into which the liquid is to be drawn may set on the platform of the scales. The receptacle is counterbalanced with weights, and enough more weight is added so that the scale will tip when the desired quantity of liquid has been drawn. The weighted end, B, of the lever, A, is raised to a vertical position, and the faucet opened. When enough of the liquid has run into the receptacle to tip the scale, the scale pan touches the horizontal arm of the lever, A, when the weighted end, B, falls on the handle of the faucet and stops the flow of the liquid.

An improved steam fog alarm, recently patented by Mr. William Leighton, of West Pembroke, Me., is shown partly in section in Fig. 2. It is intended to re-enforce and strengthen the sound of a steam whistle and to project the sound in one direction. It consists of a fog horn containing a steam whistle, behind which there is an adjustable resonance chamber.

The whistle is of peculiar construction, having straight parallel sides and straight orifices to give great volume of sound in a particular direction, instead of expending the force in all directions, as in the case with a whistle having an annular orifice.

Fig. 3 shows two forms of seed package, invented by Mr. Carl O. Wolferts, of Hicksville, N. Y. The novelty of this invention consists in placing the seed in a wrapping of paper at suitable distances apart for planting. For seeds that are to be planted in rows, the packages are made in continuous narrow strips, with the seed fixed between the folds, so that they may be rolled up in compact form for keeping. Such seeds as are usually planted in hills are fixed between disks of paper in the proper number and distance for forming a hill, and the separate packages are connected by a band or ribbon to secure uniformity in the spacing of the hills. By these means the seeds can be planted uniformly as to depth and distance apart.

The magnets, A, in the electro-magnetic motor shown in Fig. 4 are elongated and notched at B, to increase their attractive surface, and the armature, C, is provided with projecting teeth corresponding with the notches in the magnets. The motor is provided with a resistance coil which assists in demagnetizing the last acting magnet and prevents sparks at the commutator. A device is provided by which the motor may at any time be reversed. This motor is the invention of Mr. John C. Ludwig, of San Francisco, California

Fig. 5 represents an adjustable wash bowl patented by Messrs. J. L. Knight and S. Smith, of Topeka, Kan. The bowl is provided with hot and cold water supply pipes and with a waste pipe hinged together and provided with the necessary stop cocks.

An improved tap for tin cans, patented by Messrs. John T. Cooper and Julius Wagner, of Silver Reef, Utah Ter., is shown in Figs. 6 and 7. The invention consists of a bell-shaped body, A, provided with a stopcock and having a central spindle extending through it, carrying at one end an arrow-shaped head, B, for puncturing the can and holding the tap, and at the other end a wing-nut for drawing the bell-shaped body against the head of the can. The head, B, is projected some distance beyond the body, A, and forced through the top of the can; it is then turned through a quarter of a revolution and drawn up against the can top by the wing-nut.

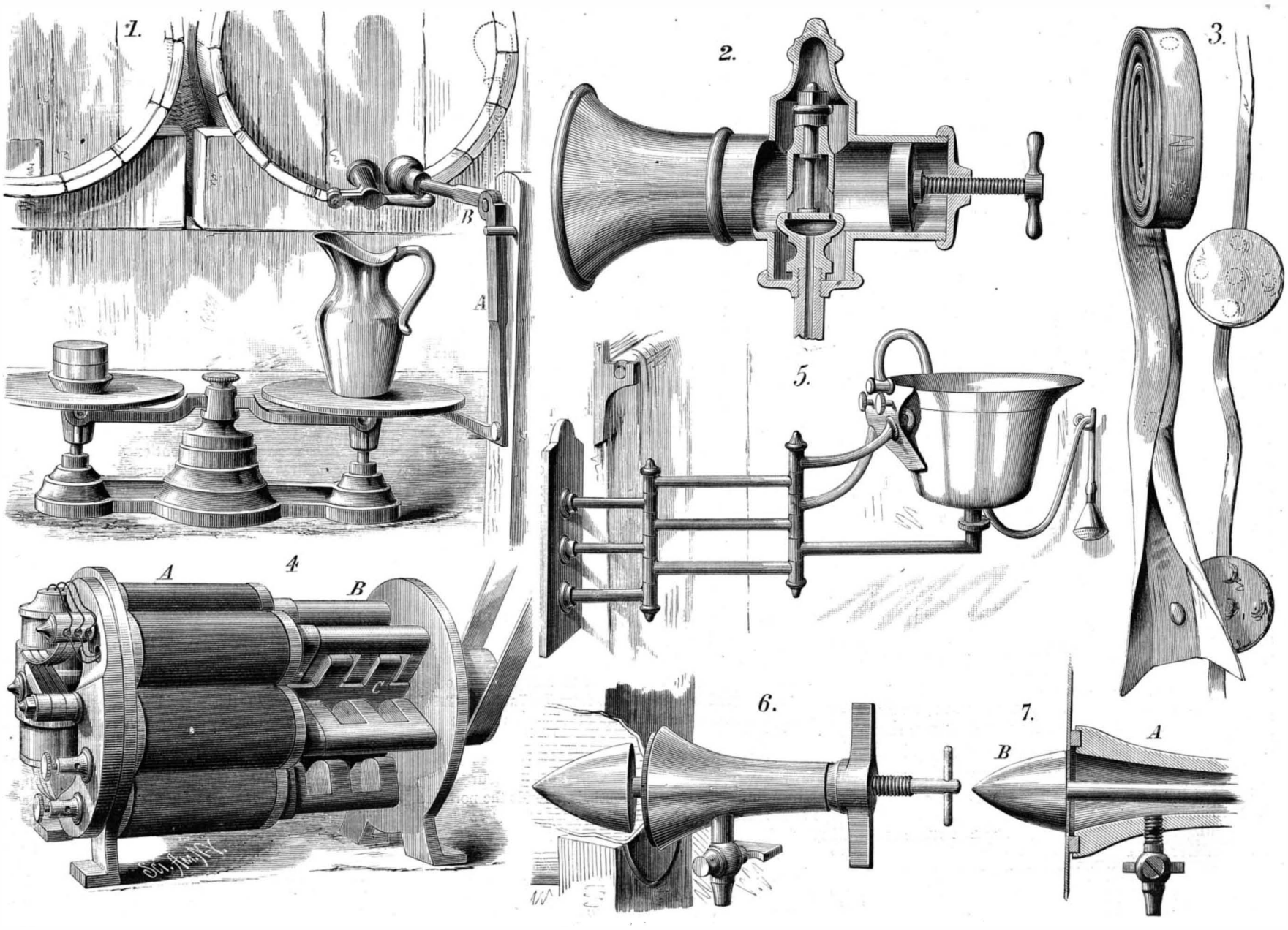
The body, A, is provided with a packing at each end to prevent the escape of the liquid. When the device is once in place the contents of the can may at any time be drawn out through the stopcock.

### Still Another Letter Copying Process.

Herr Adler has communicated to the Vienna Photographic Society a multiplying process based upon the use of the *glue plate*, consisting of gelatine, glycerine, and water (though the last-mentioned ingredient is present in a smaller quantity than usual), used in the hektograph and other similar processes. For writing or drawing Herr Adler uses a concentrated solution of alum, to which, in order to render the writing or drawing visible upon the paper, a few drops of some aniline color is added. Before laying the writing or drawing upon the gelatine surface pass a damp sponge over the latter, and allow the moisture to sink in for a few minutes so as to have a greater effect upon the alum. Then lay the written side downward upon the gelatine, and, after the lapse of a few minutes, on removing it the writing will be found reversed and eaten into the gelatine film as if it were engraved. By means of an India-rubber roller a little common printing ink is spread over the plate and absorbed by the lines sunk by the alum, and again rejected on the application of moisture upon the paper laid down upon it, and smoothed over it by the flat hand. When removed this paper will have upon it the first impression of the writing or drawing. For each succeeding impression the plate must be inked, as in lithography, by the India-rubber roller. A considerable number of impressions can be taken.

### Fusibility of Metals.

By means of extremely delicate processes, M. Violle has lately determined the fusing points of the more refractory metals. The following are given as the exact temperatures for five of these metals in the order of their fusibility: Silver, 1,749° Fah.; gold, 1,863°; copper, 1,890°; platinum, 3,195°; iridium, 3,510°. It will be seen that pure copper requires a higher temperature to fuse it than gold; ordinary commercial copper, however, melts below 1,035°. Iridium is the most difficult of all metals.




**RECENTLY PATENTED NOVELTIES.**

Fig. 1.—Automatic Liquid Weigher. Fig. 2.—Steam Fog Alarm. Fig. 3 —Improved Seed Package. Fig. 4.—Electro-Magnetic Motor. Fig. 5.—Adjustable Wash Bowl. Figs. 6 and 7.—Tap for Tin Cans.

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**THE SCIENTIFIC AMERICAN SUPPLEMENT**
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## A NEW POLICY IN LAW.

The impolicy of buying any species of property, without first making sure that the would-be seller has a legal right to sell, has been pretty thoroughly learned by most men. There are swindlers in every business, who are never better pleased than when they can "sell" an over-confiding buyer by persuading him to pay for property to which they can give no title. And when the dishonest seller has taken himself out of the way, and the honest but incautious buyer finds that he has paid for something he cannot hold, the real title being vested in another, the case seems very hard. But the fact that the buyer purchased in good faith is not accepted in any court as a valid reason for his holding the property against the actual owner. To overturn this just rule of the law would open the way to no end of injustice. It would make it impossible for the owner of any piece of property to retain possession of it, unless he were endowed with practical omniscience and omnipresence, that he might always know when and where he was likely to be defrauded by a false sale in which the purchaser should act in good faith, and at the same time be able to appear on the spot at the critical moment to disprove the fraudulent seller's claim to proprietorship. On such terms no property would be worth the trouble and cost of maintaining possession of it.

For instance, what would any man's farm be worth if any swindler could sell it from under him; or, what amounts to the same thing, if any buyer, purchasing in good faith, could hold the property on that plea alone and in spite of the seller's lack of ownership? Or what would any horse or wagon, plow or thrashing machine be worth, if any thief could sell it and the purchaser's title be good simply because he bought in good faith and for his own use?

It is sheer absurdity to ask such questions; and no one would be quicker than farmers to denounce such a reversal of the rules of law, were such a thing proposed, however much the innocent purchaser might suffer from his investments in stolen goods. The courts very properly hold that it is the buyer's business to find out whether the man he buys of has a right to sell; and if he neglects so to do, he, and not the true owner, must suffer the consequences. The law will punish the fraudulent seller if he can be caught and convicted; but it is no part of its business to make good the buyer's loss—certainly not at the cost of the real owner of the property.

The nature of the property sold does not alter in any way the moral or legal principles involved. The buyer can gain no title beyond that which the seller is able to convey. This is common sense, as it is common law. Yet a body of people styling themselves the National Grange Patrons of Husbandry have had the assurance to petition Congress to reverse this rule in all questions pertaining to patent rights. And the farmers of Northern Indiana have induced their representative, Mr. Baker, to introduce into the House a bill designed to make good faith on the part of the purchaser of a patent right a legal title to ownership, though the seller has no title to convey.

That a great many farmers have been swindled by fraudulent patent sellers is only too true. So other men have bought stolen horses in good faith, and town lots to which the seller had no legal title, and mining claims that had no legal standing, and railway stocks which had been uttered by men without proper authority to issue them, and stolen bonds, and in a thousand ways have paid their money and had no choice but to consider their loss the purchase price of dear experience. It remained for farmers to demand of Congress a special law for their protection, to shift the burden of their unwisdom to the shoulders of the rightful owners of what they thought they were buying.

## THE ATCHISON, TOPEKA AND SANTA FE RAILROAD OVER THE RATON MOUNTAINS.

The railroad over the Raton Mountains, of standard 4 8½" gauge, is a branch of the Atchison, Topeka and Santa Fé Railroad, under the names of Pueblo and Arkansas Valley, in Colorado, and New Mexico and Southern Pacific, in the Territory of New Mexico. The Ratons, a spur of the Sangre de Christo range, culminate in Raton (or Fisher's) Peak, 9,800 feet above the level of the sea, while the summit of Raton's Pass is reached by the grade line at an elevation of 7,720 feet above the same plane. The following details of grade and curvature are condensed from a paper read by Mr. James D. Burr before the American Society of Civil Engineers:

From La Junta, Col., to Trinidad, a distance of 81 miles, maximum ascending grades of 60 feet per mile have been used, with adverse grades of 30 feet per mile. Curves of 1,146 feet radius are used, with a compensation or reduction of grades on curves at the rate of 0·05 foot each 100 feet for each degree of curvature. Between La Junta and Trinidad there are but three short planes of descending gradients of any considerable moment. In order to locate a line on 30 feet ascending grades to the north, from La Junta to Trinidad—compared with the location of the Kansas Pacific surveys made in 1871–2 on 70 feet maximum gradients each way—a loss of 3,000 feet in distance was sustained. From Trinidad the line follows the valley of the Purgatoire; thence, turning sharply to the south, it ascends the northern slope of the mountain proper by Raton Cañon, on two planes. The first plane, from the mouth of Raton Creek to Morley, 8 miles, is nearly a uniform ascent of 105·6 feet per mile. At Morley, with an elevation of 6,727 feet above tide water, a water tank, turn-table, etc., have been established. At the south end of this grade the second inclined plane commences, having 3·5 per cent maximum grades. Between Morley and Summit there are 3 miles of maximum supported grade. The average ascent is 151·4 feet per mile.

The summit is passed by a tunnel, which will be 2,011 feet long. At the south portal of this, 7,584 feet above the sea, the line commences to descend the southern slope of the mountain, on 3·32 per cent maximum gradients, to Willow Springs, which has an elevation of 6,595 feet above tide, having made a descent of 990 feet in 38,400 feet, or a uniform gradient of 2·58 per cent. On the mountain division, from Trinidad to Willow Springs, maximum curves of 573·7 feet radius are freely used. Maximum grades are compensated for curvature at a rate of 0·05 feet per degree of curvature, each 100 feet. The outer rail has been elevated at the rate of ½ inch per degree of curvature. From Willow Springs to Las Vegas, 110 miles beyond, the line has been located on 70 foot maximum gradients, with 6° curves from maximum curvature.

The excavation at each end of the tunnel being very deep, 56 feet at the north portal and 50 feet at the south end, mostly in solid rock, a shaft near the south portal was begun on June 1. The shaft reached the roof of the tunnel section July 9. Up to August 31 the track had reached a point 65 miles south of La Junta, and it became evident that the completion of the tunnel must be hastened or a temporary track built over the mountains to avoid delay. It was, therefore, decided to build the mountain track, and a location for a "switch-back" was made at once. Before the close of December, 1878, the track had been laid, and the work of transporting material for the construction of 118 miles of the N. M. and S. P. Railroad began. At first the switch back was operated by the ordinary eight-wheeled American engines, with 17 inch by 24 inch cylinders, 60 inch driving wheels, weighing about 35 tons; but the advent of the "Uncle Dick," a "consolidation" eight wheeled connected engine from the Baldwin shops, revolutionized transportation on the "Mountain Top" line.

The ordinary round trip, 5½ miles, requires 50 minutes. The ordinary train consists of 7 loaded cars, of 43,000 pounds each; tank of coal, 44,000 pounds; and engine, say 120,000 pounds. Eight loaded cars can be taken over at one time quite readily, and at one time 9 loaded cars were taken at one trip, so that during the day of ten hours 6,020,000 pounds could very readily be moved over the mountain with one engine. The capacity of engines of this class is more than double that of the two engines of 16 inch by 24 inch cylinders, while the quantity of coal consumed is but little more than that consumed by a single light engine. As to controlling trains on these steep inclines it is a question of brake and adhesion to the rail. Under fair conditions of rail one single hand-brake to each car, together with the driver and tank brake, with three brakemen to a train of eight cars, is sufficient for safety, unless the train should acquire a speed of 18 to 20 miles per hour, in which event all the wheels in the train might be skidded far enough to lead to disaster. In the "Uncle Dick" this is reduced to a minimum; for, as sand can be delivered along the rails in front of all the wheels, and two sets of air brakes may act on all drivers simultaneously with sufficient force to slide all the wheels, the maximum of adhesion is obtained.

## DR. DANIEL DRAPER'S CONTRIBUTIONS TO METEOROLOGY.

In his report as Director of the New York Meteorological Observatory, for 1878, Dr. Daniel Draper takes occasion to review briefly the work done by him in the observatory during the ten years since it was founded and placed in his charge. The high value of this work can be fully appreciated only by those familiar with the influence which his inventions have had in promoting the constant and exact recording of weather changes by automatic apparatus, and the important bearing which his special studies of climate have had on the recent rapid progress of the science of meteorology.

