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## PROPOSED ELECTRIC LIGHT TOWER AT NEW ORLEANS.

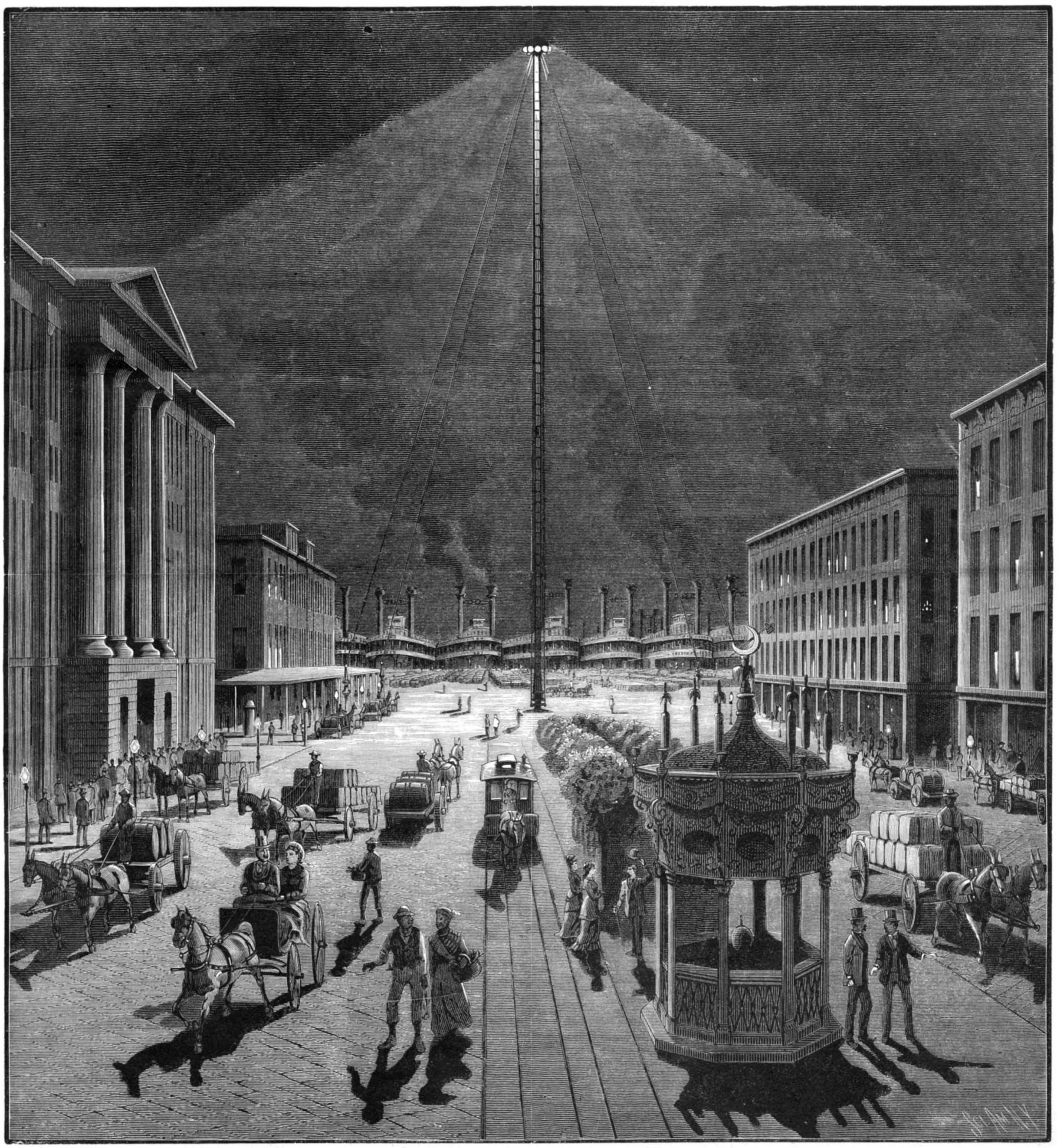
The convenience and economy of electric illumination for harbors and water fronts, particularly when it is desirable to handle freight by night as well as by day, have been amply demonstrated in this countryand in Europe. The experience of Liverpool on this point has been especially valuable, both in showing the economy of the electric light for docks and shipping, and the very satisfactory working of lights raised high in the air.

The crescent shape of the river front at New Orleans, the massing of the shipping business along a comparatively short reach of shore, and the broad open space along the levee to be illuminated, conspire to make the elevated electric light especially serviceable and appropriate there; while the high cost of wharfage makes it extremely desirable that every possible facility should be afforded for the rapid transference of the vast cargoes of cotton, sugar, grain, and other bulky commodities handled at that port. It is doubtful whether there is in the whole country another space of equal magnitude calculated to be so largely benefited by the new method of lighting as the busy crescent of the New Orleans levee.

Two serious obstacles have been encountered in the practical development of plans of securing such artificial illumination on a grand scale by means of powerful electric lamps raised on lofty towers. The towers are costly and not easy to erect; and a good deal of awkward machinery is required to lower the lamps for trimming every day and return them to their position at the top of the mast. To do away with the latter difficulty entirely and to very materially lessen the former are the objects of the light tower invented by Mr. William Golding, of New Orleans, and illustrated by the engravings herewith.

From time immemorial a standard illustration of perversity and impracticableness has been the man who would begin to

[*Continued on page* 162.]



ELECTRIC LIGHT TOWER FOR CANAL STREET AND LEVEE NEW ORLEANS.—DESIGNED BY WM. GOLDING, M.E.

# Scientific American.

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NEW YORK, SATURDAY, MARCH 18, 1882.


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**THE SCIENTIFIC AMERICAN SUPPLEMENT,**

**No. 324,**

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## PROPOSED PATENT LEGISLATION.

Several bills of general interest to patentees are now awaiting action by the Committee on Patents.

Senate bill No. 1,226, introduced by Mr. Call, February 16, proposes to introduce a novel and questionable practice designed to limit the rights of owners of extended patents. It provides that when letters patent for a valuable invention have been extended, owing to the failure of the patentee to receive reasonable compensation for his invention in consequence of poverty and inability to manufacture and introduce his invention, the extended patent shall not give any right to the exclusive manufacture and sale of the invention. The manufacture and sale must be open to the public, subject only to the payment, to the inventor, of a royalty not exceeding for the first year a net amount of 20 per centum on the cost of the materials used in the manufacture of the article, and diminishing in a regular ratio each successive year during the life of the patent.

The bill further provides that in all cases where letters patent shall be extended under the provisions of the act, the Commissioner of Patents shall advertise the application for the space of three months in some newspaper of general circulation, and a hearing be given to all persons objecting to the extension; the applicant is allowed the right of appeal to the District Court of the United States for the District of Columbia, on giving bond for cost. The cost of the advertisement is to be paid by the inventor if he is able; if not it is to be paid out of the fund subject to the control of the Commissioner of Patents, and remain a lien in favor of the government on the patent until the same is paid.

A bill introduced by Mr. Platt, February 17 (S. 1,238), to regulate practice in suits for infringement where the purchase is made in good faith for the defendant's personal use, provides that if the plaintiff does not recover twenty dollars or over he shall have to pay costs, unless the defendant had actual notice of the existence of the patent or disputes the plaintiff's right to recover anything.

It further provides that when suit is brought against a defendant other than a manufacturer or seller the plaintiff shall first deposit with the clerk of the court the sum of fifty dollars as security for the costs and expenses of the defendant. In case the defendant prevails the deposit (or a "reasonable" part of it) is to be allowed by the court for counsel to the defendant, and the plaintiff will have to pay the costs in addition.

The obvious purpose of this bill is to repress suits against actually or suspected infringing users of patented inventions; and while it may be calculated to prevent certain alleged abuses its discrimination against patentees of small inventions is certainly not in harmony with the general spirit of the patent laws.

In the House Mr. Skinner introduced, February 13, a bill to limit the reissue of patents (H. R. 4,353). It forbids the reissue of patents except within three months of the issue of the patent in all new cases, and within three months of the passage of the proposed act in case of all patents already in existence.

The principle of limiting the period during which a patent may be surrendered for reissue is good; but it may reasonably be questioned whether a three months' limit is not too brief.

A bill introduced by Mr. Vance, February 20 (H. R. 4,573), makes it the duty of the Attorney General to take legal proceedings in equity in the Supreme Court of the District of Columbia to secure the annulling of any patent which he has ground for believing to have been procured by fraud or misrepresentation. In case the party at whose complaint the proceeding is begun fails to establish the invalidity of the patent he will have to pay the costs incurred by the Attorney General in the litigation.

## THE TRANSFORMATION OF BACTERIA.

The transformation of the innocent bacteria usually found in healthy organisms into the specific forms associated with certain more or less malignant diseases is something quite unexpected and altogether contrary to prevailing theories; yet the experiments lately made by Dr. Rosenberger, at Wurzburg, strongly indicate that such may sometimes be the case.

Dr. Rosenberger's experiments were begun to determine the cause of the death of an animal poisoned with a septicæmic virus, which had been heated so as to destroy all the bacteria in it. The prevailing belief is that cooked virus is simply a poison, and that the injection of it into the blood of a healthy animal kills as strychnia does, as a poison, not as an infection. To decide this question septic blood and serum were heated, filtered, evaporated, and then injected. The animals died with all the symptoms and pathological appearances of septicæmia, just as if uncooked virus had been used. The only effect of the cooking was to lessen the virulence of the poison, which, however, was redeveloped in the blood of the animals poisoned. To insure the killing of all the micro-organisms in the cooked virus, the virus was exposed to a temperature of 140° Cent. for two hours; and that this temperature was sufficient to sterilize the liquid was proved by the inaction of it (the cooked virus) in culture liquids.

The inference from Dr. Rosenberger's observations is, as pointed out by the *Lancet*, that the application of a degree of heat which apparently sterilizes effectually a septicæmic virus, so far as artificial cultivation of the organism is concerned, does not prevent the virus from producing in the animal body its specific form of septicæmic and of septic bacteria. From these facts the startling conclusion is drawn that the bacteria are not primary but secondary elements in the morbid process, and that their development is associated with a chemical or at least unorganized poison; a poison, however, which the bacteria are the means, and the only means, of multiplying in the animal body. Since these septic bacteria are not contained in the cooked virus when it is injected, the question arises: How then do they come to be in the poisoned animal, which was previously without them?

Dr. Rosenberger holds that they arise from the non-specific bacteria already in the organism; in other words, that under certain conditions bacteria may radically change their nature, so that from being harmless they become virulently malignant. This conclusion is in harmony with the results of Buchner's observations, which seemed, though not conclusively, to show that the bacillus of anthrax might be developed from a non-specific fungus found in hay; and also with the observations of Rossbach in connection with the physiological action of papayotin, a chemical ferment of vegetable origin, which, when injected into the blood of a perfectly healthy animal, causes such a multiplication of bacteria as to produce effects comparable with those of a true infection.

If these observations are sustained by further experiments in this direction, the current theories with regard to the origin of certain specific diseases by infection, always and exclusively, will have to be materially modified; and the position maintained by many intelligent physicians in retired places, that specific diseases like typhoid fever, scarlet fever, and the like, do sometimes originate where the theory of infection is untenable, will be abundantly justified.

### Effects of High Barometric Pressure.

In connection with the recent high barometric pressure some noteworthy phenomena have occurred. Thus, at Antibes (a seaport in the southeast of France) the sea level was depressed about a foot, laying bare portions of shore over which boats can usually sail, and exposing surprised sea slugs and other marine animals to the direct rays of the sun. This continued about a fortnight, and is attributed by M. Faye to the high air pressure. Again, General de Nansouty reports from the observatory at the top of the Pic du Midi that the lowest temperature there this winter has been only —5° C., and during the recent high pressure, from January 8 to 20, the air being in a state of exceptional purity, temperatures as high as 26° C. were registered. The highest at Bagnères-de-Bigorre is considerably short of this, so that we have here an inversion of temperature with altitude. The General states further that from the 1st of January the zodiacal light was distinctly made out; probably this has never happened before in our climates, so near the winter solstice. Once more, the General and his assistants, on January 20, at 6:30 P. M., saw distinctly the earthshine on the moon and the thin crescent, though only 25 hours 46 minutes old.

### Berlin Elevated Railway.

The City Railroad (elevated) in Berlin, built by the government and opened February 7, has cost about $16,000,000 —$2,300,000 per mile. It was projected (but not by the government) some ten years ago, when Berlin was growing with unexampled rapidity, and the crowding of the city and the rents paid for the poorest quarters were absolutely frightful, and when, too, there were practically no horse railroads. Now there are many street railroads, and the high rents caused such a furor of building that there are said to be 15,000 unrented dwellings in the city. The new road, however, is thought to have fair prospects of financial success. By building it the government avoided an expenditure of $2,500,000 for a station for one of its roads, and it will be of very great value as a connection of existing railroads, used for bringing suburban trains from various lines into the heart of the city—something as if the suburban trains of the New Jersey roads entered New York over one of the elevated roads and stopped at all its stations.

### Mental Distance of the Moon.

M. Plateau lately sought to estimate the distance to which the moon is mentally referred in the sky, by getting some one, after looking at that body, to project the accidental image on a wall, then move to or from the wall till the diameter of the image seemed equal to that of the moon; and he obtained the distance 51 meters. Again, Prof. Thirion, of Namur, got twelve students to draw on a blackboard a circle the size of the moon as it appeared to them. The circles varied from 19 to 79 cm., mean 32 cm, and it was inferred that the moon was mentally referred, on the average, to about 35 meters. Dr. Charpentier, by still another method, obtains the value 12·9 meters, so that there are great differences, and in any case the distance is much less than might have been thought. M. Plateau has, says *Nature*, further applied accidental images to finding the distance to which the imaginary celestial vault is referred. A spot in a white square of paper on a dark ground was looked at steadily at the side of an open window for twenty seconds, then the person looked skywards, above the opposite houses, then to one of these houses, and compared the sizes of the accidental images in either case. The sides of the two were by one person estimated as 5 to 6, by another as 4 to 5; and the width of street being about 30 meters, the distance assigned to the celestial vault is inferred to be in one case 30, in the other 29 meters. A similar result was got by night.

### A RAILWAY-CROSSING INVENTION WANTED.

Notwithstanding the fact that American railroad managers have adopted various devices to prevent accidents where highways cross railways at grade, the list of accidents at crossings is a long one. In many instances of death and damage at crossings the blame should properly rest with the victims, as it is usually the result of their own carelessness or stupidity. But in case of storms the bell or whistle may not be heard, or in foggy darkness and deep cuttings on curves the head light may not be seen, and the passer may keep a sharp lookout and still be caught. It not unfrequently happens that enginemen neglect to sound either whistle or bell at crossings; this is often the cause of disaster; or the attention of one or both enginemen is suddenly drawn to some urgent matters pertaining to their duty, and the whistle and bell escape their minds until the crossing is passed.

Formerly, railroad companies were constantly under prosecution for neglecting to give the customary warnings at crossings, or not blowing the whistle, or commencing to ring the bell at the distance from the crossing prescribed by legislative enactment. As a remedy for this, the prescribed distance was measured each way from crossings, and posts set that engineers might know at what point the law required them to sound the alarm, which would relieve the company from blame in case of accident. This plan was not without its merits, but for reasons already explained these posts would be run past unheeded, and they did not afford the desired protection.

Another plan was the steam bell ringer. By this arrangement the bell could be set ringing at any desired point, and the ringing would continue until stopped by the engineman. By this arrangement the bell could be set going at any desired point, and firing, oiling, or other duties attended to until the crossing was passed; the bell needing no attention. But it occasionally happened that, like running past the whistle or ring posts unheeded, the bell was not set ringing, and the crossing was passed without any warning.

Another plan was to place a bell stationary on the truck frame, under the head light, and a hammer that struck the bell was actuated by a rod and eccentric attached to the driving shaft. This gave a stroke of the bell at every revolution of the driving wheel. Residents along lines using this device could judge of the speed of the train by the strokes of the bell. When it was not desired that the bell should ring, it was thrown out of gear. This plan, like the others, was good when properly attended to; but when forgotten was liable to cause serious mischief.

The public are accustomed to listen for warning at crossings, and if a sound is not heard or signal shown, they are led into a trap; hence such devices as above mentioned, not being self operating, are elements of danger rather than protection. The foregoing has reference to grade crossings in the country. In cities and towns, safety gates are operated by an attendant, or flag-men are employed, but at country crossings the whistle and bell are relied upon as protection.

Various other devices have been resorted to to save life at crossings, but none of them meets the requirements, and a *perfect crossing alarm* is one of the pressing needs of the day. Railroad companies are subjected to enormous expense by interminable lawsuits arising from accidents at crossings, and it is believed that every railroad company would willingly pay any reasonable price for a *reliable* crossing signal. Here is a rare opportunity for inventors, and it is earnestly hoped they will take advantage of it.

The foregoing has been written to point out to inventors, in a measure, what has been done in this line in order that they may not go over ground already worked; and, although we have not mentioned a tithe of the inventions that have been brought out for the purpose under consideration, those alluded to are the nearest perfect of any in use, and would be the most likely to be reproduced by inventors who are not familiar with the general subject.

There are also gongs placed at the crossings which are designed to be sounded by approaching trains through the medium of electric appliances, or a system of wires and levers operated by the wheels of passing trains; but none of these is satisfactory on account of liability to derangement. Either of these two latter plans contains the elements of success when thoroughly perfected, and this would seem to be the right direction for the inventor to work to insure success. As already explained, any device depending on the vigilance of train-men to operate is unreliable, and the only safe arrangement seems to be in providing a gong at crossings which shall be sounded automatically and continuously from the time a train reaches the point prescribed by law until the crossing is covered by the train. Semaphores have been made to act automatically with tolerable success in daylight, but are of no account in fogs, snowstorms, or at night. If the gong is used it must be placed in a suitable box or housing at the crossing, and so arranged as to render a failure to sound at the proper time an impossibility. This may seem as putting it rather strong, but it must and can be done. Of course such an arrangement will need constant supervision to be kept in order, and must be so arranged as not to be rendered inoperative by snow or ice. Another requirement is that the apparatus shall not interfere with the work of track repairs. With a gong ringing sharply at a crossing, no one would attempt to cross the track with that stupid indifference engendered by familiarity with crossings and so characteristic of a large class of people.

The public demands faster trains, and the increase of traffic requires a greater number of them, all of which creates a greater necessity for a reliable danger signal at crossings.

Perhaps some good might result from the enactment and *enforcement* of a law compelling all persons to come to a halt at crossings before attempting to cross. This would afford them an opportunity to decide whether or not they could cross with safety; but as no amount of legislation would be effective in all cases, it remains for inventors to guard the public safety to a great extent in this as in many other matters connected with travel by rail and water.

WM. S. HUNTINGTON.

[Our correspondent has omitted the mention of the best plan of all for the prevention of accidents at crossings, which consists in depressing the track of the railway so as to pass under the road; or the bridging of the track so as to carry the road above it. We believe that in some countries, and in some towns in this country, this method is required by law.—ED.]

### How to Make Paper Negatives and Prints.

BY CAPTAIN ABNEY, R.E., F.R.S.

