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STONE STEPS AT HIGH BRIDGE, NEW YORK CITY.

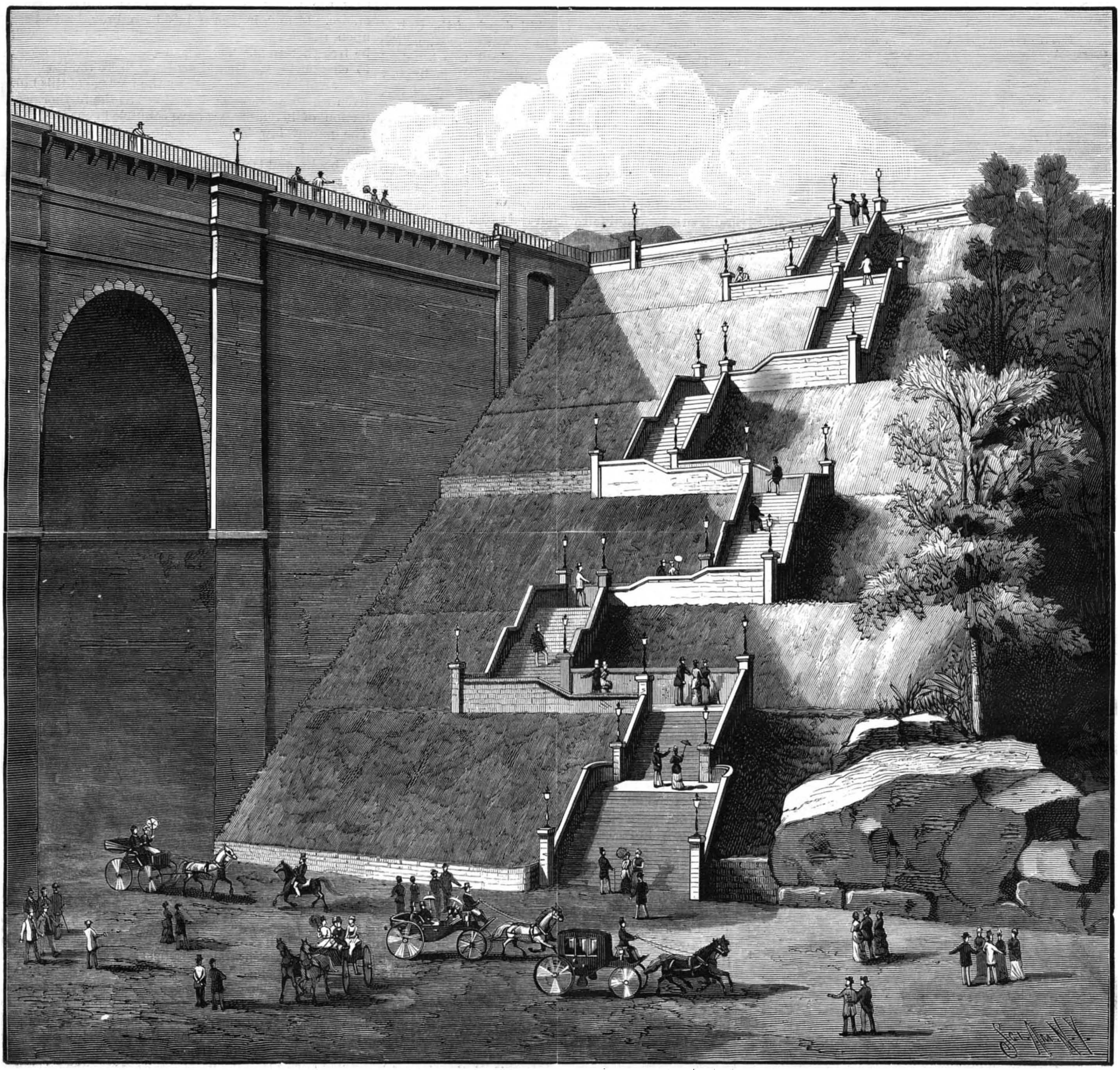
The Harlem River in the vicinity of High Bridge, across which flows the entire water supply of New York city, has long been a favorite resort, the western bank and wooded slopes affording many secluded and cool resting places. For sightseers the central attraction is the famous bridge, at the western end of which are the mammoth pumps that raise the water to the reservoir on the extreme top of the hill. On the bank of the reservoir, toward the river, stands the stone tower, which serves as a smaller reservoir, furnishing water to the more elevated districts.

The bridge at the opposite side of the river is about on a level with the top of the hill, and it is from this side that the majority of visitors reach the aqueduct. Along the shore runs the railroad track, and through the first arch, a little way up the hill, passes one of the main roads leading to Jerome Park. In former times the searcher after quiet and refreshing nooks reached this stage of his journey feeling encouraged by the few obstacles he had encountered tending to increase by exertion the effects of summer heat; but the first view of the old wooden steps, representing every degree of dilapidation, leading from the road to the summit, and the thought that up these his way led, dispelled all visions of coolness. About three years ago relief was provided, but only for a season, by an individual who combined philanthropy with business, and erected an inclined railroad up the hill.

But last year the Department of Public Works came forward, and built the stone steps shown in our frontispiece. These enhance the natural beauty of the surroundings and harmonize well with the massive bridge, to which they form a most fitting approach. As will be seen from the engraving, there was no attempt by the designer at forced or profuse ornamentation—the whole presenting a plain, rich, and substantial appearance, no matter from what point it may be viewed. The short flights, separated by roomy landings, serve to lessen the fatigue of the upward journey, and enable the traveler to more fully appreciate the beauties of the more attractive opposite shore, as it gradually expands before him.

The steps, coping and caps are of bluestone, all the rest being built of gneiss. The coping is 2 feet wide, the lowest flight of steps 16 feet wide in the clear, the top flight 12 feet wide, and the intervening ones 8 feet. The extreme width from out to out is 43 feet. The total length of the steps is 207 feet, and the vertical height 88 feet.

THE sheet iron covering for cotton bales, which we have heard considerable about lately, if it proves not to be too expensive, and its weight not objectionable, and one can be used several times, will prove a successful invention. Considerable cotton is burned in transit, and several pounds from each bale is lost in various ways. The iron covering would materially lessen the risk from fire, keep the cotton clean, and the bales from depletion.



STONE STEPS AT HIGH BRIDGE, NEW YORK CITY.

Scientific American.

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NEW YORK, SATURDAY, JUNE 5, 1886.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 544.

For the Week Ending June 5, 1886.

Price 10 cents. For sale by all newsdealers.

ANOTHER PATENT NULLIFICATION BILL.

We give in this issue the text of a bill (H. R. 4,458) that threatens very gravely the interests of the inventors of this country. It was introduced in the House of Representatives by Mr. R. W. Townshend, of Illinois. During the last two years, it has often been our office to comment on proposed enactments that had the same bad tendency—a tendency to the abridgment of the rights of patentees. We have reiterated the expression of the best jurists that this country has ever seen, that the inventor is a pre-eminently useful member of the community, and deserving of every protection and encouragement that the law can afford him. Judge Story, and other judges only less eminent than he, support this view of the case. Notwithstanding such support, the House of Representatives, for some reason, during the last two years, has had a paroxysm of activity in the production of bills impairing the standing of patentees in the courts.

But the present bill has gone further than most of its predecessors. It has, after consideration, been reported favorably by the Committee on Patents, and presumably is in a fair way to pass the House. A glance at its provisions is enough to condemn it. It strikes at the root of our patent system, and threatens a gross injustice to the inventors of the country. A patent already granted is a pledge, and any curtailment of its rights is a violation of that pledge. The effect of the present patent system has been to place America in the van of nations, as regards her progress in the technical and industrial arts. Almost any change must be for the worse, when the original has proved so good. Yet such violation of contract and such change of a practically beneficial system, as proved by years of efficiency, is to-day proposed in Congress.

The first provision of the bill deprives the United States courts of jurisdiction in patent cases where the amount in controversy does not exceed two hundred dollars. By this provision, infringement is by law allowed on the majority of inventions. By one clause, the most meritorious inventions, and those that contribute the most to our comfort in every-day life, are declared unworthy of compensation. There is no need to refer to the records of patents to identify them. Sewing machines, churns, washing machines, straw cutters, plows, mowing machines, hardware, boots, shoes, clothing, furniture, stoves,—all these and innumerable others would fall within the two hundred dollar limit. Had this law been in force for the last fifty years, no small inventions would have been made. The inventor would have no incitement to use his talent, save in the larger class of subjects. None of the minor improvements in household conveniences, productive of health as well as comfort, would have been carried out. Our lamps might smoke, for who would invent anything to improve them under the two hundred dollar limit? Our coffee would be ground with mortar and pestle, or in inferior mills. Our culinary utensils would not be coated with enamel, but the poisonous copper vessels of old days would still be used. Our sewing machines, if manufacturers succeeded in maintaining the price above two hundred dollars, would not be provided with automatic tension devices, hemmers, and fellers, for the line of invention in the direction of such small objects would be closed. Many an inventor of small capital has fought his way to success by small but important improvement. This law would end the career of all such workers.

This first provision declares in effect that an inventor must submit to infringement by any individual to that extent before he can sue for relief.

If his patent is infringed, he cannot strike at the evil in the beginning, but must patiently wait until a wrong of a definite extent has been committed. Again, he may suffer great injustice by a multitude of infringers, none of whom may pass the two hundred dollar limit. In such a case, he can do nothing. Any one can infringe with impunity if he does not exceed this amount. In this provision, injustice and absurdity are rivals. It licenses and encourages infringement. It would seem that such a clause would stand not the shadow of a chance of passing, were it not that the presumable temper of the House has been shown in the recommendation of the bill embodying it, by the Committee on Patents.

The next provision aims at the rights of the "innocent purchaser," of whom we have heard so much during the last two years. He stands in all justice in the position of the innocent violator of a law, and in fact is such, and should be so treated. He should for the good of the community be subject to the same penalties as the willfully infringing purchaser. To make any law operative, the knowledge of its provisions on the part of the violator must be presumed. This is the experience of all governments. The patent right in an invention becomes valueless if the ignorance of an infringer is to protect him against the consequences of infringement.

The bill provides that purchasers of a patent right for actual use shall not be liable for its value, or for infringing the same in any manner, if, at the time of its purchase, they had no knowledge of the existence of claims of a third person. In other words, if a fraudulent patent is obtained, and sold to a manufacturer, he can work under it quite regardless of the rights of an original and anticipating inventor.

The proviso of ignorance, at the time of purchase only, of such claims on the part of the purchaser is included. The clause is a blow at the equities of the case. The most admirable provisions of our patent laws are devoted to guarding the rights of original inventors.

Interference proceedings in the Patent Office and test cases in the courts continually arise for the purpose of determining priority of invention. By this act, all these safeguards are nullified, and such priority is made a secondary consideration, and subsidiary to fraud. The purchase of fraudulent patents is legalized, and a reward is offered for perjury. The bill in the same clause excludes from liability the innocent purchaser of a patented article, until a written notice of the existence of the patent has been served upon him personally. This is a minor provision following the same erroneous line of action.

All these provisions are a direct temptation and incitement to fraud. They do no good to any class of the community, except as a law depriving laborers of their wages might be held to benefit capitalists. Inventors are the servants of the community. They have served it faithfully in the past century, as the splendid record of over three hundred thousand patents shows. It now remains to be seen whether their compensation is to be taken away from them.

The ingratitude of such an action counts for little, unfortunately; its injustice should count for more; but its shortsightedness and impolicy should be within the scope of every legislator. It is to be hoped that the House will not follow the action of its committee. If any influence has been brought to bear upon the latter, the whole body, it is probable, will be free therefrom. Though only one step on its road to enactment, we should be sorry to see the House of Representatives committed by the passage of this bill. Even where a bill ostensibly aimed at the further protection of inventors, we have counseled conservatism. The patent law is best let alone. It has done good work; it has been systematized, codified in standard text books, and is understood by all. A radical change in it is always to be feared, but especially when it has a direct tendency toward injustice. We hope the bill will never reach the Senate; we hope that the full body of Representatives will effectually kill it, and relieve the air of so threatening a menace.

We hope that the House of Representatives will not pass this measure. If they do, the Senate will be under a great responsibility to the country for their action in the matter. If it should become law, then the majority of inventors will be deprived of their granted rights. Thousands of small industrial establishments, in all parts of the country, will be obliged to close and discharge their workers.

All who feel interested in preventing the consummation of this great error should lose no time in writing to their members of Congress, and protest against the passage of the bill, giving their reasons as fully and as forcibly as possible.

The members of the present Congress have taken a more favorable view of another class of intellectual works, the productions of authors. International copyright has been favorably considered, and the bill reported by the Senate Patent Committee, and the grant of patents to foreign authors, not members of the community, many of whom never have and never will see this country, is now in a fair way of being realized. In the same breath, the legislature that thinks so well of fostering foreign authors proposes to undo the laws protecting home inventors. If a book, as the product of the brain, is entitled in any sense to protection, *a fortiori* is a title to such protection due to an actual invention, which has assumed a tangible form under the clause of the patent laws requiring full and clear description and operativeness or utility. Inconsistency could go no further than this—to refuse to home inventors what is granted to foreign authors.

GLOUCESTER FISHERS.

Contending with perils at sea and Canadian armed cruisers inshore, the life of the Gloucester fisherman is not a happy one. If, however, he can escape from the first and elude the second, he is pretty certain to find a good profit awaiting him, for rarely is there a glut in the deep sea fish market. Mackerel may be so plenty as to be almost given away, as was the case at Fulton Market, New York city, recently, during the early run of young mackerel or "tinkers;" but a large supply of halibut, cod, hake, and haddock only tends to so far reduce the price as to bring them within the means of the many. The "mackerelers" and the "bankers" may fairly be looked upon as two distinct orders of fishermen, for while the latter sometimes engage in mackereling in summer seas, the mackerel men rarely risk the dangers of the stormy Banks in winter.

The visitor to the Gloucester wharves will be surprised to find that the "bankers" are manned by young men exclusively; perhaps it would be safe to say that at least half of these fishermen are under twenty. In many cases the skipper himself is as young as three and twenty. Indeed, it is said at Gloucester that there is no "old" bank fisherman; that is to say, there are none who have for many years continued to fish during the winter on George's and the Grand Banks.

Grim death menaces the life of the Bank fishermen in too many ways to permit of such a career. A few successful seasons of this fishing will often put several thousand dollars and sometimes very much more in the pockets of a single hand. Then is the time for him to quit the business. He usually does this, and employs himself thereafter in less hazardous enterprises afloat or ashore.

The statistics show that the number of fishermen lost on the Banks has averaged nearly one hundred and fifty a year for the past decade from the port of Gloucester alone. Heavy seas, fierce winds, and fogs and thick weather prevail on the fishing grounds all winter and these serve, of course, to intensify the peculiar dangers to which these fishermen are exposed. Most of the time the fishing schooners must be hove to under storm trysail; for should they come to anchor, the holding ground is so uncertain that, swinging with the tide, they are like to foul it and, athwart seas, tear their bows out with plunging. Sometimes during gales, they drift down on to one another, and this nearly always means disaster. Another and no less serious danger is that of being run down by the transatlantic steamers, for they lie almost directly in their track. Perhaps the most menacing danger of all is that experienced by the "trawlers" in setting and hauling in their nets. The "trawlers" always set four nets at some distance from their vessel. One of these nets is ahead, another astern, and one on each quarter. Two men go out in each dory, and are sometimes gone for hours. If the weather be thick, the fog horn is kept going on the schooner, but those to windward are not always able to hear, and those to leeward not always able, if a heavy sea is running and a gale blowing, to get back. Now, to be adrift on George's or the Grand Banks in a dory under such conditions of weather is more than dangerous, it is perilous. If a crew have their net aboard, they are likely any moment to be upset, and their only chance of a rescue lies in the possibility of drifting down upon some other fisherman and of being picked up.

The crew of a banker has a share in the catch; this share, under certain circumstances, amounting to one-half the fish they take. But the skipper and the cook, who is always next in rank, get the largest share. They are a sober, steady, and fearless lot of men, these fishers, whose habits and customs differ wholly from those of the ordinary Jack before the mast.

"Slow Burning" Construction.