These studies have been serviceable in two directions—in correcting popular errors with regard to climatic changes, and in solving great problems in connection with the general sweep and movement of atmospheric changes.

Of the former sort may be mentioned the researches proving that, contrary to popular impression, the clearing of land does not diminish the fall of rain; that the climate of the Atlantic States is not undergoing appreciable change; and that, considered in periods of five years, the summer temperature of the United States has not undergone any modification.

Of the latter sort are the determination of the great law that a very large proportion of the atmospheric fluctuations of the United States cross the country from west to east; that these fluctuations continue across the Atlantic, and that the time of their arrival on the European coast may be predicted. It is on the basis of these studies that the successful prediction of the arrival of American storms in Europe has been made possible, an achievement of the highest scientific and practical value.

In the meantime Dr. Draper has, as already remarked, invented and improved a variety of meteorological apparatus by which the work of meteorological observation has been turned over to automatic machinery, and the records of atmospheric fluctuations made continuous and unerringly accurate. The several pieces of apparatus employed in the observatory are minutely described by Dr. Draper in his report, and the descriptions, with engravings, appear in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT.

The entire outfit of a working observatory is covered by

seven pieces of apparatus: 1. Barometer; 2. Dry and wet metallic thermometers; 3. Sun thermometer; 4. Instrument for recording the direction of wind; 5. Instrument for recording the velocity of wind; 6. Instrument for recording the force of wind; 7. Rain gauge.

For the most part these instruments can be fashioned and set up by any bright boy; and we can imagine no occupation more agreeable and profitable during these long winter evenings, or the leisure days which are so common in winter, than their construction and erection in the garret, the barn, or the shop-loft. There certainly can be no more direct or enjoyable method of beginning the study of the fascinating and always profitable science of the weather. If the student has any mechanical skill the simple clock-work employed in some of the pieces of apparatus can be easily made; the cheap machinery of a "dollar clock" can be purchased almost anywhere by such as do not choose to attempt this part of the work. In each case the method of making and using the instrument is given with such minuteness of detail that no intelligent person need be afraid of undertaking the practical study of meteorology by means of them, making if he will every part of his observatory. A very little daily attention thereafter will make the intelligent possessor of such apparatus weather-wise beyond the wildest imagination of the old-fashioned oracle, even though he be the much-quoted "oldest inhabitant."

It may serve as an encouragement to those who may contemplate the practical study of the weather by the means indicated, to say that the inventor of the apparatus described made with his own hands the several pieces he employs; and that by their use he has made the New York Observatory, though housed in a little garret room at the top of the old Arsenal building in Central Park, one of the most efficient meteorological observatories in the world. It is to be hoped that the construction of a new building for his use on some elevated part of the park, where instruments can be placed for the taking of sun spots, earth magnetisms, earth temperatures, and so on, may not be longer delayed.

## TRADE MARKS IN CONGRESS.

The proposed constitutional amendment giving Congress the power to grant, protect, and regulate the exclusive right to adopt and use trade marks was reported back from the Committee on Manufactures, December 17, with their unanimous approval, and referred to the Committee on the Judiciary. The Committee on Manufactures expressed a strong desire that the resolution might be agreed to by Congress early in the session, that the amendment might be submitted to the State legislatures in session this winter, as a number of them would not meet again for two years.

The committee urge the necessity of protecting trade marks for the benefit of purchasers, as well as for the encouragement of manufacturers. They insist, also, that the control of the matter should be vested in Congress. Trade marks are not and cannot be confined to State lines; and the treaty-making power, of which this has become an incident, is one solely within national control. The fact that other nations—Great Britain, Germany, France, Belgium, Spain, Russia, and others—have made trade marks a subject of national interest, is further urged as a reason for our following their example.

Undoubtedly a wisely drawn national trade mark law would greatly simplify the regulation of trade marks, and in many ways be a benefit to trade. It is obvious, however, that a law presenting the obnoxious features of the one now declared unconstitutional would not and should not so meet the approval of the several States as to induce them to surrender to the general government their reserved rights in this matter.

The provisions of the law of 1870 with regard to the fraudulent use or counterfeiting of trade marks were quite sufficient. The party misusing a trade mark was made liable to an action for damages; and the party aggrieved was entitled to have his remedy according to the course of equity to enjoin the wrongful use of his trade mark and to recover compensation therefor in any court having jurisdiction over the person offending. In 1876 Congress saw fit to pass an act for the special punishment of trade mark offenders, which put the matter on an entirely different footing. It provided a maximum fine of one thousand dollars or two years' imprisonment, or both, for offering for sale goods bearing a fraudulent trade mark; for affixing such a mark; for putting up packages bearing such a mark; for manufacturing such a mark, or having in possession the means employed in such manufacture, such as dies, brands, engravings, or the like; for in any way dealing in or having in possession any representation, likeness, similitude, copy, or colorable imitation of any private label, trade mark, or the like; for having in possession any used or empty box, envelope, wrapper, case, bottle, or other package to which is affixed a trade mark which might have been obliterated but had not been, so as to prevent its fraudulent use.

The power which such provisions put into the hands of vindictive men to harass or injure their rivals was as unjust and as unreasonable as the punishment provided was excessive. But this was not the worst feature of the law. In one sentence—three yards long, carpenter's measure—section 7 provided that if the owner of any registered trade mark or his agent were to make oath that he had reason to believe that any one was offending in any of the particulars given above, either of the judges of the Circuit or District courts of the United States, or the commissioners of the Circuit courts, were empowered to issue search warrants directing the United States marshal for that district to invade the suspected party's premises and seize any suspected article—as, for example, an empty match box or gin bottle bearing a fraudulent trade mark, or a genuine mark which might have been but was not obliterated. And any one who should knowingly aid or abet any one in violating any of the provisions specified was, in section 8, made liable to a fine of five hundred dollars, one year's imprisonment, or both.

It is safe to predict that the legislatures of the several States will be little likely to put it in the power of Congress to repeat such enactments, even should the proposed amendment to that effect be favorably considered by the Houses now in session.

A more favorable method of securing all that is necessary with regard to the national registry and protection of trade marks is offered in Mr. Caswell's bill, introduced in the House, December 15. This bill embodies the idea set forth by Mr. Bartlett in our issue of last week, namely, that the Commissioner of Internal Revenue be empowered to furnish at a nominal price, to such as may desire the incidental protection thereby afforded, a special revenue stamp, to be known as a trade mark stamp, the fraudulent use or counterfeiting of which would be punishable after the manner of other offenses against the revenue laws. The objections to this method were sufficiently stated by us last week. Its advantages are obvious, not the least of which is the simplicity of its working and the absence of any necessary surrenders of State rights to the general government.

The disposition to hurry the action of Congress in this matter, manifested by the Committee on Manufactures, is much to be deprecated. The existence of State regulations substantially protecting the rights of manufacturers in the matter of trade marks largely removes the alleged urgency of the case, so that immediate action is not so much needed as a permanent and practical settlement of the question on a basis of justice and sound policy. The advantages of the trade mark system are not so great as to warrant any invasion of the just rights and privileges of the people to secure them.

It must not be forgotten that the theory of the protection of purchasers by trade marks, so strongly urged by the committee on manufactures, holds good only so long as the owners of trade marks choose to maintain the original quality of the wares in connection with which the marks acquired their value. But the public have no guarantee that such will be the case, or that the confidence they repose in any mark may not be grossly abused by the original owner or some subsequent purchaser of it. Practically, therefore, the benefit arising from the protection of trade marks accrues chiefly if not entirely to the owners of them. If trade marks were granted only in cases of positive superiority on the part of the wares to be marked, as a sort of reward of merit for real excellence, their influence so far as purchasers are concerned would be vastly different; and the standing of the trade mark owner before the people would be to some degree comparable with that of the patentee. As the matter stands there can be no comparison between them. As a rule, neither the trade mark nor the thing marked adds anything new or valuable to the common stock either of useful ideas or material goods. Yet under the old law, as we have seen, a greater degree of protection was accorded to the owner of a trade mark than to the owner of a patent for invention; a national cheapening of the value of original and useful ideas that should be avoided in future legislation. It is neither just nor politic to place the man who, originating nothing, simply appropriates for his own use something from the common stock of words, phrases, or forms, on a higher level before the law than the man whose thought and labor had created something of public benefit through the advancement of the useful arts.

Under proper restrictions a national trade mark law, as already said, might be desirable. The matter, however, should not be over-hastily considered, either in Congress or in the State legislatures, should it be referred to them. And the subject should be treated with especial caution at this time, when public sentiment is so ill-disposed toward anything partaking of the nature of monopoly, or looking like an unnecessary surrender of rights and privileges either to the national government or to individuals.

## A DISSERTATION BUREAU.

About eight years since considerable commotion was created at home and abroad by a published statement that a certain legally chartered medical college in Philadelphia was *selling degrees*. The rumor proved true, and the institution was suppressed. It is, however, a fact that at that very time one of the smaller German universities was conferring degrees upon men who had never seen a German university, without even the formality of their visiting that country, much less of submitting to an examination. Bad as this was, the said institution required, as nearly all German institutions now do, an original investigation, the results and details of which were to be presented in the form of a dissertation.

Recently Berlin has been greatly disturbed by the discovery in that city of a large dissertation factory conducted by one Doctor (?) Rosenbaum, who also gave private lessons and coached candidates for examination. The authorities have succeeded in securing the books and correspondence of this curious establishment, and found that it had been widely and extensively patronized. Strange as it may seem, the dissertations furnished were not merely articles copied from an encyclopedia, but really scientific productions, showing that brains and talent were engaged in this nefarious swindling scheme. The charge for a doctor's dissertation was only $112.50, while small papers were furnished for $37.50. Every profession was represented, for the bureau supplied dissertations in jurisprudence, medicine, philosophy, history, philology, and theology. Owing to the judicial investigation now in progress many details are withheld for the present. It is thought that an investigation will result in degrading a number of persons who have gained their promotion by virtue of these false papers.

The discovery of so deep and dangerous a plan of systematic educational swindling among the honest Germans should lead them to be more lenient toward us for our sharp Yankee tricks and incite us to suppress our own factories of bogus or worthless degrees, that we may be more blameless than vaunted Germany. Our medical colleges especially should be closely watched in the matter of giving degrees. The title, too, of professor, should be more sparingly applied to second rate teachers, and made to mean something.

## INFLUENCE OF ELECTRICITY ON VEGETATION.

Some months ago, says *La Nature*, M. Grandeau, director of the agricultural station at Nancy, announced that experiments made upon Indian corn and tobacco proved that atmospheric electricity exercises a very favorable influence upon vegetation. M. Maudin, director of the National Botanical Garden of Antibes, to-day makes known some facts which go to prove directly the opposite. He experimented on other plants, and in another climate; and, as will be seen, he draws the conclusion that M. Grandeau's inferences were too general. According to him, atmospheric electricity, like all other agents of vegetation, plays a useful part, but which, in its absence, can be replaced by another force. The experiment was made in the following manner.

In a kitchen garden bed well exposed to the light, two squares of 51 decimeters each were selected at 7 meters apart, and in each of them was planted a bunch of dwarf kidney beans, a lettuce, a tomato plant, and two cotton seeds. One of the beds was left to itself, and the other was covered with an iron cage, the four uprights of which terminated in points to attract all of the atmospheric electricity. For a fortnight the two cultures appeared to be alike; but at the end of this period, a difference was observed between them, and the difference, which was to the advantage of the cage, kept increasing more and more. The bean plants under the cage were much better developed and much richer in seeds than those in the open air. As for the lettuce, its height in open air was 1 meter, and under the cage, 1·20 meters; its total weight was 337 grammes in the open air. and 427 grammes under the cage. The tomato plant in the open air had attained a height of 0·8 of a meter, and under the cage, 1 meter; its weight in open air was 0·072 of a kilogramme, and under the cage, 3·754 kilogrammes. While under the cage the plant bore 83 tomatoes, weighing 2 162 kilogrammes, the number on the plant in the open air was only 37, with a weight of 1·08 kilogrammes.

## THE COMMON REWARD OF INTELLIGENCE AND ENERGY.

The *Recorder*, of Americus, Georgia, reports the case of a farmer, near that place, whose experience shows very clearly what there is in the common Southern complaint that farming cannot be made to pay in the South. Of this man the *Recorder* says:

"He began life since the war, a poor young man, as a farm hand, working for wages. He has inherited nothing, and has been engaged in no business except farming. He, this year, will make 90 bales of cotton, has not brought a single bale to market, does not propose to sell a bale before spring, and he is able to hold it. He owns one of the best plantations in Southwest Georgia, and it is his boast that he buys nothing upon which to feed man or beast, except sugar and coffee, but, on the contrary, has something to sell of almost any product of Southern soil. Last year he made 1,600 gallons of sirup, and this year has sold over 200 pounds of butter."

If such examples are rare in the South—as they probably are in too many parts of our country—the fault lies more in the men than in their surroundings. There is no part of the settled portions of the United States so poor in natural advantages and opportunities that men of intelligence, pluck, and energy, cannot win therein, if they will, a fortune which, in comparison with that of their less enterprising neighbors, may seem phenomenal.

## Animal Rubber.

An insect, which produces a species of India-rubber, has been recently discovered in the district of Yucatan, Central America, by an American explorer. It is called *neen*, and belongs to the Coccus family; feeds on the mango tree, and swarms in these regions. It is of considerable size, yellowish brown in color, and emits a peculiar oily odor. The body of the insect contains a large proportion of grease, which is highly prized by the natives for applying to the skin on account of its medicinal properties. When exposed to great heat the lighter oils of the grease volatilize, leaving a tough wax, which resembles shellac, and may be used for making varnish or lacquer. When burnt this wax, it is said, produces a thick semi-fluid mass, like a solution of India rubber.

THE SECOND AVENUE ELEVATED ROAD.—The first train was run over the Second Avenue Elevated Railway, December 15.

### The Detroit River Problem.

A board of engineer officers, under orders from the War Department, have been making inquiries with regard to the proper means of solving the transportation problems that have arisen at Detroit, Mich. Briefly stated the difficulties to be overcome and the interests to be reconciled are these:

At Detroit two immense streams of commerce come into direct interference, namely, one by water and the other by railroads. The problem before the Board was to so arrange by either bridge or tunnel that these might cross each other with the least injury to both, and in such manner as to accommodate the railroad traffic, and at the same time do no material or undue injury to the interests of navigation. The magnitude of these conflicting interests at this point may be realized from official statements, which show that the number of vessels of various kinds passing Fort Gratiot lighthouse during the fiscal year ending June 30, 1879, was 22,150, and that the business of the railroads crossing the river at Detroit during the year 1878 was as follows: 129,113 passengers, 12,258 passenger cars, 3,873 baggage cars, and 104,359 freight cars.

The board are unanimously of the opinion that a tunnel under the river offers the most complete solution of the problem. They, however, indorse the bridge plan conditionally. A former board of examiners reported against a bridge project which contemplated draw openings of 166 feet. The present board regard a bridge more favorably in consideration of the facts that draws of more than 200 feet have been since constructed, and that it is now proposed by bridge builders of high reputation to construct them with openings of 300 feet on each side of a pivot pier, or of 400 feet between two pivot piers. With such a bridge they hold that with the present traffic there will be ample time during the intervals between the passage of vessels to move all trains across the bridge. There will occasionally be delays, but the railroads can accommodate their time tables to compensate for any ordinary delays. They say, however, that in case authority to construct a bridge should be granted by Congress it should be distinctly provided that vessels have the right of way, except when moving trains are passing over the bridge.