In compliance with your request to me, I beg to communicate to you the method of preparation of the bromo-iodized paper with which my lectures already delivered before the Society of Arts have been largely illustrated. Before the rapidity attainable by the gelatino-bromide paper, however, it cannot be hoped that it will be largely utilized. It has, however, the good quality of cheapness and ease in preparation, which the gelatine paper has not. The preparation paper was described at a meeting of the Photographic Society, in 1880, and with one exception its preparation is the same as before.

The method of preparation must be adapted to the purpose for which it is intended to be used. 1st. For the production of paper negatives.. 2d. For the production of prints. In the first case the paper is soaked in the following: Potassium iodide, 200 grains; potassium bromide, 300 grains; water, 20 ounces.

To this is added a solution of iodine in alcohol till it assumes a deep claret color. (This is added for the convenience of knowing when the sensitizing is completed, and is not necessary.) After filtering the solution. the paper, which should be as smooth as possible (Saxe or Rives answers), is immersed in it, taking care that no air-bells cling to the surfaces, and allowed to remain soaking for half an hour. The sheets are turned once or twice during the operation. They are then taken out and allowed to drain and dry spontaneously, after which they are floated on silver nitrate, 500 grains; glacial acetic acid, 1 ounce; water, 20 ounces.

The smooth side of the paper is floated as is done when albumenized paper is sensitized; after a couple of minutes the purple or brown tint at the back of the paper will be replaced by this yellow bromo-iodide of silver tint. After a couple more minutes the sheets are removed to a dish of water to remove the excess of silver. After another wash the paper is transferred to water containing about fifty grains of potassium bromide to the pint of water, and allowed to soak ten minutes. It is then thoroughly washed and dried. By this plan the paper will be slow. In order to render it more sensitive it may be given a soak in beer diluted to half its strength with water to which a little white sugar has been added, say one lump the size of a nutmeg to a pint; or it may be floated in a solution of potassium nitrate or sodium sulphate, about half a grain to the ounce, and then dried. These would render the paper a good deal more sensitive than in its normal state, and can be used with safety. Any sensitizer, such as gallic or pyrogallic acid, might be mixed with the beer, but in this case care must be taken to wash it all out before applying the iron developer, since any trace left will form ink with the iron. The exposure is long, compared with gelatino-bromide paper—say thirty times longer. I now prefer to develop by brushing over the ferrous-citro-oxalate developer, using a nearly vertical plate on which to hang the paper, which should be previously dampened. This is more economical than using a dish, and is a great saving in time. The ferrous-citro-oxalate gives even purer whites than the ferrous-oxalate, and I therefore recommend it. The brushes I use are three inch flat badger hair brushes, and I have found no deterioration in them by use. From time to time the paper should be examined to see what density has been obtained, and when the image is through the paper it will be found sufficient for printing purposes. After fixing, washing in hot water (to remove the size), and drying, the paper is waxed in the usual manner.

To obtain prints, plain paper is brushed over on its smooth surface with the above solution, to which about five grains to the ounce of gelatine may be added. When dry, a second coating is given, and when that is dry the paper is floated on the above silver nitrate solution for four minutes, after which it is washed and treated exactly as above, and developed in the same way.

Pure bromide paper answers almost as well. A solution of thirty grains to the ounce of potassium bromide is brushed over the paper twice, which is floated on the silver bath, and treated as before. To develop such paper it is, however, as well to add to each ounce of ferrous-citro-oxalate developer about five grains of common salt. This keeps the whites purer than they would be without it. Paper so developed should be beautifully bright and clear in the lights and shades, and gives excellent prints on which to work if considered desirable. There is a tendency, however, for the prints prepared with bromide alone to have a greenish tint. The use of the iodide gives a black. This is not astonishing when it is considered that silver iodide alone develops a ruddy color. This, mixed with the green, gives a black tone.

I may add that many photographers apparently fail to make ferrous-citro-oxalate. The plan is as follows: Take 500 grains and dissolve in 5 ounces of water, warm the solution to boiling point, and then add to it 110 grains of ferrous oxalate powder. Shake this up immediately in a corked flask, and it will be found to dissolve It should have a greenish-red tint, and is then in its most active state. I advise those who develop collodion dry plates, or gelatino-chloride, to try this developer, and use it without any restrainer.—*Photo. News.*

### How Mosaics are Made.

The London *Telegraph* has the following: The guardian in the velvet skull-cap came to my aid, when I was at fault, with most courteous explanations. He mentioned incidentally that in a portrait of Pope Pius V. there were 1,700,000 pieces, each no larger than a grain of millet; but this statement I take to have been merely guesswork. The enamel, he proceeded to tell me, is a kind of glass, colored with metallic oxides, and it is so fusible that it can be drawn out into threads, small rods, or oblong sticks of varying degrees of fineness, slightly resembling the type used by compositors. These polychromatic rods are kept in drawers properly numbered, so that the artist always knows to which case to repair when he requires a fresh supply of a particular tint or tints. When the picture is commenced the first step is to place on the easel a slab of marble, copper, or slate, of the size fixed upon; and this slab is hollowed out to a depth of about three and a half inches, leaving a flat border all round which will be on a level with the completed mosaic. The excavated slab is intersected by transverse grooves or channels, so as to hold more tenaciously the cement in which the mounts of enamel will be embedded. Then the hollowed slab is filled with "gesso," or plaster-of-Paris, on which the proposed design is accurately traced in outline, and usually in pen and ink.

The artist then proceeds to scoop out a small portion of the plaster with a little sharp tool. He fills up the cavity thus made with wet cement or "mastic," and into this mastic he successively thrusts the "spiculæ," or the "tesseræ," as the case may be, according to the pattern at his side. In the broad folds of drapery or in the even shadows of a background, or a clear sky, his morsels of enamel may be as large as one of a pair of dice; in the details of lips, or eyes, or hair, or foliage, or flowers, the bits of glass may be no larger than pins' heads. The cement, or mastic, is made, so far as I could gather from my informant, of slaked lime, finely-powdered Tiburtine marble, and linseed oil, and when thoroughly dry is as hard as flint. Sometimes the mastic which fills the cavity is smoothed and painted in fresco with an exact replica of the pattern, and into this the bits of glass are driven, according to tint, by means of a small wooden mallet. If the effect produced wounds the artist's eye, he can easily amend the defect by withdrawing the offending piece of enamel and driving in another while the cement is still wet; and, by observing proper precautions, it can be kept damp for more than a fortnight. When the work is completed any tiny crevices which may remain are carefully plugged or "stopped" with pounded marble, or with enamel mixed with wax, and the entire surface of the picture is then ground down to a perfect plane, and finally polished with putty and oil. Byzantine may be broadly distinguished from Roman mosaic by the circumstance of the surface of the former being left unground and unpolished—save where there is burnished gold—thus leaving an irregularity of surface productive of great vigor of effect. A virtuous picture of the Byzantine style can at once be recognized as a mosaic, even if it be hung at an altitude of one hundred feet from the ground; but a perfected mosaic picture, after the Roman manner, might easily be mistaken, even at a very short distance, for a very elaborately finished and highly varnished painting in oils.

### Remarkable Brain Wound.

A young man named Leonard E. Spencer, of North Fenton, Broome County, N. Y., was wounded in the head October 8, 1881, by the bursting of his gun. His physicians were able to insert a finger its full length into the wound, but were unable to find the fragment of the gun which penetrated the brain. Partial recovery took place. He was at work February 20, when unfavorable symptoms set in and he died the next day. At the autopsy the cylinder and tube of the gun were found embedded in the brain, inside the membranes and on the floor of the middle fossa, near the fore part of the skull. The cylinder and tube were connected in one piece and weighed about three-quarters of an ounce. The patient had survived the injury four and a half months.

### Export Edition of Scientific American.

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### The Science of Teaching and the Teaching of Science.

The annual general meeting of the Teachers' Training and Registration Society and of the Bishopsgate Training College was lately held in the theater of the Society of Arts, Lord Aberdare presiding.

Professor Goldwin Smith, in moving the election of the council, said that the void in their system was in secondary education, and to that point the efforts of the friends of education should be specially directed. In America at the present time they were afraid that superficial education made some persons restless, and induced them to leave the small towns and flock into the cities. That objection, however, applied to the lower strata of society rather than to that with which the association dealt. What was, however, to be guarded against was the mere show of education—the attempt to teach what teachers did not know. After all, it was not in the culture but in the character of the individual that the usefulness of their lives appeared.

Professor Huxley, who seconded the resolution, said that more than twenty years ago he was appointed one of the examiners in the Science and Art Department, as now, and one of the first things his colleagues and himself discovered was that their great difficulty was with the teachers. In respect of the teaching of science, he had constantly brought before him the wide gulf fixed between the two different kinds of what persons called knowledge. The one was a mere learning to repeat a verbal proposition, and the other was knowing the subject at first hand—a knowledge based upon a knowledge of the facts. That which they had constantly to contend against in the teaching of science in this country was that teachers had no conception of that distinction; for they thought it quite sufficient to be able to repeat a number of scientific propositions and to get their pupils to repeat them as accurately as they themselves did. If he might offer one suggestion to the governing body of the college it was that so far as they taught science at all they should aim at giving real and practical scientific instruction; that it should be confined to those things about which there was no dispute; and that the teacher should be instructed that his business in teaching was to convey clear and vivid impressions of the body of facts upon which the conclusions drawn from those facts were based. The resolution was adopted unanimously, as were two others.

### Another Ballooning Failure.

An attempt was made March 4, by Colonel Brine, of the British Royal Engineers, and an aeronaut by the name of Simmons, to cross the English Channel in a balloon.

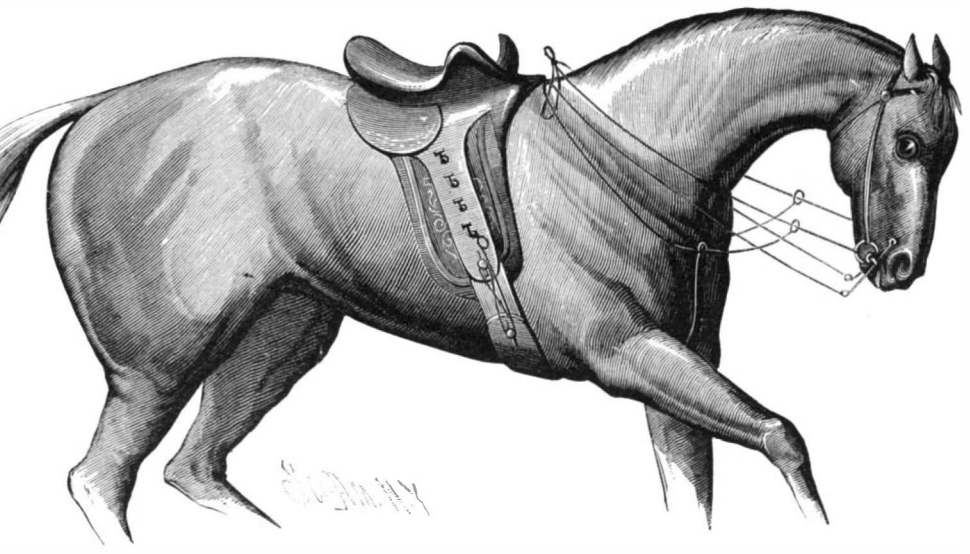
Before they were half way over the wind shifted and was driving them toward the North Sea, when they dropped into the sea and were picked up. They say that their descent was intentional.

### NEW SIDE-SADDLE GIRTH.

The engraving shows an improved side-saddle girth which can be tightened by the rider without leaving the saddle. The girth is composed of two sections, united at two adjoining ends by straps and buckles, the other ends overlapping each other, one end sliding upon the other, both being provided with pulleys over which a rope or strap passes which is fastened to the end of the sliding band and terminates in a ring which is hooked on one of a series of hooks on the fixed band above the upper pulley.

When the girth is in use the ring at the end of the rope is hooked on the lowest hook and the girth is passed around the horse, and is fastened by means of the straps and buckles in the usual way. If the girth becomes loosened—as it generally does a short time after it has been fastened— the rider seizes the ring with the right hand, unhooks it, and by pulling on it brings the two pulleys, F and G, together (Fig. 2); by this means the girth is shortened and consequently tightened. The ring is then hooked on one of the hooks, L, and should the girth again become loosened it may be tightened in the same way.

This invention was recently patented by Mr. William McNaught, of Cartersville, Ga.



McNAUGHT'S SIDE-SADDLE GIRTH.

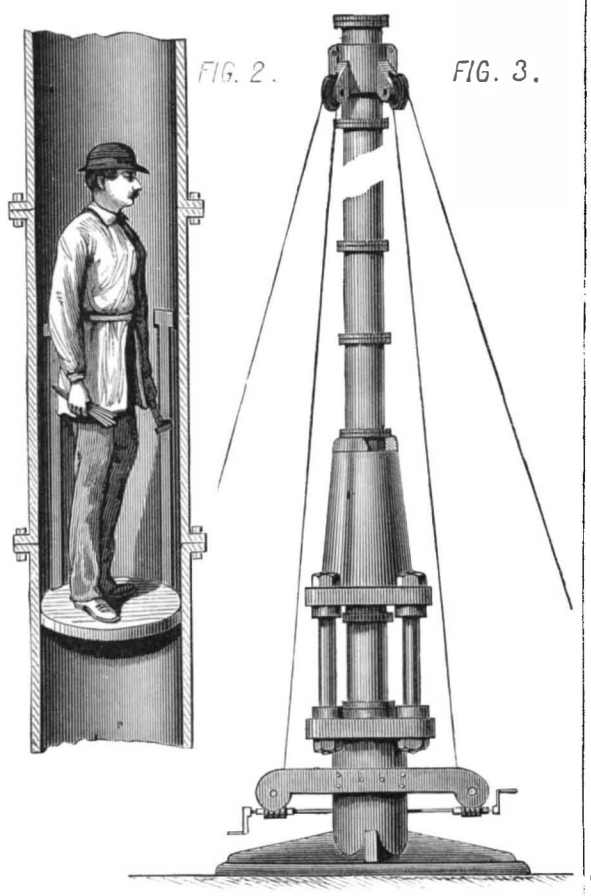
### Some Representative Americans.

The theory that the human race will not be able to maintain a high order of physical development on this continent did not receive much encouragement at a recent social gathering in this city. The Titans, a society to which only gentlemen of position and of a stature not below six feet two inches are eligible, now numbers about a hundred members, largely representative of our oldest and best known American families. Seventy-three Titans sat down together at the recent annual dinner of the society. The tallest measured six feet six inches. There were a dozen generals and colonels among them, as many prominent physicians, and a long list of distinguished lawyers and business men.

### PROPOSED ELECTRIC LIGHT TOWER AT NEW ORLEANS.

[*Continued from first page.*]

build his home at the top. With the boldness of the genuine inventor, Mr. Wm. Golding, M.E., not only essays to accomplish this proverbially impossible task, but actually shows how it may be done in a way that certainly presents no obvious features of impracticability.




VERTICAL PLAN OF GOLDING'S ELECTRIC LIGHT TOWER. —SECTION SHOWING LIFT FOR LIGHT TRIMMER.

Mr. Golding dispenses with stagings and the usual machinery of tower building, and raises his tower into the air by additions made at the bottom. The tower is a cast iron cylinder built up of short sections, five hundred feet high, if need be, and kept vertical while in process of erection and afterward by means of guys. The top sections, to which the lamps are to be permanently attached, are put together first, and, by means of an ordinary derrick, are set vertically over a hydraulic press placed upon the intended foundation of the tower. The hydraulic lift raises the top sections until a new section, say five feet long, can be set underneath. While the lift is returning to admit a new section the raised tower is held in position by a clamp and kept vertical by means of the guys which are simultaneously fed off by a wormwheel gear as the tower is pushed up. When the new section has been securely bolted on, the whole is lifted another length; and thus by successive lifts and additions at the bottom the tower is raised until the required altitude is attained. The method of lengthening the guys is simple and practically automatic, and no trouble is anticipated in keeping the rising tower steady and exactly vertical.

Each section of the tower will be bored out before it is put in place, and have a diameter sufficient to allow the easy passage of a circular platform carrying the lamp trimmer, who will be lifted to the top of the tower by means of a piston operated by compressed air supplied by pumps or a rotary blower. The inventor thinks that the pressure need never exceed half a pound to the square inch. The cost of a five hundred foot tower complete (without the lamps) raised in the way described is estimated at about $30,000.

Mr. Golding proposes for the levee at New Orleans a five hundred foot tower, to carry an electric light of 40,000 candle power. He would have it placed at the intersection of Canal street, as shown in our large engraving. Such a light so placed, it is evident, would abundantly illuminate the levee, the harbor, and the opposite shore.

The smaller engraving shows the method and machinery requisite for raising the tower and for lifting the lamp trimmer to the top.

Mr. Golding suggests that the tower might be used as a look-out station for the fire department, and be further used as a telegraphic center, wires being run from the tower to the different offices about the city and across the river to Algiers without other support, the over-river wire being high enough above the water to be entirely clear of ships' masts.

The erection of lofty light towers such as Mr. Golding proposes would not only be clearly advantageous to the commerce of New Orleans, but would make that port conspicuous for its convenience to shipping as well as for its nocturnal splendor.

### MISCELLANEOUS INVENTIONS.

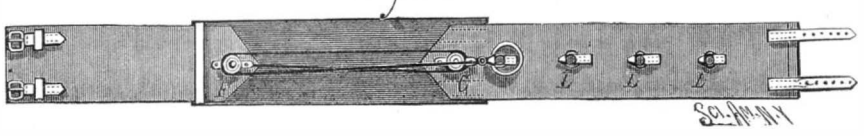
Messrs. Thomas Neely and Alfred Marland, of Pittsburg, Pa., have patented a simple and effective guard for fence wires so constructed as to prevent the skin and flesh of cattle from being torn as they are liable to be when barbed guards are used. The invention consists in combining with one or more wires metal disks having smooth, sharp edges, by which a clean cut is made in the skin of cattle coming in contact therewith.

Mr. Richard Mills, of Buffalo, Ill., has patented an improvement in gang plows, in which the plows are constructed with forwardly-projecting prongs upon their shears and guards upon their mould boards, by which the furrow slices will be raised and kept upon the mould boards till they reach the proper point to be turned.

### Explosion of a Locomotive.

A singular explosion was that of locomotive No. 419, used on the Peoria branch of the Wabash, St. Louis and Pacific Railway, which exploded in the round-house at Lafayette, Ind., at 7 A.M. of the morning of February 20. Neither the engineer nor fireman had arrived, and as one of the men in charge of the building was in the act of turning the table in front of the engine, without any kind of warning the boiler burst, carrying destruction and injury in every direction, but happily without loss of life. The roof of the building, which was 154 feet in diameter and of sixteen stalls, was cone shaped, supported by brick walls and covered with tin. The explosion forced the walls outward, and the roof fell down, a complete wreck. Only fragments of the walls are standing. A correspondent of the Chicago *Tribune* says: One singular feature about the explosion is the fact that it made comparatively small noise, the concussion being more in the nature of a heavy thud, causing the earth to jar for a moment. The pieces of the wreck were not blown over all creation, as is usually the case, but the force of the explosion seemed to have spent itself in the demolition of the wall. There were a number of narrow escapes, but outside of the men who were in the building no serious accident occurred. One of the locomotives was about half way out from beneath the arch when the explosion occurred. The fireman was thrown from the cabin to the tank, but aside from an injury to the hand like that produced by a falling brick, he was not hurt, though stunned. The engine was considerably damaged, the smokestack knocked off, rods bent, and other like injuries. There were thirteen locomotives in the building at the time of the explosion. All of them are damaged, but probably not to any great extent. Headlights are broken, smokestacks demolished, and rods and bars bent and broken, but as soon as they are gotten out they can be very speedily repaired. The men in charge are unable to account for the accident, save from some defect in the boiler. There is said to have been an abundance of water therein. Five men were injured—one only seriously.