The Boston Fire Underwriters' Union have issued several circulars recently which are full of suggestiveness to property owners. One of these gives rules for the proper construction of fire doors, so as to meet the requirements of the underwriters. Another important circular gives a brief standard schedule of what is needed to construct a slow burning building. We print this last mentioned circular in full for the benefit of the many whom it concern:

Mills, factories, stores, warehouses, and other buildings used for similar purposes, constructed in accordance with the following instructions, will be slowly combustible, and will receive the lowest ratings from the Boston Fire Underwriters' Union, viz.:

Walls.—To be of brick; of such thickness as the intended occupancy and building laws of the city may require, and not to exceed 60 feet in height from the sidewalk. The inner surface to be left plain or plastered direct on the brickwork.

Cornices.—To be of brick.

Roof.—To be flat and of "mill construction" (*i. e.*, made of heavy timbers and planking, without plastering or sheathing), and covered with gravel or metal, No wooden Mansard or French roofs allowed, as they are regarded as "lumber yards up out of reach of water," furnishing so much additional material for the fire to feed on, as well as greatly increasing the risk of fire from adjoining property.

Girders and Columns.—To be made out of the best Southern pine timber. Iron girders and columns not allowed.

Floors.—To be made of "mill construction," consisting of heavy Southern pine timbers from 5 to 10 feet apart, according to the burden they are expected to carry; covered with three inch tongued and grooved plank; then two layers of asbestos or other heavy floor paper (in stores and warehouses an inch of lime mortar can be used instead), and then an inch flooring above. These floor timbers and floors to be left exposed beneath, without plastering or sheeting.

Elevators and Stairways.—To be placed in brick well holes extending at least two feet above the roof, and crowned with a skylight having an iron frame and thin glass protected with a wire screen. All openings on the various floors to be protected with standard tin clad fire doors.

Well Holes for Light.—Not allowed in this class of buildings.

Shutters.—To be placed on all windows and other openings at the rear and sides of buildings, when exposed by other property or by another section of the same property cut off by division brick walls. To be of standard construction, and the fastenings so arranged that they can be opened from the outside.

Blind Attics.—And other concealed places that cannot be readily readily reached by firemen not allowed.

Boilers.—For heating or power, to be placed in separate buildings or fire proof rooms, and provided with regular boiler chimneys.

Preservation of Wood.

The prevention of decay in wood is said to be effectively accomplished by exhausting the air from the pores and filling them with a gutta percha solution, a substance which preserves the wood alike from moisture, water, and the action of the sun. The solution is made by mixing two-thirds of gutta percha to one-third paraffine, this mixture being then heated to liquefy the gutta percha, when it is readily introduced into the pores of the wood, the effect of the gutta percha being, when it becomes cool, to harden the pores.

NIGHT SKY.—MAY AND JUNE.

BY RICHARD A. PROCTOR.

The Great Bear (*Ursa Major*) occupies all the upper sky from west to north, except a small space occupied by the Hunting Dogs (*Canes Venatici*). The Pointers are in the northwest, almost horizontal. A line from the Pole Star (α of the Little Bear—*Ursa Minor*) to the Guardians of the Pole, β and γ, now occupies the position of the minute hand of a clock three minutes past an hour.

Due south, low down, lies *Cassiopeia*, while above, somewhat toward the east, we find the inconspicuous constellation *Cepheus*. The Camelopard is in the west of north, and getting upright.

Low down in the northwest lie the Charioteer (*Auriga*) and the head stars of the Twins (*Gemini*) further west. The Crab (*Cancer*) is nearly due west, the Sea Serpent (*Hydra*) holding his head almost exactly to the west point. Above is the Sickle in the Lion, its blade curved downward, and the tail of the Lion (*Leo*) lies above, toward the south of west.

On the Serpent's back we find the Cup (*Crater*) and the Crow (*Corvus*), in the southwest and to the south of southwest respectively. Above these constellations, and extending beyond the south toward the east, the Virgin (*Virgo*) occupies the mid-heavens.

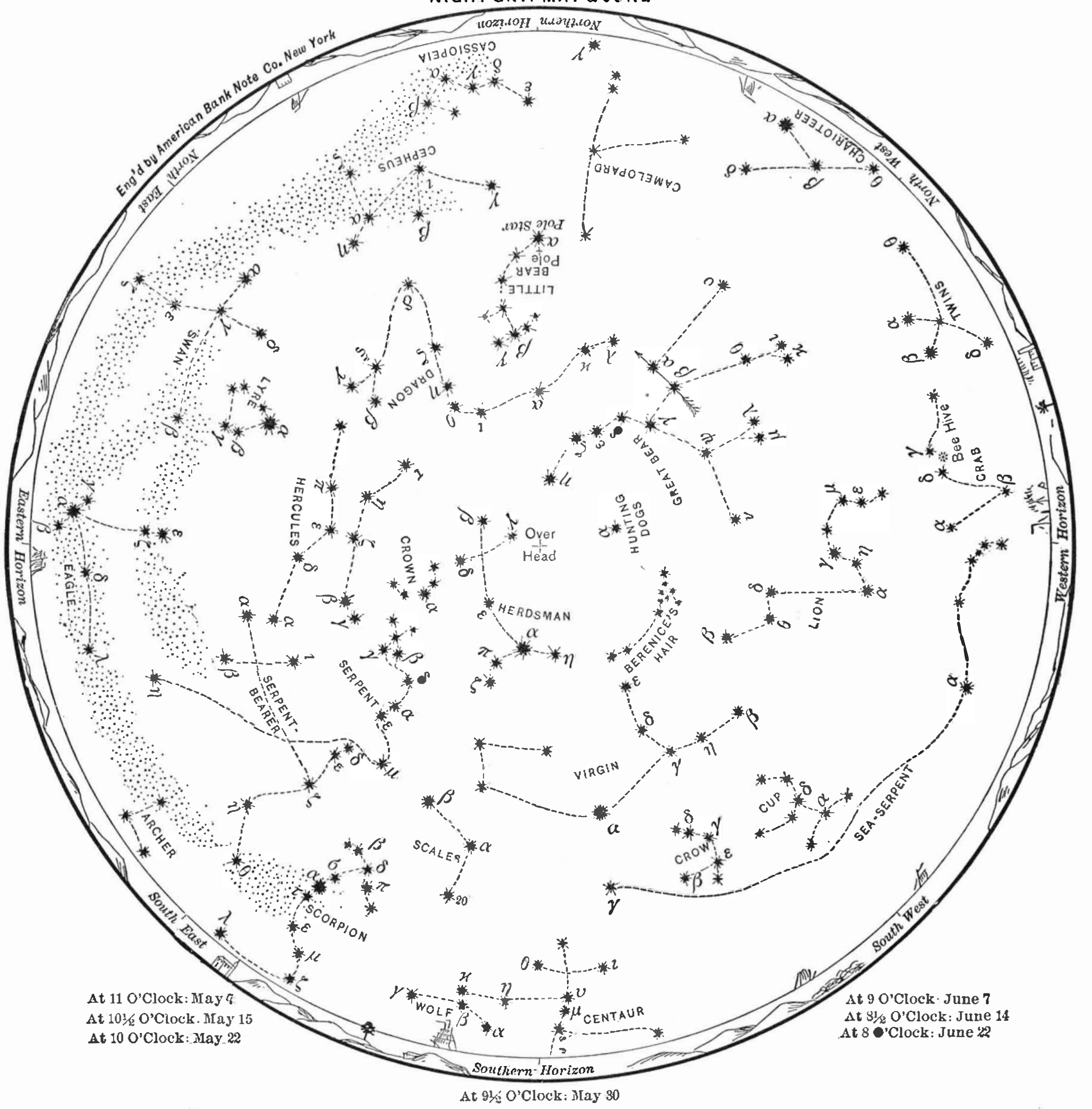
Above the Virgin we see the Herdsman (*Bootes*), his head and shoulders nearly overhead. Low down in the south is the Centaur (*Centaurus*), bearing on his spear the Wolf (*Lupus*) as an offering for the Altar (*Ara*), which, however, is invisible in these latitudes. Above the Wolf we see the Scales (*Libra*), while the Scorpion (*Scorpio*), one of the few constellations which can at once be recognized by its shape, is rising balefully in the southeast.

The Serpent Bearer *Ophiuchus*) bears the Serpent (*Serpens*) in the mid-heavens toward the southeast, the Crown (*Corona Borealis*) being high up in the east, close by the Serpent's head.

Low down in the east is the Eagle (*Aquila*), with the fine steel blue star Altair, the Swan on the left about northeast, and above it the Lyre (*Lyra*), with the still more brilliant steel blue star Nega. Hercules occupies the space between the Lyre on the one side and the Crown and the Serpent's head on the other. He is high up, due east.

Lastly, the Dragon winds from between the Pointers and the Pole round the Little Bear, toward Cepheus, and then eastward toward the feet of Hercules, close by which we see his head and gleaming, eyes, β and γ.

NIGHT SKY: MAY & JUNE.



In the map, stars of the first magnitude are eight-pointed; second magnitude, six-pointed; third magnitude, five-pointed; fourth magnitude (a few), four pointed; fifth magnitude (very few), three-pointed, counting the points only as shown in the solid outline, without the intermediate lines signifying star rays.

THE *Textile Manufacturer*, London, thinks there is likely to be a great deal of trouble growing out of the winding up of the New Orleans Exposition. The governments of Honduras, Ecuador, Peru, the Argentine Republic, the Samoan Islands, Uraguay, Chili, Santo Domingo, Hayti, Nicaragua, and Russia sent goods under the guarantee that all expenses of transportation to and fro would be paid by the Exposition Company. Even Dom Pedro, Emperor of Brazil, has his son on the way with goods, in expectation that the show would be open into the fall. The enterprise has closed a miserable failure, and the goods of these nations are held for the charges due. It would seem not at all improbable, from the moral support the United States gave the affair by granting it subsidies, that it would in good faith be bound to take these goods out of pawn and send them back.

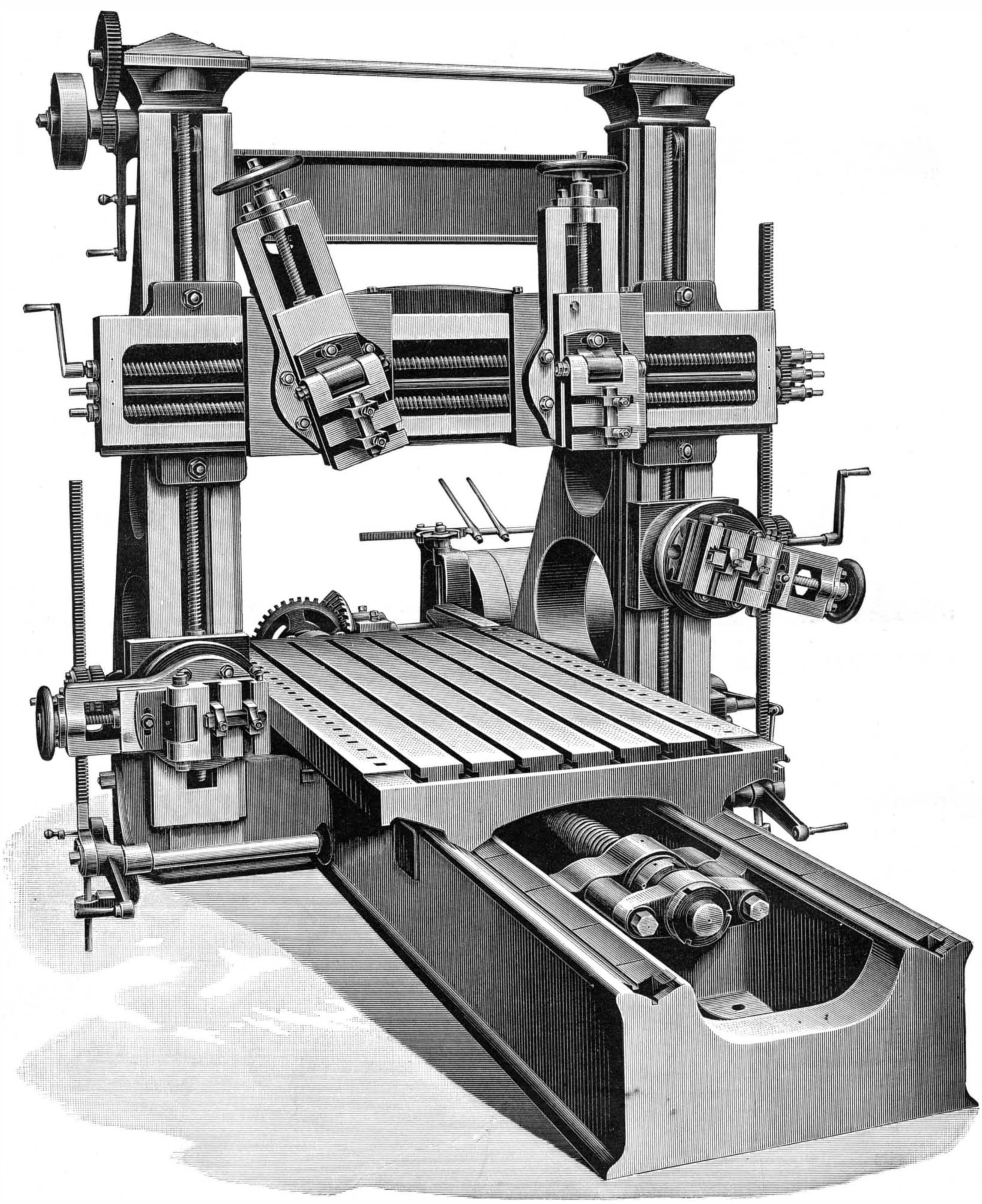
Brooks Comet No. 3.

On the evening of May 22, Professor Brooks, of Phelps, N. Y., discovered another comet, having a right ascension of 11 h. 51 m. 15 s., and a north declination of 8° 55′ 15″. The wanderer is reported as large but faint, and has a slow motion to the southeast. Its discovery secures to Professor Brooks the first, second, and third Warner prizes of the year.

IMPROVED PLANING MACHINE.

We illustrate a special planing machine for planing heavy pedestals, made by Rushworth & Co., of Sowerby Bridge. This machine, as will be readily seen from the engraving, which is from *Engineering*, is of exceptional strength and rigidity for the size of work which can be passed through it. It is designed to plane objects up to 7 ft. in length and 4 ft. 6 in. square. The bed and uprights all fit level on the foundation; the bed itself is of double box section with strong box bars, and the table, which is 4 ft. wide, has T slots planed out of the solid with slot holes on each outer edge. It is driven or worked by a steel screw 4½ in. in diameter running in gun-metal bearings at each end, and engaging with a gun-metal nut 2 ft. long, made in two parts, so that the slightest wear in the thread can be taken up.

At each end of the screw there are double-thrust bearings; that at one end consists of a tail bar with an adjustable steel pin, and that at the other end of a bridge, with gun-metal washers 8 in. in diameter. By this arrangement the bevel gear on the screw is always kept in the same position. The bevel gear is steel, and is driven by pulleys of 30 in. and 24 in. diameter for the cutting and return strokes respectively. The machine has two strong tool boxes on the cross slide worked by steel screws and a steel shaft, and self-acting in horizontal, vertical, and angular feed. The vertical range is 15 in., which is of great importance for this class of tool, for planing inside a pedestal or a valve chest. The two tool boxes on the upright stands project the same distance from the cross slide, so that all the four tools, when in use, finish the cut together. These tool boxes are balanced by weights inside each upright, and are self-acting vertically. The feed motion is very simple and durable, and is operated from a wrought-iron rack on each side; all the tool boxes have a variable feed, self-acting, from one-sixteenth to seven-sixteenths, a range of feed which cannot be got in most planing machines. The catch-box wheels and the wheels on the screws and the shaft on the cross slide are all cut from wrought iron, and the feed wheels in the tool boxes are of gun metal. The loose disks or adjusting strips to the slides are also of wrought iron, so that there is no danger of their breaking, however tight they are nipped when doing the heaviest of work. The machine can be stopped or started on either side, and the gear and pulleys being at the extreme end, both sides of the machine are left entirely clear for the workman to stand in front of the tool boxes, etc. The bed is fitted with lubricators. The approximate weight of the machine is 12 tons.



IMPROVED PLANING MACHINE.

Ice in the Sick Room.