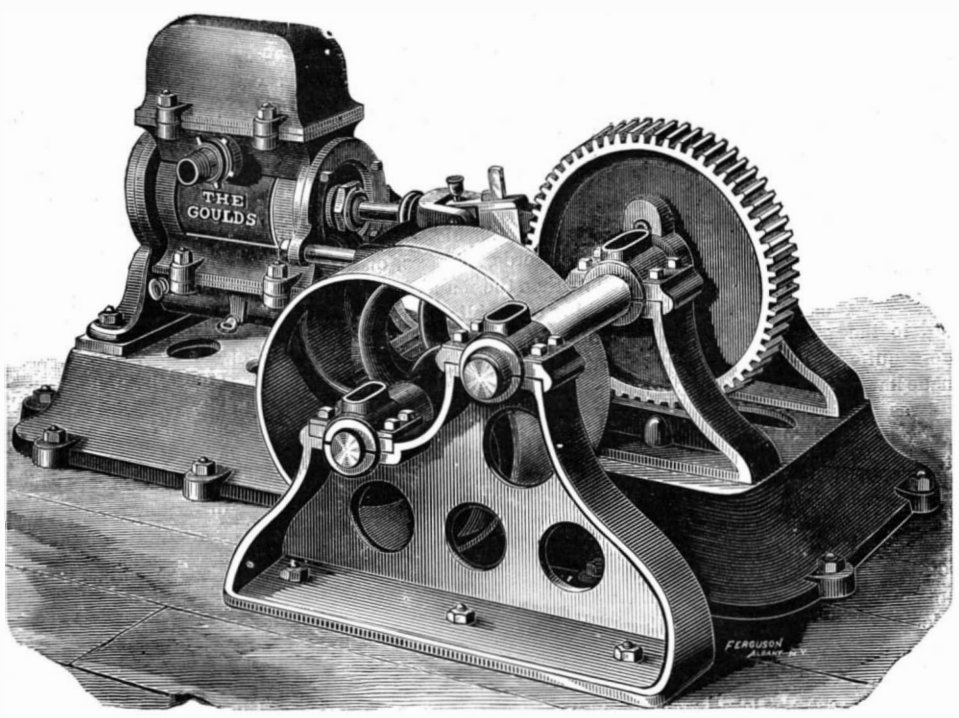
### Cotton and Corn.

The report of the Department of Agriculture as to the condition of the cotton and corn crops, Dec. 15, shows that owing to favorable weather in all parts of the cotton belt the crop will be somewhat better than was previously reported. Imperfect ripening in some of the Northern States slightly reduces the average yield of corn per acre. The figures still leave the corn crop larger than that of any previous year by 150,000,000 bushels. The States and Territories west of the Mississippi River return over 100,000,000 bushels more than in 1878.

### HORIZONTAL DOUBLE-ACTING FORCE PUMP.

We give herewith an engraving of a very substantial and efficient force pump made by the well known Goulds Manufacturing Company of Seneca Falls, N. Y. It is intended for feeding boilers, elevating water, and for other purposes requiring a first class pump.

The working parts of the pump are all brass. The cylinder is brass lined; and by unscrewing the brass nuts at the side, both the upper and lower valves are accessible, without disconnecting either the suction or discharge pipes. The gears are cut, and are six inches and sixteen inches diameter respectively. The relative sizes of these gears may be changed if desired, arranging them so as to work against a very heavy pressure, or to run faster, against lighter pressure. The connecting rod has strap joints with gib and key, and with brass boxes. The crosshead runs on two substantial guides, taking all the lateral pressure from the stuffing box and piston, and at the same time forming a brace from the pump cylinder to the pillow blocks. The pulleys are eighteen inches diameter and five inches face, and have an outside bearing. The frame is all cast iron (weighing over 700 lb.), very heavy and strong, occupying a space five feet long by two feet three inches wide—at the pulleys three feet three inches wide. The whole pump weighs about 1,000 lb. The pulleys may be run at from 120 to 160 revolutions, which would give 90 to 120 strokes of pump respectively. For continuous work the less speed is the best for the economical working of the pump. When used for fire protection it may be run at the higher rate of speed.



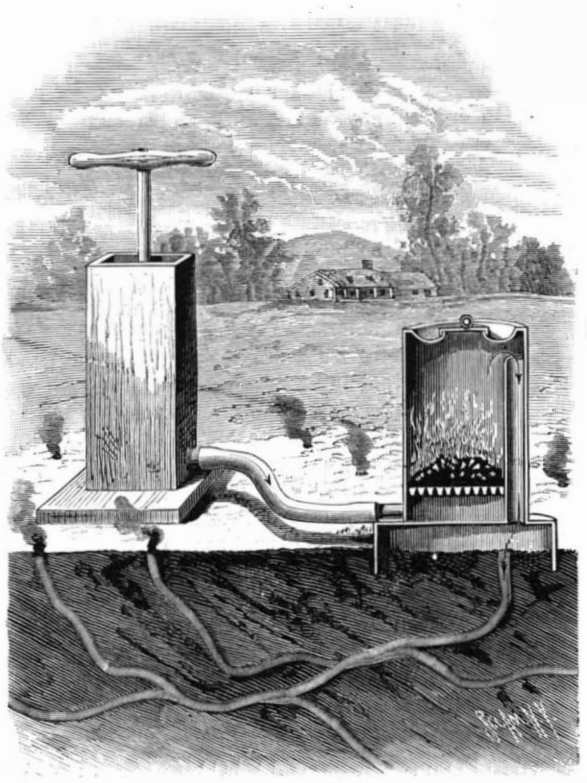

THE GOULDS DOUBLE-ACTING FORCE PUMP.

### A Use for Blast Furnace Cinder.

The following method of utilizing blast furnace cinder in jacketing steam pipes is recommended by Mr. Franz Buttgenbach: Mix 150 parts of cinder dust, 35 parts by weight of fine coal dust, 250 parts of fire-clay, and 300 parts flue dust, with 10 parts of cows' hair, add 600 parts of water, into which 10 or 15 parts of raw sulphuric acid has been poured, and make a stiff dough of the whole. This is thrown in small amounts upon the warmed pipe, hardening rapidly. Upon this rough coat a second, third, etc., is laid, according to the thickness which is to be used. By the action of sulphuric acid, gypsum is formed, and the silica, rendered free, hardens. The mass becomes as hard as porcelain, and is still porous It adheres firmly, and never cracks. Mr. Buttgenbach states that he has tested its merits by ten years' use, and has found it to meet all requirements.

### GOPHER AND ANT DESTROYER.

The California ground squirrel, commonly known as the gopher, is a great pest to the farmer, destroying enormous quantities of grain and doing great injury to gardens and orchards. The cutting ants which infest many of the Southern States and parts of California and Mexico, and the moles which are found in various parts of the country, are all enemies to the agriculturist, and destroy millions of dollars' worth of crops every year.



MELCHER'S GOPHER AND ANT DESTROYER.

The accompanying engraving represents a novel and effective gopher and ant destroying apparatus, patented by Mr. John C. Melcher, of O'Quin (Black Jack Springs P. O.), Texas. It consists in a fire chamber, having around the bottom a sharp flange which cuts into the ground around the ant or animal hole, forming a tight joint. The fire chamber has an air space under the grate, which communicates with the air forcing pump through a short section of flexible tube. An internal pipe extends from the bottom of the fire chamber upward to convey the poisonous fumes from the top of the chamber down into the chamber formed by the flange.

A fire having been made in the fire chamber, the poisonous compound is dropped in upon it, and the opening in the top of the chamber is closed. The air-forcing machine being started, all of the smoke and poisonous vapors are forced down into the hole, killing everything animate with which it comes into contact.

### The Need of Mechanical Industries in the South.

Commenting upon the general need of new industries in the Southern States, the New Orleans *Times* says:

One often hears the remark that the South is slow to take up manufactures which will, undoubtedly, add millions to her wealth, and provide employment for thousands of hands that now perforce are idle. But it must be remembered that, previous to the civil war, the attention of the Southern people was concentrated upon agriculture, which paid, or was supposed to pay, a magnificent profit. The war demonstrated better than anything else could have done the inherent weakness of a people whose entire reliance is placed on one branch of industry. The growth of Southern manufactures has since been slow but steady.

In looking around one finds innumerable articles which were formerly imported now made at home. The magnificent machinery used to take off the sugar crop is now made in New Orleans. And the same is true of many other branches of industry. Cotton manufacturing now, for the first time, comes forward under really favorable auspices, and it is not unreasonable to suppose that it will progress as similar industries have done.

New Orleans has a large population which could furnish the very best class of skilled labor. Our people have all the aptness and taste which they inherit from the Latin race. The great problem we must face is how to convert this large mass of people, who are idlers from the force of circumstances, into bread-winners, adding health and vigor to the community.

### A Rise in Rubber.

Owing to reports of a partial failure of the rubber crop of Brazil, and the clever management of speculators at Para, the price of rubber was forced from 50 cents to one dollar a pound during the second week in December. During the excitement it is said that in one day several houses in New York and Liverpool bought 2,000,000 lb. of rubber at prices ranging from 75 to 80 cents a pound. Though the report of a short crop was strenuously disputed the price continued far above its natural level. The Para district produces about half the rubber crop of the world, or from 15,000,000 to 18,000,000 lb., the other half coming from Africa and the East Indies.

### ENGINEERING INVENTIONS.

Mr. Seth C. Doyle, of Harrisonville, Mo., has patented an improvement in the class of couplings in which a swinging link is raised and held in horizontal position for engagement with the drawhead of an opposite car by means of a lever which is attached to the same car as the link.

Messrs. James B. O'Donnell and William J. Dever, of Hazleton, Pa., have patented a brake that can be easily applied to coal or freight cars, gondolas, oil cars, and the like. It is operated by the contact of one car with another.

Mr. Gustave J. Crikelair, of New York city, has patented an improved apparatus for elevating water above the height to which it would naturally rise, by the combined action of gravity and compressed air.

An improved water elevator, patented by Mr. Robert M. Catlin, of Tuscarora, Nev., relates to apparatus for raising water by compressed air, and the apparatus is especially intended for use in mines as a substitute for pumps. The use of pumps for that purpose is open to many objections and disadvantages, such as loss of power from friction, and by reason of the distance the plungers are placed from the motor, the disarrangement of valves and other mechanism, and the cutting out of the piston heads and cylinders by the grit contained in the water.

Mr. Samuel S. Burt, of Marquette, Mich., has invented an improvement in elevated railways. It pertains, first, to securing the track rails upon ties which are so constructed that their ends are made elastic, thus adapting them to yield when a train passes over the road. The manner of construction adopted to secure the requisite elasticity is to slot the ends of the ties and insert rubber blocks between the posts separated by the slot.

Mr. John M. Cayce, of Thompson's Station, Tenn., has patented a motor designed to operate without weights, springs, magnetism, or expansive gas, which he calls the "hydro-buoyant motor," for the reason that it takes advantage of the buoyant value of a float contained in a body of water. It consists in arranging the float in a receptacle filled with water in such a manner that the float is free to rise, and in rising shall communicate its power to extraneous mechanism, the operation being made continuous by reversing the position of the receptacle containing water, which gives a renewed position to the float, from which it may again rise.

### Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although merely approximate, they will enable the observer to recognize the planets. M. M.

POSITIONS OF PLANETS FOR JANUARY, 1880.

**Mercury.**

On January 1 Mercury rises at 5h. 49m. A.M., and sets at 3h. 5m. P.M.

On January 31 Mercury rises at 6h. 58m. A.M., and sets at 4h. 12m. P.M.

Mercury will be near the waning moon on the morning of the 10th.

**Venus.**

Venus rises on January 1 at 3h. 56m. A.M., and sets at 1h. 53m. P.M.

On January 31 Venus rises at 4h. 47m. A.M., and sets at 2h. P.M.

Venus, although less brilliant than in December, will yet be very beautiful in the early mornings of January, and on the 8th may be seen north of the waning moon.

**Mars.**

On January 1 Mars rises at 7m. after noon, and sets at 3h. 10m. the next morning.

On January 31 Mars rises at 11h. 24m. A.M., and sets at 2h. the next morning.

Mars is easily known by its reddish tint; it is among the stars of Aries, and on the 20th will have the same right ascension with the moon, and be 2½° south of the moon in declination. The satellites of Mars are so small that only the largest telescopes will show them. They are exceeding difficult objects even with a glass of 12 inches diameter.

An ordinary telescope with an object glass of 3 inches diameter will show markings on the surface of Mars, and the whiteness of the polar regions.

**Jupiter.**

Jupiter sets early in January, and is farther from us than in the Autumn.

On January 1 it sets at 9h. 28m. P.M., and on the 31st it sets at 8h. 1m. P.M.

Observations upon it must be made between 6 and 7 P.M.

During that hour the first satellite will disappear on the 6th by going behind the planet; on the 7th, will reappear from transit; on the 14th, will be invisible, because in transit; on the 15th, will come out of shadow; and on the 30th, be seen to pass from the face of Jupiter. During that hour the second, or smallest moon, will reappear from transit on the 4th; will be in transit on the 11th; and behind the planet on the 27th.

On the 14th the largest moon will pass off from the face of Jupiter between 6 and 7 P.M.

On the 8th the most remote of Jupiter's moons will be in transit between 6 and 7 P.M. On the 25th this moon will pass from the disk.

On the 21st, between 7 and 8 P.M., the first satellite, or that nearest Jupiter, and the third, which is the largest, will enter upon the disk of Jupiter nearly together; if the planet is not too near the horizon this will be a very interesting sight.

**Saturn.**

The large planets are all becoming more distant.

On January 1 Saturn sets just before midnight; on the 31st it sets at 10h. 11m. P.M

Saturn will have the same right ascension as the moon on the 17th, and will be 8⅓° lower in declination.

Although small telescopes will show the two satellites, Titan and Rhea, when Saturn is in its best position, probably Titan only can be seen during January. It should be looked for early in January on the west of Saturn as seen in the telescope.

**Uranus.**

Uranus is coming into better position. It is very remote, and appears only as a very small greenish white moon, when seen in the field of the telescope. It is still near the star λ Leonis, but by a retrograde motion it passes that star and will be found late in the month west of it and 2° south of it in declination.

**Neptune**

On January 1 Neptune rises about 1h. P.M., and sets at 2h. 33m. A.M. of the next day.

On January 31 Neptune rises at 11h. 1m. A.M., and sets 35m. after midnight.

On the 1st Neptune passes the meridian about 13m. before Mars, and is 5° south of Mars.

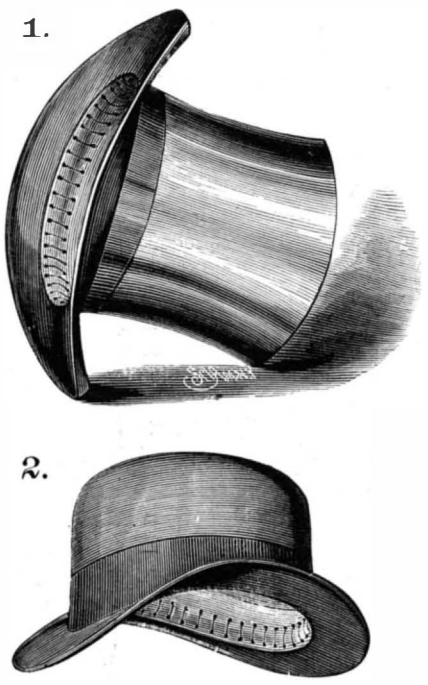
### A Novel Theory as to the Origin of Diamonds.

One of Dr. W. B. Fletcher's frogs escaped from his frogarium some time ago, and was found the other day behind a register at his office starved to death and shrunk to half its former dimensions. The doctor dissected it, and coming to its lungs found these organs clogged with thousands of black crystals which looked like coarse gunpowder. Under the microscope those crystals presented regular facets with smooth surfaces, presenting the same angle of crystallization as the diamond. On burning they gave off carbonic acid gas, and they are pure crystals of carbon, as the diamond is. According to the Indianapolis *Herald*, the doctor ingeniously theorizes that in the ages gone by the huge reptiles of the antediluvian period, dying under circumstances similar to those under which the frog did, may have formed large crystals of carbon in their lungs which were afterward transformed into the hard and lustrous diamond.

### NOVEL HAT SWEAT.

We give herewith an engraving of an improved hat sweat lately patented by Mr. Caesar Simis, of No. 10 Broadway, New York. The sweat has two rows of ventilating holes connected by transverse slits, and along the back of the sweat there is an elastic band which presses the slotted portion inward, making it convex and diminishing the size of the hat. The slits may extend entirely around the sweat, or they may be formed in the front part only, as may be desired.

By means of this improvement two important advantages are secured, which will be appreciated by both hat dealers




IMPROVED HAT SWEAT.

and hat wearers. One advantage is that of the most perfect and thorough ventilation of the hat; the other is the adaptability of the leather to any shape or to any pressure brought to bear upon it by the head. In fact it converts the hat into a perfect "conformator," avoiding the usual fitting and shaping of stiff hats, and saving a great amount of time, labor, and expense. A stiff hat provided with a sweat of this kind is much more comfortable to the wearer than an ordinary soft hat.

To the hat manufacturers this invention is of great importance, as it obviates the necessity of using so many different sizes of blocks, as the hat provided with this improved leather or sweat will answer for two, and in some cases three different sizes of heads. For the same reason it is of great value to the retailers.