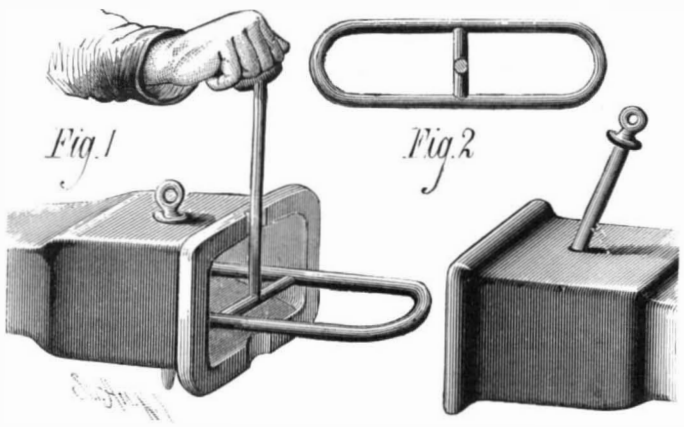
Fig. 2



McNAUGHT'S SIDE-SADDLE GIRTH.

### NEW SAFETY CAR COUPLING.

The engraving shows an improved car coupler in which a light handle, attached to the link, reaches up far enough to permit of holding it up by the hand with perfect safety while coupling. A narrow shallow groove is formed in the face of the drawheads, in which the handle sets when the drawheads bump together; this prevents injury to the handle. To couple the cars the free end of the link is held up by the handle and guided into the mouth of the drawhead, the pin is then dropped as usual. There is no danger, as the hand does not go between any colliding parts. When more convenient to couple from below, the handle may be turned downward, and the link held up by one hand below the drawheads, while the pin is dropped by the other hand above. It is not necessary to go between thecars, as a short rod may be passed through the ring on the handle to hold the link up.




FRITTS' SAFETY CAR COUPLING.

The ordinary form of link is used, with a bar across the middle and a handle welded to the bar. The handle may be made of a small iron rod one-quarter by one-half inch. The groove in the drawbar face is about one-quarter inch deep and one inch broad. This groove can be formed when making the drawbar, or ground in the face of one already made, by means of an emery wheel. It is not absolutely necessary to take the drawbar off the car to alter it, as a portable emery wheel can be employed for the work.

An ordinary coupling changed to this form is in no respect unfitted for coupling with cars fitted with other couplings, as it will couple into any other form or device that it could couple with before being altered over. If the handle gets worn or accidentally broken off, the coupling is still asgood as the ordinary link.

This coupling, when put into use, will undoubtedly prevent a very large proportion of accidents in coupling.

Further information may be obtained by addressing Mr. Charles E. Fritts, at 42 Nassau street, New York city.

### IMPROVED NUT LOCK.

The engraving shows an improved nut lock consisting of a plate of iron of the desired length, breadth, and thickness, having recesses formed in its face capable of receiving the nuts of the bolts in connection with which the plate is to beused. At the bottom of these recesses there are slotsthrough the plates, which allow the bolts to pass through. These slots extend beyond the open ends of the recesses far enough to permit of readily turning the nut. The end of the plate has a head to admit of driving it one way and the other. These recessed plates, when used as fish plates, are placed on one side of the abutting rails, and a plate having square bolt holes is placed on the opposite side. The bolts have square shanks, and pass through both plates and the rails.

After the nuts are screwed up the recessed plate is driven along lengthwise of the rail until the nuts are in the recesses. The nuts will then be locked and cannot be turned until the plate is driven back.

This style of nut lock can be applied with great advantage to cars, wagons, machinery, iron buildings, and, in fact, in many places where bolts are employed, but it finds its principal application to railroad rails.

Further information may be obtained by addressing Mr. W. D. Simpson, Anderson, S. C.

### RECENT INVENTIONS.

A novel clothes drier has been patented by Mr. John R. Buckwalter, of Buyerstown, Pa. The object of this invention is to provide a cheap and simple drier, especially adapted for application to ordinary stove-pipes, for drying articles of clothing. It consists of two semicircular bands having arms and at right angles thereto, supported by flanges having sockets for receiving the arms.

Messrs. James Casey, Sheldon Juniper, and John H. Mitchell, of Savannah, Choctaw Nation, Indian Territory, have patented a dumping car provided with an end gate carried by a bail pivoted to the sides of the car, the end gate being provided with a recess in its upper end for receiving a hook suspended from a frame above a tilting platform, upon which the car is run, so that when the car is tilted this hook will hold and raise the gate, permitting the contents of the car to slide down the inclined floor.

An improved chimney cap and ventilator has been patented by Mr. William D. Bartlett, of Amesbury, Mass. This invention is an improvement on the chimney cap shown in letters patent granted to the same inventor September 21, 1880, No. 232,434. The invention consists in wing strips combined with a suspended hood for the purpose of diverting or breaking up the gusts of wind and preventing back eddies.

A dumping car of simplified construction, and one which can be operated with greater ease than those in common use, has been patented by Mr. Aaron Park, of Ottumwa, Iowa. This invention consists in providing the frame of the car truck with a longitudinal central shaft, and also at or near its ends with vertical plates, the upper edges of which are made heart-shaped to form tracks upon which the car box moves when dumping the load in either direction, the car box being connected with the frame of the truck by a rod passing through curved slots in the vertical plates and operated by levers.

A novel cattle tongs for catching and holding wild cattle in slaughter-houses and other places has been patented by Mr. Christopher Brühl, of Greenpoint, N. Y. The invention consists in cattle tongs having its jaws hinged to the handles. The handles have a hinged serrated locking arm and a locking pin for holding the jaws closed.

A refrigerator that will secure as much as possible the direct effect of the ice and prevent the currents of warm and cold air coming in contact and mingling with each other, and one which will be perfectly ventilated, has been patented by Mr. John Alexander, of Toronto, Ontario, Canada. This invention consists of an open ice rack at the top of the refrigerator, separated from the provision chamber by a water-shed and trough, which permit the free downward passage of cold air into the provision chamber, and at the same time catch and conduct off all drip from the ice, the sides of the ice box being slotted adjacent to vertical partitions in such manner as to form side passages for the downward currents of cold air, the lower edges of the boards being provided with deflectors for turning the downward currents toward the center of the provision chamber, and for guiding the upward currents to passages or flues formed by the partitions and the walls of the refrigerator, from whence the air returns to the ice rack or box, to be again cooled and to descend again to the provision chamber.

An improvement in the manufacture of key-board coverings for musical instruments has been patented by Mr. George B. French, of Ivoryton, Conn. The invention consists in so punching or cutting the spaces for the short keys in a sheet of covering material—as, for instance, celluloid—before the same is glued to its baseboard that the punched or cut-out pieces may be utilized by being glued to the narrow portions of the long keys of a second base.

A novel barrel cleaner has been patented by Mr. Charles Vonderlinden, of Rhinebeck, N. Y. The invention consists in a series of metallic balls or blocks provided with projecting brushes, the balls being connected by pieces of chain, so that they can be passed into a barrel through the bung-hole, and can be moved about in the barrel to scour it, water having been previously poured into the barrel.

A method of and apparatus for disinfecting dead bodies has been patented by Mr. John D. Nietscke, of Somerset, O. This invention consists of a series of air-tight boxes or receptacles provided with tubes having cocks connected to a retort and to each other by pipes. The vapors or fumes are forced from one box or receptacle to another by means of a bellows, the vapor or fumes being used over and over again.

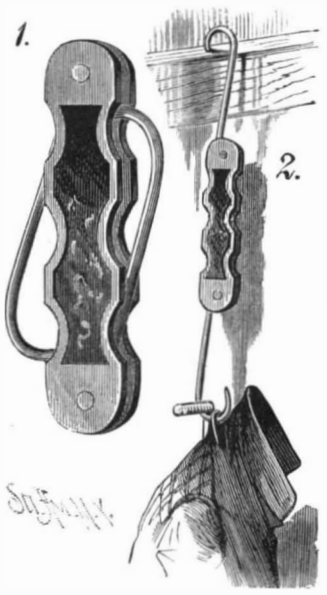
A novel curtain cornice has been patented by Mr. George Baldwin, of Buckland, Conn. This is a cornice to be applied to the top of the window frame for holding and concealing the top edge of the curtain. The center piece of the cornice is provided on its back with two bars, which extend the entire length and serve to strengthen it. One of the bars is provided with hooks for the attachment of the curtain by means of rings at its upper end.

Mr. Lewis Merrifield, of La Grange, Ind., has patented an improved cowl, consisting of a semi-cylindrical hood open at the ends and adapted to be swiveled upon the chimney or pipe, and held to the wind by means of a vane. The windward side of the hood is formed at the ends with beveled or inwardly crimped deflectors, which cause the wind, as it sweeps past the cowl, to act as an exhaust in the flue.

### POCKET HANGER FOR HATS AND GARMENTS.

The engraving shows a very convenient and useful pocket book for hanging overcoats, hats, and other garments against the wall or on the backs of opera chairs, church pews, and for use in various other places.

The invention consists of an ornamental handle similar to the handle of a pocket knife, having pivoted in its opposite ends hooks which are capable of folding up into the handle as shown in Fig. 1. One hook is made of the best steel and tempered, and has a very sharp point which may be inserted in the wall or into any other appropriate and convenient surface. In case the hanger is intended to be used mainly upon opera chairs or church seats or in some similar way, neither of the hooks need be sharpened.




McDONALD'S POCKET HANGER FOR HATS AND GARMENTS.

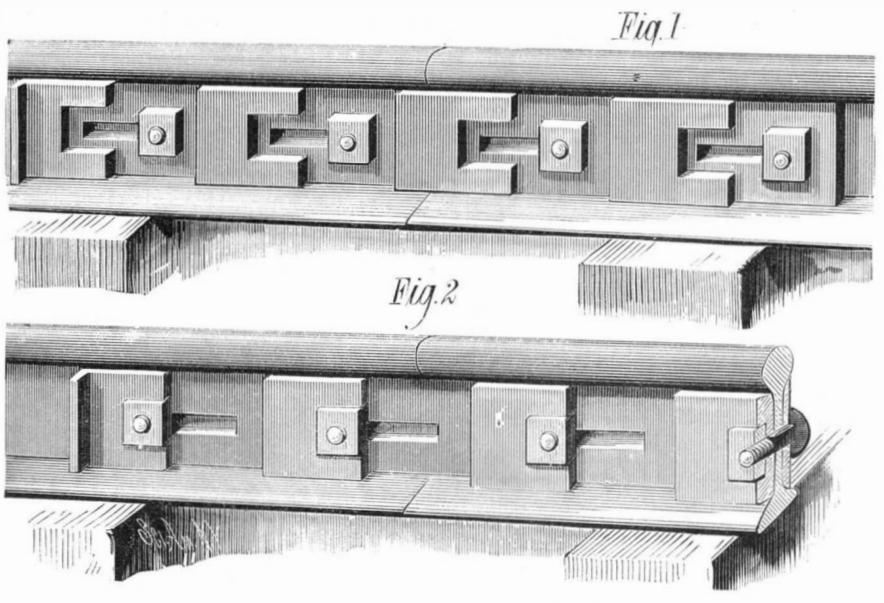
This device can be shut up into very small compass so that it may be carried in the vest pocket. It is hardly necessary to say anything in regard to the usefulness of this device, as it seems to be one of those articles that every one has use for.

The invention was lately patented by Mr. Thomas McDonald, of Austin, Texas.

### The Sense of Touch.

Professor McKendrick, in a recent lecture before the Royal Institution, said that probably touch was the most primitive of all the senses; and then described its anatomical arrangements in man. These consist of the end bulbs of Krause, the touch corpuscles of Wagner, and the bodies first described by Vater, and usually called Pacinian, after Pacini, their closest examiner. All these minute corpuscles contain a gelatinous-like matter, in which the ends of the nerves are embedded. Tactile sensations are excited by mechanical contact, pressure, or traction. The mode of excitation varies according as the body is solid, liquid, or gaseous, and sensibility increases with the amount of pressure, till it becomes pain. Inequality of pressure is one of the conditions of tactile sensation; hence the use of papillæ to increase the points of contact, and therefore the delicacy of touch.

After illustrating this by the vibrations of tuning forks, and alluding to the sensation caused by contact with fluids and gases, the Professor suggested the probable mode of action of the terminal organs. Mere contact may give rise to sensations differing in quality; such as the touch of metal, wood, and fat. Weber's method of testing the delicacy of touch was described as observing compound tactile sensations. Tactile sensibility increases from the proximal toward the distant end of the limb—as, for example, from the shoulder to the fingers. More than four or five points of contact cannot be observed at the same moment. It was shown by experiment that one continuous impression may be produced by about six hundred tactile impressions in a second. The sensation of touch does not correspond exactly to the duration of the excitant; and sometimes is referred to the surface of a body beyond it, as when we touch teeth. The Professor explained how there may be a tactile field corresponding to visual field.




SIMPSON'S IMPROVED NUT LOCK.

## THE LURAY CAVERNS BY ELECTRIC LIGHT.

BY H. C. HOVEY.

The facilities now furnished by the Shenandoah Valley Railroad have drawn twelve thousand visitors to the Caverns of Luray since last June. The majority of these have had to grope their way by candles, with occasional flashes of red lights or magnesium tape; and, on special days, the galleries have been illuminated by fixed chandeliers, ten thousand candles having been thus consumed on a single occasion. The unavoidable result has been the dropping of a great amount of melted tallow among the crystals and into the springs and pools, the smoking of some of the more delicate stalactites, and the change of those bright colors that attracted the admiring gaze of visitors who saw, as the writer did, the cave in its unsullied purity, just after its discovery, in 1878, by Messrs. Campbell and Stebbins. It may be added, in self-defense, that some of the beautiful objects, described by me in articles then written for the SCIENTIFIC AMERICAN, have been thus transformed beyond recognition—a remark especially true of the alabaster grotto known as "The Bridal Chamber," and the scale-covered column called "The Mermaid."

There are, however, attractions enough remaining to justify the boast of the proprietors that they have the most beautiful cave ever found; and new rooms are being frequently opened, so that the local residents in the vicinity imagine that these are discovered to order, whenever the curiosity of the public begins to flag. Whatever may be true as to this, it is well that the law is most stringently enforced against mutilating the formations or taking specimens; because, famous as the cave has become, its proportions are limited, and it might quickly be spoiled of charms that centuries were required to produce.

In order to the better preservation of the cave, and also that its wonders might be seen to the best advantage, the company have lately had electric lights introduced with admirable success; and as this is the first attempt of the kind, the particulars may be of general interest.

When I say that thirteen electric lights are kept burning in Luray Cave, the statement may not seem extraordinary, now that lights of this description are common in every city. But a moment's reflection will show that it is quite different to run wires along poles or over house-tops, and to run them underground, under perilous masses of dripstone, through nearly inaccessible galleries and across profound chasms. The hard carbonates into which holes had to be bored for the insulators proved to be so very hard as repeatedly to snap the drills. There were also unusual magnetic disturbances, and the difficulties of perfect insulation were such that some of the workmen received severe shocks while testing the wires.

The engine is more than a mile from the cave, being the same that is used to supply water for the Luray Inn, and for the tank at the railroad station. The power required for each light is three-fourths of one horse power, and the expense of putting in the works, aside from the engine, was about $3,500. The length of the single wire used is three and a half miles, which, with the return current through the earth, makes an entire circuit of *seven miles*, and is supposed to be the longest current yet attempted with one engine. Automatic regulation is of importance in managing so extended a circuit; and this was secured by using the Thomson and Houston system, the special advantage of which, in this case, as explained to me by the electrician, Mr. T. H. McCollin, is that it allows any number of lamps to be turned on or switched off, without any change in the running of the engine. The current regulator is actually an electric governor. By rocking the brushes on the commutator the current is increased or decreased automatically. Otherwise, when some of the lights were extinguished, the same amount of electricity would continue to be generated as if all were burning, unless specially checked by hand; and consequently the machinery would become heated unless slowed down or else a proper means of wastage provided. But here the excess above the quantity of electricity generated for actual use is provided for, without diminishing the number of revolutions of the generator or the speed of the engine itself. The decrease of resistance, however, in case lights are extinguished, is immediately felt by the engine, and results in less consumption of fuel and steam.

The lamps, with a single exception, are used without shades, there being little draught except near the entrance, and the shades only serving to intercept the rays. From 2,000 to 2,500 nominal candle power is claimed for each lamp, which ought to give for each about 1,000 for available use in illumination. But I observed that the amount of light actually obtained was much less than what would be expected in the ordinary atmosphere. I found the explanation of this in the fact that the cave atmosphere, being *optically pure*, does not carry the rays as effectually as would be done by air in which motes were floating. This theory was verified by me last summer, in other caverns, by burning blue lights and magnesium tape. Returning to the same localities about an hour later, the increased light from our torches was very perceptible, and was accounted for by the fact that particles had thus been set afloat in the air that served as vehicles for spreading the rays.

The lamps in Luray Cave are in a measure movable, that is, they may upon occasion be swung from one point to another. But as they are at present placed they throw light on points of most interest to the visitor. The first is in the Vestibule, and finely lights up Washington's Pillar and the entrances to Stebbins' and Specimen Avenues. The next is in the Fish Market, making the long strings of bass and mackerel glisten as if they were real fish instead of stone.

Two lamps cast their beams into Pluto's Chasm, a pit said to be 500 feet long and 70 feet deep. Another is amid the alabaster scarfs and brilliant stalactites that embellish Hovey's Hall. Others light up to advantage Oberon's Grotto and the diversified and curiously beautiful bronze, pink, blue, and white formations in the Cathedral, the Giant's Hall, and the Ball Room. The most remote points reached by the lights are Collins' Grotto and Campbell's Hall. The last object of interest usually exhibited, and which the visitor carries away as something to be cherished in memory as long as memory shall endure, is the Imperial Spring and Brand's Cascade. The "Spring" is not properly a spring, but a limpid pool, overarched by a grotto 25 feet across, and so thickly studded with bronze stalactites from three inches to three feet in length, that after several trials at counting the number on a square foot, we estimated the entire number in the vault to be about fifty thousand, each tip gleaming with a crystal drop. The light is so placed as to cause all these sparkling pendants to be reflected from the face of the pool.

Brand's Cascade, it should also be understood, is not a real one of water, but a mass of alabaster, seeming to gush from the side of the Imperial Spring, and to have been frozen in the act of falling down into the ravine below. Imagine a cataract of milk suddenly caught in mid air and polished to a wax-like luster, and beyond it another as yellow and golden as amber, and the whole mass flooded by electric light, and you will see that the scene could not be painted by pencil or pen.