A correspondent of the *National Druggist* makes the following seasonable suggestion:

"The writer's son suffered with typhoid fever during the heated term of last summer, when the temperature of the room often rose to 90° or 95°, and the patient's temperature ran up to 105° F. and over.

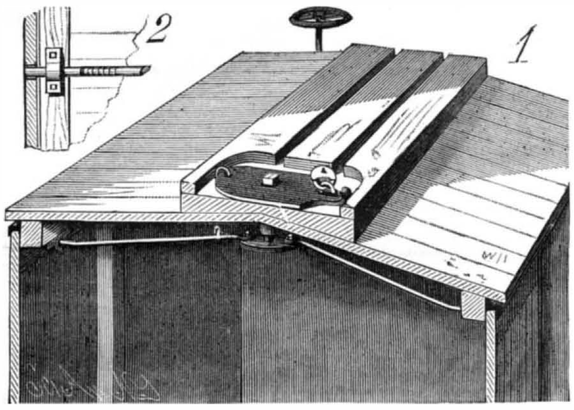
"A number of tubs were placed in the room, and kept filled with ice, and the doors kept closed. The temperature of the room sank to 80° or less, an average of 12° or 15° below the temperature of the other rooms in the house; and the cooler atmosphere not only added to the comfort of the patient, but aided in keeping down the body temperature, and materially contributed to a final recovery."

The Next Louisville Exposition.

For three years past, commencing with 1883, the exhibitions held at Louisville, Ky., have been brilliantly successful, alike in the attendance and in the variety and excellence of their display of works of art, industry, and agriculture. This year the exhibition opens Aug. 28 and closes Oct. 23, and its managers propose to make the show contribute materially to the attractions which Louisville always presents to visitors at that season.

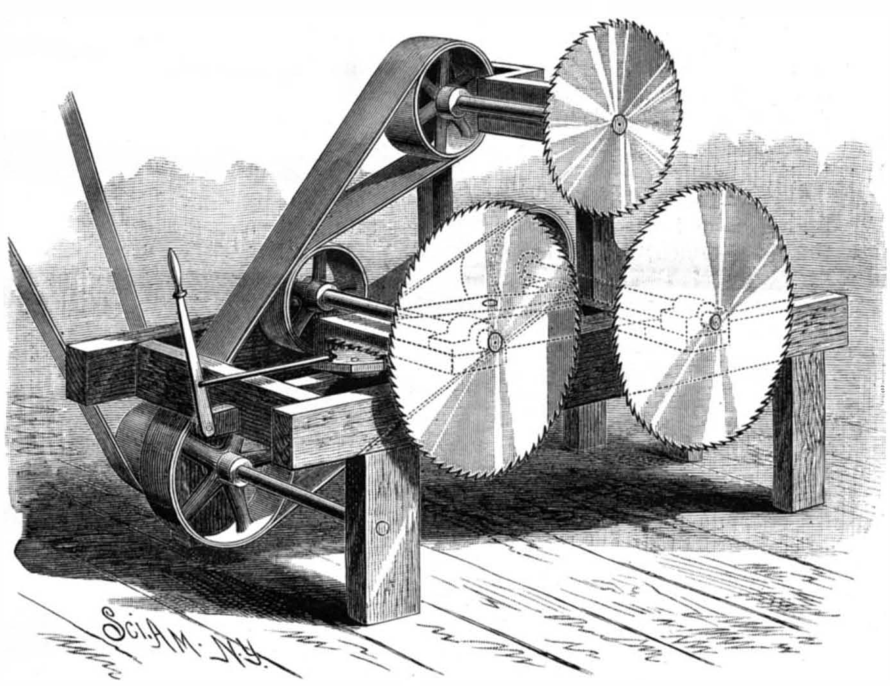
IMPROVED FREIGHT CAR DOOR LOCK.

This lock for the sliding doors of freight cars is operated from the roof of the car; it is simple in construction, safe, and reliable. The squared upper end of a vertical shaft journaled in the roof of the car projects into a recess in the gang planks. In one end of the recess is hinged a hasp provided at its middle with a square hole fitting the end of the shaft; the free end of the hasp has a slot to receive a staple. Secured to the



ABBOTT'S IMPROVED FREIGHT CAR DOOR LOCK.

lower end of the shaft is a disk, to opposite points of which are pivoted rods which extend to the sides of the car, and can be passed into holes in the upper parts of the doors. The rods are guided by clips on the under side of the top beams of the sides, as indicated in Fig. 2. The position of the locking rods is shown by a groove in the top of the shaft, which extends in a direction across the car when the doors are locked. To lock the doors, the shaft is turned by means of a key, to move the rods toward the sides, when the hasp is placed over the squared end of the shaft, the staple passing



MOORE'S CIRCULAR SAW MILL.

into the slot. A padlock is then passed through the staple and sealed, or a car seal of the usual form can be passed through the staple and closed.

This invention has been patented by Mr. James Abbott, of 836 North Main St., Elmira, N. Y.

CIRCULAR SAW MILL.

The shafts carrying the two lower saws can be moved longitudinally in their bearings, to bring the saws alternately in position for action. One end of each shaft is held in a bearing secured to the side piece of the frame, and the other end revolves in a bearing secured to a heavy bar sliding endwise in the main frame of the machine, for shifting the shaft and saw attached to it. Upon one of the moving bars is a rack with which meshes a pivoted toothed segment operated by a hand lever, to move the bar in either direction. This construction is clearly shown at the left in the engraving. The other moving bar is operated from the first one by a centrally fulcrumed lever, the ends of which enter recesses formed in the facing edges of the two bars. The belt from the driving pulley passes over the pulley on the shaft of the saw at the right hand, then around the pulley driving the second lower saw, then over the pulley on the upper shaft. In this manner of applying the belt the lower saws are revolved in opposite directions, both toward the center of the machine. The teeth of the saws are pitched toward the center, so that one will act when the log is carried in one direction, and the other when the log is moved back, the required saw being brought forward by operating the lever. The lower saws may be made with their teeth pitched in opposite directions, outward toward the ends of the machine, and revolved away from each other, so that they will cut in opposite directions when the log is moved back and forth. In this case the shafts are not shifted, and the saws revolve in the same plane. The top saw runs in the same plane with the saw that is moved out for action.

This invention has been patented by Mr. John P. Moore, of Snow Hill, Maryland.

The Transportation of Young Shad.

The United States Fish Commissioner's car recently arrived at Portland, Oregon, with a large consignment of young shad. It started with a million, but about three hundred thousand died *en route.* Half a million were placed in the Columbia River, at Wallula Junction, and the remainder in the Willamette River, at Albany. During the journey across the continent, the experiment was made of hatching the shad in the car while *en route*, and proved entirely successful. Six hundred thousand eggs were taken into the car at Havre de Grace, Md., and placed in four Macdonald jars. A pump was kept constantly at work moving the water to preserve its freshness. In addition, fresh water was obtained at every available point. During the nine days' journey, which covered a distance of 3,000 miles, fully 95 per cent of the eggs were hatched. Most of the loss was due to premature hatching.

These prairie-born shad have also been placed in the Willamette River at Albany.

HAY LOADER.

This hay loader collects the hay from the ground, raises it to a suitable height, and discharges it upon the hay rack of the wagon. The wheels are rigidly attached to the axle, to which, or to the spokes of the wheels, is secured a large drum. The ends of the axle revolve in bearings near the rear ends of side bars of a frame, the forward part of which is provided with a staple to engage with a hook attached to the rear end of a hay rack. To the upper ends of inclined and properly braced standards secured to the forward ends of the side bars, is journaled a small cylinder. Around the two cylinders are passed endless belts united by cross bars, to which are attached teeth having their outer parts curved forward slightly, so that they will take hold of the hay more surely, and carry it up the elevator and discharge it more readily at the upper end. Upon a cross bar uniting the rear ends of two bars pivoted to the ends of the axle are held the rake teeth, which are bent forward and then downward, and their lower parts are curved forward until the lower ends are near the ground beneath the axle.

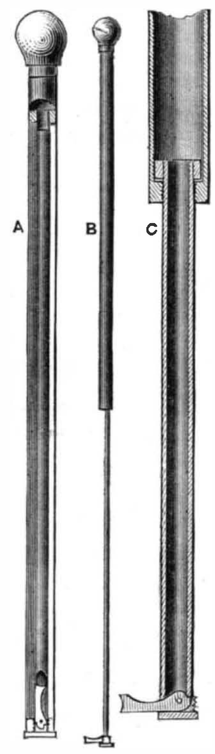
As the machine is drawn forward, the rake teeth collect the hay, and the carrier teeth carry it up over the small cylinder and discharge it into the hay rack. In the rear ends of the side bars of the frame are holes to receive a pin, by which the rake teeth can be raised more or less from the ground. When detached from the rack, the forward end of the machine is supported upon a hinged leg.

This invention has been patented by Mr. B. D. Spilman, of Fort Meade, Dakota.

SPILMAN'S HAY LOADER.

EXTENSIBLE CANE, ETC.

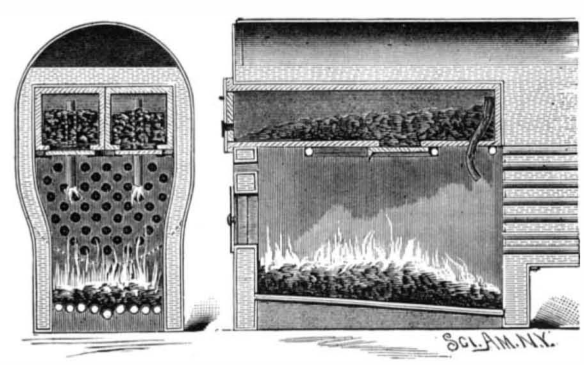
The object of this invention, patented by Mr. Arland H. Allen, of Red Wing, Minn., is to provide an extensible rod adapted to various uses, but more especially for closing the lids of outside burial cases after the cases are lowered into the grave. At the upper end of the tube forming the body of the cane is the usual head, and at the lower end is an internally threaded flange. Within this tube is a second one having a collar at its upper end and a cap at its outer end threaded to fit the flange. In a slot through the end of the inner tube and cap is pivoted a hook formed with a shoulder engaging with a shoulder on the tube, when the hook is unfolded as shown at C. When the rod is contracted, A, the inner tube is held within the outer one by the cap screwing into the flange. When the rod is extended, B, the inner tube is drawn out, so that its collar engages with the flange. The hook is then opened, C, so that it forms a right angle with the tube. The lid of the burial case is closed by bringing the hook into engagement with a staple projecting from the free edge of the lid. This device may also be used for reaching otherwise inaccessible objects in show windows and other places.



FURNACE FOR BURNING FINE COAL.

The accompanying views show a furnace for burning soft coal screenings, commonly known as "slack" or "culm," either alone or in combination with hard coal or coke screenings. This furnace is the invention of and has been patented by Mr. Anton Hardt, of Wellsborough, Pa. Above a firebox of ordinary form are placed two fireclay retorts, similar to those employed in gas works. In the bottom of each retort is an opening that may be closed by a slide, made of fireclay, and near the rear end of each retort is a fireclay tube, extending upward to near the top and downward within the firebox. The front ends of the retorts are closed by doors provided with peep holes. The fire is started in the usual way on the grate, and when sufficiently hot the retorts are charged with fine coal. After the coal has been converted into what the inventor terms "semi-coke," one of the slides is drawn forward by an implement inserted through an opening just below the retorts, when the coke drops down upon the fire, being shoved and drawn to the opening.

After one retort has been emptied it is refilled with fine coal, and as soon as required the second one is



HARDT'S FURNACE FOR BURNING FINE COAL.

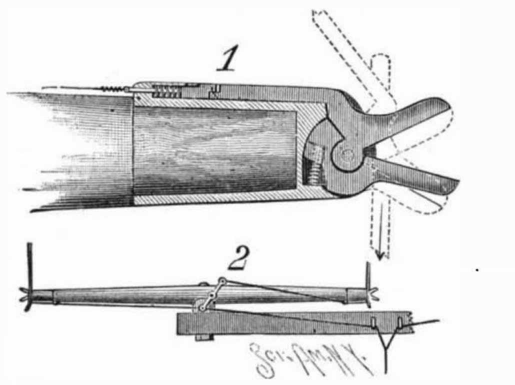
emptied and filled again, the retorts being used alternately. The gas driven out of the coal passes through the tubes into the firebox, where it ignites and furnishes additional heat.

Cleaning Petroleum Pipes.

The pipes by which petroleum is transported from the oil regions to the seaboard are cleaned by means of a stem 2½ feet long, having at its front end a diaphragm made of wings which can fold on each other, and thus enable it to pass an obstruction it cannot remove. This machine carries a set of steel scrapers somewhat like those used in cleaning boilers. It is put into the pipes and propelled by the pressure transmitted from the pumps from one station to another. Relays of men follow the scraper by the noise it makes in its progress, one party taking up the pursuit as the other is exhausted. They must not let it get out of their hearing, for if it stops unnoticed its location can only be established by cutting the pipe.

HORSE DETACHER.

The object of the invention herewith illustrated is to provide a simple and efficient device for releasing horses from vehicles in case of a runaway or accident. In a recess in the outer end of the ferrule on the end of the whiffletree are pivoted two arms, one of which is extended along the side of the ferrule, and has its end formed with a bevel and shoulder to receive the end of a bolt sliding in a socket, as shown in Fig. 1. A spring holds the bolt into engagement with the arm. A spiral spring tends to push a shoulder formed on the front or lower arm against a shoulder on the other arm. Normally, the free ends of the arms are separated, as shown in the full lines in Fig. 1; and when it is desired to place the traces on the arms, the



TEETER'S HORSE DETACHER.

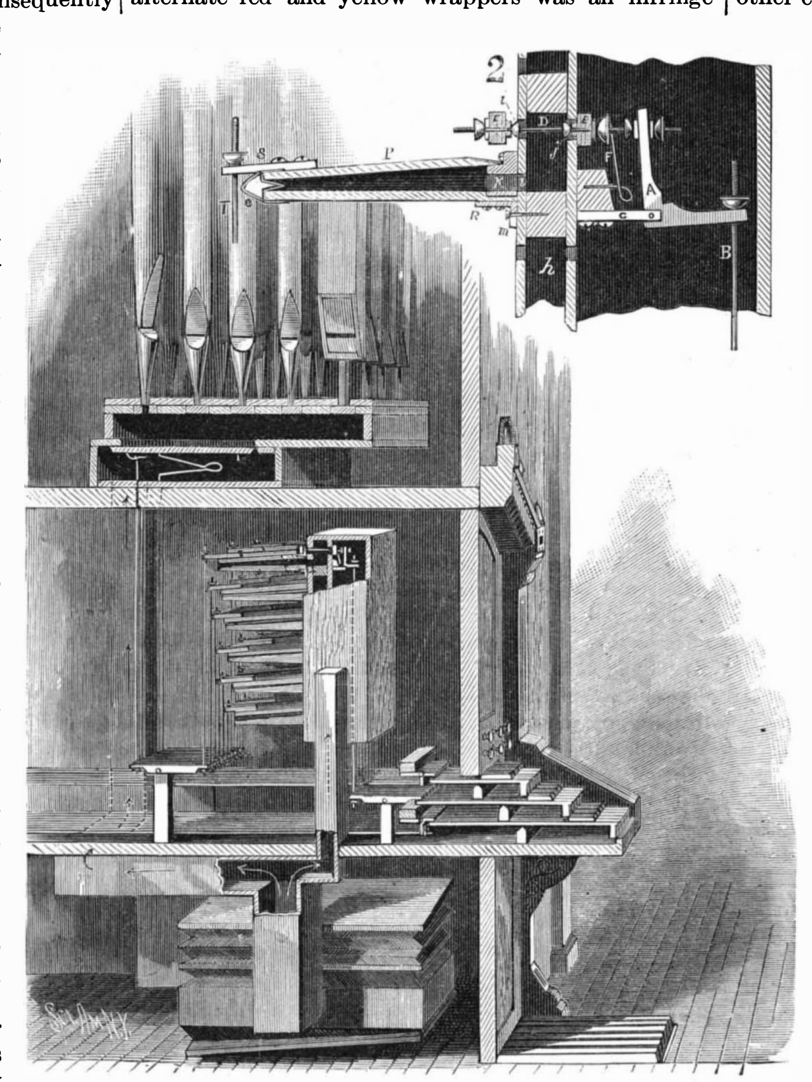
front one is moved toward the other, against the pressure of its spring, into position indicated by the dotted line, when the trace can be readily put on. The spring then forces the arm away and retains the trace in place. Near the middle of the singletree is an equal armed lever, that receives in its opposite ends the cords secured to the sliding bolts at opposite ends of the tree. These cords are led, as shown in Fig. 2, within easy reach of the driver. The strain of the traces comes mainly upon the upper or rear arm. By pulling upon the cords the bolts are withdrawn, and the rear arm, being released, is pulled into the position shown in the dotted lines, when the arms, being parallel, allow the traces slip from them.