### IMPROVEMENT IN EYE-GLASSES.

The engraving represents an improvement in nose-clamps for eye-glasses recently patented by Mr. Alonzo C. Blethen, of Lynn, Mass.

BLETHEN'S IMPROVEMENT IN EYE-GLASSES.

The frame of the glass is of the usual form, and the attachment consists of a clip having at its ends hooks for engaging the projecting edge of the frame. A short piece of small elastic tubing is stretched over the clip, and forms a yielding surface, which affords a firm hold upon the nose without being uncomfortable to the wearer.

This improvement will be appreciated by those who have worn the ordinary glasses with ribbed or serrated edges, as it does away with the irritation and discomfort caused by a continual pressure of such a surface upon the nose.

Further information in regard to this improvement will be furnished by the inventor on application.

### Moulding Mixture for Gelatine Photo-Plates.

For moulding the gelatine relief Leipold's mixture may be employed, and by the exercise of care very perfect results may be obtained. The following receipt for Leipold's mixture is taken from Husnik's *Heliographie:*

Seventy parts of bitumen are melted at a moderate heat, and to the melted bitumen there are added the following, each being melted previously: 425 of spermaceti, 200 of stearine, and 170 of white wax. All these being well incorporated, 70 parts of finely ground blacklead are stirred in. The plate to be moulded being thoroughly swelled, is removed from the water, dried with a cloth, and gradually raised to as high a temperature as it will bear without injury to any details of the device, this being generally about 35° C. A metal border being now fixed round the edges, the above composition, which ought not to be at a higher temperature than 40° C., is poured on, the composition being allowed to flow over the plate in one continuous wave. The thickness of the layer of composition may vary from half-an-inch to one inch in thickness, according to the size of the plate, and no attempt should be made to remove the cast until the next day, when it will generally separate with great ease. The mould is next made conducting with bronze powder, and electrotyped. The first electrotype cast obtained should be very slightly oiled, and a second cast made in it will be the required printing plate.

### Curious Speculation Concerning Electrical Action in the Human Body.

At a recent meeting of the London Physical Society Dr. Shettle read a paper on the "Influence of Heat upon certain forms of Induction Coils, considered more especially in relation to the Inductive Power which the Blood Exercises on the Various Structures of the Body." The author found that when a copper and zinc wire were insulated from each other by parchment paper and paraffined silk, and wound in close proximity to each other, a (induced) current was indicated on a galvanometer whose terminals were connected to the neighboring ends of the zinc and copper wires respectively, the other ends being left free. When the latter were connected across the deflection was *nil*. On raising the temperature of the two wires by causing hot water to flow inside the coil into which they were wound, the deflection was largely increased. These experiments led Dr. Shettle to imagine that there is a similar action in the animal body. The heart is made up of nerves and muscular fibers winding spirally, and some of these wind round each other so as to form a spiral cord, round which the blood capillaries also wind. Dr. Shettle compares these nerve and muscle bundles to the coils of zinc and copper wire in his experiments, and infers that electric currents may be induced in them as in the wires. The flow of the warm magnetic blood would also tend to produce currents in them. Dr. Shettle further drew attention to the fact that animals live and move in a magnetic field, and that electricity must be generated in them by their movements, internal and external.

FAILURE OF THE IODINE TEST FOR STARCH.—Puchot noticed, in testing a sample of butter suspected of containing starch, that the iodide of starch reaction is impaired by the presence of certain nitrogenous organic substances, among them albumen, whether from milk or eggs.

### The Solar System in Miniature.

The London *Times* describes an interesting if not useful invention by an Italian, Signor N. Perini, long a resident of London. For want of a better name it is called a planetarium, though vastly different from anything of that name hitherto constructed.

It is erected in the center of a room of "ordinary size," with a high ceiling. On entering the room one sees a high circular chamber, or box, standing on twelve wooden pillars. On entering underneath this chamber, and looking up, a dome is seen, deep blue, and sprinkled with stars, the chief northern constellations being in their proper places, and round the base of the dome the names of the signs of the zodiac. Pendent from the top of the dome by a narrow tube is an opal globe, lit inside by gas, and representing the sun. From wires, almost invisible, the planets are suspended around the sun, of sizes and at distances approximately proportionate to the real sizes and distances, and each having its proper inclination to the plane of its orbit. The various moons are in their places, and Saturn has his rings. The general effect on looking up at this arrangement from below is impressive, and this effect is increased when Signor Perini, by simply turning a key, sets the system in motion, rapid or slow, as he chooses. The sun turns on his axis and the planets in their orbits, all in time accurately proportionate, and on watching the movements for a short time one easily realizes the immense differences in length of the years of the earth and those of the outer planets. By an ingenious watch-work arrangement inside the earth, which is the size of a walnut, our world is made to revolve on its axis, the latter, by a special effort of ingenuity of Signor Perini, being always made to point to the same quarter of the heavens. The same arrangement causes the moon to revolve round the earth in its own proper orbit. Perhaps the great triumph of this invention is the fact that the planets revolve round the sun in proper elliptical orbits, which are traced around the inside of the dome. The dome is fourteen feet in diameter at its base and fourteen feet high. In the chamber above the dome the machinery invented by Signor Perini is arranged, the details being as yet

secret. The moving power is clock-work, the originality in the arrangement being, we believe, the method by which the inventor effects the elliptical motion of the planet. Not a sound is heard when the machinery is in motion, the whole working in that "solemn silence" which the hymn tells us is characteristic of the starry sky. The inventor could, we believe, make his planetarium of any size, from the dome of St. Paul's to a little thing that might be used for school instruction. Signor Perini has devoted his nights and mornings to this structure for seven years, and has expended upon it something like $3,500; the earth itself, we believe, has cost him $200. We believe he has been prompted to this work solely by the enthusiasm of a mechanician, and by a desire to do something to enable those interested in astronomy to realize, as far as possible, the arrangements of the solar system.

### The Clay-Pits of Pennsylvania and Delaware.

The chairman of the Committee on Crude Materials reported to the Potters' Association that the immense deposits of fine, pure kaolin in Chester and Delaware counties, Penn., and across the line, in the State of Delaware, are sufficient, if properly opened and worked scientifically, to supply all the potteries of this country for a century. He adds, however, that the clay mines of this rich region have been thus far opened and worked in the most unscientific, slovenly, and wasteful manner. And the worst feature of all is that what clay they do get out is absolutely spoiled for the finest wares by this slovenly, wasteful process of mining. The system, or rather want of system, upon which these mines have been and are being worked is to open a small, insufficient area at the surface, just to enable them to reach the top of the clay, with an opening too small to enable them to separate the strata and keep the coarse and fine yellow and white clays from being mixed. Then, at every rain-fall, earth, sand, and gravel are washed down the bank into the pit; the sides of the pit cave in and cover all the clay over, then they are compelled to stop, clean out and separate the dirt and clay as best they can. Then they begin to get out clay until another caving in takes place, when all is mixed and turned into confusion again. Some of these pits have been worked over and over so long in this way, and the excavation become so large, and the dirt thrown around so loose, that regular land-slides occur, burying machinery, tools, and clay all in the utmost confusion. It needs no prophet to tell what kind of clay results from this process. There are one or two mines more broadly and better opened, where the different strata could be kept separate, but instead of doing this they systematically mix the white and yellow veins together, by taking alternate tubs of each, which is then washed and sold as best clay. The National Kaolin Company, with a pit in much confusion, under all the disadvantages of land-slides, are, by sharp, personal supervision, and with an evident intention of doing the best they can under the circumstances, getting out some really fine clays. The new mine opened by Major Willaner has been opened on a broader scale than most others, and he promises to immediately clear off a still larger area of superincumbent earth, sufficient to prevent its being washed into the pit among the clays. Then, if the fine white clays are kept separate from the yellow, thus making two grades of clay—*i. e.*, a first and a second quality—a great step will be taken in the right direction, for that is the direction in which our clays must be worked.

### A Nitroglycerine Explosion.

A magazine of nitroglycerine and mica powder on Fox Island, opposite Amherstburg, Ontario, exploded December 12. The explosion was felt forty miles away, in Leamington and Ruthven, shaking every house in both towns. At Fletcher, on the Canada Southern Railroad, forty-four miles away, the people ran out of their houses in alarm, the shock was so severely felt.

The cause of the explosion is not known, but it is supposed to have been caused by hunters leaving a fire on the island, which reached the magazine. At the time of the explosion an immense blaze lighted up the whole heavens, the earth trembled, and a tremendous report followed. There were about three tons of nitroglycerine, besides mica powder, in the magazine at the time. Nothing remained of the magazine, a hole 60 feet in diameter and 15 feet deep marking the spot where it stood.

### The great Suspension Bridge between New York and Brooklyn.

In a lecture on the Brooklyn bridge, Mr. E. F. Farrington, Master Mechanic of the work, gave some interesting facts in regard to the construction of the bridge. The lecture was illustrated by a large sectional view of the roadway, showing the carriageways and foot-walks on the outside of the roadway, and the two trackways for the cars, that are to be run across the bridge by means of an endless chain. Four high trusses were also displayed, which will run the whole length of the bridge, distributing the weight more evenly and stiffening the structure against the action of the wind. High above the flooring proper will be built a promenade, 15 feet in width, from which pleasure-seekers and others may obtain an excellent view. The roadway will be 135 feet above high tide, and its length from tower to tower is 1,595 feet 6 inches. It has two land spans (from the towers to the anchorages) of 930 feet each, and an approach on the Brooklyn side of over 900 feet, and on the New York side of over 1,500 feet. The total length of the bridge will be a little over one and one eighth miles. The suspenders which hang from the cables and support the roadway have enormous strength. The greatest weight which will ever be brought to bear on them is 10 tons apiece, yet they have been tested with a weight of over 140,000 pounds without giving way. There are no such things as rotten wires in this bridge. The first wire was thrown across the East River on the 23d of May, 1877; on the 11th of June following the process of running the wire across began. The process of wrapping the cables was so tedious, that frequently not more than 15 feet was wrapped in a day.

If the requisite funds are not withheld, the completion of the bridge is promised in eighteen months, or the middle of 1881.

### NEW MUSICAL INSTRUMENT.

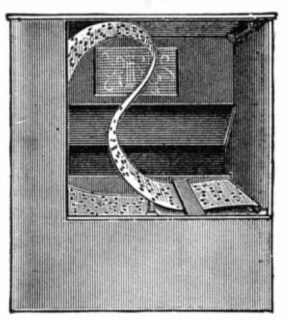
Undoubtedly the happiest households in the land are those in which music forms a part of daily life. It is not necessary to inaugurate a grand concert, nor to employ an orchestra, nor an organ to produce music that is enjoyable, that will render home pleasant, and cultivate tastes of the children and older ones.

The little instrument shown in the accompanying engravings is designed not for anything pretentious, but for home use and pleasure.

Some of the recent improvements in musical instruments have reduced the matter of playing to a mechanical performance, so that with properly prepared sheets any music may be played correctly. The phonographic piano shown in the accompanying engraving is an instrument that can be furnished at a small cost, and will play any tune in a purely mechanical manner, something on the principle of the wonderful phonograph.

FIG. 1.


FIG. 2.



PHONOGRAPHIC UPRIGHT PIANO.

A child can play it as well as a grown person, and it affords a great deal of amusement to both young and old.

Fig. 1 in the engraving is a front view of the instrument, and Fig. 2 is a rear view, giving an idea of the arrangement of the endless strip of paper in which the tune has been perforated. This strip is inserted between rollers, and the door is closed, when, by turning a small crank, the paper strip is made to move through the instrument and over the key board. The keys or strikers press through the perforations, when the hammers strike the bars and produce music which it is said is clear, loud, and melodious. The instrument does not get out of tune, and it will furnish music for dancing, or an accompaniment for singing. Paper strips may be perforated for any new music and readily applied to the instrument.

The manufacturers of this instrument are the well known Massachusetts Organ Co., 43 Washington street, Boston, Mass., who will furnish further particulars on application.

### The Armor of the Polyphemus.

Mr. J. L. Buskett, of St. Louis, Mo., claims that the method of convex armor plating of three inch steel, proposed for the British naval vessel Polyphemus, and described as the invention of Sir George Sartoris, was anticipated by himself several years ago.

Under date of November 26, Mr. Buskett writes as follows: "I had a model made which two years ago I took to Washington City and submitted to several of our principal ordnance officers, who declared the idea to be impracticable. Last June I was again in Washington and called upon Commodore Jeffries, Chief of the Ordnance Department of the Navy, to whom I explained my idea, and he also declared it to be totally impracticable and useless. Being poor and not having money to make the necessary experiments myself, I left my model at the office of A. H. Evans, Esq., and for the time being abandoned all hope of having it tested by our government.

"Judging from the meager description in the article referred to, I am inclined to think my invention was not only first conceived, but is superior to that of Sir George Sartoris, in that in mine the plates are not only convex, but are also circular in form, and each one fastened to the vessel by a single round bolt passing through the center, so that the *plate is set in motion at the moment of impact, and the deflection of the missile made certain.*"

### New Steamers.

The Compagnie Générale Transatlantique, one of the largest French steamship companies, has lately given an order for the construction of several large steamers to four English shipbuilders, and this fact has excited considerable indignation in French mercantile circles. The president of the company has addressed a letter to a French journal explaining the circumstances under which the order was intrusted to English instead of to French hands, and stating the following interesting facts. The vessels were required to be delivered in eight months, and when estimates were invited from the principal French shipbuilders they all, with one exception, declined to tender on the ground that the time allowed was too short. The Société des Forges et Chantiers du Havre et Marseilles offered to build six vessels at 1,400,000 francs (£56,000) each, and to deliver the first in ten months and a half, the second in twelve months and a half, and the rest in fourteen months. Fourteen English firms tendered, besides several whose offers arrived too late to compete, and four of them agreed to deliver the vessels at an average of 1,139,750 francs each. This is 260,250 francs, or £10,410, less per vessel than the lowest French estimate, and each firm contracted to deliver the vessels within seven months and a half.

### MECHANICAL INVENTIONS.

An improved device for stopping horses, patented by Mr. Isaac J. Warner, of Watertown, Conn., consists in mechanism for pulling upon the bit of a horse, constructed so that power may be applied to the mechanism by operating a lever, or from the running gearing of a vehicle, to check and hold the horse should he become frightened or fractious In the latter case the apparatus works automatically without the presence of the driver. The same device answers for checking and unchecking without alighting from the vehicle. It is also useful in breaking and training colts. It is simple and inexpensive, and does not injure the appearance of the vehicle. The inventor states that it may be applied to sleighs as well as carriages.

Messrs. William E. Jones and Benjamin P. Myers, of Jones' Station, Ohio, have patented an improved carpenters' lever for facilitating the laying of floors, wainscoting, weatherboarding, and especially to overcome the difficulties attending the use of warped and crooked lumber.

Mr. John L. Copp, of Rochester, N. H., has invented an improved buffing machine for boots and shoes. The improvements consist in a swinging standard hung upon a driving shaft, and extending over the bench, to the upper end of which is jointed an arm that carries the sandpapering roll, and is capable of movement to bring the roll to the positions required. The roll is driven, by pulleys and belts, from an intermediate cone pulley on the standard, which is driven by a belt from the driving shaft.

### An Advertiser's Experience.

*To the Editor of the Scientific American:*

Permit me to use a little of your valuable space to give expression to my views of advertising one's business, and the best medium. Some nine years ago, while still in the oil business, I had associated with me as salesmen practical engineers and chemists. Our observations led us to devise some plan whereby we could lubricate the bearings without the great waste of oil and consequent drip. The result was a lubricating compound known as "lubricene," which met every requirement, and reduced the cost of lubrication to its minimum.

We considered ourselves among the benefactors of the human race, and as such looked for our reward. We prepared our machinery, and began manufacturing and sending out samples and salesmen. Every one admitted we had a "good thing," but we found it slow work, and were forced to the conclusion advanced by a successful business man that "the more confidence you have in your goods the more need there is to advertise it." Acting on this hint we got out pamphlets, showcards, etc., but the response was very limited. We then resorted to the different trade journals, and now after these years of experience we are free to say that we have had a far larger return from the SCIENTIFIC AMERICAN than any four other papers combined. We are glad we advertised.

Yours very respectfully,
R. J. CHARD.