During my last visit to Luray, a few days ago, a photographer from Philadelphia, Mr. C. H. James, was trying to fix on paper some of these indescribable visions. The experience of those who have hitherto attempted underground photography has not been very encouraging, but this gentleman has overcome many of the difficulties in the way, and hopes to get good pictures. Those he has already secured certainly surpass any taken by calcium or magnesium light, both in sharpness of outline and distinctness of detail.

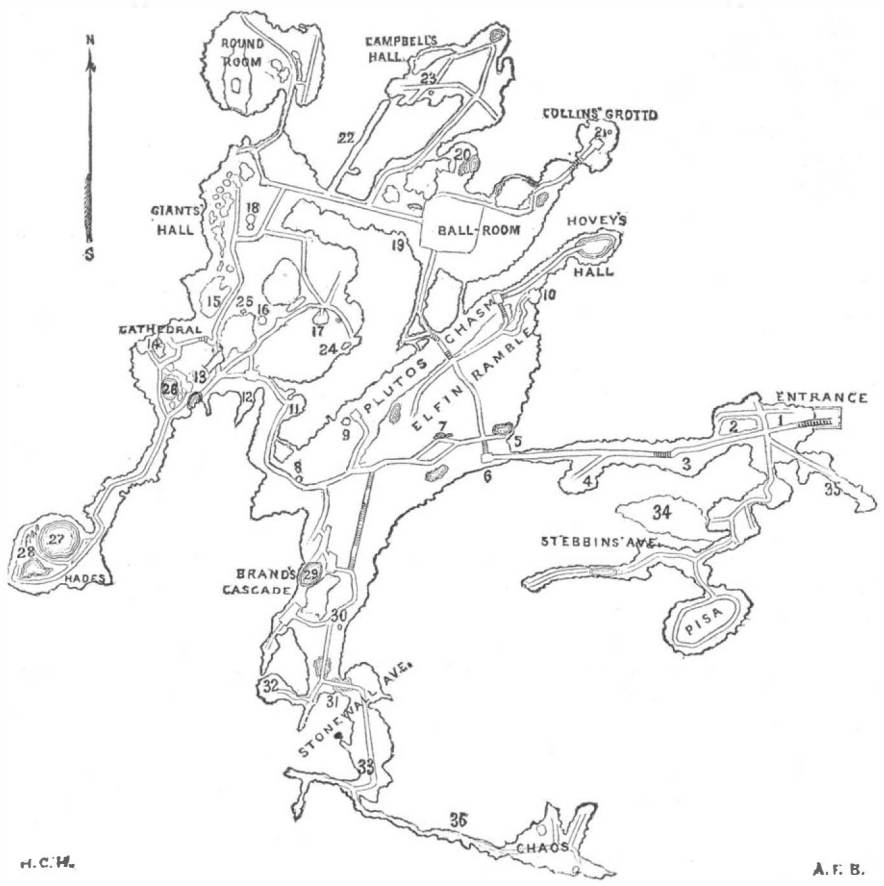
Wisely the guides show to visitors only those parts of the cave that have been made easily accessible by concrete pavements, plank walks, bridges, and stairways. Places that can only be reached by creeping and wading are not open to any but explorers who cannot rest until they have seen all that can be seen. Work is constantly in progress to facilitate the examination of the entire cavern without one's being obliged to retrace his steps, but emerging from his underground journey at an exit to be made about five hundred feet south of the entrance.

The pick and crowbar are the main reliance for enlarging narrow passages, but an occasional charge of dynamite has been fired in places where other galleries were not endangered by the explosion. Among the huge blocks thus dislodged I noticed some that were remarkable for size and also for fineness of texture. Experimenting on a few fragments given me for the purpose, I find that, on being cut into slabs and polished, they are quite equal to the celebrated Mexican onyx, from which they differ mainly in vividness of color.

A correct map of Luray Cave has long been wanted by persons interested in subterranean regions. A sketch was prepared by Mr. A. Y. Lee, for the *Herald*, in 1878; and another, embodying certain improvements, was made in 1880, by Mr. S. Z. Ammen. It is no disparagement to these gentlemen to say that their maps were imperfect, for they could hardly have been otherwise under the circumstances.

Since the electric lights have been put in a new survey has been made with the greatest care, resulting in the accurate map that accompanies this communication. It is published by the consent and approval of the company, and can be depended on as to its details. It was found impossible to indicate every object of interest; but a list of the more important ones serves to explain the map. Nearly all the points indicated are now exhibited to visitors; and others will be opened to the public during the next season.

Should the reader desire more full particulars concerning this wonderful series of caverns, he will find them in the files of the SCIENTIFIC AMERICAN for 1879, in the reports of the Smithsonian Institution, and in various magazines.




1. The Vestibule.—2. Washington's Pillar.—3. The Flower Garden.—4. The Amphitheater.—5. Natural Bridge over Muddy Lake. 6. The Fish Market.—7. The Crystal Spring.—8. Proserpine's Pillar. 9. The Spectral Column.—10. Hovey's Balcony and Scarfs.—11. Oberon's Grotto. 12. Titania's Vail. 13. Saracen's Tent, and Fallen Column.—14. The Organ and Throne.—15. The Tower of Babel.—16. The Empress Column.—17. The Hollow Column.—18. Henry Baird (or Double) Column.—19. Chalcedony Cascade.—20. The Coral Spring.—21. The Dragon of Luray.—22. Bootjack Alley.—23. The Mermaid, or Scaly Column.—24. The Lost Blanket.—25. Helen's Scarf.—26. Chapman's Lake.—27. Broaddus Lake.—28. The Castles on the Rhine.—29. The Imperial Spring.—30. The Skeleton.—31. The Twin Lakes.—32. The Engine Room.—33. Miller's Room.—34. Hawes' Cabinet.—35. Specimen Avenue.—36. Proposed Exit Avenue.

MAP OF LURAY CAVERN.

### The Expanding Power of Ice.

In a recent number of *Naturen*, Hr. Bergh has drawn attention to the powerful agency exerted by ice in severing rocks, of which he gives a striking instance occurring on the Aalesund in West Norway, where a low ledge rising out of the fjord is all that remains of a once extensive fjæld promontory, which, in the year 1717, was suddenly blown up and precipitated into the water by the force of the ice within the interstices of the stone. The winter had been mild, and during a rapid thaw a considerable stream had welled up from the ice covered summit of the fjæld, and carried its waters into every crevice of the rock, when a sudden change of wind brought about a sharp frost, which turned the descending waters of the newly formed stream into ice, arresting their course within the interstices of the rock. The result was the explosion of the entire mass of the fjæld below the outbreak of the stream, and its projection from a height of more than 1,500 feet into the neighboring fjord, which ingulfed the whole of the promontory, with its cultivated fields and farmstead. Simultaneously with the disappearance of the land below the surface of the fjord, a huge mass of waters was propelled against the opposite shore, carrying with it rusty anchors, boat rafters, and numerous other objects which had long lain at the bottom. The disturbance extended a mile beyond the point at which the land was submerged, and the waters in retreating carried with them a wooden church which had stood fifty feet above the fjord, besides sweeping away all the fishing boats for a distance of two and a half miles. Before this occurrence, which was attended by loss of life to about a score of persons, the headland had been much resorted to on account of the halibut which abounded in the neighborhood, but since that period the fish has never returned, a circumstance which, according to local popular belief, is due to the covering up by the infallen rock of certain submarine cavities and springs frequented by the fish.

### MISCELLANEOUS INVENTIONS.

An improved dentist's broach has recently been patented by Mr. Olof Johanson, of New York city. The object of this invention is to improve the construction of the ordinary dental broach for cleaning hollow teeth and extracting nerves by rendering it equally flexible in all directions, so as to reach every part of a hollow tooth, and making it stronger, so that when revolved it shall be less liable to break than the ordinary broach.

Mr. Charles Royle, of New York city, has patented an improvement in that class of lamps in which the oil chamber is surrounded by, supported upon, and connected with the pedestal by a body made of ornamented porcelain. The invention consists of the body made of cement moulded into shape and covered with a shell of ornamented sheet metal or paper.

An improvement in desks has been patented by Mr. Joseph H. Burrows, of Boise City, Idaho. The invention consists in combining with a main section and writing board two hinged bars pivoted to the lower ends of two slide rods and a block.

An improved method of embroidering and apparatus therefor has been patented by Mr. Joseph Halter, of Rebstein, Switzerland. The object of this invention is to make different kinds of lace, guipures, and other varieties of machine embroidery that can be made on ordinary embroidery machines with cotton, flax, wool, silk, or other thread upon a ground of paper or other material that can be easily washed away or removed when the lace or other open work is completed; also to provide apparatus to support the paper when it would by itself be torn by the embroidery needles and thread; and to connect the embroidery figures by strong thread passed through each figure, so that they are suspended to each other; and to wash away or remove the paper or other easily destructible ground on which the embroidery has been made.

A new apparatus for facilitating adding numbers, and to enable persons not acquainted with the addition table to add numbers, has been patented by Messrs. David M. Fulwiler and James A. Fulwiler, of Lexington, Ill. The invention consists in a board divided into longitudinal columns, each provided with an index letter and containing rows of numbers, the board sliding in a frame attached to a base, and provided with a transverse rule or strip above the board, and having subdivisions corresponding with and indexed the same as the columns on the board, with which they coincide, this frame being also provided with a longitudinal casing at one end, containing a slide with numerals on the upper surface, showing through a slot in this casing, and with ratchet teeth on the lower side, in which teeth a spring pawl in the sliding board catches.

An improved basket for gathering or holding cotton has been patented by Mr. George W. Starr, of Vicksburg, Miss. This basket can be folded very compactly, so as to occupy very little space while being transported or stored. It is formed of an upper metal ring with loops, in which rods are pivoted, having their lower ends bent over, so that they will catch under the bottom, which is attached to the sides, made of canvas.

An improved device for holding drawers in such a manner that they will not be inconvenient to the wearer, and can be fastened or unfastened easily and quickly, has been patented by Mr. William W. Beach, of New York city, assignor to himself and Charles V. Goddard, of same place.

An improved wagon has been patented by Mr. Silas Van Patten, of Duanesburg, N. Y. This wagon is constructed in such a manner that it can be loaded and unloaded by the action of the team while attached to the wagon.

## FAILURE OF MATS AS A PROTECTION TO THE RIVER FRONT OF NEW ORLEANS.—SOMETHING NEW WANTED.

The board of engineer officers appointed last fall to examine the work in progress for the protection of the river front of New Orleans have reported against the continuance of the present plan of operation. This work, it will be remembered, has been going on for several years to stop the more or less rapid erosion of the river front of the city, by carpeting the slope of the river bed with mats of brush and cane.

The course of the Mississippi at New Orleans is such as to throw its powerful current directly against certain portions of its bank. Issuing from the straight reach above Nine Mile Point, it makes a sharp bend to the right at Carrollton, then gradually curves to the left to the foot of Canal street, and then makes another sharp bend to the right, after which it follows a nearly straight line until beyond the city limits. The width at Carrollton is about 2,250 feet, and the channel depth about 140 feet, and these dimensions remain nearly uniform to about the middle of the gentle leftward curvature, when the width is gradually reduced and the depth increased. The former finally becomes about 1,900 feet and the latter reaches a maximum of over 200 feet, and it is in this shape that the river enters the sharp bend below Canal street, called in New Orleans the third district. The entire Mississippi River, concentrated to a degree nowhere else to be found along its course, and possessing therefore its maximum power of excavation, is here turned about an angle of 90° upon a radius of about 3,000 feet. The concave bank—meaning by that term the entire slope from the top to the bottom of the river—which can resist such a force for even a brief period must possess great stability. Rapid excavations and deep incursions are to be expected.

It was ascertained by the Board of Engineers convened by the Mayor of New Orleans, in 1877, that the bank at Carrollton Bend had receded about 500 feet in twenty years. While this has resulted in the loss of considerable valuable property and should be checked, the locality is of altogether secondary importance when compared with the third district. At the latter place vast commercial interests are concentrated; the bank is crowded with wharves, and every inch of the adjoining ground has a value. Here the bank is practically where it has been for a century and a half, or rather there has been no recession. At the extreme upper end of the bend, in the immediate vicinity of Canal street, there have been large accretions, several blocks of the city having been added and built upon outside of what was formerly the shore line. This is due to the natural movement of the bend down stream. In the bend itself considerable batture formations have occurred at intervals and then disappeared. This cannot be accounted for without a knowledge of the various obstacles, such as wharves, wrecks, etc., that may have been placed in the river at various periods—information not now attainable.

The explanation of the fact that the main bank as a whole maintains its position is found in the multitude of wrecked wharves and bulkheads which here line the river front. There is no record of how many wharves and bulkheads have gone in at any one place, but the number is known to be large. In some cases a wharf has lasted but a single year. Divers report that the remains of these structures are to be found all the way to the bottom of the river.

The piles, beams, and planks, though more or less held together, are twisted into irregular shapes, making excellent silt-catching devices. But this is a very expensive protection; and the repeated destruction of the wharves has rendered high wharf rates a necessity, so that the entire commerce of the port is interested in having the evil removed.

The plan proposed in 1878 was to cover the upper section of the river slope at Carrollton with a layer of brush ballasted with stone. For the section from Morgan's Wharf to the foot of Congress street, including the sharp bend below Canal street, it was proposed to form a bulkhead in line with the outer row of wharf piles, by driving piles in pairs three feet apart, the distance between the pairs to be six feet; these piles to be bolted together at low water and at the top, and a wall of brush fascines set up between the piles, up and down stream, to low water mark; the rest of the space to high water to be planked. From the foot of the row of piles it was planned to lay upon the slope mats of brush ballasted with stone as far out as might be necessary to cover all defective strata.

Operations have been carried on during the low water seasons of 1878, 1879, 1880, and 1881, the work for the first three years being confined to the third district, while the greater portion of the work done the next year was in Carrollton Bend. The following method of construction was adopted for the former district:

The mat was first made in small sections, 24 feet by 25 feet, the material used being cane. In the finished section the canes lay in a single layer, side by side, with sufficient interval between them to allow for the stitching, say one inch. It was sewed from one end to the other by seven continuous pairs of wires or pieces of marline, the latter being used to the exclusion of wire after the first few mats were placed. The stitch was the shoemaker's stitch; that is, one marline passing under one cane, passed over the next, under the third, over the fourth, and so on, while the other marline of the same pair alternated in the same manner, but passing on the opposite sides of the canes. The marlines thus crossed each other at each interval between the canes. In crossing they were not caught together. They were secured only to the middle and end canes of the section. The breaking of a marline at one point destroyed its efficiency throughout its length. An opening was made in each joint of each cane to destroy its buoyancy and admit sediment from the river after sinking. Eight of these small sections were sewed together, end to end, making a mat 200 feet by 24 feet, and it was in this shape that the mats were put down during the seasons of 1878 and 1879. For placing them a row of guide piles 6 feet apart were driven upon the line of the front wharf piles. These were heavy piles of pine 65 feet long, and were intended to subsequently form part of the brush wall described in the plan. An iron ring was slipped over each pile, fitting loosely, to which the end of the mat, the 24 foot side, was secured by a piece of light rope. The barge upon which the mat was spread was then moved out into the stream by a tug boat, the mat was launched and placed upon the bottom, with its longer side as nearly as possible perpendicular to the shore. The ballast used with the first few mats was old boiler tubes, and afterward sand bags. Buoys were attached to each mat before sinking, by means of which its location upon the bottom could afterward be approximately ascertained.

Care was taken to sink a new mat at any place which seemed to have been left uncovered, but notwithstanding this precaution, it is probable that some portions of the slope within a distance of 200 feet were left uncovered. The presence of ships at the wharves was a serious inconvenience to the work, causing frequent interruptions. It could not be made continuous. The work done in 1878 and 1879 was begun just below Picayune Pier and extended to the foot of Mandeville street, covering a length of 1,116 feet measured along the bank. It consisted entirely of matting of the above description, nothing being done toward the brush wall except the piling.

In resuming operations in 1880 it was found impossible to begin at Mandeville street, where the work of 1879 terminated, because of the number of ships moored below, as many as twenty sometimes lying between Mandeville and Montegut streets. These the wharf master refused to move. Work was accordingly begun at Montegut street, leaving a gap of 2,262 feet between that and the work of 1879. The general construction of the mats was the same as before, except that they were made larger. Forty sections, each 14 feet by 25 feet, were sewn together, making a mat 200 feet by 70 feet, instead of 200 feet by 24 feet, as before. Floating ways, having the direction of their slope parallel to the shore instead of perpendicular to it, as before, were moored to the guide piles. The mat, being secured to the latter in the same manner as before, was launched up and down stream instead of across stream, as before. Ten such mats, covering a length of 560½ feet of bank between Montegut and Louisa streets, were laid in 1880.

The ballast used was sand bags. Very little work was done at this place last season.

The wharves in front of which the work of 1878 and 1879 was done fell into the river in 1880. They were rebuilt and were wrecked again in 1881. The wharves in front of which the work of 1880 was done were destroyed in 1881.

The decision of the board of engineers is that the plan of improvement as executed, so far at least as the third district is concerned, is a failure.

"The impossibility of doing continuous work, and the flimsy character of the matting put down, would perhaps account for this. Under any plan a remedy for the first evil consists in withdrawing the portion of the river front under improvement from wharf service while the work is going on, and this requires the co-operation of the city authorities. The cane is not, in the opinion of the board, a good material for the protection of the banks of the Mississippi. Its straightness and smoothness deprive it, to a large degree, of the silt-catching quality which is of so great importance in the revetment of the banks of this river. A mattress made of cane receives little if any re-enforcement from the deposits of the river. If this material be used the mattress should be fabricated with great care, all its fastenings should be made substantial, and if it be found impracticable by any disposition of the material to procure an artificial roughness, it should be prepared to resist by its own strength all the forces which may be brought to bear against it. This has not been done, and in the opinion of the board the mats, as constructed, do not form a protection as efficient as the one contemplated in the plan.

"While the method of construction has been defective, and the circumstances of carrying on the work have been singularly difficult, it is the opinion of the board that no better results would have been attained in the third district if both these causes of failure had been wanting. The problem here seems to be one of wharf protection rather than of bank protection, though the latter question appears in the background.

"The root of the principal evil—the repeated destruction of the wharves—seems to lie in the construction of the wharves themselves. The bearing piles, fender piles, and mooring piles alone obstruct the flow of the water and cause deposits. When to these are added the remains of old wharves, old broken and settled piles, and old bulkheads, a collection of obstacles is found near the top of the bank which, for efficiency in causing silt deposits, could hardly be excelled if designed for that purpose. Heavy deposits are made among them and between the wharves during the higher stages of the river when it is charged with sediment. This mass of soft material acquires in time a bulk and weight which the steep slope below cannot support, even while it remains submerged. When the river falls the new deposits are often uncovered, and the tendency to rupture is increased by the withdrawal of the support furnished by the water. The difficulty is aggravated by the presence of vessels.