This invention has been patented by Messrs. S. M. and C. A. Teeter, of Tuscola, Ill.

IMPROVED PNEUMATIC ACTION FOR ORGANS.

The pressure applied to the keys is resisted, especially in large organs requiring much wind and consequently large valves, by the compressed air in the wind chest and the valve springs. This resistance has been a source of trouble, as it affected the touch of the performer, and made the pressure required to depress some of the keys so great as to be fatiguing. To a certain extent, this annoyance has been overcome by means of pneumatic bellows, or comparatively small supplemental bellows in connection with the larger valves—those offering the most resistance—and under the control of the keys through the intermedium of levers, connecting rods, and valves, the smaller bellows being also in communication with the main bellows and shut off therefrom alternately as the keys were operated. The air pressure produced by the main bellows was thus utilized to aid the performer in opening those valves presenting the greatest resistance.

The accompanying engraving shows a pneumatic action—the invention of Mr. Ira Bassett, of 453 West Harrison Street, Chicago, Ill.—which is remarkable for its simplicity and compactness, for promptness of action, and for the ease with which it can be taken apart for repairs, if necessary, after years of use. The organ pipes are arranged upon the chest, as plainly shown in Fig. 1, and are controlled by means of slides, which constitute a part of the stop movement of the organ. The connections between these slides, the pneumatic bellows, and the keys are plainly shown in the engraving. The channel board, which constitutes the back of the chest, consists of an outer and inner wall, between which are diagonal strips and horizontal intersecting blocks that divide the space into separate compartments or comparatively small air chambers, *h*, as shown in Fig. 2, which is an enlarged view of one of the pneumatic actions. In the outer wall are two valve openings, *i i*, for each compartment, and in the inner wall is one opening, *j*, for each compartment.



BASSETT'S IMPROVED PNEUMATIC ACTION FOR ORGANS.

The lower side of the pneumatic bellows, P, is rigidly connected to a heel piece, *k*, in which is an opening, but the upper side is hinged. The rear ends of the two sides are connected by an infolded material, and the sides are constructed as usual to permit inflation. Too great inflation is prevented by a tape, *o*. The bellows are attached to the rear side of the channel board by means of angle plates, R, having slots, *m*, formed in their depending parts to receive screws, which hold the bellows firmly in place and yet permit of their easy removal. The opening, *k*, corresponds with the lower opening, *i*, in the compartment. The trackers, T, are joined to the small arms, *s*, applied to the expanding ends of the bellows. These trackers lead to levers connected with the slides in the chest.

Connected with the lower ends of the bell crank levers, A, are trackers, B, leading to levers operated by the keys. The other ends of the levers, A, are attached to wires, D, carrying the valves, E; these wires pass through the upper openings in each chamber. Springs, F, hold the inner valves closed and the outer ones opened. Depressing a key tilts the lever, A, opens the inner valve and closes the outer one, when the air in the chest enters the compartment, passes into and inflates the bellows. As the bellows is inflated, it raises the tracker, T, whose lever is tilted to draw down its other tracker, which moves its slide to allow wind to pass through and sound a pipe. The air producing this result is of course under pressure, the chest being in communication with the main bellows. When the key is released, the spring returns the valves, E, to their first position when the bellows exhausts, a spring at the same time closing the slide in the main wind chest. The air escapes from the bellows through its opening in the heel, *k*, and the open valve, E. The large view shows six sets of pneumatic actions, each one being similar to the one shown in detail in Fig. 2. As usually made, each row of pneumatic bellows has a chest for supplying air to the bellows and levers for operating the valves But by supplying air to the bellows by means of a vertically arranged channel board divided into chambers, as described, much less space is occupied, since the bellows are separated from each other only sufficiently far to permit of their inflation. By loosening one screw, *m*, the bellows can be removed.

A Trade Mark Decision.

The case of Davis *et al. vs.* Davis *et al.*, decided by the United States Circuit Court at Boston, arose upon a bill in equity filed by the plaintiffs to restrain the alleged infringement of their trade mark. The plaintiffs manufactured and sold what was known as "Welcome Soap," and the defendants what was known as "Davis' Old Soap." The plaintiffs, who had their trade mark registered under the laws of the United States, alleged that the arrangement by the defendants of the cakes of soap in boxes with alternate red and yellow wrappers was an infringement of their (plaintiffs') trade mark. The court in denying a motion for an injunction held that the registration, in so far as it could be interpreted to cover the sale of boxes of soap, was entirely void, for the reason that the object or thing included in the inscription was not such a thing as could be lawfully registered as a trade mark. The trade mark, the court said, must be something other than and separate from the merchandise. In reference to the claim that the trade mark consisted of the colors in the wrappers, the court said that this seemed to be no less than an attempt to claim a patent for an idea under the guise of the registration of a trade mark.

THE FLUTTERING FLY.

A very important article in the equipment of the sportsman who with rod and tackle essays to tempt the shy trout or black bass to exchange his icy brook for a soft bed of leaves in a fishing basket, is his assortment of artificial flies. Heretofore they have been arranged so that the fly headed toward the line. In this position the wings offer considerable resistance to the air when the line is being cast, and lie so close to the body when the fly is drawn through the water that the motion of a live insect is not very successfully simulated. A much more satisfactory arrangement is that just patented by Mr. Wakeman Holberton, of Hackensack, N. J., in which the fly or other bait is headed in the opposite direction, that is, toward the point of the hook, as shown in our illustration. When so arranged, the wings offer less resistance to the air in casting. As the fly is slowly drawn toward the angler the wings expand, and give it a fluttering, life-like motion, much more alluring to the fish. The patent for tying artificial flies in this manner is controlled by Messrs. Abbey & Imbrie, the well-known manufacturers of fishing tackle in this city.

Resting after Meals.

A friend of the writer's, who has suffered from dyspepsia during almost her entire life, considers the suggestions in the following extracts from an article in a recent issue of *The Journal of Health* to be the most in accord with her own experience of anything on the subject lately published.

Hurried eating of meals, followed immediately by some employment that occupies the whole attention and takes up all, or nearly all, of the physical energies, is sure to result in dyspepsia in one form or another. Sometimes it shows itself in excessive irritability, a sure indication that nerve force has been exhausted; the double draught in order to digest the food and carry on the business has been more than nature could stand without being thrown out of balance. In another case, the person is exceedingly dull as soon as he has a few minutes of leisure. The mind seems a dead blank, and can only move in its accustomed channels, and then only when compelled. This, also, is an indication of nervous exhaustion. Others will have decided pains in the stomach, or a sense of weight, as if a heavy burden was inside. Others, again, will be able to eat nothing that will agree with them; everything that is put inside the stomach is made the subject of a violent protest on the part of that organ, and the person suffers untold agonies in consequence. Others suffer from constant hunger. They may eat all they can, and feel hungry still. If they feel satisfied for a little time, the least unusual exertion brings on the hungry feeling, and they can do no more until something is eaten. It is almost needless to say that this condition is not hunger, but inflammation of the stomach. Scarcely any two persons are affected exactly in the same way, the disordered condition manifesting itself according to temperament and occupation, employments that call for mental work, and those whose scene of action lies indoors, affecting persons more seriously than those carried on in the open air and those which are merely mechanical and do not engage the mind.

All, or nearly all, of these difficulties of digestion might have never been known by the sufferers had they left their business behind them and rested a short time after eating, instead of rushing off to work immediately after hastily swallowing their food.

Nature does not do two things at a time and do both well, as a rule. All know that when a force is divided, it is weakened. If the meal were eaten slowly, without preoccupation of the mind, and the stomach allowed at least half an hour's chance to get its work well undertaken before the nervous force is turned in another direction, patients suffering from dyspepsia would be few.

A physician once said: "It does not so much matter what we eat as how we eat it." While this is only partly true, it certainly is true that the most healthful food hurriedly eaten, and immediately followed by work which engages the entire available physical and mental forces, is much worse than a meal of poor food eaten leisurely and followed by an interval of rest.

PHOTOGRAPHIC NOTES.

Decline in the Price of Magnesium.—Owing to the great sensitiveness of the present dry plates, a new field has been opened for the use of magnesium ribbon in furnishing an actinic artificial light whereby pictures can be readily secured at night. This, together with improved and cheaper methods of producing it, has recently led to a marked decline in the price. The fall in England has been from 15 shillings to 2 shillings and 6 pence per ounce, or nearly seven times cheaper than formerly.

It is probable that the same product will be sold in this country at the rate of 75 cents per ounce instead of $3, as heretofore.

For obtaining a uniform actinic light in the making of enlargements and positive prints on gelatino-bromide paper, the magnesium ribbon is unexcelled. It will, in fact, be as cheap, for this purpose, as common gas. The reduction in cost is likely to bring the metal into more extensive use for photographic purposes.

Simple Remedy for Frilling.—For plates inclined to frill, Mr. A. L. Henderson, of London, recently suggested the following plan, which we find in the *British Jour. of Photo.* After exposure and prior to development he flows over the plate a solution of gelatine and water (5 grs. of gelatine to each ounce of water), and allows it to dry.

Then the plate is put in the developer, and frilling will be prevented; the additional film of gelatine does not in the least affect the action of the developer. By a simple experiment, he discovered the value of this remedy. Taking a plate which was cast aside because of its frilling tendencies, he coated half of it with the gelatine. When placed in the developer, the portion not protected at once frilled to an extraordinary degree, while the part coated with gelatine remained smooth and unaffected.

Reproducing a Brilliant Negative from one that is Overtimed.—In the *American Journal of Photography* appears a practical account by Mr. Wm. H. Rau of his plan to obtain good duplicate negatives from a poor original, as follows:

We had made upon large plates exposures of the interior of a handsomely furnished room, especially arranged for the occasion; and imagining that we had given the correct time or near it, and not for an instant suspecting an overexposure, we confidently placed the plate in the normal developer. The image did not begin to appear at once, but almost immediately on its appearance began to overcast. We at once saw that the exposure was probably four times as much as it should have been. We were anxious to save the plate, as the conditions for making another exposure were no longer possible.

It was very tame and flat, but full of detail. We added more pyro. and bromide, in order to give it the density necessary for printing, and, when sufficient strength was had, fixed it in the usual manner.

We then resorted to the following means for getting a brilliant picture by reproducing the negative.

We took a rapid plate, and exposed it for one second under the negative to the light of an ordinary gas flame, at a distance of 18 inches.

Great care was necessary in developing this positive, and we used the following proportions of developer, to secure as much contrast in the impression as possible.

We made the following solutions:

A.

Water	10 oz.
Crystallized sulphite soda	2 oz.
Carbonate potassa	4 oz.
Water to make up to 16 oz.	

B.

Water	10 oz.
Sulphite soda, cryst	2 oz.
Sulphuric acid (added slowly)	1 drm.
Pyrogallic acid	1 oz.
Water to make up to 16 oz.	

Of these solutions we took of:

A	1½ drms.
B	6 drms.
Water	6 oz.
Solution of bromide potassium (20 grs. to oz.)	1½ drms.

The development proceeded slowly, and gradually built up a vigorous and plucky positive, full of detail and crispness.

We then used this positive to reproduce the negative, employing a rapid plate, giving the same exposure, and using the same developer.

The final negative had all the appearance of a properly timed plate.

In connection with the above, it may be of interest to know the value of Farmer's solution as a local reducer of too great intensity, either in a negative or print.

It consists of a mixture of hyposulphite of soda and ferrid cyanide of potassium, commonly called red prussiate of potash.

A solution of each is made of equal strength, say one ounce to a pint of water; when used, one-half drachm of the ferrid cyanide is added to one ounce of the hypo, the negative is plunged in the solution, and as the high lights are attacked first, they may be effectually reduced before the shadows are touched.

The solution may also be used for reducing overprinted photographs upon paper without affecting the tone in the least.

Simple Apparatus for Making Lantern Slides.—At a recent meeting of the Photographic Society of Philadelphia, Mr. C. R. Pancoast, according to a description published in the *American Journal of Photography*, explained a simple way of copying transparencies from negatives. Upon a board he had hinged a frame held in an upright position at right angles, and on the frame were two parallel strips, sliding vertically, provided with grooves for receiving the glass plate. The strips could be used to approach each other by sliding up and down on the frame, and thus accommodate different widths of plates. On each face of the frame was marked a scale commencing from 0 (naught) at the center to inches on each side. In this way a negative could be quickly centered, and any portion of it could be readily brought to the center, or opposite the lens. The camera was placed on the board behind the negative frame, the space between the latter and the camera being covered by a dark cloth. The apparatus was easily made, and at the same time was simple and effective.

House Bill 4,458.

The following is the text of a bill introduced in the House of Representatives, January 26, 1886, by Hon. R. W. Townshend, of Illinois:

A bill to limit the jurisdiction of United States courts in patent cases, and to protect persons who, without notice, are *bona fide* manufacturers, purchasers, vendors, and users of articles, machines, machinery, and other things for the exclusive use, manufacture, or sale of which a patent has been or may hereafter be granted.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That hereafter the United States district and circuit courts shall have no jurisdiction to hear or to try any case arising from the actual use of any patent right, or its infringement by such use, by any person in or citizen of the United States or the Territories, wherein the amount in controversy does not exceed two hundred dollars against one person or citizen.

SEC. 2. That purchasers of any patent right for actual use shall not be liable to damages, royalty, or for value of the same, or for infringing the same in any manner, who at the date of such purchase had no knowledge of the claims of any third person, or that the inventor of the same has an interest therein adverse to the seller thereof. That no person who shall in good faith purchase, use, manufacture, or sell, without previous knowledge of the existence of a patent therefor, any article, machine, machinery, or other thing for the exclusive use, sale, or manufacture of which any patent has been or hereafter may be granted to any person, persons, or corporation whatever, shall be liable, in damages or otherwise, for an infringement of such patent until after written notice of the existence thereof shall have been personally served on such person or persons or corporation, as the case may be, and such infringement shall be thereafter continued.

SEC. 3. That all laws or parts of laws inconsistent herewith are hereby repealed.

SEC. 4. That nothing herein contained shall affect any pending suit or proceeding in any of the courts of the United States or in any court of any of the several States.

Improvements in Heliogravure.

The art of heliogravure, writes Herman Reinbold in the *Inland Printer*, has been brought to great perfection lately. The processes have not only been simplified, but the results obtained have been more satisfactory, and the cost of printing cheapened. Some of these methods and improvements obtained are hereby described.

HELIOTYPEGRAVURE FOR SIMPLE LINE WORK.

This process is very valuable for the reproduction of lithographs, steel or copper plate prints, especially when the subject is to be reduced. The zinc plate, after having been well washed and polished, is coated with a solution of 100 parts of water, 10 parts of gelatine, 25 parts of honey, 8 parts of bichromate of potash, or 12 ounces of water, 2 ounces of sirup or molasses, 4 drachms of bichromate of ammonia; and dried in a strong heat.

A reversed negative is laid on the surface of one of these plates, and exposed for four or five minutes to sunlight. When it is printed, the plate is taken out and exposed to steam, which is done best by holding it over a pan containing boiling water. It will then be noticed that the parts not exposed to the light will get moist, while the other remains dry. The moist places will now take emery powder, which is put on the surface with a fine camel's hair brush, while it will not stick on the dry places. The plate is now dried once more, and this surface placed in contact with another plate of type metal or zinc, which is put under hydraulic pressure. By this procedure the emery powder will be pressed into the metal, and there produce a fine grain. From this plate impressions can be printed the same way as is done in steel plate printing.

MEZZOTINT HELIOGRAVURE.