6 Burling Slip, New York.

### Preservation of Wood.

The improved French method of preserving wood by the application of lime is found to work well. The plan is to pile the planks in a tank, and to put over all a layer of quicklime, which is gradually slaked with water. Timber for mines requires about a week to be thoroughly impregnated, and other wood more or less time, according to its thickness. The material acquires remarkable consistence and hardness, it is stated, on being subjected to this simple process, and the assertion is made that it will never rot. Beech wood prepared in this way for hammers and other tools for ironwork is found to acquire the hardness of oak, without parting with any of its well known elasticity or toughness, and it also lasts longer.—*Amer. Building News.*

### The Science of Government.

Commodore Whiting, a century or so ahead of time, has presented to the Senate a memorial asking that body to authorize the President to invite all the governments on this continent to unite in an offensive and defensive confederation. The memorial proposes that each government remain independent in the administration of its own affairs, but be otherwise subordinate to the general government of the confederacy; the general government to have the executive right to declare war, to proclaim peace, to maintain armies and navies, and to regulate commerce.

### History of the Cucumber.

A writer in a recent number of the *Science Gossip* says that the cucumber is known to have been cultivated for more than three thousand years. In ancient Egypt it was extensively grown, and so at the present day. The want of this vegetable was one of the grievances complained of to Moses by the Israelites in the Wilderness; we also find it mentioned in other parts of Scripture. It is mentioned in a particular manner by some of the early Greek writers on plants. Cucumbers grown in the neighborhood of Antioch were considered by the ancient Greeks the finest. Columella mentions that the inhabitants of Mendes, in Egypt, were accustomed to take the largest bramble bush they could find, transplant it to a warm, sunny spot, cut it down about the time of the vernal equinox to within a couple of fingers of the ground, then insert a seed into the pith of the bramble, the roots of which were well covered over with fine manure to withstand the cold. By this plan they were enabled to have cucumbers all the year round. This same author states that cucumbers ought to be propagated from seed that has been steeped in milk and honey for a couple of days, this method having the effect of rendering them sweeter and pleasanter to the taste.

Pliny states that in Italy the cucumbers are small, but in some countries are large and of a wax color or black. He tells us that the Emperor Tiberius was so fond of this vegetable that it was served up at his table all the year round. The same author appears to have considered the cucumber unwholesome in an uncooked state, as he tells us it will live in the stomach until the next day, and cannot be reduced to food; but when boiled and served up with oil, vinegar, and honey, it makes a delicate salad; he also recommends a pinch of the seed beaten up with cumin and taken with wine as a good remedy for a cough.

The precise date at which the cucumber was first cultivated in England is unknown. It was probably introduced with other fruits and vegetables at the time the Romans were masters of the country. It became neglected in time and entirely lost, but was at length introduced again at the later part of the reign of Henry VIII. Parkinson, in his "Paradisus" (1656), tells us that in many countries they do eat cucumbers as we do pears and apples, paring and giving slices of them as we would to our friends of some dainty apple or pear. The cucumber was not generally cultivated till almost the middle of the seventeenth century, and it is stated that the first successful forcer of this plant in England was Thomas Fowler, gardener to Sir Nicholas Gould, of Stoke Newington. Some years ago the cucumber was cultivated in large quantities in the outskirts of London, and it is stated in Dr. Wynter's "Curiosities of Civilization," that fourteen acres might be seen under hand glasses in a single domain, and that it has been known that 200,000 gherkins have been cut in a morning for the pickle merchants. In Loudon's time large quantities were grown in the fields of Hertfordshire, without the aid of glass, for the London markets during the summer months. The village of Sandy in Bedfordshire, has been known to furnish 10,000 bushels of gherkins in one week for pickling purposes.

The cucumber, notwithstanding its extensive use, is considered unwholesome by most medical men. Dr. Doran, in his "Table Traits," mentions that in the days of Evelyn (1699) the cucumber was looked upon as only one remove from poison, and adds that it had better be eaten and enjoyed with that opinion in one's memory. Abernethy also gave a quaint recipe for its use, which was to peel the cucumber, slice it, pepper it, putter vinegar to it, then throw it out of the window.

The extent to which this vegetable is consumed by the inhabitants of Egypt and the southwest of Asia, but also in European Russia and Germany, would scarcely seem credible to this country. You never see a Russian peasant at dinner but you see the lump of black bread and a cucumber. The vegetable seems certainly a singular dish to be so national in a country with a climate like that of Russia. Some writers say that there used to be a great annual fair at Leipsic for cucumbers, when the streets were heaped up a story high with that precious element of German cookery. In Germany barrels of half and also full grown cucumbers are preserved from one year to another by immersion in deep wells, where the uniform temperature and exclusion from air seem to be the preserving agents. Tartary has been assigned as the native country of the cucumber, but upon what authority is equally questionable with that of the melon. No modern traveler appears to have found it growing wild.

### Ericine, a Color from Poplar Wood.

This new coloring matter, says the *Moniteur de Fils et Tissus*, has received its name of ericine from *Erica vulgaris*, the botanical description of the common heath. It is prepared by heating with an alum solution the wood of (1st) the common heath; (2d) different kinds of poplar.

A liquor is obtained of a fine, clear yellow color, which becomes turbid on cooling, yielding a yellowish resin. The liquid separated from the resin by filtration oxidizes rapidly in contact with air and light, becoming at the end of a few days of a beautiful golden yellow, capable of competing with similar substances prepared in France by means of the weld (wau) of Avignon berries, or even with those manufactured in England.

The operation is conducted thus: The stems of the common heath, or the new branches and twigs of the poplar, cut, crushed, and pulverized, are boiled with alum solution in the following proportions: For 10 lb. wood, 1 lb. alum, 3 gallons water.

The whole is boiled for 20 to 30 minutes, then filtered. The filtrate becomes turbid on cooling, and deposits a greenish yellow resin abundantly. When the liquid is sufficiently free from the resin, it is filtered again and left for three or four days (sometimes five, according to the weather and season) exposed to the double influence of light and air. The liquor thus acquires the golden yellow color, and is fit to be worked either into extract or precipitated as a yellow lake. The extract is obtained in the usual way, by evaporating the mother liquor down either to a sirupy consistence or to the dry state.

The *ericine extract* has all the qualities belonging to the yellow extracts ordinarily found in commerce, but it surpasses most of them in brightness.

It is easily recognizable, not only by the peculiar orange appearance it possesses, but especially by chemical analysis, giving a peculiar brown coloration with alkalies, particularly with ammonia; besides which the alum it contains can be easily detected by the well known reactions for alumina. Here are a few of the results obtained with this new product:

Greens.—In connection with indigo, Prussian blue, greens can be obtained on wood, silk, cotton, etc.

Chamois and noisette shades with oak rind.

Green or bronze with most of the iron salts, especially sulphates.

Wood shades with nitrate of iron.

Orange in connection with red woods, as well as with cochineal, turmeric, etc.

Orange yellow with ericine extract alone. The goods are mordanted first with acetate of lead or manganate of potassium, tartar, or any other basic salt, or, better still, with muriate of tin; then it is dyed in a boiling bath with the necessary quantity of ericine.

Light yellow, on wool, cotton, etc., by simply dipping in the dye bath prepared with the extract.

Fast golden yellow obtained as follows: The liquor, oxidized by exposure to air, is treated with muriate of tin; this precipitates the lake, which has only to be collected on a filter and dried. This solid yellow can be employed in paper staining, in the manufacture of artificial flowers, calico printing; in one word, in all industries where a yellow in the solid is applicable. Finally it unites with Prussian blue or indigo to form greens, and with sandal wood to give oranges.

### The Alum Industry of France.

The principal chemical factories for the production of alum, sulphate of alumina, and sulphate of iron in France, numbering about 10, are grouped around Laon, La Fere, and Noyon. Others are met with at Lyons, Paris, Fontainebleau, and Montpellier. They number 14 in all, and the value of the plant is estimated at 6,000,000 francs. They produce 180,000 tons of alum, sulphate of alumina, and sulphate of iron. These establishments use 70,000 tons of raw materials extracted from the soil or furnished by French industry, and supply to the railways and canals 40,000 tons to transport. They pay directly or indirectly in salaries a sum of 1,500,000 francs to 1,200 workpeople. These factories produce annually alum and sulphate of alumina exceeding the national wants by 4,000 tons, which finds its outlet in exports. It is not necessary to enlarge here on the various industrial uses of alum and sulphate of alumina: the paper manufacture, dyeing, and currying are largely dependent on it. The use of sulphate of iron is even more extensive: in dyeing, in the purifying of gas, the polishing of plate glass, the disinfection of fæcal matters, and agricultural operations it is extensively employed. Even the residues of the manufacture are utilized, in the state of the mother liquor, or the exhausted ashes, for purifying the sewage waters of towns, and a fertilizer for artificial grass lands. All these substances, therefore, are of real and indispensable utility as raw materials for a large number of industries. These facts are set forth in a memorial from the manufacturing chemists, complaining of the competition they meet with from Italy, and they oppose the renewal of the treaty of commerce with that country.

The importation of Italian alum has reached 2,000 tons, and the export of French alum dropped to 1,200 tons. In consequence five of the French chemical factories were closed last year. In 1876 a financial company became proprietors of the alum mines of Tolfa, formerly in the Papal States, which contain natural deposits of alum valued at 2,000,000 francs. These operations were aided by the treaty of commerce, which admitted alum at a duty of 5 per cent *ad valorem*, and by introducing large quantities of this Italian alum, they naturally sent down the price of the home production, so that it now fetches in Paris only about 13 francs the 100 kilos. The Italian company is enlarging its capital and operations, and pretends to be able to supply the universe with alum. Vessels loaded with 2,500 tons of the mineral have been sent to France to supply new factories being established at Rouen and Avignon. These 2,500 tons of raw materials represent more than 7,000 tons of pure alum, as the mineral is so rich that it yields 300 per cent. This composition, it is alleged, will close many more of the chemical factories, and also those making sulphate of iron, as this can only be made cheaply from the aluminous schists of Picardy. What the result of the Government Commission appointed to take this matter into consideration has been we do not know.

### Pearl Inlaying.

Cast and sheet iron and *papier maché* are the materials upon which pearl is generally inlaid. If the article be of cast iron, it is well cleaned from the sand which usually adheres to the casting, and is blackened with a coat of varnish and lampblack. When this is thoroughly dried, a coat of japan or black varnish is spread evenly upon it. Before the varnish becomes too dry, pieces of pearl cut in the form of leaves, roses, or such flowers as the fancy of the artist may dictate, or the character of the article may require, are laid upon the varnish and pressed down with the finger, and they immediately adhere to the varnished surface. The work is then placed in a heated oven and kept there for several hours, or until the varnish is perfectly dried. It is then taken from the oven and another coat of varnish applied indiscriminately on the surface of the pearl and the previous coating, and again placed in the oven till dry. This process is repeated several times. The varnish is then scraped off the pearl with a knife, and the surface of pearl and the varnish around it are found to be quite even. The pearl is then polished with a piece of pumice stone and water, and the surface of the varnish is rubbed smooth with powdered pumice stone, moistened with water.

It is in this unfinished state that the pearl has the appearance of being inlaid, and from which it derives its name. Its final beauty and finish depend altogether on the skill of the artist under whose hands the shapeless and almost unmeaning pieces of pearl are made to assume the form of beautiful flowers, leaves, etc. The artist traces the stems and leaves of the flowers with a camel's hair pencil dipped in a size made of varnish and turpentine; upon this he lays gold leaf, which adheres where there is size, and the superfluous gold is carefully brushed off with a piece of silk. The flowers and leaves are then painted in colors, and when dry the picture and surface of the article are covered with a coat of refined white varnish.

The kinds of pearl used are three—mother-of-pearl, in the pearl oyster, or white pearl, as it is called by the artist, and it is known by its clear white surface; aurora shell, which can readily be told by its wrinkled appearance and its various prismatic colors, and is made from the shell of the genus of *Mollusca* known as the sear-ear or ear shell, and known to the conchologist as *Haliotis;* the green snail shell, which can be told by its glistening colors of light and dark green, or soft yellow and a bright and beautiful pink, blended together.

To manufacture the pearl ready for inlaying, the workman cuts the rough shells in pieces with saws, and then grinds the pieces upon both sides upon a common grindstone until they are of the requisite thinness. Out of these pieces the artist cuts the forms of leaves, flowers, etc., with a pair of common scissors preparatory to placing them in the varnished surface. The necessary forms may be cut from the thin pieces of pearl by means of a punch and dies, with power applied by the foot of the operator. When a number of pieces are required of the same size, the pieces may be fastened together with glue as one solid plate, and then the required form marked upon the outside one; then these being held in a vise, the form can be carefully sawed out with a fine saw. By placing the cemented pieces in warm water, the glue softens, and the shells are easily separated, and the glue washed off.

This art of inlaying is not confined to the representation of flowers alone; landscapes with houses, castles, trees, churches, and bridges are very easily made, and when represented as being seen by moonlight are very beautiful. The rising moon can be represented surrounded by clouds of gold and silver bronze; and when pieces of pearl are placed in certain positions to reflect their colors, the moonbeams are represented as glancing over the landscape in alternate light and shadow.

A varnished surface can be ornamented by transferring drawings or engravings to it, and the process is quite simple. A thin coat of copal varnish is spread upon the surface of the article, and when nearly dry the engraving is applied with its face downward and carefully pressed to exclude all air bubbles. When the varnish is sufficiently dry, the paper is thoroughly moistened with a sponge dipped in warm water, and the paper can be rubbed off, leaving all the lines of the print upon the varnished surface.—*Hardware.*

### Nevada Names.

There is much in a name. A class of boys in geography will stumble dreadfully over a string of commonplace Smithtowns, Jonesvilles, Robinsonports, and so on. But we gaurantee that not one in twenty would miss in reciting a lesson set down in genuine miners' terms, as, for example, this, from the geography of Nevada: "Buttermilk cañon is in the Paradise mountains, northwest from Eden, about ten miles from Gouge-Eye, on the road leading from Limburga to Whoop-'Em-Up, via Bull Town, Lay-'Em-Out, and Hungry, and just over the mountains from Bung-Eye and Knock-'Em-Stiff."

### Claude Etienne Minie.

M. Minie, the inventor of many improvements in firearms, died recently at Paris. He was born in Paris in 1805, and after serving several campaigns in Algeria was promoted to a captaincy of chasseurs. Subsequently he devoted himself to inventing improvements that would perfect the service of the infantry. Favored with the special protection of the Duke of Montpensier, he was able to secure the adoption of various of his improvements, which affected the shape and make of balls, cartridges, and gun barrels.

## TYPE CASTING MACHINE.

Great advances have been made in the methods of casting type for printing purposes from the time of the wooden blocks and rude types of Laurentius, of Haarlem, to the improved hand moulds of Archibald Binny, of Philadelphia, at the beginning of the present century. By the latter as many as six thousand types per day were produced. The hand moulds were supplanted in 1845 by the complex and effective American type-casting machines, which have wrought an important revolution in the business.