"Vessels lying at the ends of the wharves deflect the current downward toward the bottom, and while preventing deposits at that place cause a scour upon the material below. The deeper the draught of the vessel the deeper will this action extend. A vessel drawing 25 feet will, if left long enough at one spot in a rapid current, deepen the water by an amount nearly equal to its draught. Here are all the conditions necessary to explain the various phenomena which accompany the destruction of the wharves. The slope of the bank being too steep to bear the great additional weight at the top of it yields, and may yield in a variety of ways. The new material may slide out, carrying the upper parts of the piles with it, and leaving the toes undisturbed; in this case the piles will be inclined outward. Or it may settle down vertically, pushing out a layer of similar material from beneath it. If the latter layer is within the range of the piles it will carry their toes out, and in this case the piles will be inclined inward; if it is beyond the range of the piles these will simply sink and not be inclined either way. In the disintegration attending these disruptions a crack may be formed into which a pile will sink of its own weight, and, tearing loose from its cap, will settle down with greater rapidity than the balance of the wharf. A combination of the two movements above described, or unequal loading of the wharf, or an eddy about its extremity, or the unequal stability of different portions of the soil underlying the fresh deposits, will account for the irregularities which sometimes appear in the wreck of a single wharf. The yielding of the bank may occur at any stage of water, though it is most usual immediately after the fall from a high stage, and is rare immediately after a prolonged low stage. The increased draught of the sea-going ships now visiting New Orleans would cause more rapid wrecking of their wharves than formerly. While the presence of vessels at the ends of the wharves aids and hastens their destruction, it is, as before stated, not essential to it.

"How far down this sloughing of the bank extends is not now known, and it can be ascertained only by careful and prolonged observation. It would seem probable that the depth is not great, not exceeding perhaps a depth of 40 or 50 feet. But whatever the depth, a preliminary to any efficient protection must be the removal of the primary cause of the sloughing, viz., the overloading of the top of the bank by silt deposits. The brush wall proposed in the plan under discussion would have the contrary effect. It would increase the amount of this overloading and would aggravate the evil.

"The board is, therefore, forced to the conclusion that the present plan of improvement, whether viewed in outline, as to its general merits, or in detail, as to its method of execution, should not be continued."

The board does not offer any substitute for the plan of operation which it condemns.

## NEW INVENTIONS.

Mr. William L. Davis, of South Amboy, N. J., has patented an improved car coupling constructed with a bumper head made open at top and bottom, and having a hook connected with the inner parts of its sides by a pin; with this pin is also connected sliding bars or the sides of a link for turning the connecting pin to raise and lower the hook, and connected at their outer ends by a pin to adapt them to serve also as a coupling link.

An improvement in that class of chairs in which the rockers, legs, arms, back, and seat are so arranged with relation to each other that they may be folded together, when not in use, so as to occupy less space, and be easily transported, either singly or in quantities for shipping, has been patented by Mr. William H. Gifford, of Poughkeepsie, N. Y.

Mr. George S. Moler, of Ithaca, N. Y., has patented an improvement in call instruments for telegraph lines, the object of which is to allow calling of any one station on the line, and at the same time indicate at all stations that the line is in use. The invention consists in polarized armatures and ratchet mechanism combined with the call bell for setting the instrument and selecting the bell to be rung.

Mr. Henry Glass, of Golconda, Ill., has patented a flux, consisting of fluorspar, pure carbonate of lime, silex, alumina, and oxide of iron.

A hair pin which, when inserted in the hair, will so grasp and hold the lock or mass of hair inclosed within the prongs that the hair pin will not be liable to drop or work out from the hair, has been patented by Mary T. Foote, of Boston, Mass. The ends of the hair pin are first bent out and then in toward each other, so as to form at the point a clasp which seizes and holds a lock of hair, and the exterior shoulders of which bent portion also prevent the pin from slipping out.

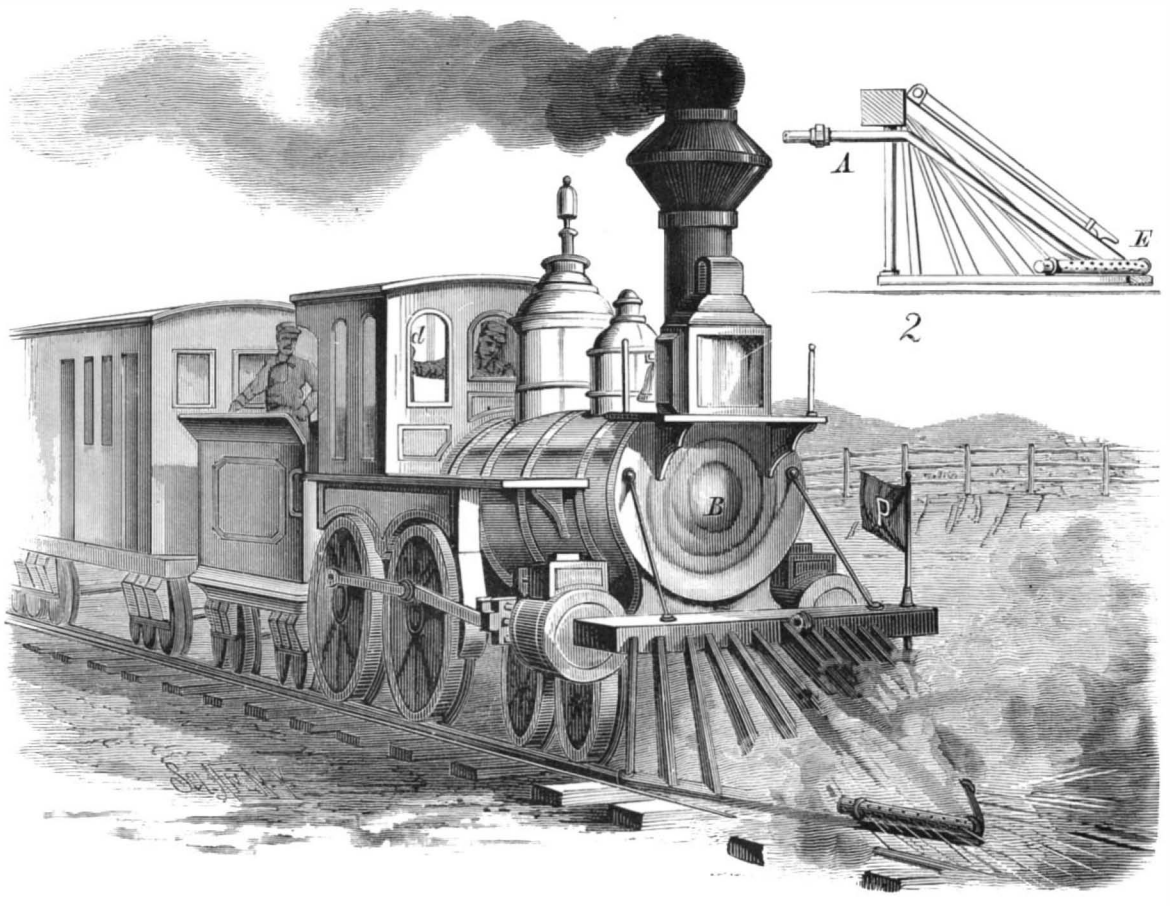
A novel hay and straw burner has been patented by Messrs. Martin B. Parker and Richard W. Richards, of Blue Earth City, Minn. In this device the fuel can be compressed while being burned, and a draught space kept open all around the said fuel.

Mr. Otto Mossberger, of Guttenburg, N. J., has patented a spittoon provided with swinging covers to obstruct from view the contents. The invention consists in blocks sliding vertically in guides on the spittoon, and having foot levers connected by cords with arms of the pivoted covers, so that the covers can be raised or swung open by pressing one of the foot levers.

## NEW STOCK-ALARM FOR LOCOMOTIVES.

In some portions of the country one of the difficulties of railroading is the occupation of the track by cattle, and it is often with no little difficulty that the animals can be frightened away by the means ordinarily available; the result is the loss of cattle and often the loss of human life, and the destruction of railroad property.

The engraving represents a very simple and efficient device calculated to frighten cattle by both visible and audible signals. The device consists of a steam pipe, A, leading from the boiler of the engine, under the cow-catcher, and connecting with a bent pipe, E, secured upon the nose or lower rail of the cow-catcher, as shown in Figure 2. This pipe is perforated with numerous small holes. In the steam supply pipe there is a cock connected by a rod to the lever placed in the cab in convenient position for operation by the fireman or engineer. In most cases the supply pipe enters the boiler at or a little below the ordinary level of the water, so that upon turning the cock some water will be forced out with the steam and thrown some distance ahead of the engine. This is very effective in frightening and driving the stock off the track. In case the water in the boiler is below the pipe, the cloud of vapor and the hissing noise produced by the escape of steam will be effective in frightening and driving off the animals. The pipe, however, in most cases will be located so that upon opening the cock both steam and water will be ejected from the perforations of the pipe.




PLACE'S STOCK ALARM FOR LOCOMOTIVES.

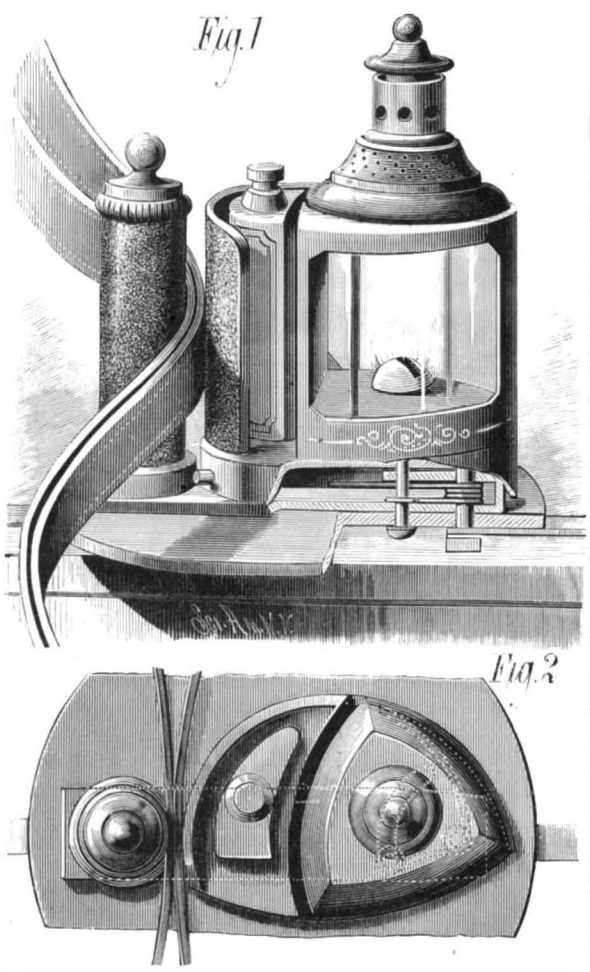
This invention was lately patented by Mr. Willard A. Place, of Lincoln, Neb., who should be addressed for further information.

### Railway Wear and Tear.

A curious fact was lately mentioned by Mr. F. W. Webb, president of the Manchester Association of Employers, etc. The Northwestern Railway Company, he stated, used steel rails, and yet the wear under the ordinary traffic of the road was so great that one-third of a pound of steel was lost on every mile run, or 1,500 pounds every hour of the day. The collective wear of the locomotive engines, of which there are 1,679, was such that a new engine was required to be put into the traffic once in five days.

## NOVEL REIN-HOLDER.

The engraving shows a novel rein-holder lately patented by Mr. Nathan S. Whitney, of North Alton, Ill. It can be




WHITNEY'S IMPROVED REIN-HOLDER.

attached to the dashboard of a vehicle or to a frame behind or in front of the dashboard, or it may be placed in any other convenient position. It may be provided with a lantern, as in the engraving, or it may be made very plain and inexpensive. Figure 1 in the engraving is a perspective view, and Figure 2 a plan view.

A cylinder made of metal, with a roughened or serrated outer surface, is attached vertically on a base plate by a screw bolt, which also passes through an aperture or slot in one end of a strip of metal, resting on top of the base plate and below the bottom of the roughened cylinder. The opposite end of this strip supports one end of a casing provided with curved sides, roughened or serrated on the outer surface, and pivoted eccentrically so that it may act in conjunction with the roughened cylinder in holding the reins. The casing is pressed forward toward the roughened cylinder by a spiral spring coiled around its pivot.

The casing is provided with panes of glass and with a lamp connected with an oil reservoir, separated from the lamp by a double walled partition, which prevents the oil from being heated. The casing is also provided with a shield which prevents the heat of the flame from acting on the burner and oil tube. The inner wall of the lantern is removable to admit of lighting and trimming the lamp. The top of the inner casing is provided with a chimney, and is thoroughly guarded against the wind. The base plate is attached to the top of the dash board or to a metal standard fixed to the vehicle, behind or in front of the dashboard, and extending across the front of the vehicle.

The casing swings on its pivot, and when the reins are to be held the casing is turned so that the distance between the casing and the cylinder is increased sufficiently to admit the reins. The casing being then released, the reins will be pressed between the casing and the cylinder. If the horse pulls on the reins the surfaces of the cylinder and the casing will approach still nearer to each other and the reins will be held more firmly between them. The apparatus is so arranged that the driver, by pulling on the reins, may release them from the holder.

### Habits of Orinoco Natives.

A French naval doctor, M. Crevaux, has lately made important explorations in the northern parts of South America, more especially in the valley of the Orinoco and its affluents. Among other facts of observation, he states that the Guaraunos, at the delta of that river, take refuge in the trees when the delta is inundated. There they make a sort of dwelling with branches and clay. The women light, on a small piece of floor, the fire needed for cooking, and the traveler on the river by night often sees with surprise long rows of flames at a considerable height in the air. The Guaraunos dispose of their dead by hanging them in hammocks in the tops of trees. Dr. Crevaux, in the course of his travels, met with geophagous, or earth-eating, tribes. The clay, which often serves for their food whole months, seems to be a mixture of oxide of iron and some organic substances. They have recourse to it more especially in times of scarcity; but, strange to say, there are eager gourmands for the substance, individuals in whom the depraved taste becomes so pronounced that they may be seen tearing pieces of ferruginous clay from huts made of it and putting them in their mouths.

### Ocean Telegraph Cable.

At a recent meeting of the stockholders of the Anglo-American Telegraph Company, London, Viscount Monck, the chairman, said he was happy to inform them that their cables were all working, and were in good condition. One of the cables had been broken close to the shore at Valencia in one of the storms which occurred last autumn, but he was happy to inform them that since the report was presented that cable had been restored to working condition, and was now doing its duty equally with the rest of their cables. Bad weather—storms for instance—were unfavorable to cable property. They were injurious to it in two ways—first, mechanically, because they found that the action of the waves in shallow water had a great tendency to fray the cables, and so destroy their efficiency; and that actually occurred the other day in the case of the 1874 cable, the repair of which he had just announced to them. But there was another mode in which storms and atmospheric disturbances affected their cables very much, and that was the effect they had on the electrical conductivity of the cables. When the atmosphere became surcharged with electricity it very often happened that the electrical conductivity of their cables was either diminished or possibly wholly destroyed. Luckily they had escaped anything of that kind this year, but on former occasions it had occurred, and might occur again. He thought that the state of their cables was matter for congratulation. He would remind them that one of their cables, which was working with perfect efficiency (the French cable from Brest to St. Pierre), had now been nearly thirteen years under the ocean. He believed he was correct in stating that it was the oldest Atlantic cable in existence—it had lasted longer than any other Atlantic cable laid down. It had been necessary to take a fault out of that cable, and for that purpose it had been lifted from a depth of 1,700 fathoms—a fact which he considered was matter of congratulation, and one showing that the cable must originally have been of very good stuff.

### NEW TOOL HOLDER FOR GRINDSTONES.

We give an engraving of an improved device for holding tools - such as chisels, plane bits, etc. etc.—to a grindstone in such a way that one person can turn the stone and control the position of the tool conveniently at the same time without damaging or mutilating the cutting edge of the tool and without danger to the operator.

The device consists in tongs with adjustable jaws for holding the tool to be sharpened, the end of the tongs being pivoted in a block sliding on an upright of the grindstone frame. When not in use the tongs is supported by a ratchet bar passing through a slot in the upright.

The article to be sharpened, a plane bit or a chisel, for example, is clamped between the jaws by means of the ring which holds the shanks of the jaws together, the upper jaw

BAYHA'S TOOL HOLDER FOR GRINDSTONES.

having been previously adjusted according to the thickness of the plane bit or chisel. The sliding block is then adjusted higher or lower, according to the desired bevel of the cutting edge, for the bevel varies with the inclination of the tongs, and this inclination varies with the position of the block, on which the end of one shank of the tongs is held by a ball-and-socket joint. When the tool that is being sharpened is to be held above the periphery of the stone the ratchet bar is drawn upward a suitable distance, and the tongs is allowed to rest on the upper end of the bar.

This invention was recently patented by Messrs. George G. and Benjamin D. Bayha, of Niobrara, Neb., who should be addressed for further information.

### FOUR-BARRELED HAMMERLESS GUN.

There has always been an obstacle to using a revolving gun for sporting purposes, because of the inconvenience experienced by the revolutions of the barrels. The invention illustrated, however, completely solves the difficulty.

This four-barreled gun, although constructed on the principle of the ordinary revolver, differs in that, instead of the chambers turning before each discharge, a piston-like hammer rod is made to perform a similar office by the pull of the trigger, its head being brought to bear in turn on the center of the four barrels, which are brazed together in the usual way, so as to form a square, and are fitted to a break-off, which is necessarily of double the usual height. The action may be either the "double grip" or "snap;" but, though the prong of the break-off is solid, the extra leverage brought to bear on it by the upper pair of barrels requires some top connection, and a "doll's head" is therefore used to give greater security.

To understand the construction of the lock, it must be considered as having three offices to perform: First, the simple blow necessary for the explosion of the cap; secondly, the cocking process; and, thirdly, the rotation of the hammer rod which it has to perform—the three being here placed in the reverse order of that which they go through in practice. To effect the blow a solid steel rod is firmly socketed, parallel with the axis of the barrels, and opposite the central point between the four. Its forward end is turned to a right angle, enabling it to reach a little beyond the centers of the four barrels, when it revolves in succession toward them, and is then capable of giving a blow to the selected striker, of which there are four fixed in the usual way in the break-off. On this rod is a collar, which receives the blow of a flat tumbler placed on one side of it, and furnished with a swivel and a flat mainspring hung on the rebounding principle.

To cock this rod there is behind the tumbler another collar, by which it brings back the hammer rod to full-cock from the half-cock, where it was left by the rebound. There is only one trigger, which is either of the usual form or like a ring, as shown in the engraving. To this is hinged a lifting scear, which fits into a deep bent or notch, cut in the tumbler in such a form that as the trigger is pulled it lifts the tumbler backward over its center or axle, and at the same time compresses the mainspring.