The plates are prepared in the same manner, and a good negative (half tone) placed on it. Now expose for one minute in full sunlight, putting the plate under a right angle to the rays. The light will change only the lightest parts under the negative, and consequently only these will remain insoluble, while all the rest will take the emery powder. After having the plate dried, the impression is made on the printing plate, whereupon the film is taken off, and a new coating given to it. It is then exposed under the same negative for two minutes, dampened, and dusted with emery powder, and a second impression made on exactly the same place where the first impression was made. This will bring out the middle tints. A third exposure for three minutes on print and impression will make the darkest parts, and the plate is ready to be printed from. Care has to be taken to get all three impressions on the same place, to get the picture exact, and if this is done, the effect is surprising.

ATMOGRAPHY.

Under this name a new process has been brought out in France, by which it is made possible to get the printing plate right in the camera, thus saving the trouble of making a negative, and though a little more expensive, saves time and gives better results than copying.

The action of the light on chrome salts is very slow, compared with its action on silver salts; its action on the former being due to the decomposition of the alkaline salts into a simple chrome salt and chromic acid. It has recently been discovered that bichromate of lithium decomposes about as quick as nitrate of silver. A zinc or copper plate coated with the following mixture, and exposed like a negative for the same time as is given by the wet plate process, will give very satisfactory results: 4 ounces water, 1¾ ounces albumen, 2 drachms bichromate of lithium.

The solution must be kept in a well corked bottle, and will not be valuable longer than two weeks.

After the plate has been exposed it should be immediately placed in cold water, and afterward in a fifteen per cent solution of sulphuric acid in water; again washed, and then placed in a vessel containing a bicarbonate of soda solution. The unnecessary moisture should next be taken off with a wool roller, and the plate covered with lithographic or etching ink, and dusted with asphaltum and heated. The back should then be covered with asphaltum, and etched slowly with sesquichloride of iron in alcohol until sufficiently deep. The plates made in this manner can be printed on a steam type-printing press.

The Last of the Old Handloom Weavers.

In the manufacturing districts of the West Riding of Yorkshire the handloom will soon be as rare as is now the spinning wheel or the "tummer." Not often in these days is heard through the open cottage door the click-clack of the shuttle and the rattle of the "yelds," or the soft thud of the beam closing up the weft. Seldom will the traveler (says the *Pall Mall Gazette*), in the dark afternoons and long evenings of winter, be puzzled by the quick and regular glancing of candle gleam through the blindless casements, as the to and fro motion of the weaver's beam alternately hides and reveals the light within, reminding the beholder of the revolving ray of a lighthouse in its sudden appearing and disappearing, except that the alternation is much more rapid. In the former times, when with the dark days of winter "waking and water porridge" began—a local phrase which expresses more than can be concisely explained—on many a hillside there might be seen these lights of the loom flashing and fading in quick exchange, like the dancing of Jack o'lanterns in the valley below; here for a few moments a steady gleam, while the weaver refilled his shuttle or "took up" a broken thread, and then again the quick exchange of gloom and gleam. Nowadays we do not, without some surprise, meet man or woman, lad or lass, with the donkey, "going a-bunting"—which to the uninitiated may be explained simply as carrying to the weaver's home the warp and weft to be woven, and again carrying back the completed piece of cloth. Very, very rarely is a man or woman seen with the leathern strap across the forehead and the huge burden—bigger far and heavier than any illustrator has ever ventured to place on the poor Pilgrim's back—weighting the step and bending the back.

Arizona Alum.

According to the Clifton (Arizona) *Clarion*, Graham county in that section has a valuable alum deposit. As exposed, the entire face of the bluff for at least 500 feet is a solid bed, chief part of pure alum, though in other parts highly impregnated with copper. As it appears on the face of the bluff, it is a mixture of quartz, iron, and copper, but as the hill is penetrated the quality improves in purity The vein proper, or that which carries the larger percentage of alum, cuts through the mountain and is plainly visible from a distance. The trend of the vein deposit is northwest and southeast, although no trace of the mineral is found on the east side of the creek. In many places the deposit closely resembles the carbonate beds which occur in Nevada, especially in the Eureka district. The mass is solid where not exposed, and will require blasting. Pockets are found frequently almost of pure alum, nearly up to the standard of the marketable commodity.

The Tunnels of the Ancients.

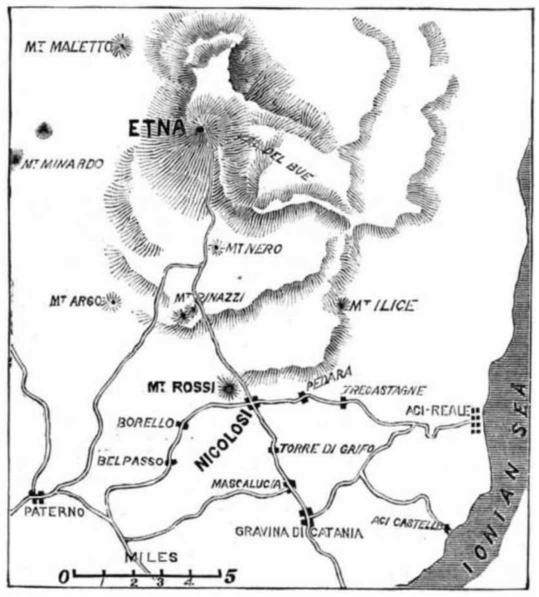
Leaving Naples by carriage, the road immediately leads through a tunnel three-quarters of a mile long, and cut right through a mountain eight hundred feet high. This tunnel is driven through a volcanic tufa. This tunnel of Posilippo, as it now exists, was cut through only twenty-seven years before Christ. Augustus Cæsar's great minister of public works, Marcus Agrippa, made the present tunnel, or he may have enlarged it from a smaller one that answered the commercial communications and necessities of the days before the Empire. This tunnel is to-day the great highway to the heart of Naples, as it has been for more than 1,900 years. The great Appian way ran to Capua, within thirty miles of Puteoli; thence this magnificent Roman high road, under the name of the Consular Way, was continued to Puteoli, and the then Consular Way pushed on through Neopolis, Herculaneum, Pompeii, Stabia, Nucera, Salernum, Paestum, down to Rheulm. This tunnel of Posilippo was formerly called the grotto or tunnel of Puteoli. The ancients began their perforations at each end, and also from above, in two places equidistant from the termini of the tunnel. The guide-books, both Murray and Baedeker, tell that the shafts from above were made by Alfonso I., in the fifteenth century, which is altogether wrong. No less than four tunnels of Roman construction existed in the vicinity of Naples, and they, all of them, even the latest, rediscovered and open in 1842, have shafts from above.

The Romans were great road, tunnel, and bridge builders, and we have never yet given their engineers half the credit which we should for their great science and skill. Nowhere, not even in the city of Rome or on the Roman Campagna, are there so many evidences of their engineering skill as are to be found in the vicinity of Naples. At the recent meeting of the British Association of Science, held at Aberdeen, Scotland, Mr. B. Baker, an eminent British civil engineer, read a paper recalling certain engineering feats of the ancients. Mr. Baker says: "I have no doubt that as able and enterprising engineers existed prior to the age of steam and steel as exist now, and their work was as beneficial to mankind, though different in direction. In the important matter of water supply to towns, indeed, I doubt whether, having reference to facility of execution, even greater works were not done 2,000 years ago than now. Herodotus speaks of a tunnel eight feet square and nearly a mile long, driven through a mountain in order to supply the city of Samos with water; and his statement, though long doubted, was verified in 1882, through the abbot of a neighboring cloister accidentally unearthing some stone slabs. The German Archæological Society sent out Ernest Fabricius to make a complete survey of the work, and the record reads like that of a modern engineering undertaking. Thus, from a covered reservoir in the hills proceeded an arched conduit about 1,000 yards long, partly driven as a tunnel and partly executed on the 'cut and cover' system, adopted on the London underground railway. The tunnel proper, more than 1,100 yards in length, was hewn by hammer and chisel through the solid limestone rock. It was driven from the two ends like the great Alpine tunnels, without intermediate shafts, and the engineers of 2,400 years ago might well be congratulated for getting only some dozen feet out of level, and little more out of line. From the lower end of the tunnel branches were constructed to supply the city mains and fountains, and the explorers found ventilating shafts and side entrances, earthenware socket-pipes with cement joints, and other interesting details connected with the water supply of towns."

This tunnel of Posilippo is also a fine specimen of ancient engineering. Millions of human beings have each year, for nearly twenty centuries, passed through it. Roman chariots and other ancient vehicles have left their autographs scraped and scratched into the lining stone, and modern wagons and carriages still rub their hubs against it, leaving their traces for generations to come. Strabo wrote about this tunnel. Seneca described his passage through it. Petronius satirized it, and Petrarch, Boccaccio, Cappaccio, and more modern writers have told us their thoughts about it; and it seems good for a thousand years to come. Virgil's tomb is just above its eastern entrance, and his farms (where he wrote part of both the "Georgics" and the "Æneid") are over it.

ERUPTION OF MOUNT ETNA.

On May 17 an eruption of Mount Etna began, which, according to the latest dispatches from Catania, Sicily, is daily increasing in proportions, and now threatens destruction to a number of the villages scattered over the lower slopes of the mountain. Vast volumes of flame and torrents of lava are issuing from 11 of the smaller openings to the south of the main crater, and in the neighborhood of Monti Rossi. Earthquake shocks are constantly occurring. A stream of lava, in some places 200 meters broad, flowed toward the town of Nicolosi, advancing at the rate of 40 meters an hour. At last reports, it was within one kilometer of the town,



and has in all probability repeated the violence of former years. The adjacent country has been desolated over large areas, and the people forced from their homes. All the streams and water courses in the district have dried up, and a water famine prevails.

Mount Etna, or, as the Sicilians commonly call it, Mongibello, is one of the most celebrated volcanoes in the world. It is situated on the eastern seaboard of the island of Sicily. Its name signifies the burning mountain, and was known to the earliest classical writers, by whom it was invested with many legendary terrors. To them it was the prison of the fabled giant Enceladus. The flames were his breath, the thundering noises his groans, and, when he turned on his side, earthquakes were the vibrations produced by his ponderous frame. The ancients had very exaggerated notions of the size of the mountain, and computed its height at three and even four miles. As recently determined by the Italian Government, its true height is 10,868 feet. It must, however, be remembered that the cone of a volcano is far from constant in its dimensions, a diminution of more than 300 feet having been produced by a single eruption. The impressiveness of its elevation is due largely to the fact that it rises directly from the sea, while few of the interior peaks attain such a height above their respective plateaus. From the summit, the radius of vision gives an included area of 39,900 square miles. The circumference of the mountain is approximately 91 miles, and its area 480 square miles. The accompanying illustration represents Mt. Etna as seen from Catania, Monti Rossi and Nicolosi being on its southern slope. The map shows their respective locations.

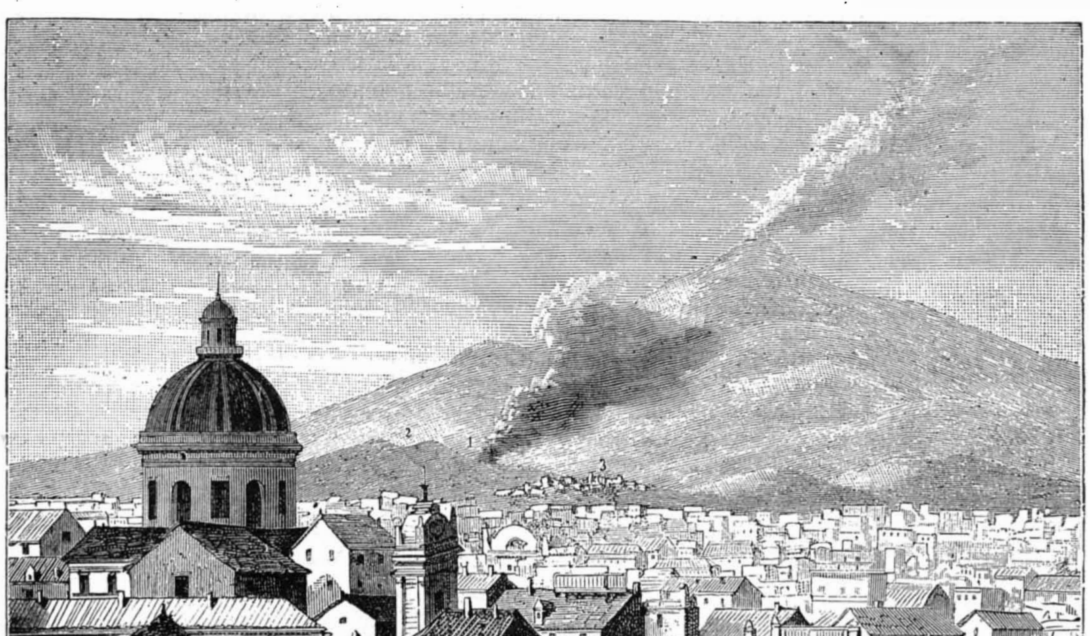
There are two cities, Catania and Aci Reale, and 63 villages on the mountain. In spite of its tragic history, Mount Etna is far more thickly populated that any other part of Sicily or Italy, no less than 300,000 persons living within its area. Its general aspect is that of a pretty regular cone with very gentle slopes. On the eastern side, the uniformity is broken by an oval valley, four or five miles in diameter, called the Val del Bue. It is bounded on three sides by nearly vertical precipices, from three to four thousand feet high, and is entirely sterile.

The mountain itself is divided into three distinct regions. The lowest of these, the *Coltivata*, is extremely fertile, and produces an abundance of semi-tropical fruits and grains. When decomposed, the lava makes a very rich soil. This zone covers the entire base of the mountain, and extends to an elevation of about 2,000 feet. Above this is the *Selvosa*, or woody region, which is covered with large forests. From its upper limit, at a level of 6,300 feet, to the summit is the *Deserta*, a dreary waste of ashes and lava. For a large part of the year this remains permanently covered with snow. A characteristic feature of Mount Etna is the large number of secondary cones scattered over its sides. There are at least eighty of these cones which possess some prominence. If one counts the monticules, there are between six and seven hundred.

The first eruption of the volcano within the historic period happened during the seventh century B. C. Since that time we have a record of seventy-eight different eruptions, many of which, however, have been of a comparatively harmless character. One of the most disastrous of the earlier eruptions was that of 1169. A violent earthquake destroyed Catania in a few minutes, burying 15,000 people beneath the ruins. In 1669 another terrible outburst occurred. Nicolosi was entirely destroyed. An immense stream of lava poured down the sides of the mountain. On reaching the walls of Catania, it accumulated without progression until it rose to the top of the wall, a height of 60 feet, and poured into the city in a fiery cascade. The lava flood covered at least 40 square miles of territory. In 1693 Catania was again destroyed by an earthquake, and in all Sicily between sixty and a hundred thousand people lost their lives. On the 26th of August, 1852, a very violent eruption occurred, which lasted for nine months. A party of English tourists were climbing the mountain at the time, and had a very narrow escape. The mass of lava ejected during this period is estimated to be equal to an area six miles long by two broad, with an average depth of twelve feet.

In 1864 earthquakes were frequent, and in 1865 an eruption of some violence took place. After that the mountain remained in a quiescent state until March 20, 1883, when an outburst occurred in almost the same locality as the destructive eruption of 1669. It created great consternation, but the phenomena ceased on the third day without causing damages. The present eruption occurs in almost the same part of the mountain, and were it not for the interval of time which has elapsed, could readily be considered a resumption of the hostilities then begun.

Geologically, Mount Etna is somewhat older than Vesuvius. Lyell states that its formation probably began in the newer Pliocene period.



1. Place of the Eruption. 2. Monti Rossi. 3. Village of Nicolosi.

ERUPTION OF MOUNT ETNA, MARCH 22, 1883.

Another Inventor Gone.

Mr. E. F. Loiseau, formerly of Philadelphia, and well known as an inventor of a practical method of making compressed artificial fuel, died in Brussels, Belgium, on the 30th of last April.

Mr. Loiseau was enthusiatic on the subject of compressing coal dust with adhesive substances for fuel, and he went abroad several months ago to erect machinery at some Belgian collieries for the manufacture of fuel from the coal waste. A short time before his death, he wrote home that he had been obliged to bury his machinery to prevent its destruction by the infuriated laborers, who objected to the introduction of his machinery in the mining districts.