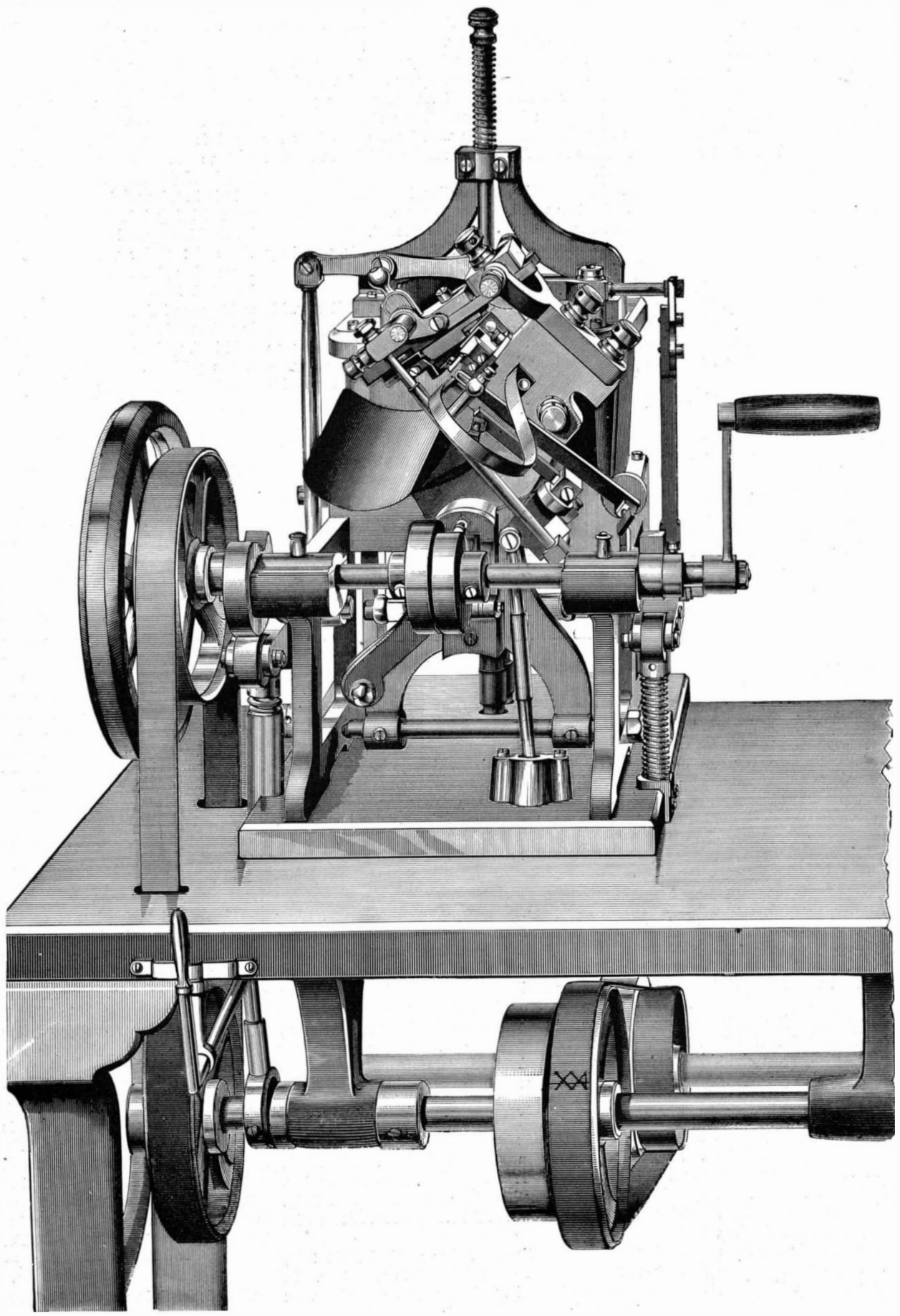
Our engraving represents a type-casting machine made by Messrs. MacKellar, Smiths & Jordan, of Philadelphia. The average production for this machine is about one hundred per minute for the ordinary sizes of printing type, being far beyond the amount of product of the earlier methods. The machines may be operated either by hand or power. The advantage in using power is that it enables one man to attend to two machines.

Type metal is an amalgam of lead, antimony, copper, and tin in such proportions as to produce a materia hard but not brittle, ductile yet tough, flowing freely, yet hardening quickly. Each letter is first cut in reverse shape on the end of a short strip of steel, the greatest care being taken to insure accuracy of proportion and harmony of appearance in the letters of the entire alphabet. The least variation is inadmissible, as it would destroy the harmonious effect of the types when composed or formed into columns or pages. The steel strips when finished are termed punches; and after criticism and approval, each punch is placed in a stamping machine, and a deep impression made of it in one side of an oblong piece of copper near its end. These pieces of copper are called matrices. They are dressed and fitted up with delicate skill, so that the types cast from them shall be of uniform height and accurate range. They are then ready for use in the casting machine.

The machine casts but one type at each revolution. It consists of a furnace, on the top of which is a small reservoir of metal kept in a fluid state. In this reservoir is a pump, the plunger of which operates in a cylinder in the bottom, and projects at each stroke a small quantity of the molten metal out from a small hole in a spout or nipple in the front face. The mould in which the stem or body of the type is formed is of steel and is movable, being set in place in front of the reservoir, and worked by the action of the same machinery which operates the pump. The copper matrix, containing any special letter stamped into it with the punch, rests with its face against the bottom opening of the mould, being held in position by a curved steel spring shown in the engraving. The method of operation is as follows:

The initial movement of the machine brings the upper opening in the mould opposite to the matrix exactly against the hole in the nipple. A simultaneous action of the pump projects a stream of the liquid metal into the mould with considerable force, at the same time stopping the opening in the nipple by a small plug from behind to prevent the further escape of metal. The next movement draws the mould away from the nipple and opens it, throwing back the matrix, extricating the type, and dropping it by a slide into a box below. This operation is repeated over and over again as rapidly as the crank or wheel of the machine is turned, and a type is cast each time. On the rapidity of the motion depends the quantity produced. Such is the modern type casting machine—turning out one hundred types per minute, or sixty thousand per working-day of ten hours, every one of which is a mite contributed to the spreading of knowledge over the world for good or for evil.

The type as thus formed is passed to boys, who break off the jets or waste ends; then to the dressing-room, where the rough edges are rubbed off on the faces of large circular stones; and finally, they are set up in lines, slipped into a long stick, screwed tight, and the bottom of the type is neatly grooved by a planing-tool. The letters are afterward closely inspected with a magnifying-glass, and all imperfect ones rejected.



STEAM TYPE CASTING MACHINE.

## MISCELLANEOUS INVENTIONS.

Mr. William Gardner, of New York city, has patented an improved apparatus for keeping lager beer, ale, porter, cider, etc., fresh and lively from the time it is tapped until the contents of the cask are exhausted. The invention consists of a combination of devices which cannot be clearly described without engravings.

An improved fire lighter, patented by Mr. Samuel M. Craig, of Austin, Tex., consists in the arrangement of a clamp holding a match and a slide provided with a roughened surface by means of sandpaper or some other suitable material, so that when the rough surface is drawn across the head of the match, the match is ignited and will light the kindling materials.

An improvement in tellurians has been patented by Mr. Gideon McBride, of Dover Hill, Ind. The object of this invention is to furnish for the use of schools an improved tellurian of simple construction, by which the elliptical orbit of the earth around the sun and the orbit of the moon around the earth, together with all the phenomena resulting from the relation of sun, earth, and moon together, may be fully and lucidly illustrated, embracing among others the succession of day and night, the changes of the seasons, the changes of the moon, solar and lunar eclipses, the entrance and progress of the sun into and through each of the twelve signs of the zodiac, the entrance and progress of the earth into and through each of the twelve months of the year, etc.

Mr. Fortonato C. Zanetti, of Bryan, Texas, has patented improvements in the construction and arrangement of cabinets for containing sewing, writing, and shaving materials and various other articles of domestic use in frequent demand.

Mr. John Boyd, of La Grange, Ind., has patented an adjustable hay rack for wagons or sleds, that may be lengthened or shortened at will. The sections can be easily separated from each other and handled by one person. It may be lengthened or extended from twelve to twenty feet or more to fit any length of wagon or sled within reasonable limits.

Mr. John G. Barrington, of North Sidney, Nova Scotia, has patented an improved oil cup or lubricator for those parts of machinery that have a reciprocating upward and downward movement; it consists of a globular cup provided with an interior vertical valve and a screw cap carrying a tube provided with a regulating spring and rod. A concave plate of sheet metal is attached to the top of the tube. As the machinery to which it is attached moves up and down the resistance of the air to the movement of the plate operates the device.

An improved attachment for cultivators, which will do away with stay rods or chains, will give a direct draught, and will prevent any down draught upon the horses' necks, has been patented by Mr. Jonas Dierdorff, of Goshen, Ind

Mr. Moritz Leiner, of New York city, has patented an improved combined slate cleaner and pencil holder, which consists in a vessel or cup provided with a sponge upon its lower part, and having a stopple provided with sponges at one or both ends, and the cord provided with the loop and the hook.

An improved egg carrier, patented by Mr. George W. Peck, of Omaha, Neb., is designed especially for carrying eggs, but it may be used for other purposes. It consists in a box having a cover made with cleats or flanges to rest upon the edge of the body. The body is made with a cross partition projecting above its edge so as to pass in between the side cleats of the cover and rest against the cover. The box is provided with a novel and efficient fastener,

### THE BRAZILIAN PORCUPINE.

In Southern America the porcupines find a representative in the coendoo, an animal which is not only remarkable for its array of quills, but also for the prehensile power of its long tail.

As might be presumed, from the prehensile tail and the peculiarly armed claws, the coendoo is of arboreal habits, finding its food among the lofty branches of trees. On the level ground it is slow and awkward, but among the more congenial boughs it climbs with great ease, drawing itself from branch to branch by means of its hooked claws; but seldom using its tail, except as an aid in descent. The food of this animal consists of leaves, flowers, fruit, bark, and the soft woody substance of young and tender branches, which it slices easily with its chisel-edged incisor teeth. During the summer months the coendoo becomes extremely fat, and its flesh is then in great request, being both delicate in flavor and tender in character. The young of this animal are born in the month of September or October, and are very few in number.

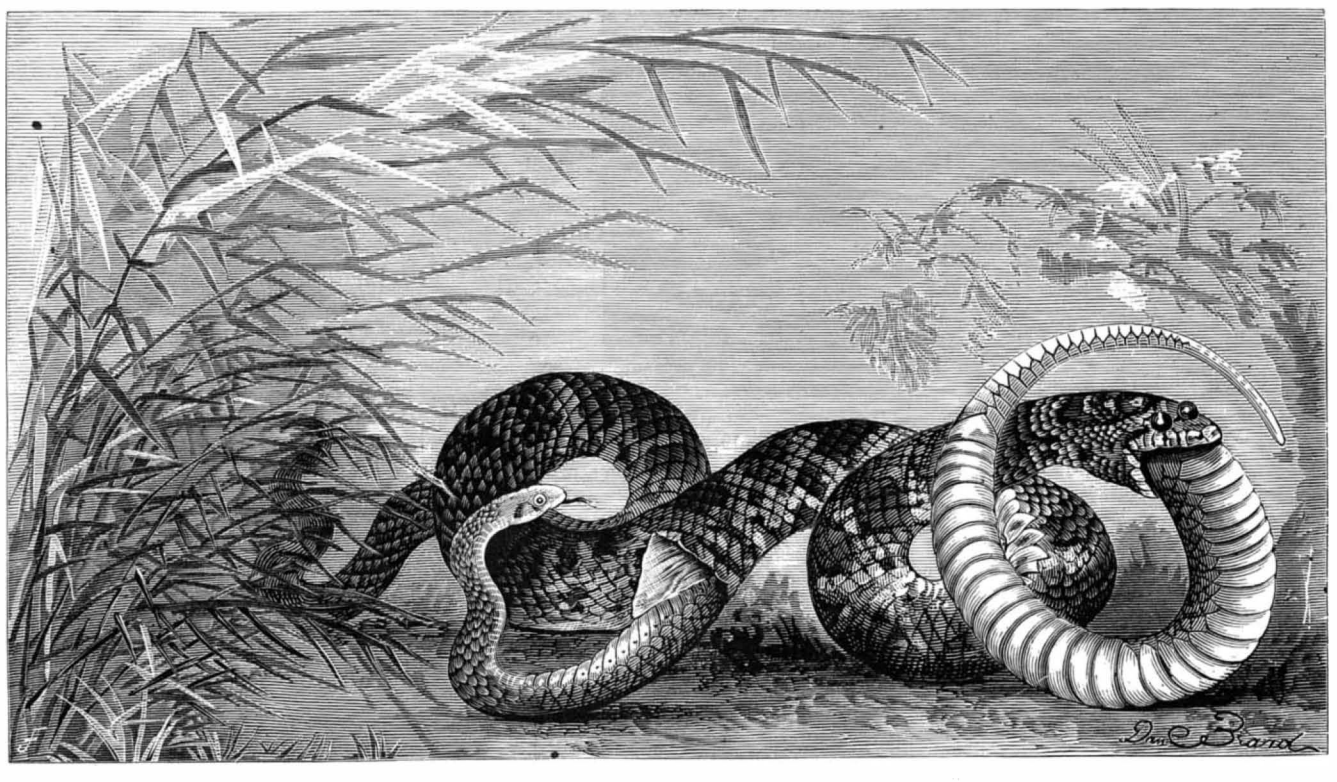
The total length of the coendoo is about three feet six inches, of which the tail occupies one foot six inches. Its nose is thick and blunt, like that of the common porcupine, and the face is furnished with very long whisker hairs of a deep black. The numerous spines which cover the body are parti-colored, being black in the center and white at each extremity. Their length is rather more than two inches on the back, an inch and a half on the fore legs, and not quite an inch on the hinder limbs. A number of short quills are also set upon the basal half of the tail, the remainder of that organ being furnished with scales, and tapering to its extremity. The color of the scales is black. The entire under surface of the tail is covered with similar scales, among which are interspersed a number of bright chestnut hairs. The abdomen, breast, and inner face of the limbs are clothed with dense, brown, coarse hairs. It is a nocturnal, sleeping by day, and feeding by night.

**COENDOO, OR BRAZILIAN PORCUPINE.**—*Cercolabes prehensilis.*

### SNAKE EATING SNAKE.

We do not know that either of the snakes shown in the engraving is a snake-eating snake, but it is certain that a portion of one snake, by accident or otherwise, has passed between the jaws and through a considerable portion of its body. The double specimen from which our engraving is made, and which we now have before us, was captured in a hay field near the village of Collinsby, Canada, by Mr. John Filmer, a well known engraver of this city.

It is Mr. Filmer's opinion that while thrusting the fork into the hay to get a lift he must have struck the belly of the larger snake, making the opening through which the smaller one was partly liberated. Both snakes were alive. The larger one is familiarly known as the garter snake; the smaller one as the common brown snake.



**SINGULAR RESULT OF A SNAKE ENCOUNTER.**

### Sea Snake Caught in Submarine Telegraph Wire.

Mr. Moginie has called upon me, says Frank Buckland, the celebrated naturalist, in *Land and Water*, with a lovely specimen of a sea snake which he wanted properly mounted in a bottle for the board-room of the Eastern Extension Telegraph Company. One of the cables belonging to this company was being raised from the bottom of the sea, I believe in the Indian Ocean. When the cable came to the surface the snake in question was found coiled tightly round the telegraph cable. Luckily it was killed before it could do any mischief, as these sea-snakes are excessively poisonous. In the College of Surgeons there is a sea snake which crawled up the anchor chain of a man-of-war when she was moored in the mouth of the Ganges. The midshipman of the watch saw something moving along the chain, and without thinking, went to pick it up. The venomous brute immediately turned upon him and bit him. The poor young midshipman did not live many hours after the accident. Mr. Moginie's snake is about a yard long, and the general color of it is white, and it is most beautifully marked on the back with black, or rather dark chocolate, patterns.

The tail is, as in all sea snakes, quite flattened, like the end of an oar. This, of course, gives the animal great power of swimming. My friend, Dr. Day, luckily came in just as I was consulting Sir Joseph Fayrer's magnificent illustrated work on the "Venomous Snakes of the Indian Peninsula," and I am now enabled to give the following account of it by Dr. Day:

"The example of sea snake (*Pelamis bicolor*) which you showed me as having been killed by a deep sea telegraph wire in the Indian Ocean is a species having a very wide geographical range. I have taken an example in Scinde, another in Orissa, while it is reported to extend throughout the subtropical and tropical portions of the Indian Ocean. I have only met with a few examples, and do not look upon it as nearly so common as the blue-banded *enhydrina*. All these sea snakes, I need scarcely observe, are exceedingly venomous.

"This instance recalls to my mind a circumstance which," continues Dr. Day, "occurred off the coast of Beloochistan, near the Persian Gulf, in 1871, when the telegraph cable was ruptured. A few days subsequently the dead body of a whale was discovered on the sea beach, and I think the end of the cable was found wound round the animal's tail, just in front of the tail fin. It appeared to me that the accident must have occurred somewhat in the following manner, premising that (as all know) the tail fin of a whale is placed transversely to the body, and not as in a fish. If the telegraph wire passed from one rock to another, or from an elevated spot to the bottom of the sea, it would not be difficult to imagine that a whale swimming past might very easily become entangled. Should its transverse tail have hitched over the wire the animal would become frantic, and rolling itself round and round, it might burst the wire in two, but still be held fast, due to telegraph wire encircling its tail just below the origin of the fin."

### Intellect in Brutes.

The Duke of Argyll, in his "Reign of Law," was, I think, the first who promulgated the dictum that man is the only tool-making animal. As far as I can ascertain, this assertion is admitted by developmentists, yet it is undoubtedly true that the Indian elephant makes two *implements*, or forms and alters certain things so as to adapt them specially to fulfill definite purposes, for which, unaltered, they would not be suitable.