There is a quarter revolution of the hammer rod to be effected, so as to bring its head in turn on each of the four barrels. This is done by cutting four inclined grooves or slots on the rod, as well as a corresponding number of straight slots in front of the tumbler and opening into one another. Into these slots there is fitted, on a spring plate, a stud, so placed that the hammer rod, being drawn back by the tumbler, is made to rotate one-quarter of a circle by the inclined grooves; and, this being done after each barrel is fired, the four are discharged in succession by so many pulls of the trigger. These slots are cut of different depths, the spring of the stud dropping from one to the other at the desired points, so as to effect the revolution, when in the inclined slot, and yet permit the hammer bolt to pass straight forward in striking the blow, and return to the slanting slot for the next quarter turn. By a combination of these three movements, as the trigger is pulled, it, by the aid of its lifting scear, raises the tumbler (and with it the hammer rod) to full cock. While doing this, the stud in the spring plate above mentioned has caused the rod to revolve a quarter turn, and has consequently brought its head from the center of the barrel last fired to that next in succession. The scear then leaves the bent free, when the tumbler drives the hammer rod forward to explode the cap. Immediately after this, a long straight spring under the front of the trigger carries the scear into the bent of the tumbler, ready for the next shot, in which it is assisted by a light spring between the scear and trigger.

It is difficult to imagine anything more simple than this piece of mechanism, though it requires the elaborate description we have given it to make it intelligible.

LANCASTER'S FOUR-BARRELED HAMMERLESS GUN.

### Six Cents a Piece for Wasps.

Wasps are such an obstacle in the way of English fruit growers that one of them, Mr. William Taylor, thinks it worth while to pay three pence each for queens. And last season he bought and destroyed no less than 1,192. About 230 nests have been annihilated within a mile of his premises, and still there is enough left for seed. He declares that the price named is not too high, "since it takes considerable skill to catch them," and because of their enormous fecundity, of which he says, in the *Cottage Gardener:* "Understand that every wasp seen before the middle of June is a queen, and liable to have a nest of 10,000 at least. I lately estimated the number of cells in a rather large nest, and made out 9,000 of them. A great many of the young had flown, and fresh eggs were laid in their places, and I have reason to believe that there is often more than one succession of young insects from the same cells, therefore 10,000 is a comparatively small family."

### A Schooner Sunk by Rats.

The fishing schooner Addie Thatcher had a singular mishap recently. She was laid up at Wilson's wharf, Fall River, for the winter, and during the recent cold snap rats gnawed a hole through her planks just above the ice, the bottom of the hole being on a level with the ice. The hole was not noticed at the time, and the weight of snow upon the deck caused the vessel to settle until the water ran in through the hole and she sank. She has since been bailed out and the hole has been patched up. The wiseacres of the neighborhood are discussing the problem whether the rats gnawed their way out or in, there being a difference of opinion concerning the ability of the animals to fix upon the location of the surface of the ice, if they gnawed their way out.—*Providence Journal.*

### IMPROVED FIRE ESCAPE.

The engraving represents an improved fire escape recently patented by Mr. John S. Shaw, of Rosita, Custer County, Col.

The window-sill is made hollow, of cast iron or other suitable material, and is provided with a door opening downward. In the chamber of the sill is stored a folding iron ladder, the links and rounds of which are bent from one piece of wire and jointed together, as shown in the engraving.

The upper link of the ladder is attached at one end by a ring surrounding a vertical rod fixed in the hollow sill. The

SHAW'S FIRE ESCAPE.

other end of the link is attached to a short piece of chain secured to the window sill.

The ladder is compactly folded and stored in the chamber of the sill, and when desired for use it can be readily dropped at a moment's notice. This device is simple, inexpensive, and always ready.

### To Prevent Plaster from Adhering.

Liquid silex, carefully applied with a small *bristle* brush, and allowed to dry before packing the flask, leaves the plate with a durable polish less liable to absorb the fluids of the mouth than is the ordinary finish, especially the palatine surface of plates with deep undercuts. Of course, a first requisite is smooth plaster casts. Keep the liquid silex in a short bottle with a rubber stopper. Wash the brush in hot water after using. Don't leave the brush in the bottle.—*Dental Register.*

### Demand for Practical Men.

One of the happiest outcomes of the Atlanta fair is the demand that has sprung up, not for more money, but for more men in the South, practical men, as they are pleased to style them down there, by which they mean mechanics, not those whose trades are their masters, but who are masters of their trades; farmers who can handle a plow as well as direct some one to do it.

And this demand is not coming from those who are dazed with the cotton manufacturing craze, but from farmers, blacksmiths, tailors, machine shops, and other industries quite as much needed and vastly more profitable than cotton manufactories.

There is scarcely an operative now at work at the fair who has not had from one to a dozen proffers of employment at the South, some of which have been accepted. This demand on the part of the business men of the South is of the utmost significance, inasmuch as it implies a recognition on their part of the fact, so patent to us here in the North, that men are needed vastly more in the South to-day than money. The future development of the wonderful natural resources of the South depends vastly more on men than on money.

The land is teeming with richness for other things besides cotton, and when they get the "practical" farmers, whether from the North or from among their own people, a radical

revolution may be confidently looked for in the manner of doing things agriculturally and otherwise in that section of the country. Brain and brawn have in part made the North what it is to-day. The South needs the same elements.

### Railway Matters.

At the recent annual dinner of the Manchester Association of Employers, Foremen, and Draughtsmen, held at Manchester, Mr. F. W. Webb, of Crewe, the president, spoke at length on matters connected with the management of railways.

Alluding to the increased use of steel, he claimed that the London and Northwestern Railway Company had been the first great firm to recognize the importance of the improvements of Bessemer and Siemens. Steel had been substituted in nearly every portion of the locomotive which formerly was made of iron. At present the company had 1,679 engines with steel boilers, and so far they had every reason to be satisfied with the result. The company was also one of the first to use Bessemer steel plates for its passenger vessels. It now had four first-class steamers constructed of this material running regularly between Holyhead and Ireland, and from the examination made from time to time of the hulls of these vessels it was found that the material admirably answered its purpose. The plates had been manufactured under his superintendence. They had the misfortune last year to get one of their steel vessels on a sunken rock at the entrance to Carlingford Lough. Had it been built of iron he felt certain it would have become a total wreck. As it was, ninety feet of her keel passed over the sunken rock, which bulged it in some places to the extent of five or six inches, but there was not a single crack in the plates, and no water got into the vessel.

Notwithstanding improvements in material the quantity of rails annually required for repairs and renewals on the London and Northwestern Railway was now 20,000 tons. For every mile run, the actual loss of rails was about one-third of a pound of steel, so that on the London and Northwestern Railway 15 cwt. of steel disappeared from the rails every hour of the day. The collective wear and tear of locomotives on the London and Northwestern Railway necessitated a new engine being put into the traffic every five working days. The question of the future permanent way was a very important one, and one that sooner or later would have to be dealt with, as with the immense consumption of wooden sleepers going on all over the world we would be sure in a short time to find ourselves on the very verge of a terrible famine. They had tried to solve the problem themselves on the London and Northwestern Railway by introducing a sleeper made of iron or steel, the chairs themselves being made of steel, worked up from the crop ends of rails. Most of the schemes which had been adopted had failed for want of elasticity from the facts that the bolts and nuts had been used to a large extent. In the chairs on which several miles had been laid down on the London and Northwestern Railway they had tried to avoid all these defects, and certainly they had every promise of success. Between the surface of the chairs and the rail, and also between the rail and the sleeper, a sheet of bitumenized brown paper was placed before the chairs were riveted by hydraulic power to the sleeper itself. This was intended to obviate the grinding away of the metal surfaces. The wooden key had been retained, and placing it outside, as they did, they got a most perfect cushion between the rail and chair, and as far as they had tried it, in consequence of the key swelling into the hollow made in the chair bracket, stamping up. They had not had a single instance in which the key had worked back. If iron or steel could be introduced successfully for sleepers the world would be able to find for iron and steel industries work equal in amount to that required for the making of rails.

The constantly increasing weights of passenger trains, and the question of how to provide more powerful locomotives than existing ones without having more weight upon a pair of wheels than a road will carry with economy, was a problem yet to be solved, as also was the question of further economy in the working of the locomotive. Thinking the compound principle, if simply carried out, would do something toward this end, he had designed an engine in accordance therewith. The engine had two pairs of driving wheels, one pair being driven by the high-pressure cylinders, and the second pair by one low-pressure cylinder, the use of coupling rods, which gave trouble at high speeds, being abandoned. He had been enabled to do this without complicating things, thanks to the valve motions brought out by Mr. David Joy. This system did away with the old eccentrics; not that the old eccentrics had been a bad contrivance, but on the narrow gauge there was no room for wide bearings for them, so as to allow the engine to run without hot brass. He had called the engine "Experiment," but from her performance he thought it was an experiment they would repeat. Last week he had the engine out for its first run in the traffic, starting from Crewe as the assisting engine with a very heavy train to Euston. Next morning he ran the engine with the 7:15 Irish mail from Euston to Holyhead, arriving there at 1:40, and leaving again at 3 o'clock with the boat express.

The engine maintained its steam to the point of blowing off the whole journey, and only consumed 23·54 pounds of coal per mile for the whole trip, including that for raising steam. Seeing that the engine was new, and the men strange to one of this construction, he thought it showed that something might be done in still further economizing the fuel in locomotives. The fact that a new compound engine ran during its first round trip upward of 528 miles, and was as cool at the end of its journey as when it started, promised well for the future.

Another problem which had been before them for the last few years was the question of continuous brakes. There were many inventions in the field, but out of over a thousand patents for brakes which he had examined, one taken out by Messrs. Swinburne & Laining, in 1865, had the germ of a good many of them. Most of the leading engineers had been against the automatic action, firmly believing that these machines would be more liable to cause mischief than to help in avoiding it, and this belief had been verified by more than one unfortunate accident. On looking at one of the engineering papers, which were supposed to deal impartially with these questions, he was really surprised to see the remarks made in one of them relative to the Blackburn accident. The paper went so far as to state that a snubbing had been given by the president of the Board of Trade to one of their oldest and most respected officers. The fact was, there was not so much snubbing in it, after all. The appendix to the report states things very clearly. It is essential the defects in the automatic brake should be provided against, and every precaution taken to insure the brake acting only when required. So far as the principal English railways were concerned, they were arriving at a solution of the difficulty, and they had to thank in some degree Messrs. Gresham & Craven, who had rendered considerable assistance, and who had made the manufacture of the necessary details a specialty.

### Manufacture of Clog Soles and Wooden Shoes.

The works of the Mersey Wood Working Company, Bedford place, Bootle, is the occasion of the following particulars in the Bootle *Times:*

The principal manufacture carried on at these wooks is that of wooden soles for what are called in Lancashire "clogs," in France "sabots." Familiar as are the "wooden shoon," few persons would conceive how ingeniously the manufacture of the soles is conducted and how vast are the quantities which are issued daily, weekly, and hourly from these works. The yard was first visited where there is usually stored from two to three thousand tons of timber. The native timber is first stripped of its bark, the foreign logs being already barked when imported. The logs are then raised from the yard by a crane and cut up by circular saws into segments averaging about a foot long. These segments are next cut into planks of convenient size, a dozen saws working at once and the planking being effected with marvelous rapidity, about sixty tons of wood being cut up into clog soles every day. On the side of each plank a metal gauge is laid, and a girl with a pencil roughly outlines the size and number of soles which can be cut from it. The planks pass on to a band saw, where they are cut up into blocks with the required curvature for a sole. Thence they pass to the roughening machine which roughly shapes them. Another machine cuts the sides; another shapes the shanks; yet another rounds the heels; and yet another shapes the toes. They pass next to a revolving cutter, which roughly hollows the upper side of the sole, and subsequently this hollowed surface is smoothed in another machine. They pass next through the various finishing machines, where the bottoms, sides, shanks, heels, and toes are successively rendered perfectly smooth by friction with swiftly revolving bands covered with a mixture containing ground glass and other attritive materials which scour them in the same way as if with sand or emery paper. They next go to the gripping machine which bevels the edges, leaving a "grip" to which the leather boot uppers can be fastened.

It will thus be seen that the sole of each wooden shoe, from the time when the log of wood is first cut into segments to the time when the edges are beveled by the gripping machine, passes through fifteen distinct machines, and as the required sections are marked by hand, and the right and left sides of toes and heels are separately shaped, each sole passes through the hands of eighteen different workpeople. Perhaps the advantages of the "division of labor" have never been exhibited in any manufacture with more remarkable results. The motive power for these various processes is supplied by a pair of sixty horse power compound high and low pressure condensing engines. The waste wood is also manufactured at these works into a valuable commercial product. It is chopped up by machinery, treated with chemicals, steeped to a condition of softness, and all knotty pieces having been removed, the softened woody fiber is drained and compressed between a series of rollers until it is transferred into sheets of pulp, or rather half made paper, which is supplied to paper manufacturers, and being mixed with other materials is transferred into some of the best qualities of paper. Lord Hamilton was shown a sample of fine rose-tinted note paper which was made chiefly from the waste cuttings off wooden clog soles.

The works include a chemical laboratory and joiners', fitters', and grinders' shops. The extensive cellars are stored with clog soles, which are kept there for the time necessary to season the wood before being finished, and vast quantities of finished goods are passing daily from the warerooms to English, continental, and colonial markets.

### MECHANICAL INVENTIONS.

Messrs. Theophilus Tanner and Hermann H. Fischer, of Osage, Neb., have patented an improvement in post-hole diggers, in which a cogged cylinder is attached to the auger shank and follows it downward as it is rotated by the gearing. Racks and pinions are used to raise the auger and its load of earth.

Mr. Nelson Arave, of Hooper, Utah Territory, has patented an improved fruit-stoning machine, which consists of a series of circular knives supported in a frame and revolving in vertical planes, and converging to a common center with their edges far enough apart to permit the passage between them of the fruit stones, the knives being designed to draw in the fruit and to slice and strip the flesh from the stones.

An improved speed regulator for horse-powers has been patented by Mr. Barnard L. Olds, of St. Albans, Vt. This invention relates to devices for insuring regular and uniform motion to horse-powers, and preventing sudden increase of speed in case of accidents, such as the belts slipping from their pulleys; and it consists in an equalizing lever, combined with centrifugal weights and a winding drum for operating on the brake.

An improved moulding machine has been patented by Mr. James Anderson, of Boston, Mass. This improvement relates to machines for forming spiral mouldings upon stairway posts and similar articles. This is accomplished by automatic mechanism and by devices which allow variations in the character of the ornamentation.

An improved rock-drilling machine has been patented by Mr. August Pirch, of Denver, Col. The object of this invention is to combine a number of drills in such manner that they can be operated singly, or two or more, so that a hole may be drilled of any size desired and according to the nature of the material operated upon.

An improved saw frame has been patented by Mr. Charles H. Bennett, of Blossburg, Pa. The invention consists of externally inclined clamps, one of which has an inside stud passing through the other clamp and through the saw, and the triangular yokes on the inner ends of adjustable screws, the adjustable screws passing through opposite ends of a curved saw frame.

A cheap and efficient sand guard for the wheels of carriages, wagons, etc., has been patented by Messrs. John P. Schoeni and Allen A. Link, of Hubbardston, Mich. It consists of a folded or plicated cup adapted to fit upon the axle, in combination with an overhanging rim or flange to be secured upon the hub of the wheel.

Messrs. William W. Wallace and John A. Kramer, of Frankfort, Ind., have patented an improved clay crusher and separator, which consists of two rolls set side by side and parallel with each other in suitable housings, each roll having formed on its face a right-hand groove, thread, or screw, extending from the center to one end, and a left-hand screw or groove extending from the center to the other end. The rolls are then set in their housings with the right-hand thread or screw on one roll in opposition to the left-hand groove, screw, or thread on the opposite roll, so that when the clay is introduced between the rolls through a hopper fixed centrally over them the stones in the clay are carried in the screws or grooves to the one or other end of the rolls and there ejected, while the clay passes through between the faces of the rolls, and is thereby crushed or pulverized to the desired condition.

A simple, durable, and easily applied friction clutch for pulleys, gear wheels, etc., has been patented by Mr. John J. Daly, of Boston, Mass. This invention cannot be clearly described without engravings.

A novel water cart has been patented by Mr. John G. Littlefield, of Milton, Mass. The object of this invention is to provide for filling the tanks of water carts, especially street watering carts, rapidly and conveniently in situations where water under pressure is not to be had, the cart horses being used for that purpose.

A combined lathe and drilling machine, patented by Mr. John F. Rakes, of Greenup, Ky., consists in a novel arrangement of a reciprocating drilling machine, by which provision is made for converting the frame of the drilling machine into the frame of a lathe, and for driving the lathe by the wheel used for operating the drill.

### An Underground River.

Mete Green, not long since while out with his cattle, made a most startling discovery and one that may possibly take its place among the grand wonders of Idaho. He was riding along early in the morning on the divide between Indian Creek and Snake River, when his horse sprang aside, snorted, and otherwise gave evidence of having seen or heard something unusual. The spot was on a little knoll on the comb of the ridge, and Mete, who had been almost asleep, taking a sweep around with his eyes to learn the cause of his horse's behavior, finally rested his vision on what seemed to be a hole in the ground a few paces distant. Dismounting he was soon looking into a funnel-shaped orifice fifteen or twenty feet deep by ten or twelve at its rim in diameter. At the bottom of this funnel—the soil giving cut there—was a rift in the rock two or three feet in width by four or five in length, which seemed to open into the very bowels of the earth. Through this aperture came up from the depths below a terrible roaring, as if a leaping cataract, a mighty rush of waters, tumbling over rocks. The ground trembled, and the subterranean noise continued uninterruptedly. Mete remained some time, and the longer he listened the more convinced he became that what he heard was running water, but how far down to the stream he could not even conjecture—it might have been a few feet or half way to China. And as the fissure was large enough to take him in should his foot slip or "head swim, his observation was not an extended one. The principal thing he did while there was to listen low and strong and think loud—at a safe distance from the brink of the hole.—*Idaho Democrat.*

## TWO-STORY BIRDS' NESTS.

BY DANIEL C. BEARD.

While the expanding leaves of tree and shrub retain the tender tints of pink, and the broad lily pads commence to mosaic the surface of the ponds with green, in perfect harmony with the bursting bud and opening flower comes the summer yellowbird, and from hedge and bush may be heard his song, as simple and pleasing as the tasteful but modest plumage that covers his little person. Almost immediately after the first appearance of these industrious little birds they commence their preparations for housekeeping. The male bird flies busily about selecting such material as feathers, plants, fibers, the furze from ferns, the catkins from willows, and other similar objects, all of which he brings to his mate, who arranges and fashions their delicate nest. So quickly and deftly do this little couple labor that they build the greater part of their house in a single day.

There is often a third party interested in the construction of this nest, a homeless, happy-go-lucky Bohemian bird, who has a sort of tramp's interest in the housekeeping arrangements of most of the smaller feathered denizens of copse and woods. This is the well-known cow blackbird, who disdains to shackle her freedom with the care of a family, and shifts a mother's responsibility by farming her progeny out, while she seeks the incongruous but apparently congenial companionship of the cattle, with whom she appears to be on the most intimate terms.

The cow blackbird deposits its eggs indiscriminately among the nests of smaller birds. The blackbird's eggs generally hatch out a day or two before the adopted mother's own eggs, so, when the legitimate members of the family do come, it is to find their nest already occupied by the strong, lusty interlopers, who, on account of their superior size and strength, come in for the lion's share of all the food brought to the nest. Thus the innocent parents rear the aliens, while their own young starve. It is really a pitiable sight to see a couple of little greenlets anxiously searching from daybreak till evening for food to fill the capacious crop of one or more young cow blackbirds, considerably larger than the greenlets themselves.