THE latest invention in hat lining is a map of the city of London printed on silk, so that any stranger or gay young fellow may find his way home or see at a glance if cabby is taking him the nearest route to his destination.

Steamers to Run Fifty Miles an Hour.

At a recent meeting in London of the Society of Junior Engineers, Westminster, a paper was read by Mr. C. Hurst, explanatory, among other things, of the power necessary to obtain a speed of 40 knots in steam vessels. Mr. Hurst explained that the power necessary to be introduced into steamers of light construction in order to obtain any required speed could not be determined by the old method of reckoning the resistance as proportionate to the midship section, but was to be ascertained by Reech's law, taking the actual speed and proportions of a first-class torpedo boat as the basis of comparison.

According to Reech's law, the speed attained by a model with any given power will illustrate the speed attainable in a large vessel having the same proportion of power, the speed of the large vessel being in all cases greater than that of the small in the proportion of the square root of the increased dimensions. Thus, if we take a first-class torpedo boat for our model, 110 feet long, 12 feet broad, and 6 feet 3 inches draught of water, and 52½ tons displacement, the speed, with 470 horse power, will be 21¾ knots, and these elements will enable us to determine what the speed of a vessel would be of the same form and of the same proportionate power, but three times larger every way. Such a vessel will be 330 feet long, 36 feet broad, and 18 feet 9 inches draught of water; her displacement will be 3^3 or 27 times greater, or it will be 52½ × 27 = 1,417½ tons. As each 52½ tons displacement must have 470 horse power, the total power will be 470 × 27 = 12,690 horse power. We shall then have two vessels in all respects identical, except that one is constructed on three times the scale of the other.

Although, however, the power is strictly proportionate in the two cases, the speed will not be the same, but by Reech's law the larger vessel will be the faster in the proportion of the square root of 1 to the square root of 3, or 1·732 times. If, then, the speed of the smaller vessel be 21¾ knots, that of the larger will be 21¾ × 1·732, or 37·6 knots per hour. If we take the larger vessel as four times the size of the smaller, the speed, with the same proportionate power, will be twice greater, or it will be 21¾ × 2 = 43½ knots per hour. The power necessary to attain this high speed will be 4^3 or 64 times 470 = 30,080 horse power. The displacement of the larger vessel will be 4^3 × 52½ = 3,360 tons, and the displacement due to the machinery will be 805·71 tons, taking the weight at 60 pounds per horse power, as in Thorneycroft's engines. The total number of horse-power required will be 470 × 4^3 = 30,080 horse power. The displacement will be 134·4 tons per 1 foot of draught. The weight of the machinery will therefore increase the immersion by 5·9 feet; and if we take the weight of the hull as equal to the weight of the machinery, the draught of water with water in the boilers and the vessel ready for sea, except coal and stores, will be 11·8 feet, leaving a balance of 13·2 feet for coal and stores. If we take the consumption of fuel at 2 pounds per horse power per hour, the consumption of coal will be 26·8 tons per hour for 30,080 horse power; and if we take the speed of the vessel at 43½ knots per hour, equal to 49·4 statute miles, the time required for a voyage of 3,000 statute miles in length will be 3,000 ÷ 49·4 = 60·8 hours. Consumption of coal to be provided for will be 26·8 × 60·8 = 1,629·44 tons as total consumption for the voyage.

This weight of coal will depress the vessel 12·12 feet, which brings up the draught to 23·92 feet, leaving a margin of about 150 tons for extra fuel and for stores. The result of the whole calculation is to show that a speed of 40 knots, or thereby, is attainable on an Atlantic voyage with a vessel of moderate size and light construction and without any inordinate consumption of fuel; and it rests, says Mr. James C. Paulson, in the *Engineer*, with those who challenge the accuracy of this computation to show wherein it is erroneous, if they can. In merchant vessels advantage has not hitherto been taken of the quality of lightness for the attainment of high speed, and it is important that this essential condition should now be taken into account.

Calorific Power of Coal Gas.

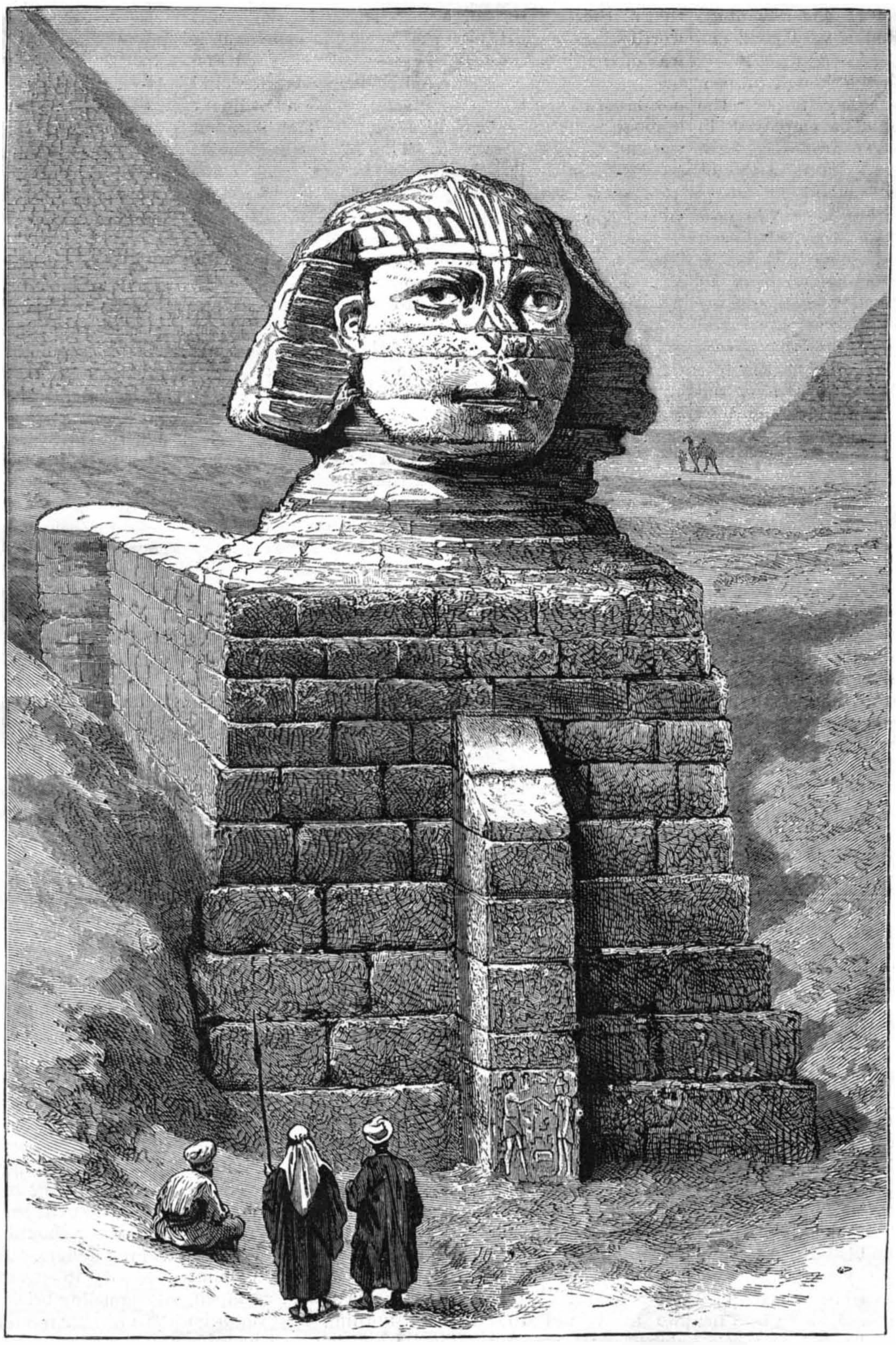
The *Annales de Chimie et de Physique* recently contained a description, by M. Witz, of his experiments for determining the calorific power of coal gas. The method pursued was that of Berthelot, and consisted in the instantaneous combustion of an explosive mixture in a shell plunged in the water of a calorimeter, the elevation of the temperature of which could be exactly measured. A number of trials led to the determination, for a well-purified gas, of a calorific power of 5,200 calories per cubic meter of gas at 0° temperature and 760 millimeters pressure, saturated with aqueous vapor. This result was obtained from a gas mixed with six times its volume of air. Before passing through the scrubber and purifier, the same gas had a calorific value of 5,600 calories; so that it lost something by purifying. If the heat developed by the explosive mixture of one volume of gas and six volumes of air is taken as the standard for comparison, it is found that the same gas gives 5 per cent more heat when fired with 1·25 volumes of oxygen. With 11 volumes of oxygen, on the contrary, the calorific power is less by 4·6 per cent. It, therefore, decreases with dilution in oxygen. It is not so when gas is mixed with air. When diluted with 11 volumes of air, the calorific value is greater by 2·5 per cent. than when the gas is mixed with only 6 volumes of air. Thus the effect of the extra dilution is inversely to what might have been expected upon general principles.

THE EGYPTIAN SPHINX.

For some months past, excavations have been carried on at Ghizeh, near Cairo, with the view of freeing the famous Egyptian Sphinx from the masses of sand which have gradually buried the monument. M. Maspero, the Director of the Boulak Museum, has superintended the operations, which have proved remarkably successful, and in a recent letter he states: "The result is beyond all my hopes. The face, raised fifteen meters above the surface, is becoming expressive, in spite of the loss of the nose. The expression is serene and calm. The breast has been a good deal injured, but the paws are almost intact. We have nearly reached the limits of the diggings of Mariette and Caviglia. The work now going on is in beds of sand, which have not been disturbed since the first centuries of our era." Later he writes: "The stones of the right paw are covered with Greek votive inscriptions, while the left have none—an indication that the piety of the faithful was called into play more on the south side."

Accordingly, M. Maspero thinks that there might have been direct communication between the Sphinx and the granite temple to the south, and that in the intervening space either an unknown chapel may be concealed or some group of statues, such as Mariette discovered at the Serapeum. Another important question to be solved by excavation is whether the Sphinx rests on a bed of rock or on a specially hewn out pedestal. Egyptian sculptors represent the Sphinx on a pedestal ornamented with designs similar to those on early sarcophagi; and if their representation prove true, there is a prospect, according to M. Maspero, of finding the door of a temple or a tomb on the eastern side.

In this case the pedestal may have been buried by the time of the Roman occupation, and the Ptolemies may have erected their monumental stair over the sand which covers it. This question will be decided when M. Maspero unearths the first steps. Our illustration is from a sketch by Mr. Charles Royle, Alexandria.—*The Graphic.*



THE GREAT SPHINX AS NOW CLEARED FROM THE ENCUMBERING SAND.

The Mercurial Preventive of Phylloxera.

Prof. E. W. Hilgard, of Berkeley, Cal., in a note to *Science*, says: It appears perfectly practicable to protect vines planted in uninfested ground from attack coming from without, by surrounding the stocks with a sufficiently thick (eight to ten inch) layer of mercurialized soil, which, without obstructing or repelling the entering insects, will insure their being fatally poisoned before they can pass through it. This would leave the choice between grafting on resistant stocks on the one hand and the mercurial protection on the other, in the planting of new vineyards, the cost being (in California) about the same in either case; it would also serve for protection against threatened invasion, in the case of vineyards already planted, since, apart from the case of open soil cracks giving access to the vine roots, the stocks are the only known route by which the phylloxera reaches the root. Such are the presumptions created by our small scale experiments; how far the process will prove available in large scale practice remains to be determined by experience.

As regards, however, the treatment of ground and vines already infested, our experiments tend to show that the diffusion of the mercurial vapor is too slow, at the ordinary soil temperatures, to promise success; especially in the case of clay soils, which absorb and render inert a large amount of mercurial vapor before an effective excess can be obtained. It has been abundantly shown that the mercurialized soil exerts no unfavorable action upon the growth of the vine; and there is every reason to expect that an application once made will remain effective during the life of the vine.

Steam Lifeboats.—An Opportunity for Inventors.

During the last meeting of the Institute of Naval Architects, the question of using steam lifeboats was made the subject of a very interesting and useful discussion. Messrs. Benjamin and Taylor have designed a very ingenious steam lifeboat, and they read a paper describing it, and exhibited a model. The boat in question is, of course, intended to be unsinkable, and, as we understand the description, she is also to be uncapsizable. A shallow hull has a rounded structure built up on top of it, within which the rescued crew of a ship are to find shelter, safety, and even a warm bath. Propulsion is effected by screws under the bottom of the boat, and partly incased in semicircular tunnels, excavated, so to speak, in the floor of the hull. So far as can be seen, the craft does not possess any of the characteristics that a lifeboat, as the term is now understood, has. But, whatever the defects of the scheme, it possessed the advantage that, as we have said, it elicited a very good discussion.

It can hardly have failed to strike thoughtful people that oars and men are in many respects the worst propelling agents that could be employed in working a lifeboat; and numerous proposals have been made for using steam instead. It is of the utmost importance that a lifeboat should get alongside a wreck as soon as possible; but hours are now spent in pulling from the shore to a wreck, when each minute may mean a life lost. Indeed, so fully is the inadequacy of manual power recognized, that at all large and important lifeboat stations, such, for example, as Ramsgate, the lifeboat is invariably taken out by a tug steamer to windward of the wreck, down to which the lifeboat then drops. When a rescue has been effected, her sails are hoisted and she runs for a port. But there are dozens of lifeboat stations where no tug is available; and in not a few cases the lifeboat has been unable to do any good, simply because she could not be rowed or sailed to the wreck. It is not too much to say that if lifeboats could be provided with steam power, a very large number of lives now lost each year would be saved. There is consequently the greatest possible stimulus to invention, and nothing, we believe, but the utter hopelessness of the task has prevented inventors from solving the problem set before them. No doubt the magnitude and exceeding difficulty of the problem are not fully realized. Captain Chetwynd, of the National Lifeboat Institution, a man of over thirty years' special experience, set these difficulties very clearly before the Institute of Naval Architects, and when he sat down his hearers must have felt certain that whatever power may yet be used for the intended purpose, steam cannot be employed. Captain Chetwynd explained that none but those who have, like himself, been personally engaged in lifeboat work can form any adequate conception of the force and fury of the waves on, for example, the Goodwin Sands. It is easy to talk about metacenters, and centers of gravity, and buoyancy; but in a heavy confused sea the laws of stability seem to be in abeyance. Over and over again, a 30 foot lifeboat stands literally on end against a sea. On two occasions, lifeboats have been turned clean over endwise. To say that they roll their gunwales under is nothing. The motion in them is simply inexpressibly violent, and apparently taking place in every direction at once. Apart from this, the seas continually break into them with tremendous violence. "When," said Captain Chetwynd, "I have often urged a boat's crew to go off in a heavy gale, they have met my expostulations with the argument, 'Our backs would be broken by the seas falling into the boat.'" He had experience of cases in which a breaker has tumbled over the bows of a boat, without the slightest injury to men forward of midships, while the men in the stern were maimed or disabled by the smash of tons of water into her stern; those forward being saved by the sea leaping clean over their heads. In addition to this, the boat must not draw 3 feet, or she cannot get through the shallow water of breakers to go alongside a wreck. On the Goodwin Sands, the lifeboats on a draught of but 3 feet are constantly thumped down on the bottom when they get in the trough between two waves. The graphic picture drawn by Captain Chetwynd places the indomitable courage and hardiness of our lifeboat crews in a stronger light than ever. Most of his hearers for the first time in their lives realized the character of the work done night after night on our coasts, and the wonderful qualities of the boats themselves. The National Lifeboat Institution possesses 270 self-righting boats. These latter craft have gone out 4,700 times and saved 12,000 lives, and in only thirty-nine instances have they been capsized, while in only 21 were lives lost. Of large boats the Institution possesses 22. These have been out 653 times and saved 1,668 lives, without once being turned over. The possibility of using steam has been anxiously considered by the Lifeboat Institution. They experimented as far as was possible for two years in this direction, and a special committee was formed at Liverpool to consider the subject. They came reluctantly to the conclusion that steam could not be used for the purpose.