One evening soon after my arrival in Eastern Asam, and while the five elephants were as usual being fed opposite the Bungalow, I observed a young and lately caught one step up to a bamboo stake fence and quietly pull one of the stakes up. Placing it under foot, it broke a piece off with the trunk, and after lifting it to its mouth, threw it away. It repeated this twice or thrice, and then drew another stake and began again. Seeing that the bamboo was old and dry, I asked the reason of this, and was told to wait and see what it would do. At last it seemed to get a piece that suited, and holding it in the trunk firmly, and stepping the left fore-leg well forward, passed the piece of bamboo under the armpit, so to speak, and began to scratch with some force. My surprise reached its climax when I saw a large elephant leech fall on the ground, quite six inches long and thick as one's finger, and which, from its position, could not easily be detached without this scraper, or scratch, which was deliberately made by the elephant. I subsequently found that it was a common occurrence. Leech scrapers are used by every elephant daily. On another occasion, when traveling at a time of year when the large flies are so tormenting to an elephant, I noticed that the one I rode had no fan or wisp to beat them off with. The mahout, at my order, slackened pace and allowed her to go to the side of the road, where for some moments she moved along rummaging the smaller jungle on the bank; at last she came to a cluster of young shoots well branched, and after feeling among them, and selecting one, raised her trunk and neatly stripped down the stem, taking off all the *lower* branches and leaving a fine bunch on top. She deliberately cleaned it down several times, and then laying hold at the lower end broke off a beautiful fan or switch about five feet long, handle included. With this she kept the flies at bay as we went along, flapping them off on each side every now and then. Say what we may, these are both really *bona fide* implements, each intelligently made for a definite purpose.—*S. E. Peal, in Nature.*

### Mating of Queen Bees.

At the late Bee-keepers' Convention, Chicago, Professor J. Hasbrouck, of Bound Brook, N.J., after relating many failures, went on to state the plan which he had finally found successful. It was as follows:

I took an empty sugar barrel, clean and tight, with a cover fitting tightly over the upper hoop, and into this cover I cut a round hole about four inches across in the center, and fastened a piece of glass against it on the under side. I now waited until I had the queen again in the trap, which happened about 2 o'clock. I put three drones with her, and threw them all into the barrel, standing in the bright sunlight, and quickly closed the lid. They all immediately flew to the glass, and before I had got ready to look at them fairly, the queen had mated with one of the drones. I took the barrel into a room and caught the queen and returned her to the nucleus. I had two other young queens which I expected would soon be out, and I had traps then set to catch them; but in my anxiety to see if the thing could be done again, I could not wait for them to come out, so I went to the hive and caught one of these queens with a queen cage and put her into the barrel with drones. She mated about as quickly

as the other. I next tried the third, and she likewise mated; not one of the three being in the barrel five minutes.

This was my last queen for the season. But I have done. I can hardly expect that every queen will mate as soon as these did; but the arrangement, simple as it is, accomplishes everything that seems to be necessary—namely, it induces the bees to fly without the loss of any time, to fly in close proximity to each other, and to keep constantly turning so as to notice immediately a mate when near; and so, I believe that queens can be put through the process with sufficient rapidity to make the method satisfactorily practical. With the right kind of a fertilizing cage, it does not appear to be essential that the queen should be caught on her way out to mate. I think she should be confined to the nucleus, till she is certainly old enough to mate, and then picked out and put into a fertilizing cage; but neither she nor the drones should be taken hold of with the hands nor squeezed or touched with anything that would daub them in the least.

Observing this caution, I think that any bee-keeper who will try, can in this way have all his queens fertilized in confinement; while the trouble required is as nothing compared to the loss he can prevent, and the control he can exercise over the purity and improvement of his stock.

J. Boggs, of Havana, Ill., gave his experience in the matter. He had covered over a hive in which were some queen cells with mosquito netting. When one of the queens hatched out and flew against the netting she had mated with a drone.

Mr. Clemet, of Iowa, had tried an experiment almost similar, and with equally good results.

Mr. King, of New York, stated that he had a correspondent in North Carolina who stated that he had been successful in fertilizing artificially.

### An Oil-Producing Insect.

We extract from *La Emulacion*, published at Merida, Yucatan, the following notes on an interesting insect to which we briefly referred not long ago. This insect, which has considerable economic use in Central America, belongs to the same genus as the cochineal, and is called by the native name of "ni-in." Being unknown to science, the author names it *Coccus adipofera*. The females are of a coral-red, and are covered with a fine whitish powder. They live on trees belonging to the genus *Spondias*, and known as "hog plums," their food consisting of the sap. They adhere to the trees by means of their beaks, remaining motionless, and existing in such large numbers that they frequently cover every portion of the plant.

There is extracted from these females 26 to 28 per cent of their weight of a bright yellow fat having an odor *sui generis*, and which when recently melted is homogeneous, but in a short time becomes granular and of a lighter color. It is the most quickly drying oleaginous substance known, since it becomes immediately covered over with a pellicle full of wrinkles and folds; and, if this pellicle be dipped into the grease to exclude its surface from contact with the air, the whole mass shortly becomes transformed into an infusible and insoluble resinous substance. Applied to paper or any other surface, this grease dries in six or seven hours so as to form a smooth lustrous surface, and almost odorless. Mixed with copal, or any other resin, and turpentine, it forms a golden-yellow drying varnish. Its melting point is 36°. Heated to a temperature of 200° to 210° until it becomes glutinous, it changes on cooling into a bland elastic mass (caoutchouc of ni-in) which is almost insoluble in spirit of turpentine, but soluble in bisulphide of carbon. In 95 per cent alcohol it is but slightly soluble. The various properties of this fatty matter, and its behavior with acids and alkalies, prove that its chemical composition differs from that of all other oils known. Like all drying oils, it forms by the action of heat a glutinous substance; but, while heat is indispensable to make such oils more siccative, the ni-in grease loses a portion of this property through heating. The elastic substance of oils is soluble in ether, and especially in turpentine, but that of ni-in is nearly insoluble in these materials.

In some localities in Central America this oil is largely employed for painting wooden utensils, such as ladles, etc., a mass being made with color, chalk, and the grease, and applied precisely as in ordinary oil painting. It has been observed that articles painted with it may be preserved for a long time. Guitar manufacturers also use the grease in varnishing their instruments. As yet it has received no application in pharmacy. It is probable that the ancient race which formerly peopled Central America used this grease in painting their buildings, and it is for this reason that, after a lapse of several centuries, the decorations are still to be seen in that perfect state of preservation which caused the admiration of Mr. Stevens when he visited these ruins in 1842. The journal above quoted trusts that attention will be paid to the propagation, instead of the careless destruction, of the insect, to the end that a native industry may spring up which will give the country a supply of oil that shall prove a substitute for linseed oil, which is now imported from foreign lands, and which, it adds, is often adulterated with fish oil.

### Skatol.

In his researches on the volatile substances contained in human fæces, Brieger isolated a series of bodies belonging, some to the fatty and others to the aromatic class. The principal aromatic product of the decomposition of albumen in the intestinal canal, is a substance resembling indol, to which he has assigned the name skatol. It crystallizes in brilliant white plates and possesses an intense fecal odor. It fuses at 93·5°, and is difficultly soluble in water. Warmed with dilute hydrochloric or nitric acid, it gives a violet color. Analysis gives it the formula $C_9H_9N$, its vapor density being 65·2. Blood albumen, digested with pancreas and water at 36° C. for six to ten days, yields skatol on distillation. Two and a half kilogrammes albumen gave one gramme of skatol.—*Ber. Berl. Chem. Ges.*

### How English Carpets were Driven out of American Markets.

Commenting on the influence of the power looms invented by Erastus B. Bigelow, whose recent death was noticed in a late number of this paper, a contemporary says:

Prior to Mr. Bigelow's invention America was making ingrain carpets, but the demand was limited and the popular impression favored English goods. The adoption of his loom by the Lowell Company at once sent the products of that now famous corporation to the front, and for a while the good housewives of the country would have no other. From that time the trade has steadily increased until to-day, with the exception of a few yards of such goods as those designed by Mr. Morris, no such thing as a foreign ingrain is ever seen in this market, the total importation of their goods last year being $957, while the city of Philadelphia alone last year made over twenty million yards, mostly ingrains, and the Lowell and Hartford Companies, E. S. Higgins, Stephen Sanford, D. M. Read and others added several millions more. The enormous extent of American consumption can be seen from the fact that the total production of Great Britain in all kinds of carpets was less than fourteen million yards.

In other grades of carpets the advance has been no less astonishing. Next in popularity and extent of consumption to the ingrain come the tapestry Brussels. A glance at the figures of the Custom-House will probably surprise the uninitiated reader. Beginning with the time when importations were at their highest, the following are the numbers of square yards of tapestry carpets landed in this country:

| | | | |
|---|---|---|---|
| 1871-2 | 2,759,000 | 1875-6 | 546,000 |
| 1872-3 | 2,958,000 | 1876-7 | 279,000 |
| 1873-4 | 2,099,000 | 1877-8 | 94,000 |
| 1874-5 | 1,454,000 | 1878-9 | 23,000 |

On the other hand all the American manufactories were running on these goods in 1872 only 143 looms. There are now in operation, and in many cases running over-time, 649 looms, producing over 8,500,000 yards of (three-quarters wide) carpet. There are now going up or contracted for by various manufacturers 200 more looms, which will bring the production up to 13,000,000 yards.

In the more expensive body Brussels the importations have decreased in nearly the same ratio, as follows:

| | | | |
|---|---|---|---|
| 1871-2 | 1,168,000 | 1875-6 | 256,000 |
| 1872-3 | 868,000 | 1876-7 | 132,000 |
| 1873-4 | 638,000 | 1877-8 | 93,000 |
| 1874-5 | 410,000 | 1878-9 | 55,000 |

It is noticeable, moreover, that our machinery has improved with equal rapidity, until to-day the Murkland or Duckworth looms are almost as much better than the old Bigelow looms as these were better than their predecessors.

### An Englishman's View of Protection.

In a long letter to the Sheffield *Daily Telegraph*, discussing the causes of industrial depression in England, Mr. Edward Sullivan, of Sheffield, uses some plain language with regard to "the sophisms, the paradoxes, the theories of Free Trade." He says: "In America, France, Belgium, Germany, Switzerland, Holland, in fact, wherever the common sense of mankind is allowed to assert itself, the first and great commandment, the 'whole law and the proph ets' of political economy is allowed to be this: 'That national prosperity depends on general employment.'

"The skill or industry of the workman in his trade is his capital, 'the capital of labor;' in an industrial community the capital of labor is the chief productive capital of the country, but without general employment it is valueless. It is general employment that turns over this capital, and makes it increase and multiply.

"The 'capital of labor' cannot afford to remain long idle. If employment is denied in one place it speedily emigrates to another more congenial.

"This is the first lesson of political economy as read by the light of universal suffrage in France and America, and so it would be the reading in England, too, if we had universal suffrage."

Further on he says: "America, France, and Belgium have never swerved in one single instance from their policy of protecting the employment of the people; and what is the result?—that the capital of labor has been steadily turning over, accumulating and multiplying, and enriching all classes of the community. In America, especially, the effect of protecting the employment of the people has been little short of marvelous. The best workmen of England have flocked to her; industries that ten years ago had no existence, have sprung into vigorous life; she has multiplied her make of Bessemer steel eighteen times in ten years; she has seven hundred iron works in full operation; she now supplies herself in almost every manufactured article she requires; and neither war nor rebellion, nor debt, nor soft money, nor hard money, has been able to cause more than a temporary derangement of her prosperity.

"This is the country that Mr. Vivian tells us, in his interesting notes on America, 'has the curse of protection upon it,' 'and,' adds he, with a genuine burst of free trade fanaticism, 'where man interposes his short-sighted laws, the best provision of Providence is shackled and blighted.' Are we to understand that America is shackled and blighted, or merely that free trade has a Divine origin?

"We see what America is. What she would have been if free trade had been her destiny instead of protection we can easily realize. There would be no iron works, no cotton works, no glass works, no paper factories, no teeming hives of industries; every manufactured article would be imported from Europe. Her iron and coal mines would be still undeveloped; she would remain a purely agricultural country, like Russia, and her progress and civilization would be indefinitely postponed."

### David Haviland.

David Haviland, of New York, founder of the firm of Haviland & Co., porcelain manufacturers, of Limoges, France, died December 12, in his sixty-fifth year. Mr. Haviland was born in Westchester County, N. Y., in 1814. In 1836 he was engaged in the importation of English earthenware, but owing to the superiority of the French ware he visited France in 1840.

Resolving to discover if possible the secret of the production of French porcelain, Mr. Haviland went to Paris and afterward to Forcy, but finding himself unable successfully to prosecute his work in those places, he finally established himself in 1842 at Limoges, the only place where good kaolin is to be found in France. Here he built his manufactory. The industry of porcelain had then hardly obtained a footing, and Mr. Haviland found that he was obliged to manufacture everything connected with the work. However, despite the many difficulties to be surmounted, the undertaking did not prove too formidable for his energy and perseverance He began to make shapes, and employed four professors to educate 200 pupils, as no good painters were then to be found in the place. At first he did not attempt to make any porcelain, but he soon was able to undertake its manufacture. With the increase and development of the business many improvements were made, so that a great part of the modern process of manufacturing and decorating this kind of ware originated with his firm. The faience called the Limoges would more properly be called the Haviland, since it is all produced at their Auteuil factory, it being impossible, it is said, to secure at any distance from Paris artists of sufficient reputation to paint this ware.

The Limoges factory is in the center of the city, and covers three acres of ground. There are nine double kilns for porcelains, twenty-one muffles for fixing the decorations, and about 1,200 persons are continually employed.

### The Healing Power of the Imagination.

The records of medical practice are full of illustrations of the influence of the imagination, for good or evil, over the functions of the body; and philosophy finds in them a key to the wonderful persistence of many popular superstitions. The firm belief that any disastrous physiological result, even death itself, will surely follow a given act or occurrence, is very apt to bring about the dreaded calamity; and every repetition of the seeming sequence of cause and effect, tends to confirm and strengthen the mischievous belief. As a means of counteracting this tendency of perverted imagination, charms for averting evil often play a really beneficial part. The protection is as imaginary as the dreaded evil; but, assuming a belief in the fictitious danger—a belief strongly tending to make the danger real, the charm substitutes a more hopeful belief, and the danger ceases.

A curious illustration of this action of the mind is reported from San Francisco, in connection with a case of transfusion of blood. An aged negro, at the point of death, was saved by this operation, the blood—about eight ounces—being taken from his wife's arm. The man recovered, but the woman went into a curious decline, against which tonics and nourishing food were of no avail. At last the patient confided to the doctor the secret of her ailment, which kept her from resting day or night. "I tell you, doctor," she said whisperingly, "its that blood of mine the old man is carrying about inside of him; and, doctor, when that old man comes back, I want you to give me my blood back." The doctor, seeing that the woman would not be appeased unless he complied with her request, promised to return the next day, first informing her of the dangers of the operation, and that it was resorted to only in the most urgent cases. She would hear of no explanations, but demanded that the operation be gone through with. It was accordingly done the next day, the doctor taking from the man about half an ounce of blood and transfusing it into the woman's veins. After the operation the woman brightened up perceptibly, saying, "I'll be all right now, doctor." And that the operation did prove a success was fully demonstrated by the sick woman, who began work a few hours afterward, declaring that the "doctor was a wonderful man, and now that she's got her own blood back again she was all right."

### The Electric Light at Sea.

The pioneer in the use of the electric light in passenger steamers, the Inman steamship City of Berlin, arrived at this port, October 14. Six electric lamps were employed, four in the main saloon and two in the steerage, each of 400 candle power. The passengers expressed themselves as highly delighted with the new method of illumination.

## 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 publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.*



## NEW BOOKS AND PUBLICATIONS.

MATHEMATICAL TABLES. First Series. By Professor James Mills Peirce. Boston: Ginn & Heath.

Contains tables, chiefly to four figures, as follows: Logarithms; logarithms of circular functions; logarithms of sums and differences; inverse circular functions; logarithms of hyperbolic functions; natural sines and cosines, natural tangents and cotangents, natural secants and cosecants, table of proportional parts. In addition are ten sections devoted to instruction with regard to tables in general and the particular uses of the tables given.

KEY TO THE UNIVERSE, OR A NEW THEORY OF ITS MECHANISM, WITH MATHEMATICAL DEMONSTRATIONS AND TABLES. By Orson Pratt, Sen. Published by the author, Historian's Office, Salt Lake City, Utah.

Mr. Pratt's theory rests upon a double hypothesis involving: I. A continuous orbital propulsion, arising from the velocity of gravity and its consequent aberrations; II. A resisting ethereal medium of variable density. The object of the theory is to "extend the universality" of the law of universal gravitation. The author asserts and essays to demonstrate mathematically the existence of an ocean of rotating currents, set in motion by the rotation of the sun, and extending outward millions of millions of miles; so that all bodies entering the sun's dominions must partake not only of his controlling power of gravitation, but also of the great controlling power of rotation, which in connection with ethereal resistance must determine their orbital paths, prescribe their annual periods, and point out their axial rotations.