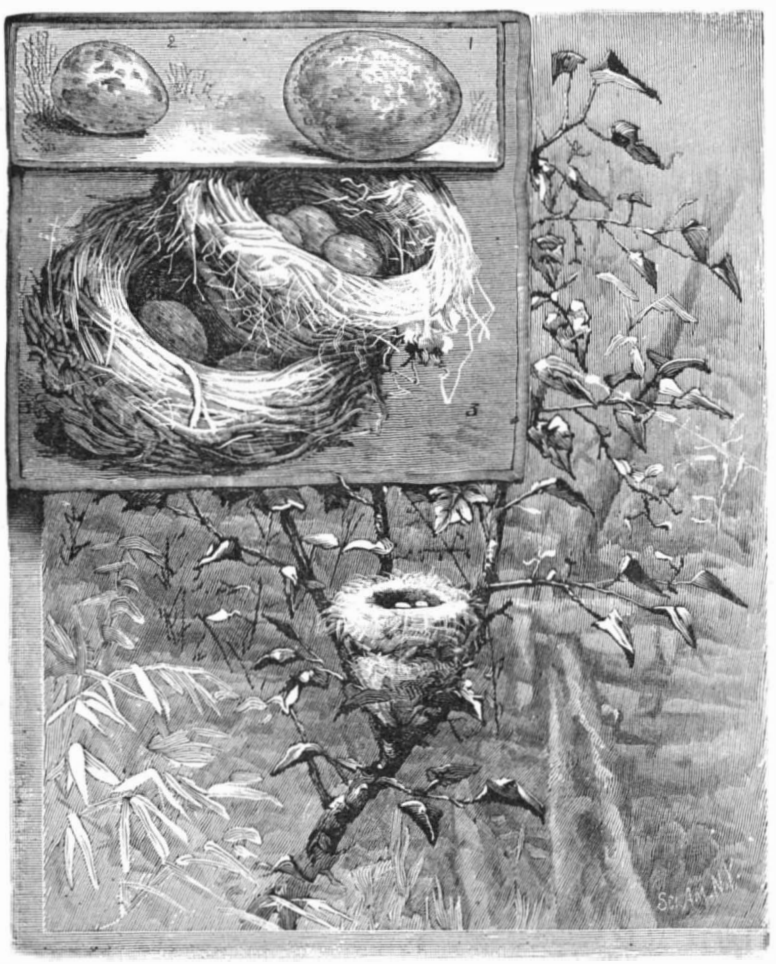
The summer yellowbird, though confiding little creatures, are not readily duped or imposed upon. Their instinct is sufficiently near reason for them to detect the difference between their own little fragile, prettily-marked, greenish-colored eggs and the great dark-colored ones the vagabond cow blackbird has surreptitiously smuggled into the cozy nest. The domestic little couple cling to the spot selected for their house and will not leave it, neither will they hatch the obnoxious eggs, which they are apparently unable to throw out; but the difficulty is soon surmounted, and so are the gratuitous eggs, for the indefatigable workers proceed at once to cover up the cow blackbird's eggs, constructing a new nest on top of the old one, building a second story, as it were, to their house.

Last summer Mr. Lang Gibson brought me one of these two-story nests which he found at Flushing, L. I.; the lower nest contained two cow blackbird's eggs, and the upper one three eggs of the summer yellowbird. Gibson watched the construction of the nest. Visiting it again after it was finished, he discovered the egg of a cow blackbird. Next day two of these eggs occupy the nest. Some time afterward, to his surprise, he found the nest contained three eggs of the yellowbird and no signs of the existence of those deposited by the blackbird, but the nest had the appearance of being much taller than at first, and an examination disclosed the true facts of the case.

The accompanying illustration was drawn by the writer from this compound nest. The upper story or nest is partly lifted so as to show the cow blackbird's eggs in the nest below.

Fig. 1 shows the cow blackbird's egg, and] Fig. 2 the yellowbird's egg. These are drawn exactly the size of nature.

Mr. Nuttal was the first naturalist, I believe, to record the observation of these two-story nests. Baird mentions a three-story nest, each of the lower nests containing the eggs of the cow blackbird, the whole structure being seven inches high.



TWO-STORY BIRDS' NESTS.

### Asiatic Tribes in North America.

From the Proceedings of the Canadian Institute, we are in receipt of a brochure of thirty-eight pages from the pen of Professor John Campbell, on the Asiatic Tribes of North America. In this the author indicates the origin of three Indian families: the Tinneh or Athabascans, the Iroquois, and the Choctaws. The Tinneh family are associated with the Tungusians of Siberia and Northern China, and the Iroquois and Choctaws (who with the Cherokees are simply disguised Iroquois) with the populations of Northeastern Asia, classed by Dr. Latham as Peninsular Mongolidæ. With respect to the Tinneh, Professor Campbell, at the close of his argument, remarks: "Certainly, no two families representing the Old World and the New present closer affinities in name, vocabulary, grammar, physical appearance, dress, arts, manners, and customs, than do the Tungus of Asia and the Tinneh of America."

Under the term Choctaw is included the entire Muscogee family, together with the Cherokees, the Choctaws reprerenting the Tchuktchi or Tshekts, and the Cherokees the Koriaks or Koraeki. The Tuscaroras of the South are taken as the oldest and purest form of the Wyandot-Iroquois, and through them the last named family are brought into relationship with the Choctaw-Cherokees, and by this path with the Koriaks in Northeastern Asia.—*Amer. Naturalist.*

### The Composition of Human Fat.

Dr. Lebedeff, of Moscow, has contributed a short memoir to Hoppe-Seyler's *Zeitschrift für Physiologische Chemie*, on the subject of the metabolism of fat in the body, in the course of which he takes occasion to give the results of his observation on the composition of human fat, a point that, singularly enough, does not appear to have received attention from any observer. Chevreul indeed examined the melting point of the fat of man, and found the panniculus adiposus melted at from 20° to 22° C., and set or solidified at from 12° to 15° C., and Lerch noticed that capronic acid existed in human fat, but there are very few, if any, other observations. Lebedeff states that fat from various regions of the body presents differences, but they are only slight in degree. Its color is yellowish or brownish. At ordinary temperatures it is rather hard, or semi-solid, and destitute of smell. It dissolves with difficulty in cold alcohol. Its specific gravity is always less than 1°. The fat obtained from the subcutaneous connective tissue contained in one case 80 per cent of oleic acid, and 16·7 per cent of solid acids, that is, palmitic and stearic acids; in another case 78·6 per cent of the former and 14·7 of the latter acid. Fat from the abdomen contained in one case 74·4 per cent of oleic acid, and 22 per cent of palmitic and stearic acids, in a second 76·6 per cent of oleic acid, and 20·9 per cent of palmitic and stearic acids.

### Brunelli Process of Embalming.

The process of embalming is as follows, and is called the "Brunelli process:" 1. The circulatory system is cleansed by washing with cold water till it issues quite clear from the body. This may occupy from two to five hours. 2. Alcohol is injected so as to abstract as much water as possible. This occupies about a quarter of an hour. 3. Ether is then injected to abstract the fatty matter. This occupies from two to ten hours. 4. A strong solution of tannin is then injected. This occupies for imbibition two to ten hours. 5. The body is then dried in a current of warm air passed over heated chloride of calcium. This may occupy two to five hours. The body is then perfectly preserved, and resists decay. The Italians exhibit specimens which are as hard as stone, retain the shape perfectly, and are equal to the best wax models. It will be observed in this process that those substances most prone to decay are removed, and the remaining portions are converted by the tannin into a substance resembling leather.

### Fall of Bald Mountain.

A large section of Bald Mountain, North Carolina, near Bakersville, is said to have fallen into the valley February 13. The rumbling noise preceding the crash was heard for miles. The cause of the fall is uncertain; probably the recent heavy rain and snow storms have had something to do with it. A smaller landslide, four years ago, gave rise to local fears of a volcanic eruption. The fallen part of the peak is described as a "slice half a mile square."

### Norwegian Fish Guano.

British Consul-General Crowe remarks, in his report upon the trade and industries of Norway, that a large business is rapidly springing up in the manufacture of fish guano, and that the heads, bones, and refuse of all kinds of fish, which a few years ago were wasted, are now advantageously utilized in the manufacture of this article. The first factory was established for making this kind of guano in Lofoden about 1860, and since then their number has increased from time to time. The Norwegian fish guano is made by grinding fish offal, composed chiefly of heads and bones of the cod, or *gadus morrhua*, which are collected during the large cod fisheries. The heads and backbones are removed previous to curing, and the following substances are likewise used in the manufacture of guano: damaged dried fish, dried and split codfish damaged by sea water, herring heads, damaged herrings, all kinds of fresh fish, and flesh of whales and Greenland sharks; but the different descriptions of raw materials used require a different mode of preparation. The Norwegian manufacturers make their guano almost exclusively from the heads and spines of the codfish, while offal from herrings and soft parts of cod and other fish are but seldom utilized for this purpose, as the expense of producing guano from the latter substance is greater and the product of an inferior quality. The manure which originally appeared for sale under the name of Norwegian fish guano was made exclusively of the first-named substances, and, according to chemical analysis, is composed of the following elements: Water, 13 per cent; organic substances (of which 8 per cent is nitrogen, and 7·6 per cent ammonia), 49·3 per cent, and inorganic substances (of which 14·9 per cent is phosphoric acid), 37·7 per cent. This larger proportion of fertilizing agents has led to its being held in such high favor in the agricultural markets. It is manufactured as follows: The heads and bones of the fish are collected at the fishing places and dried on the hills in the open air, before putrefaction sets in, the heads being tied in bundles of twenty each, and the bones carefully separated. After having been sufficiently dried, so as to be no longer exposed to the risk of putrefaction, they are carried into the manufactory, where they are cut into small pieces, thoroughly dried on plates in a kiln, and crushed, all by means of machines especially constructed for this purpose; finally, the mass is ground between large millstones to the fineness of common flour. The heads and bones are crushed separately, but mixed together during the grinding process. As a rule, one sack, containing 204 pounds of bones, is mixed up with five sacks of heads; this turns out the best result. When guano is to be produced from damaged salt fish and herrings, the mode of manufacture is different, as the fish is not capable of being dried when containing salt, which must be previously removed. This is effected by means of a cylindric caldron of iron, furnished with the necessary cranes and openings, for filling in and taking out the raw material; after that the cylinder is filled, steam is led into the bottom of the same from a boiler, and the mass exposed to a pressure of 30 pounds for about half an hour, sufficient to separate the salt, which runs off through a channel in the cylinder. The mass is then taken out, dried in the kiln, and crushed and ground in the manner above described.

Fat is a similar hinderance to drying the raw material. When guano, therefore, is to be produced from herrings, or flesh of whales, Greenland sharks, etc., the mode of manufacture is the same as in the case of salt fish, the fat being extracted by means of steam pressure, after which the mass is easily dried and ground. Guano of herring heads is manufactured in the same way as cod offal, the raw material being simply dried and ground; but this guano is of an inferior quality. As the quality of this manufacture depends very much upon the kiln, great attention is always paid to see that it is a thoroughly good one, as when the mass is well dried, the crushing and grinding is more easily and perfectly effected; if, on the other hand, the kiln is not a good one, it will cake together when ground, and yield a rough and fibrous product.

All the Norwegian manufactories are situated in Lofoden and Finmark, where the raw material can be procured cheaply and abundantly, and where the first drying process is easily effected in the peculiarly dry air of the northern regions. The consumption of cods' heads for the manufacture of guano is, on the average, about 16,000,000 per annum.

Consul Crowe states there is reason to believe that the utilization of the offal from the fisheries will be carried on to a much greater extent than hitherto, a Swedish engineer, M. Sahlström, having recently made some very important discoveries in this branch of industry. Among the articles to be produced, the inventor first mentions albumen, which is to be prepared from fish spawn. The annual yield of the latter amounts to about 50,000 barrels, which at the present value represents about £125,000, but if worked into albumen the value would be at least £305,000.

### ENGINEERING INVENTIONS.

Mr. George F. W. Harris, of Woodburn, Ill., has patented an improved grader for drains having two adjustable trestles carrying adjustable screw hooks supporting a straight bar suspended from the screw hooks, and carrying a traveling pulley, from which is suspended a grading tool, by which the bottom of the drain can be opened to a uniform grade.

An improvement in compound engines, patented by Mr. Michael Elsesser, of Brooklyn, N. Y., relates to that class of steam engines which have two cylinders, one larger than the other, the larger cylinder taking steam from the exhaust of the smaller or primary cylinder. The invention consists, principally, in forming the valves of the two cylinders integral, and providing the same with a conduit for leading the exhaust steam from the primary cylinder to the inlet ports of the secondary cylinder and with an exhaust passage for the steam from the secondary cylinder, the valves and connecting conduit being contained in the valve chamber and entirely surrounded by steam from the boiler.

An improved valve reversing gear has been patented by Mr. John M. Sailer, of Ionia, Mich. The invention consists of a novel eccentric adjusting cam in combination with the valve rod eccentric, the latter being loosely fitted on the engine shaft.

Mr. Hiram S. Maxim, of New York city, has recently patented an apparatus for extinguishing fires among the shipping and along the water front. The invention consists of a fire extinguishing boat or floating fire engine capable of throwing large volumes of water and of directing the stream or streams as may be required. This boat was illustrated in our columns not long since.

An improvement in the stern of screw-propeller steamers has been patented by Mr. Joseph W. Davis, of Port Jefferson, N. Y. The object of this invention is to provide a strong and rigid bearing for the outer ends of the propeller shafts of steamboats having a propeller shaft at each side of the rudder; and also to prevent one screw from disturbing the water of the other screw. The invention consists in a steamboat hull constructed with three stern posts, to the center one of which the rudder is pivoted, the two screw shafts having their bearings in the side stern posts.

Mr. James F. Marvin, of Fort McDowell, Arizona Territory, has recently patented an improvement in stamp mills. The object of this invention is to increase the yield of stamps in dry crushing. The invention consists in the arrangement of two stamps with an inclined bed on one of the stamps having a rotary grinding motion between its strokes.

An improved pressure roller for sawmills has recently been patented by Mr. Charles E. Lewis, of Bay City, Mich. The invention consists in a crosshead having downwardly projecting arms, a double crank shaft pivoted to the arms of the crosshead, and rollers placed upon the cranks, this arrangement permitting the rollers to adjust themselves to bear equally upon the logs, whether the logs be equal or unequal in thickness.

Mr. Henry Wells, of Glenwood, Iowa, has patented an improvement in car couplings. This invention relates to self-couplers, and it consists of a shouldered drawbar designed to be fitted on the angle formed by the end and bottom of a car, having a flaring mouth and a longitudinal slot in its top for the movement of the coupling hook; and it consists also of a peculiarly-shaped slotted coupling hook and in novel devices for uncoupling.

Mr. William A. Roberts, of Battle Creek, Mich., has lately patented an improvement in car brakes, which consists in a lever pivoted to the bottom of the end of the car, and having its lower end connected with the brake draw rods by a chain passing over a pulley pivoted in a bracket arm on the bottom of the car, so that when this lever is thrown the chain will be drawn outward and draw the brake up tight.

### Waterproof Bricks.

Mr. F. E. Kidder, of Boston, says: In order to ascertain what amount of water the bricks would absorb in their natural condition, two bricks of the same kind as those which were treated with the waterproofing were immersed in water, and at the end of one hour one brick had absorbed 9·7 per cent of its weight of water, and the other 10 per cent. This was all that the bricks would absorb, as the weight of the bricks did not increase after several hours' immersion. To ascertain the effect of freezing on the saturated bricks, one of them was exposed, for a few hours, to a temperature somewhat below the freezing point of water, and the freezing of the water in the bricks burst a piece some three or four square inches in area, and about half an inch thick at its thickest part, out of one face of the brick.

To test the protecting qualities of the waterproofing, three of the same kinds of bricks, treated on all sides with waterproofing, were immersed in water at a temperature of abont 65° Fahr. for seventy hours, when no increase could be detected in the weight of the bricks due to immersion.

One of the bricks was afterward immersed in water which was for a short time at a temperature of 78° Fahr., and at the end of forty-three hours it had absorbed 0·6 of 1 per cent of its weight of water. After 120 hours' further immersion in water at 65° Fahr., it had absorbed 1·7 per cent of its weight of water. This brick had several small cracks in it, through which this small amount of water probably entered the brick.

Two other bricks of the same kind, treated on all sides, were immersed in water at 65° Fahr. for one and a half hours without absorbing any water.

In forty-five hours' immersion one brick absorbed 0·8 of 1 per cent of its weight of water, while the other brick absorbed no water at all.

During sixteen days' immersion the brick which before had absorbed a small amount of water took up 1·3 per cent of its weight of water, while the other brick took up only 0·7 of 1 per cent of its weight of water. Both of these bricks had a large number of small cracks, and it was probably in these cracks that the small amount of water taken up by the bricks was contained.

The results of these tests may be summed up as follows:

Bricks *not* treated with waterproofing were entirely saturated after one hour's immersion, when they contained about one-tenth of their weight of water.

Three bricks treated on all sides with the waterproofing solution absorbed *no* water during seventy hours' immersion in water at the ordinary temperature.

Two bricks during sixteen days' immersion absorbed one one-hundred-and-forty-fourth and one seventy-third of their weight of water respectively. The protecting power of the waterproofing is destroyed by immersing bricks treated with it in water at a higher temperature than 100° Fahr., and probably even at a temperature of 85°. But bricks in ordinary situations would never be subjected to the presence of water at such high temperatures. The bricks tested were treated with waterproofing about two months before the tests were made.

### Tidal Power.

The utilization of the power which exists in the rise and fall of the tide has long been a favorite scheme with projectors, but its application hitherto has been of very limited character. The introduction of electric lighting, and the demand which it creates for some economical motive power, seems likely to give an impetus of a practical character to the various proposals, which have hitherto been only discussed, for rendering available the natural force which now lies waste along our shores. Great Britain, from its insular character, possesses advantages for the development of that force which countries possessed of a less extended coast line cannot possibly have, and now that a demand exists which will repay the outlay necessary to secure that development, we may expect to see rapid strides in this direction.

Attention has been called to this subject very prominently during the last few weeks by the announcement that the Corporation of Bristol had passed a vote to secure the advice of some eminent engineer as to the best method of developing the power which the great rise and fall of the tide in the rivers Severn and Avon afford, with the object of employing it for the manufacture, so to speak, of the electricity required for lighting the city. It is manifest that that object has only a collateral relation to the subject of this article. It is, in fact, only the immediate inducement to undertake the conservation of a power which may ultimately extend its useful purpose in many other directions. Secondarily, however, electricity may be the agent by which power so obtained may be transmitted, almost unreduced, to great distances inland from the source of supply; but to that branch of the matter we do not intend at present to devote onrselves, deeming it sufficient to point out how extensive the use of electricity may become in the future to aid in the full distribution of that tidal force which is the proper subject of our article. All who are acquainted with the rivers Severn and Avon and the Bristol Channel will at once realize how powerful an agent its tidal rise and fall of from thirty-five feet to forty feet must be. In such a case as this there can be but little difficulty, we should say, in the construction and erection of machinery by which the power of the water column may be utilized. It must, however, be borne in mind that the action of the current engendered by a rising and falling tide is slow, and that its power, if exerted on a limited mechanical area, would therefore be but small. Neither can the head of water obtainable be utilized after the methods common in cases where the supply at the summit is constant and the discharge free from back pressure. In the utilizatiou of the tidal column the head will be constantly decreasing, and any machinery erected must be capable of working under gradually decreasing head, and there will be besides no free discharge at the base of the well in which the turbine must be set.