It is not quite impossible that a suitable engine and propeller could be employed. The difficulty lies in the boiler. It is very difficult to see how a boiler could be fired at all; but even if it could, it is clear that the water and steam would be continually changing places. What, for example, would occur when a boat stood up on end? And without going so far as this, it is plain that no gauge yet made could give the smallest trustworthy evidence as to what was the level of the water in the boiler. The only attempt that could be made at using a boiler would be to hang it in gimbals. Again, the propeller must be at times working in air, then deeply submerged. If placed anywhere outside the hull, it would probably be torn off. If put under her, it must in the nature of things be very inefficient. It is worth notice that neither Mr. Benjamin nor Mr. Taylor thought it worth while to deal with the boiler problem as if it was of any importance. Indeed, their proposed lifeboat, being comparatively a big, heavy craft, would not labor under the same difficulties as an ordinary lifeboat would. The weight of such a boat is about two and a half to three tons. That of four large boats possessed by the Institution is ten tons each. The lifeboat of Messrs. Benjamin and Taylor weighs twenty-seven tons empty. But, as Captain Chetwynd showed, such a large craft would be useless in breakers. The modern lifeboat is a remarkable example of the skillful adaptation of means to an end, and to depart from its type in any way is, to say the least, an extremely doubtful experiment.

There is another difficulty in the way of the adoption of steam at sea which we have not yet considered. It is the grave objection which lies in the way of experimenting with an invention of this kind. Let us suppose that in a heavy gale a steam lifeboat put to sea with a dozen men on board. If the machinery broke down or became inoperative—let us say from excessive priming due to the rapidly changing position of the boiler—the lives of all on board would be lost. No one in authority would take the responsibility of trying so perilous an experiment. It is obvious, however, that before steam lifeboats can be pronounced satisfactory, such an experiment must be made, not once nor twice, but many times. Among inventors, none has had any experience of lifeboat work. It is said that one enthusiastic individual, who believed that he had solved the problem, went out one night with a lifeboat crew to gather experience. Some hours subsequently he found himself on shore, half dead with cold and misery; sorely beaten and bruised and shaken; almost drowned and wholly miserable; when he had recovered, one of his first acts was to tear up his drawings and burn his models. Even with such an experience before them, there are no doubt men who will still invent in this direction, and to such we would tender a word of advice. From any steam engine or other motor dependent on fire, nothing is to be hoped. If it were possible to put a motor on board which would not depend on such aid, it would, no doubt, prove very useful. It is a *sine qua non* that the motor must be of such a kind that it will leave the men as free as they are now to use their oars or sails, so that, should the motor fail, the crew would run no additional risk because of its presence. There is but one scheme which holds out even a faint chance of being practicable, and that is the use of electricity. It would be possible to put storage batteries into a lifeboat, and to so secure them that they would continue to work under any conditions short of turning the boat upside down. The electrical launch shows that such a mode of propulsion is, under certain conditions, possible, and the experiment of using electricity might be tried without much risk of life. But when we have said so much, we are bound to add that nothing has yet been done in electrical marine propulsion which leads us to believe that it can be applied with success to lifeboats. It may be that a steam engine may yet be devised on, say, the Lamm hot water system, which would render the use of a fire in the boat unnecessary; but of this we see, we confess, no hope. However, no one can place a limit to the power of engineers. We have set the broad facts of a most interesting problem before our readers; possibly, they may find its solution.—*The Engineer.*

The Poisonous Scorpion of Mexico.

At a recent meeting of the Academy of Natural Sciences, Philadelphia, Dr. Leidy read a communication from Dr. V. Gonzalez, giving an account of the scorpions of Durango, Mexico, and the deadly effects of their sting. They are found everywhere in the city, and every effort has been made to exterminate them, but without effect. A reward of a cent and a half for males, and double that amount for females, is paid by the authorities, and the records indicate that some years over one hundred thousand are captured and destroyed. The sting, especially in the case of children, is invariably fatal; the victim, if under two or three years of age, dying in a few hours, and sometimes in a few minutes, in strong general convulsions. No antidote for the poison has as yet been discovered, and the assistance of Dr. Leidy is asked by the writer in his endeavor to determine some successful mode of treatment. It was suggested by Messrs. Horn, Heilprin, and Leidy that the Mexican scorpion must differ from the species found in Florida and California, as the sting of the latter is not usually graver than that of a wasp.

Making Enameled Brick.

The obvious suitableness of enameled brick for use in many places exposed to moisture, or where contaminating vapors might be present in the air, has doubtless suggested itself frequently to those who have noticed its growing introduction within a very few years past; the great superiority of such bricks to painted brickwork in kitchens, laundries, courts, and cellar areaways does not admit of question, while they may also be used to advantage in many places for wainscoting in halls, as well as for ornamental fronts and trimmings.

Such brick must not, however, be confounded with a cheap glazed one, which has been sometimes used, only to open up like a chestnut burr after the first winter's frost. This description is, of course, cheaper than a good enameled brick, but the materials and workmanship that are necessary to make the latter are absolute requisites if one is looking for lasting qualities. But on account of the high cost, and the difficulty of making a good quality of enameled brick, enough of these inferior glazed ones have been used to impede the more rapid introduction of the best quality, and there are now but three or four establishments in the country which make them.

It was not until after many unsuccessful experiments that good enameled brick were produced in this country, the recipes of English and German enamelers not working well with our clays; and it is always to be borne in mind that the various proportions of the different ingredients have to be slightly changed according to the amount of oxide of iron, lime, etc., that the clay may have. In one of the enameling compounds used for a building brick, the following proportions are used: Fluor spar, 150 parts; Paris white, 60 parts; lime, 50 parts; oxide of tin, 50 parts; kaolin, 50 parts. These ingredients are pulverized and triturated to an impalpable powder, reducing the whole to a homogeneous mass, which is calcined in a crucible. After cooling, it is again reduced to a powder, water added, and the whole triturated to form an enameling compound of about the consistency of cream, in which is to be dipped that portion of the brick to be enameled, the latter to be then subjected to a sufficient temperature to fuse the enamel on the surface, this being done in seggars, or fireclay cases, holding four or five bricks each. The enamel is usually applied only to the one face or head which will be exposed after laying in the wall, except with those intended to be used for corners and reveals or window and door jambs, which have one face and head treated, and are termed "rights" and "lefts" when so moulded that they cannot be used for any corner. A black surface is made by adding to the above ingredients black oxide of cobalt, black oxide of manganese, and umber, previous to pulverizing and calcining; blue, by adding *black* oxide of cobalt; green, by adding suboxide of copper; red, by adding suboxide of copper and red oxide of iron; and almost any desired shade or tint may be given by the use of varying proportions of different ingredients.

These enameling compounds may be used on the surface of ordinary red front brick, but pressed brick are better, that the surface may be as smooth as possible, while they should be free from sand, or the enamel will not adhere. The amount of capital and the plant necessary to engage in a moderate way in the business of enameling brick, as given by a contributor to the *Clay Worker* recently, is as follows:

"In the first place, it is necessary to have a kiln adapted to this work. It is better to have a muffle kiln; but in the absence of this, a kiln can be erected with a capacity of from 6,000 to 10,000 brick for about $600 to $800. Then comes next in order the seggars; these are made to hold five brick each. They are made of fireclay, uniform in size, and burned hard, costing at the factory sixteen cents each. Next, we have the mill or pulverizer to grind the enamels in. This will not exceed twenty dollars. Indeed, any one can make a first-class one that will not exceed half that amount, and be equally as good. Next in order we have the tubs, buckets, and cups. These will cost for an establishment of this capacity about fifty dollars. Here we have an establishment all complete, except the building and enameler to do the work, for less than $2,500. With a kiln of this capacity and the assistance of a man who understands burning, an enameler and two boys can produce on an average 40,000 enameled brick per month."

The cost of enameling, as figured by this writer, is as low as $12 to $15 per 1,000, which certainly leaves a large margin for profit, at to-day's prices, but this is counting on the work being that of a good enameler, and such men are said to be very scarce.

COLOR CONTRAST.

BY PROF. OGDEN N. ROOD, OF COLUMBIA COLLEGE, ASSISTED BY THOMAS EWING.

At the recent meeting of the National Academy of Sciences, Professor Rood gave some account of the experiments on color contrast now in progress at Columbia College. Previous experiments have been altogether qualitative ; the present ones are the first quantitative experiments ever undertaken.

Colors of all objects are altered by their surroundings. An instance cited was that of a house which the Professor supposed to be of an orange yellow brown color, until he saw it in winter, when it was evident that there was not a particle of red in the color. The apparent red was caused by contrast with the green grass.

There are two kinds of contrast, simultaneous and successive. These investigations were of simultaneous contrast, which is very difficult. Successive contrast would be still more so, on account of the inability of the memory to recall slight shades of color.

The investigation was conducted by causing colored disks to revolve in such a way as to blend the colors.

The simplest case is that of uniform color all around the circle, as in the case of a disk of green surrounded with a gray ring, and that again with another green ring, Fig. 1.

The interposed gray appears rosy by contrast with the green.

In order to measure the intensity of the apparent redness of the gray ring, two methods were adopted—first by comparing it with a revolving disk of the color complementary of the green, but partly covered with black and white, and varying the amount of the disk thus covered till the color appeared to be of the same intensity as that of the gray ring, Fig. 2.

The second method of measuring was by extinguishing the induced red by partly covering with green, Fig. 3.

Still another method resorted to was copying.

The degree of lightness of the gray disk is not material unless it is made very dark indeed.

It is found that the induced sensation produced by a red disk is extinguished by 8 per cent of the complementary green ; that of a green disk, however, requires 33 per cent of the complementary red ; and that of a blue disk, 50 per cent of the complementary yellow. No reason is known for this physiological effect.

It is found also that in passing from the red to the violet end of the spectrum, the induced colors vary more and more from the true complementary. With a green disk, the induced color appears more pink than the complementary ; and with a blue disk, the induced color differs widely from the true complementary.

If the coefficient of a red disk be taken as 1, that of the emerald green disk which just balances it and produces white light is 1·7, Fig. 4.

Green when darkened looks bluish ; but if you diminish the brightness more than one-half, you only diminish the subjective effect one-third.

With blue, one-third the brightness produces fully one-half the subjective effect. Bluish colors are more effective than others subjectively.

A more difficult problem is to find the most neutral point in comparing colors not strictly complementary, as in the case of emerald green and vermilion. In this combination the most neutral tint is not gray, but yellow. To illustrate this combination of colors, an inner disk of black and white may be introduced, Fig. 5.

In order to aid the memory, an inner disk may be used of the same colors as the outer ring, which is set at the point of the previous experiments, while the outer ring is slid a little one way or the other till the vertical point is reached, Fig. 6.

It should be understood that in all these experiments, the disks are compounded of two capable of sliding one above the other, so as to expose a greater or a less proportion of each color, the individual colored disks having each a slit, which enables them to be adjusted ; each color covering a disk of this construction, Fig. 7.

The second part of the investigation was to ascertain the quality of colors that are not true complementaries.

Two colors, A and B, were taken, nearly, but not absolutely, complementary, A being used as the standard.

The value of B having been determined, as in the first experiments, it was combined with a third color, C, which was a little further up the spectrum than A. C would be combined with D, which was still a little further from the starting point. Thus all the colors of the spectrum were compared through a gradation of fifty colors. This is an entirely new process.

As a result of these and other experiments, he claims that Newton's diagram of colors should be arranged in

CHEMICAL VEGETATION.

a circle, not in straight lines, as Newton had it. Instead of Fig. 8, we have Fig. 9.

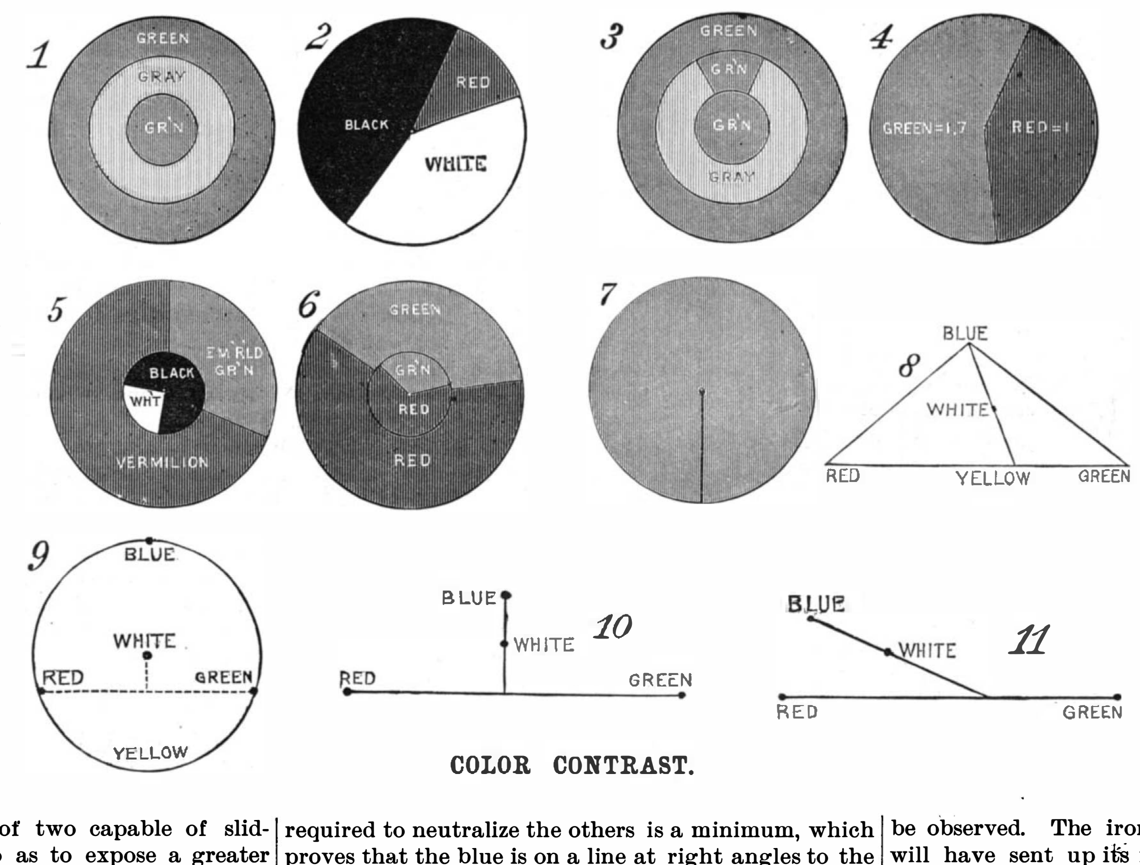
White occupies the center of the circle, and lies on a line drawn at right angles to the palest tint. Some of the experiments in corroboration of this are of the following nature :

Let the three fundamental colors be supposed to represent weights at the end of a system of bars, Fig. 10.

Then white represents the center of gravity.

If the system were arranged as follows, with the blue off at one side, white would still represent the center of gravity ; but the amount of blue necessary to counterpoise the system would be much greater, Fig. 11.

Experiment shows, however, that the amount of blue



COLOR CONTRAST.

required to neutralize the others is a minimum, which proves that the blue is on a line at right angles to the line forming red and green.

GERMANY has eight schools of forestry, where five years' training is required of those who seek positions under the Government, although a course of study half as long may be taken by amateurs. France supports a single school at Nancy.

CHEMICAL VEGETATION.

T. O'CONOR SLOANE, PH.D.

Many of our readers have tried the old time classic experiments with solutions of different metallic salts, in which tin trees, lead trees, or silver trees were produced. A bar of zinc suspended in a dilute solution of acetate of lead precipitates metallic lead very beautifully, producing the effect of an inverted tree. This was the *Arbor Saturni*, or Saturn's tree of the old school. A silver tree is produced by an analogous method, and was called *Arbor Dianæ*, or Diana's tree. By the battery, aborescent growths of metal may be produced on an electrode, which, exhibited in the magic lantern especially, produce very striking effects.

By the use of silicate of soda, chemical precipitations can be brought about that still more closely resemble vegetation, in some cases corresponding in color with their model. Crystals of metallic salts immersed in a moderately dilute solution of this silicate, or water glass, as it is often called, send out shoots of precipitates varying from stalagmitic formations to the finest threads. Each of the available salts produces a highly characteristic appearance. In some cases the resemblance to the lower forms of plant life is remarkable.