CATALOGUE OF SCIENTIFIC SERIALS. By Samuel H. Scudder. Cambridge: Library of Harvard University.

This excellent catalogue covers the entire range of scientific serials of all countries, including the transactions of learned societies in the natural, physical, and mathematical sciences, from 1633 to 1876. There are added an index of towns (places of publication); an index of titles; and one of special subjects, such as anatomy, astronomy, botany, chemistry, etc. Thus in the index of towns under New York, the searcher is referred to the pages in the national division, United States, in which the scientific serials of New York are entered. Here, for example, we find the SCIENTIFIC AMERICAN described, mentioning its scope, time of beginning, number of volumes, etc., besides some dozen or more other scientific periodicals which have started and died since this paper began to be published. For students engaged in special investigations or in looking up the history of any science the catalogue must be extremely useful. As the library of Harvard has no funds for the publication of such volumes it is to be hoped that this and similar ventures which it has in hand may somehow be made to pay their cost.

ELEMENTS OF DIFFERENTIAL CALCULUS, WITH EXAMPLES AND APPLICATIONS. By W. E. Byerly, Ph.D. Boston: Ginn & Heath. Price $2.50.

A text book embodying the results of Professor Byerly's experience in teaching the calculus at Cornell and Harvard. It is practical throughout, and apparently well suited for the use intended. Its professed peculiarities are the rigorous use of the doctrine of limits as a foundation of the subject, and as preliminary to the adoption of the infinitesimal notation and nomenclature; the early introduction of simple formulas and methods for integrating, and a rather elaborate treatment of the use of infinitesimals in pure geometry.

INSECT LIVES; OR, BORN IN PRISON. By Julia P. Ballard. Cincinnati: Robert Clarke & Co.

Designed to awaken in children an interest in the lives of our more common moths and butterflies, and to show them how to study such lives scientifically and entertainingly. The work is prettily done and admirably calculated to effect the author's purpose.

FOOT PRINTS OF VANISHED RACES IN THE MISSISSIPPI VALLEY. By A. J. Conant. St. Louis: Chancy R. Barnes.

Gives an account of some of the monuments and relics of prehistoric races scattered over the surface of the Mississippi Valley, with suggestions as to their origin and uses. Mr. Conant is an enthusiastic student of American archæology in the field as well as in the reports of other observers, and writes with unusual fullness of knowledge. His investigations lead him to the belief that the original inhabitants of America were Autochthons. The civilized tribes which the Spaniards found in Mexico were all branches of the great Nahua family, whose origin has not been clearly traced. In the advent of the Toltec domination the first gleams of ancient American history begin to be visible. The original seat of the Nahua race, he is inclined to believe, must be sought for in the Mississippi Valley. The Indians are a later race, evidently of Asiatic origin.

INDUSTRIAL HISTORY OF THE UNITED STATES. By Albert S. Bolles. Norwich, Conn.: Henry Bill Publishing Company. 8vo, pp. 936.

This work occupies, and on the whole commendably, a decided gap in popular literature. Its most obvious fault is the lack of a good index, indeed an index of any sort: a lack which seriously diminishes its usableness and usefulness. Each great department of productive industry is taken up in a special book, separate chapters being given to each important sub-division. Here under agriculture and horticulture, there is a chapter of general history followed by chapters on agricultural implements, cotton, wheat, corn, sugar, tobacco, hay, minor crops, neat cattle, dairy products, the horse, sheep, swine, horticulture, nurseries, and fruit raising. In like manner the historical development of each of the various lines of manufacture is sketched with considerable fullness of detail, considering the vast breadth of the field covered. Shipping and railroads; mines, mining and oil; banking, insurance, and commerce; trades unions and the eight hour movement; and the industries of Canada are severally honored with a separate book. The work is copiously illustrated, the selection of the engravings being determined apparently by their availability oftener than by their superior merit. The author has taken no little pains to bring his history well down to the date of publication, and his work is one that should go into every school and family library. If it could take the place of some of the political and military histories used as text books in our higher schools the change would be a beneficial one to the country.

## Notes & Queries

### HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

(1) H. P. G. asks (1) how to make a cheap and serviceable emery wheel. A. Turn wheels from well seasoned pine, of the form desired; place emery upon an iron plate heated to 200° to 212°; coat the wheels with glue prepared as for uniting wood, and roll the wheels in the warm emery. After the glue dries, the surplus emery is brushed off and another coating of glue is applied and the wheels are again rolled in the warm emery. The wheels should be allowed to become thoroughly dry before use. 2. How can I make emery sticks? A. Prepare sticks of such forms as you may require, and coat them as directed for emery wheels, or attach to them emery paper by means of glue or paste.

(2) F. J. W. asks: 1. Why do we hear sound farthest just before a storm, when the atmosphere is lightest? A. Two reasons are given for this phenomenon: one is, that the air being moist, has more than its normal conducting power; the other is, that the low-lying strata of clouds confine the sounds to the earth. 2. If, as we are taught by philosophy and observation, cold contracts and heat expands the atmosphere, why does rarefied air prove to be so cold as to preserve snow and ice at a few thousand feet above sea level? A. The rarefied air in which the snow and ice exist is not rarefied by heat but by decreased pressure. Rarefaction of air diminishes its heat-absorbing power. Another cause which influences the temperature at great heights is its removal from the ground which heats it by contact. And still another reason is that the air is drier, and therefore very diathermanous.

(3) A. H. asks how to make a cement for sharpening knives. Composed of emery altogether would be too expensive. A. Mix fine sharp furnace sand with hydraulic cement.

(4) A. McC. writes: I notice in the number for December 13, 1879, on page 387 (11), J. S. P. asks about muriatic acid for tinners' use. For a soldering fluid I have in my laboratory work found the following excellent. Dissolve 32 grammes zinc in sufficient muriatic acid, and add 22 grammes sal ammoniac (ammonium chloride), and evaporate to dryness. Dissolve the resulting salt in water, and filter. This will answer for tin, zinc, and brass excellently, the parts to be soldered scarcely needing to be cleaned when this is used.

(5) H. L. S. asks which side of a belt should run in contact with the pulley? A. The grain side next the pulley drives best and wears best.

(6) J. H. asks: Will you tell me the size of the cylinder of engine for boiler described below? Boiler horizontal, 7 feet long, 28 inches diameter, 16 4-inch tubes 4 feet long, height of boiler 3 feet, dome 15 by 15 inch to burn wood. A. It depends in part on the speed of the engine; probably a 5 inch cylinder and 6 to 8 inches stroke would answer.

(7) H. P. T. asks: Can sufficient gas be had through an ordinary dwelling house gas pipe (½ inch), with three Bunsen burners, to evaporate (through the aid of a coil boiler) sufficient water to furnish steam necessary for a 1-6 to ¼ horse power engine? A. Yes.

(8) W. L. writes: A blower being placed in a boat aft of a sail, blows hard against the same; which way will the boat move? A. As action and reaction are equal, we doubt if the boat would move either way from the mere blowing.

(9) J. W. D. asks: Was there an iron vessel or gun boat built or launched from or about the foot of 14th street, North River, by the Delamater Iron Works, at or about the time of the war? A. Yes, the Matanzas.

(10) P. H. D. asks how to find the diameter of a small wheel of a given number of teeth to gear into a larger wheel of given diameter and given number of teeth. For example, what is the diameter of a wheel which has six teeth, to gear into a wheel, two inches in diameter, with sixty teeth? A. The ratio of the diameters of the two wheels is the same as that of the number of their teeth. If one wheel has 6 teeth and the other 60, the diameter of the small wheel is 1-10th the large one.

(11) J. V. asks for the rule for finding the blow struck by a moving body. Is it the weight of the body by the square of its motion, and is the motion the motion in seconds or in minutes, that is, the initial velocity? A. Formula given by Molesworth is $F=VW$, F=force of blow in tons. V=velocity per second due to fall. W=weight of ram in tons.

(12) R. B. S. asks: What is the difference between levigation and trituration? A. Levigation is the process by which substances are reduced to a state of minute division by rubbing them between two hard surfaces while the substances are formed into a paste with water. Trituration is the comminution of substances without the aid of a liquid.

(13) T. B. asks: 1. Can old Bessemer steel rails be worked over and made into new rails? A. Yes. 2. Which side of a leather belt should be worked to the pulley, the rough or smooth side? A. The grain or smooth side.

(14) A. D. F. asks for a good recipe for waxing floors, and how it is applied. A. Stir 25 parts of shredded yellow wax into a hot solution of 12 parts of pearl ash in soft water. Keep the mixture well stirred until effervescence ceases, then remove it from the fire and stir in 12 parts of finely ground dry yellow ocher. It may now be poured into cans to cool. When wanted for use one part of it is dissolved in five parts of boiling water. Apply warm with a paint brush. It dries in a few hours, when the floor is polished with a floor brush and afterward wiped with a woolen cloth. It is said that this wax coating will last for six months with ordinary use.

(15) H. D. K. asks for a description of a powerful battery about the size of a thimble, to be used in some electric jewelry. A. The essential parts of such a battery are, two plates of carbon, one plate of well amalgamated zinc, and a solution made by dissolving 2 parts of bichromate of potash in 20 parts of hot water, and when cold adding 1 part of sulphuric acid. The zinc plate is placed between the two carbon plates, leaving a space on each side. The carbon plates are connected together and with one of the conducting wires, the zinc plate is connected with the other conducting wire. The zinc and carbon plates may be attached to a rubber stopper fitted to a small jar or bottle containing the bichromate solution at the bottom below the ends of the plates, and the solution may be brought into contact with the plates by turning the bottle down on its side. This battery works powerfully for a short time, but the solution soon becomes exhausted and must be replaced.

(16) F. Y. A. asks: How am I to judge pure lard oil? That which I usually get gums. A. Compare color, smell, taste, specific gravity (=0·9003), and

reaction with a few drops of nitric and sulphuric acids, bichromate of potassa, and caustic soda respectively, with a standard sample of the pure oil.

(17) C. & Co. ask: What chemicals are used in the dyeing of Pampas grass, red, blue, yellow, etc.? A. Use warm aqueous and alcoholic solutions of any of the soluble aniline dyes.

(18) R. M. asks: What book would you advise for new beginners in electroplating, brass, copper, tin, silver plating, nickel, etc.? A. Consult Fesquet's "Electro-Metallurgy;" Napier's "Electro-Metallurgy;" Roseleur's "Galvanoplastic Manipulations."

(19) Z. C. writes: In No. 21 of the current volume of the SCIENTIFIC AMERICAN, you give a receipt for making a "copying pad" as follows: 1 oz. Cooper's gelatine to 6¼ fluid oz. glycerine. I undertook to make a pad, following the receipt to the letter, and found that the pad would not abstract any ink (aniline according to the receipt) from a piece of paper. I then heated the mixture again and added another ounce gelatine. This time the pad would give four good copies, and only six which were at all legible. Then I added ½ oz. more gelatine, and can now take 15 good copies. A. You will have better results if you use more glycerine, as directed, and expel all or as much of the water as possible by heating over a salt water bath for some time. Pads made according to the receipt have yielded upwards of a hundred and fifty distinct copies.

(20) J. K. asks for some good stove polish that can be prepared at home—something that will not burn off. A. Common stove blacking is graphite or plumbago reduced to a fine powder by grinding. We know of nothing better. 2. What will remove stains from stove zinc, and restore its look of newness? A. The planished surface is imparted by rolling the warm sheet metal; the finish cannot readily be restored. The surface may be cleaned and brightened by moistening it with a strong solution of oxalic acid in water, and drying with sawdust, or better, with whiting.

(21) H. B. asks (1) for a receipt for making self-raising flour. A. The following are the compositions of several of these powders in extensive use: 1. Bicarbonate soda, 23 oz.; burnt alum, 19 oz.; starch, 57 oz. 2. Bicarbonate soda, 24¼ oz.; sesquicarb. ammonia, 2¼ oz.; starch, 47 oz.; burnt alum, 26¼ oz. 3. Bicarbonate soda, 31 oz.; burnt alum, 29½ oz.; starch, 39 oz. 2. For cementing leather on friction pulleys? A. Good glue is commonly employed, we believe.

(22) G. O. asks how to clear a warehouse of weevil. They live on the grain in the cracks of the floor when the house is empty. A. Dalmatian (Persian) insect powder, when well distributed, does very well.

(23) B. F. M. asks: What chemicals are used for taking the solar spectrum in colors? Can you tell me a compound that will turn yellow in daylight, also one that will turn red? A. Photographing in the natural colors has never been accomplished by direct means, although monochromatic prints in several colors have been obtained. The results in color photography by indirect means, attained by Vogel, Vidal, Alfred, and others have been noticed in the back numbers of the SCIENTIFIC AMERICAN. Consult some late work on photography and photographic chemistry. See pp. 132 and 133, Vol. 35, SCIENTIFIC AMERICAN.

(24) J. W. asks how phosphor bronze is formed, and how the phosphorus is added to the metal, and how many ounces is given to a pound of metal. A. Wrap the phosphorus—about 1-10th of one per cent—in foil, and force it by means of an earthen rod having a bell-shaped cavity at the end, beneath the surface of the molten metal (bronze). The phosphorus must be free from moisture, and great care must be observed in handling it to avoid accident.

(25) R. H. B. writes: A correspondent of the *Derrick* states that gold was extracted from petroleum oil in New York city. Does petroleum contain gold; if so, in what quantity? A. According to Mr. John Turnbridge, of Newark, New Jersey, small quantities of gold have been found in petroleum residues. See article "Petroleum and Gold," p. 377, No. 24, Vol. 39, SCIENTIFIC AMERICAN.

(26) C. C. asks (1) for the name of the acid for testing gold and silver. A. The acid used with the touchstone is pure nitric acid slightly diluted. 2. What is the best material for polishing steel and brass? A. Emery flour and oil are in general use.

## COMMUNICATIONS RECEIVED.

On Collisions at Sea. By W. L.
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On War Vessels. By J. L. R.
On Panama Ship Railway. By W. E. A.
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On Ice Boats. By A. F. B.

[OFFICIAL.]

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FOR WHICH

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

**December 2, 1879,**

**AND EACH BEARING THAT DATE.**

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, or any patent issued since 1867, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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Excavating, submarine, R. Stone, New York city.
Printing press feeding apparatus, C. Ellery, Albany, N.Y.
Tables, extending, etc., J. D. Brassington, N. Y. city.
Telephones, G. D. Clark *et al*., Chicago, Ill.
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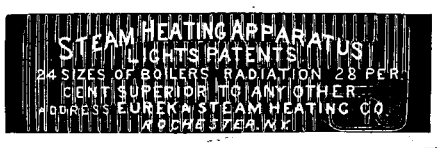


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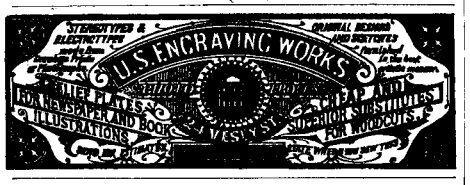


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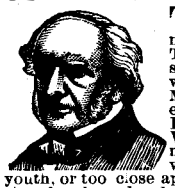

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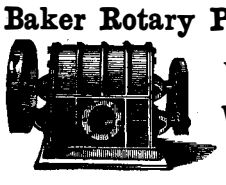

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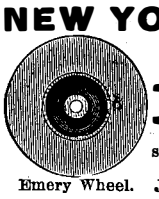
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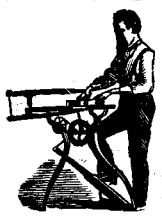

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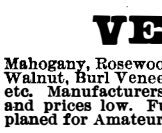


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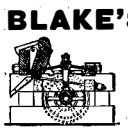

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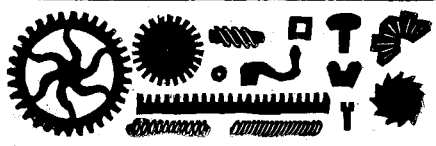

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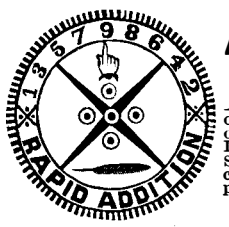


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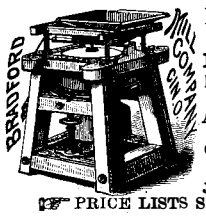


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