A cursory examination of this subject discloses that there are considerable, though certainly not insuperable, difficulties to be overcome in dealing with the force of the tide after the manner customarily employed with hydraulic motors. The chief consideration which must enter into any design which has this object must be the means whereby the water passed through any such machinery can be got rid of, for it is manifest it cannot be returned to the source of supply immediately on its quitting the machine upon giving motion to which it has expended its power. But one course seems to us to be open for overcoming this difficulty. We would suggest that only a portion—say five-sixths—of the total column should be employed, and that the discharge water from the turbine should be led by pipes to some impounding reservoir on waste land situate slightly above the level of low tide, from which its redischarge into the river would be insured at low water. Of course the direct use of head water will only be possible in cases where the rise and fall of tide is very considerable. Where it is so, it is not impossible that the plan we have suggested might be carried out without having to incur anything like a prohibitory expense.

The obstacles to be overcome in cases of extreme range of tides are not, however, numerous, except under a few local adverse circumstances. Other and more difficult cases will occur in localities where the tide is of too limited a rise and fall to admit of static pressure being economically employed, such as exist on all our sea shores and the majority of our rivers. As regards the last named, it will be practicable in some few cases to erect dams across these beds and utilize the limited head so obtained in a variety of ways. But there must be many rivers where this will be impracticable for very cogent reasons; for such, and in all instances of sea-tides, it seems to us that the old principle of the race will have to be resorted to. On the rising of the tide, water might be admitted through sluices to an impounding reservoir, the lowest level of which must be above low water level, and action would be imparted by it for a portion of the period of influx to the reservoir, to undershot wheels or turbines in the races or sluice channels. At the bottom of the tide effiux would take place through the sluices, producing a reversed action on the machines. It will be patent that, to secure any considerable amount of power with the limited head of water which would be available in such cases, a large volume must be employed, and the necessary machinery would be large and costly.

Our remarks will have shown that the subject divides itself from natural causes into three distinct classes of operation: First, that of extreme range, where two or more turbines might be used throughout, say, three-fourths the time of each tidal rise and fall; secondly, that of rivers which permit of the head waters being dammed back; and thirdly, that of rivers where the latter course is not practicable, and which have a limited tidal range—in which class also may be included works to utilize the tide of the sea on open shores. It is further to be observed that in the majority of instances within these islands, such as are those included in the first and third classes, it will only be practicable to employ the tidal power when the conformation of neighboring land enables it without much artificial improvement for the purpose to receive during the intervals of rise and fall a sufficient storage of water, by the passage to and fro of which the required power may be obtained; but we should say that there are many important towns on our shores, and by the side of our rivers, where such land might be obtained within limited distance, or which might be fitted by excavations at a reasonable cost.

We have purposely refrained in these suggestive remarks from going into the details involved in this important question, and have simply touched upon the chief ideas which occur to any one when thinking over a matter which may become of great national importance.—*The Engineer.*

### The Removal of Scars and Cicatrices.

The cicatrices, scars, or marks left by various diseases, burns, or wounds of divers kinds, are often less obstinately permanent than is generally supposed, and from some facts which have lately come under our notice we are inclined to think that their prevention or removal in many cases may be accomplished by some mild but effectual antiseptic.

Among the exemplifications of the efficacy of the formula we are enabled to lay before our readers, is the case of a gentleman of our acquaintance, whose face was so severely burnt by the violent spurting of a quantity of melted lead (owing to a workman having incautiously dropped a *wet* pipe into it), that his eyes were only saved by pebble spectacles from utter destruction.

At first, of course, carron oil was the sole application, and as for *weeks* afterwards particles of the granulated metal had literally to be dug out of the flesh, a deeply-scarred countenance was naturally predicted by all, except the patient himself. One mark of an almost imperceptible character alone remained after the expiration of six months, owing, as our friend says, to the whole face being bathed twice or three times a day, as soon as the oil treatment could be discontinued, with a lotion of the simplest character, as is readily seen by glancing at its constituents.

Lint soaked in the same solution and allowed to remain on some little time will frequently mitigate the visible results of smallpox, and we have known one case of ringworm treated in this way to leave no scar whatever, while a sister of the latter patient, who had had the same disease in a lesser degree, but had not employed this lotion, still retains the evidences of the fact.

The following is a convenient formula: Borax, half ounce; salicylic acid, 12 grains; glycerine, 3 drachms; rose water, 6 ounces. Make a lotion.—*Magazine of Pharmacy.*

### Important Patent Decision.

BOSTON, MASS., February 23, 1882.

Judge Lowell, in the Circuit Court for the District of Massachusetts, has to-day decided, in a case of the Seibert Cylinder Oil Cup Company *vs.* the Phillips Lubricating Company for infringement of the patent of the S. C. O. Cup Co. for the method of lubricating the internal working surfaces of steam engines by oil fed in visible drops through water contained in a transparent chamber (called the sight feed, the Seibert Co. being the assignees of John Gates, of Oregon), that the S. C. O. C. Co. are the true owners of said patent; that theirs was the original and first invention, earlier than that of Mr. Charles H. Parshall's, of Detroit; and that parties using this feature in oil cups are infringers. This question was an important one to be settled, because the invention is of great utility and value and fast coming into general use.

## Business and Personal.

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



## Notes & Queries

### HINTS TO CORRESPONDENTS.

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.

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

(1) J. W. asks: Could you tell me what kind of a drill will go through chilled iron and highly tempered homogeneous steel? Is there any way of softening this steel with fire or acids or alkalies, so that you could cut it with a sharp edged tool? A. Your drill must be quite thick, and ground to a flat angle, so as not to have a thin edge; it must be of best steel, made quite hard, and revolved slowly. You can heat the articles to a dull red heat, and then allow them to cool off very slowly while buried in charcoal dust.

(2) E. T. L. writes: An electrical catalogue says: "Never put batteries of different kinds in the same circuit." What is the reason of this? A. The entire series of connected batteries has the quantity of the weaker one only.

(3) A. C. inquires how to make the milk of lime. A. Twenty ounces of well burned lime must be carefully slaked in the usual manner. When slaked, add the rest of the water; stir it well until all is dissolved; then pour off the milky liquor through a fine sieve. The imperfectly burned stone will remain in the sieve. Weigh this, and, by dissolving more lime in another vessel, make up the dissolved lime to twenty ounces to the gallon. If a little stronger it will not signify; but it should not be weaker. The milk of lime should be kept in a well bunged barrel. If kept tightly stopped it will keep any reasonable length of time, but if the air gets to it it absorbs carbonic acid and becomes so weak as to be useless. Lime slaked with water and kept from the action of the air will keep its strength for any reasonable time.

(4) E. J. M. asks for a description of the process of making gelatin from sea weed. A. It is manufactured as follows: The sea-weed, called by the native name of "tengusa," is carefully washed and afterward boiled, so as to form a gluish decoction, which is strained off and put into square boxes. When cool it forms a stiff jelly, which can easily be divided into squares a foot in length. The manner in which the surplus water is removed is very ingenious. The jelly prisms are exposed in the open air during a cold night, and allowed to freeze. During the day the sun melts the water, which runs off, leaving behind what one might term the skeleton of white, horny substance, which is extremely light and easily dissolved in hot water; when cooled, it again forms a stiff jelly. This article can be applied to many purposes—for culinary uses, for making bonbons and jellies, for clarifying liquids, as a substitute for animal isinglass, for making moulds used by the plaster of Paris workers, for hardening the same material; in short, as a substitute for all kinds of gelatines, over which it has the advantage of producing a firmer jelly.

(5) O. asks how to oxidize gold, silver, and brass. A. Paint over the parts to be oxidized with a solution of chloride of platinum, then let it dry. To make the chloride of platinum in solution dissolve one drachm in two ounces of hot water.

(6) G. B. K. asks: How can I remove iron spots from clothing? A. The spots are colored blue with yellow prussiate of potash; wash with caustic soda, treat it with oxalic acid, afterward washing well with water. Treated directly with oxalic acid, only fresh spots disappear.

(7) "Microscopist" asks how to clean diatoms for microscopic objects. A. Mr. James Neil, of Cleveland, uses glycerin as an easy and efficacious means of separating diatom shells from the foreign matter with which they are naturally mixed. He fills a two ounce graduated measuring glass three-quarters full of glycerin and water mixed in equal parts. The diatoms, after being treated with acid and thoroughly washed, are then shaken up in some pure water and poured gently over the diluted glycerin. If carefully done, the water and diatoms do not at first sink into the glycerin, but gradually the diatoms sink through the water and into the glycerin preceding the light flocculent matter held in the water. After a few minutes, a pipe introduced closed through the water and into the glycerin will bring up remarkably clean diatoms, which are to be afterward freed from glycerin by repeated washing and decanting.

(8) C. S. P. says: I am running a steam grist and saw mill. The mill is 24 horse power; portable boiler, 40 inches diameter 16 feet long, dome on top; steam gauge attached to top of dome. In running with sixty or seventy pounds of steam the finger of the gauge vibrates from three to five pounds. Now, I would like to know what causes it. A. Each charge of steam admitted to the engine practically enlarges the steam room when the steam valve opens. The result is slight fall of pressure, which is somewhat exaggerated by the momentum of the pointer. This motion may generally be stopped by partly closing the cock in the gauge pipe or by making a U bend in the gauge pipe, in which a quantity of water should remain, serving the double purpose of keeping the gauge spring cool and also preventing the wear caused by the vibration.

(9) B. D. P. asks: What is the fastest time of any train in the United States and Europe? A. Sixty miles per hour has been made for short time on many roads both in this country and Europe. On the Intercolonial Road, New Brunswick, it is claimed that eighty-four miles per hour has been made for a distance of twenty miles. We do not think any faster speed than this has been made on any road.

(10) D. F. H. writes: I have a four cell Daniell battery, which is running an electric bell. H. says if one cell will run the bell one month, four will run it four months. I say it will not. Who is right? A. It depends altogether upon the resistance of the bell magnet and upon the manner in which the battery cells are connected up. If the cells are connected in series, and if the bell magnet has a high resistance, four cells will work longer than one cell, but hardly four times as long. If the bell magnet is of low resistance, and the cells are connected for quantity, there would be little difference in the time required to run down one or four cells.

(11) E. P. R. writes: I have a steam boiler 12 inches diameter outside, 32 inches long, with 14 2-inch tubes running through the entire length, which I use upright. The boiler foams, so that it throws water over in the engine cylinder, making it pound. What is the cause of it? The water is pure, such as we use for drinking and cooking. A. Probably because you have not steam capacity enough in the boiler. You can add a steam chamber to it and connect it with the boiler by pipes.

(12) C. D. D. asks: If the light of the sun should be suddenly blotted out, how long would we continue to see it? A. Eight minutes.

(13) L. J. asks: 1. What is the effect of putting rings of rubber behind the diaphragm of the phonograph described in SUPPLEMENT, No. 133, vol. vi., page 2112? A. It limits the vibrations of diaphragm and prevents too great movement of the needle.

(14) P. M. V. asks: Can I, in making an electro-magnet, screw the two soft iron cores directly into a base of wood, or will they have to have a metallic connection; and if so, would mere contact be enough? A. You will require a metallic connection, which must be of iron or other magnetic metal. Mere contact will do, if sufficiently perfect.

(15) R. H. S. writes: I desire to heat an inclosure, 4 feet square, moderately, say from 70° to 90° Fah., if possible by an electric current. Can it be done—and if so, how? A. It can be done by running the current through a wire of the proper size and length. We recommend a current sufficient to produce a small arc light connected with about 200 feet of No. 16 naked copper wire, arranged within the chamber so that the whole or a part of it may be thrown into the circuit. The convolutions of wire should have air spaces between and they should nowhere touch each other, neither should they come into contact with anything combustible.

(16) A. J. S. writes: I have a telegraph line 200 feet long of No. 18 insulated copper with five 6x8 gravity batteries for my return wire or ground wire. At one end it is attached to a lead water pipe; at the other end to an iron pipe driven about five feet into the ground. All my connections are perfect, but it will not work (it will if I use a double wire). Can you tell me through your paper what is the matter? A. Your ground is insufficient. Instead of driving a pipe five feet in the earth, you should dig a trench deep enough to reach earth that is always moist, and bury in it a copper plate having ten to fifteen square feet of surface, and connect this with your ground wire. Or you may fill this trench for a foot or so with finely broken coke, burying a large sized copper wire in the coke. Of course connection with the gas or water pipe—if you have them—will do. The connections should be soldered.

(17) J. F. B. asks: 1. What will be the size of a link for a reverse engine whose stroke is three inches and the distance from the outside of the ports is two inches, and from the inside of the ports is one inch and a half? And what is the rule for finding the size of the link? A. The best way to get the size of the link is to take actual dimensions of one in use, and reduce it, in the proportion of openings and travel of valve. 2. How do you find the throw of the eccentric? A. The throw is equal to twice the distance from the center of the shaft to the center from which the exterior of the eccentric is struck. 3. What is "kaolin," advertised in No. 4, page 52, in the treatment of comedones? A. Kaolin is the kind of pure clay used in making porcelain.

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

J. B. B.—The white powder is carbonate of lead.

### COMMUNICATIONS RECEIVED.

On a Buncher for Hay and Straw. By J. C. M.

On Lubricants. By L. M. A.

Rapid Transit on Water. By D. E.

On Aerial Navigation By O. F.

On the Conversion of Thermometric Scales. By D J. K.

What Causes a Belt to Run on the High Side of a Pulley? By C. D.

[OFFICIAL.]

## INDEX OF INVENTIONS

FOR WHICH

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

**February 21, 1882.**

**AND EACH BEARING THAT DATE.**

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost as the specifications not being printed, must be copied by hand.

Air compressor, hydraulic, W. A. Babcock ..... 253,830
Air cooling and purifying apparatus, S. Whitnum 254,081
Air motor, compressed, R. S. Tice ..... 254,072
Alarm. See Millstone alarm.
Amalgam of gold and silver containing base metals, refining. E. N. Riotte ..... 253,888
Amalgamating apparatus, A. D. Clarke ..... 253,843
Animal trap, A. André ..... 253,907
Banjo. E. J. Cubley ..... 253,819
Basin and sink trap. C. H. Denison ..... 253,852
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Boxes and dishes, machinery for forming and fastening, L. Carpenter ..... 253,839
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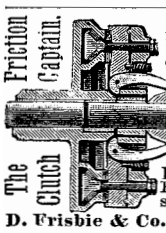


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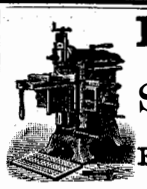

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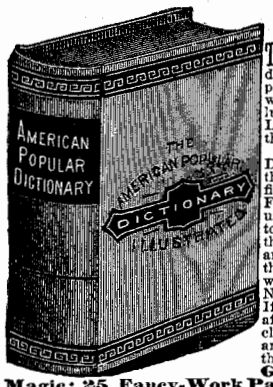


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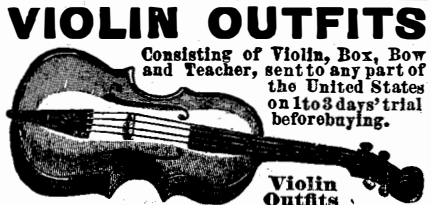

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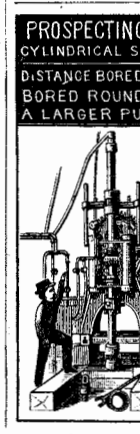

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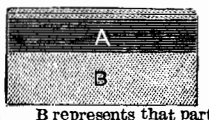


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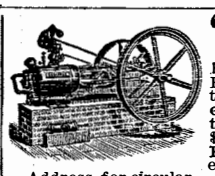

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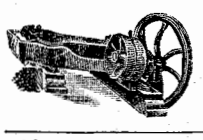

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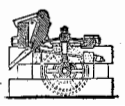

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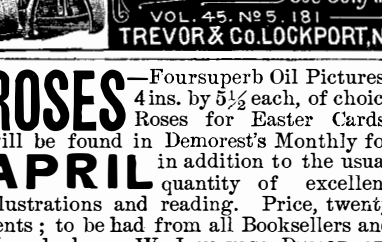

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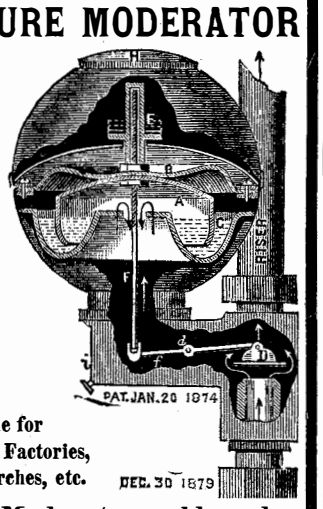


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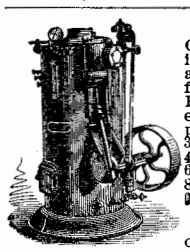

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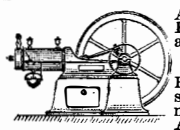

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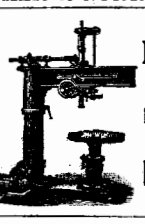

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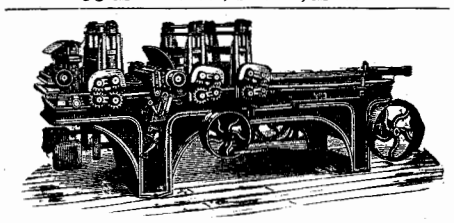

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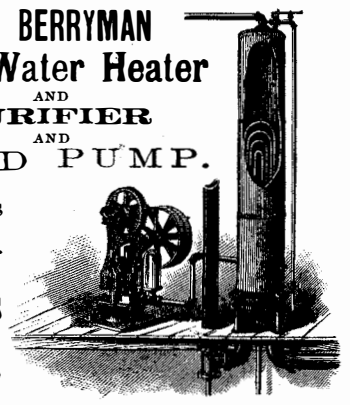

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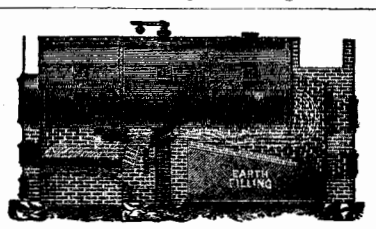


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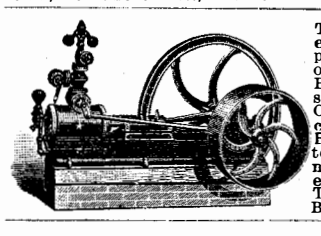

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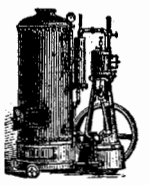

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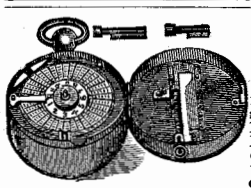

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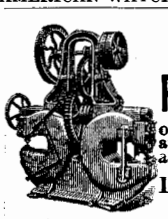

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