Silicate of soda is made by combining silica with soda. Some form of silica is heated under pressure in a solution of caustic soda, when combination takes place, and a thick solution is obtained.

It is thus prepared in large quantities for commercial use, and can be purchased by the experimenter cheaper than he can make it. In composition it is precisely analogous to glass, but is soluble to almost any extent in water. Notwithstanding this, when once in the solid condition, its solution is only effected with difficulty. This gives it a certain value as a cement. Broken glass and china can be mended by it quite satisfactorily.

As sold, it is a very thick fluid, resembling strong starch solution. For the experiment in question, it must be diluted. A clear glass bottle or any suitable vessel may be used. It is about one-third filled with silicate of soda solution, and the remainder is filled with water. By shaking and stirring, the two must be mixed perfectly. In doing this, a good opportunity is afforded for observing the action of a liquid of low diffusive power. The silicate solution mixes with much difficulty with the water, gathering into a lump or drawing out into threads. It gives a good illustration of the difficulty we should be placed in, were there no power of diffusion in liquids. Without this power to help us, it would require a long time and prolonged stirring to mix a cup of tea or coffee containing sugar and milk.

When the silicate solution has been thus diluted and mixed, a layer of sand, half or a quarter of an inch thick, is introduced into the bottle. It is best to pour it through a wide tube, reaching nearly to the bottom to avoid discoloration of the fluid. Then crystals of different salts are embedded in the sand. The object of the sand is to hold the crystals in place. It plays no active part in the experiment. The crystals must not be covered with it. Sulphate of alumina, potash alum, protosulphate of iron, or "copperas," sulphate of copper, or "blue vitriol," are good salts to start with. Clear crystals, the size of a pea, should be selected, dropped into the bottle, and by a rod pressed down into the sand until half embedded.

The bottle is then put aside in a quiet place, where it will not be shaken. In a few hours the crystals will begin to sprout to a perceptible extent. The finest possible green filaments, resembling seaweed, will start up from the iron crystals in a nearly vertical direction. More slowly, similar filaments appear with the copper crystals as nuclei, while the alum sends up a most characteristic growth of pure white stalagmites. These three forms are represented in the cut. They can be identified by the description. The iron growth is greenish ; the copper, light blue.

A curious difference in rapidity of growth will next be observed. The iron in the course of a few hours will have sent up its filaments several inches, while the copper and alum will be much more gradual in their progress. After a while the iron filaments reach the surface, and another phenomenon shows itself. Where each filament touches the surface, it spreads out, and, as the iron oxidizes, loses its green color. After a while, it becomes too large for the floatative powers of the solution, and sinks until it is caught and sustained by some of the neighboring filaments. In this way the filaments become terminated with expansions, several of which are shown in the drawing.

Many other salts can be tried, and separate growths produced in different bottles. In addition to the salts already named, sulphates of chromium, nickel, cobalt, and combinations of other acids and bases might be tried. To those who have never used silicate of soda, the behavior of this curious solution will in itself be an interesting phase of the experiment.

To arrest the growths, the silicate solution may be displaced with clear water. To do this, water must be poured in very gently through a tube reaching nearly to the bottom of the bottle. As the liquid overflows, the silicate will be carried away and water will take its place. Where it is not desired to preserve the growths, it is preferable to dispense with sand, as the process can be more closely watched without it. The only object of using it is to hold the crystals in place where the bottle is subjected to movement.

Ships' Boats.

The lifeboats of the British National Lifeboat Association have iron keels, a very extensive provision of air cases, and valves for discharging water through the bottom; they have a flat laid in them, and have so much inclosed buoyancy that if a sea breaks over them they are able to discharge through the bottom all the water as far down as the flat. They have further so much stability that if capsized they will soon right themselves. Of course, boats so completely *lifeboats* as these could not be made practical use of as ships' boats, they would be so very heavy and cumbersome. The official standard of the Board of Trade as regards lifeboats is that one and a half cubic feet of airtight compartment shall be provided for every person carried in the boat, and the number of persons carried is assumed to be one for every ten cubic feet of the boat's content. It will be seen that this is a purely arbitrary scale, and is prescribed because some quantitative regulation is necessary.

Of course, other things being the same, the more airtight space the better in a lifeboat; and, on the other hand, any boat is the better fitted for saving life by having ever so little either of airtight space or of space filled with cork. The specific gravity of cork is 0·24, consequently, a compartment filled with cork is for every cubic foot of its content equal in efficiency to three-quarters of a cubic foot of air space. A cork-filled compartment has, however, the advantage that if damaged or leaky but little harm is done, as water cannot get into the space occupied by the cork. It has been found necessary to specify the material of which air cases for lifeboats may be made in order to insure their being and remaining efficiently watertight. Thus zinc cases are not allowed, and copper cases are not admitted in a boat the shell of which is iron. Even copper cases have sometimes been found to be defective through having been fraudulently constructed of material little thicker than tin foil. The material most commonly employed in the construction of air cases is well seasoned yellow pine coated with waterproof canvas. It is also required that lifeboats shall be built both ends alike, similar to whaleboats; that they be fully and completely equipped; that the equipments, including a supply of fresh water, be always in them ready for use; and that they can by means of davits be readily lowered into the water.

Ships' boats are constructed in as diverse fashion and of as many or more kinds of material than ships themselves. The clincher built boat is that which probably has the greatest strength for its weight. The material most frequently used in its construction at the present day is larch. The diagonal built boat is also very strong, and is a good type of boat when it is desired to use very thin hard wood plank; this system of construction is often adopted in boats of the largest size. For the heavy longboats of sailing vessels, which have to be seldom got out except at ports, where they are required to be used in transporting cargo, in which service the boat should be able to put up with some rough usage, the old fashioned carvel construction presents many advantages. Iron, or rather iron coated with zinc, known usually as galvanized iron, has for many years been employed in the construction of boats, but has not made its way into very common use. A well known type of iron boat is one in which the metal is corrugated in such a manner that the boat's bottom looks very much like that of a clincher built wood boat. The consequence of this arrangement is that the boat is locally, and indeed altogether, much stronger than if constructed with plain sheets of metal.

A very efficient and strong composite boat is carried by the American mail steamers which run regularly between Liverpool and Philadelphia. The skin of this boat is iron, but the frame is of live oak, and consists of bent planks arranged longitudinally at intervals. In these boats there is no necessity for the metal skin to be corrugated. Metal boats have two important advantages over others: they may be carried near the funnel or in hot climates without liability to shrinkage and consequent leakiness, and the outer skin of the boat can be made to form the sides of the air cases, thus saving both weight and space. The disadvantage is that these boats cannot be very easily repaired; in fact, cannot usually be repaired by the carpenter of the ship.

Canvas and similar materials are, and have been for many years, used in the construction of boats, although their use is chiefly associated with one important type, which we propose to notice at some length. From the earliest times the skins of animals stretched over bent osiers or branches of trees have formed a convenient and easily transported boat, and on certain parts of the Irish coast boats in which painted canvas takes the place of plank have been employed from time immemorial, and are even now used for fishing purposes.

The portable folding boat of the Berthon Boat Company depends for its flotation upon canvas made watertight by a special paint. The framework consists of a number of longitudinal frames which are broad and flat, having their edges to the curve of the shape of the boat, and are jointed together at the upper part of the stem and stern post. They lie in parallel planes side by side when the boat is collapsed, like the leaves of a closed book, and they stand out at different but definite angles, radiating from their common center, when open. The upper one on each side, when the boat is open, forms the gunwale. The boat has two skins of waterproof canvas, one attached to the inside of all the frames, the other to the outside. She thus has a double bottom and sides, and the space between is divided into separate compartments by the wood frames. The wood frames, upon which, with the keel and stern post, the boat depends for longitudinal strength, are of American elm. The boat is carried in the ship in its folded condition, with all the oars and gear, including water breakers, in position, and all wrapped up in a canvas cover. When it is required, the canvas cover is cast off, and the boat is lifted by hooking on the davit tackles to two slings, one near each end, which are attached to the gunwale.

As the weight is taken, the boat opens, then two men jump in her and place the struts which keep her open, and she is then ready for lowering into the water and for use. It is claimed that the boats when folded only occupy one-fifth of their width when open, and that one of them can be stored between the ordinary wooden boat and the ship's bulwarks. The folding boat is also much lighter, and is said to cost less than an ordinary boat of the same size. It is obvious that if the Berthon boat is thoroughly reliable, it affords a means of carrying sufficient boats to take all the passengers and crew of an emigrant ship. One objection which readily suggests itself is that holes would be soon eaten in them by rats, but we are told that the Admiralty experience of them is proof to the contrary. The store where they are kept in Portsmouth dockyard abounds with rats; and although nests have been found in the canvas boats, in no other case have the rats eaten the canvas coated with the composition, one of whose special merits appears to be that rats do not relish it. These boats have been used by the Admiralty for the last ten years in the Indian troop ships, the only ships in the Royal Navy which are unable to take sufficient ordinary boats to carry all hands on board. They are not employed to do ordinary boat work (probably if they were they would soon wear out), and they are not considered to be nearly as durable as ordinary wooden boats, but they afford a ready means of carrying a sufficient number of boats for any emergency.

They have been used for landing troops, and we believe that on the occasion of one of the troop ships being aground in the Suez Canal, all her Berthon boats were put out in the water and used to lighten the ship. The Admiralty have also used canvas boats in connection with small torpedo craft, which had not room to carry an ordinary boat. We should not think that folding canvas boats are likely to come into use for ordinary purposes in the mercantile marine, although they may be, and we believe are often carried in yachts; but they certainly do afford a means of almost indefinitely multiplying the boat accommodation of a large ship, without taking up very much deck room.—*Nautical Magazine.*

Fatal Trichiniasis.

Eugene A. Rau, of Bethlehem, Pa., gives an account of recent cases of fatal trichiniasis arising from imperfectly cooked measly pork which had been eaten for a week from January 6, 1886. The family consisted of a man and wife and two daughters, aged five and thirteen years. The older daughter and the mother, aged thirty-seven years, have died; the other members of the family, although affected, are recovering. In the mother, who died March 8, the deltoid muscles showed under the microscope three to nine, the rectus femoris two to six, and the diaphragm one to three, trichinæ in a field view about one-fifth of an inch in diameter. In the daughter, who died February 19, trichinæ were found embedded in the deltoid muscle, in some portions as many as forty-two being counted on the field of view under the microscope.

No other portions of the daughter were examined; but the lungs, heart, liver, spleen, and kidneys in the mother were found to be unaffected. The pork used was home-raised, and, according to the owner, the animal did not at any time show signs of ill health. An examination of two other hogs raised on the premises was made, but no trichinæ were found. As usual in such cases, the meat was imperfectly cooked or fried, the tenderloin, sausage meat, spare ribs, etc., all being freely used. For several days while in water, the human trichinæ showed signs of life, coiling and uncoiling when freed from the muscular fiber; but the stage of development found in the pork showed no activity under the same conditions.

Eggs by Weight.

It is annoying to the breeder of blooded and fine fowls to find, when he offers for sale eggs nearly twice as large as his neighbors', that they bring no more per dozen than do the smaller ones. Also, the consumer is often vexed to find that he must pay the same price today for a dozen eggs weighing a pound that he yesterday paid for a dozen weighing a pound and a half. Besides, an egg from a well fed fowl is heavier and richer than one from a common fowl that is only half fed, so that weight compared to size is an indication of richness. Thus, eggs of which eight will weigh a pound are better and richer than those of apparently the same size, of which ten are required for a pound. Of course, with eggs at four and five cents a dozen (and hundreds of dozens have been sold in past years at these figures), it is not much matter as to the size; but when the price ranges from twenty-five to fifty cents per dozen, it is a matter worth looking after. It is high time that this old style of selling and buying eggs were discontinued. It is a relic of the past, and reminds us of the time when dressed hogs sold for a dollar each without regard to size, and were dull sale at that. Insist upon it, then, you who raise poultry and eggs for market, that the price for eggs shall be so much per pound, and then it will be some inducement to farmers to raise a better class of fowls, and all will get what is their just due.—*American Rural Home.*

Manufacture of Aluminum.

We have heretofore described the electrical process of obtaining aluminum. Another, and the more common, method of producing aluminum is by heating substances that contain the chloride of aluminum in connection with the metal sodium. The chlorine combines with the sodium and leaves the aluminum in the metallic state. The process is easy and simple, but very expensive, owing to the high cost of the sodium. Three pounds of sodium, which now sells at retail for from $4 to $5 per pound, are required to obtain one pound of aluminum.

Any mode by which sodium can be more cheaply obtained will, as a matter of course, lessen the cost of making aluminum. Mr. H. Y. Castner, a chemist of this city, has discovered a new process of distilling sodium, by which it is said the metal can be produced at the extremely low cost of 25 cents per pound. With sodium at this low price the problem of cheap aluminum seems solved, and with it magnesium, silicon, and boron, all of which depend upon sodium for their manufacture. The production of sodium at this low figure means far more than cheap aluminum. Who can state the future of either magnesium, silicon, or boron, as each may be prove to be of as great value in the arts and sciences as aluminum? When sodium can be had for 25 cents a pound, aluminum should not cost over $2 a pound. Of course, this seems a rather high price for any metal that may be extensively used, but in reality it is but slightly more expensive than tin at 50 cents a pound.

A cubic foot of aluminum weighs 166 pounds, while the same bulk of tin will weigh 445 pounds. The uses of aluminum are indeed unlimited, even when it is produced at $2 a pound, as may be easily conceived from its many valuable properties. It is unaltered in air even when heated, and is not tarnished when exposed to an atmosphere contaminated with sulphurous gases, which would affect almost every other metal. It is ductile, and may be drawn out in extremely fine wire. It may be cast in moulds of either sand or iron. As a conductor of electricity it ranks equal with silver, which is the best known conductor. The vegetable acids are without action on it; and when all these properties are taken in connection with its extreme lightness, it may indeed be termed one of the most valuable of metals. Above all other metals, aluminum possesses the property of forming alloys of great variety and extreme usefulness, and owing to its cost formerly it has been confined in its uses almost exclusively to these purposes. The alloy known as "aluminum bronze," consisting of copper 90 per cent and aluminum 10 per cent, has been somewhat extensively used of late, and with the production of cheap aluminum it will undoubtedly largely take the place of brass and ordinary bronze, as it possesses all their varied properties in a far more valuable degree.

ENGINEERING INVENTIONS.

A rotary engine has been patented by Mr. Karl A. Ekman, of Bofors, Sweden. This invention consists of a cylinder body having an elliptical groove in which operate pistons fulcrumed on a revolving cylinder head, which is attached to the main shaft, carrying a disk valve, while there is a fixed cylinder head with inlet and outlet ports and an exhaust.

A driving mechanism for suspended cars has been patented by Mr. John A. Enos, of Peabody, Mass. The supporting truck has wheels resting upon a single rail, combined with an electric motor, the revolving armature of which is rigidly fixed upon the same shaft as the wheels of the suspending truck, the current being taken from the lower rail and passed through the motor to the upper rail, the invention being an improvement on former patented inventions of the same inventor.

MISCELLANEOUS INVENTIONS.

A pumping apparatus for oil wells has been patented by Mr. David T. Lane, of Franklin, Pa. This invention covers a novel combination of parts and details, making an improved apparatus for operating a series of oil wells from a single driving mechanism.

A dental plugger has been patented by Mr. Robert B. Kice, of Richmond, Mo. It consists of a dental engine with a hollow standard and an air pump, the plugger being connected by a flexible tube, and the apparatus being so arranged that the force of the blow will be entirely under the control of the operator.

A banjo has been patented by Mr. Henry Hoseus, of Brooklyn, N. Y. Combined with the rim, head, and stick of a banjo is a wire ring, supporting brackets, regulatingsprings, and an adjusting screw, in a manner intended to increase the strength and clearness of tone of the instrument.

A powder puff has been patented by Mr. William H. Hudswell, of Brooklyn, N. Y. It is so made that the down will be prevented from being matted or felted by the weight of the puffs, and when the puff is applied to the powder the box cover is in place upon the box, so the dust will not be distributed around.

A log turner has been patented by Mr. Robison Shelbourne, of Blandville, Ky. This invention covers novel constructions and combinations, whereby, with devices acting automatically and under ready control, the work of turning logs on the mill carriage may be done by the machinery of the mill and without using cant hooks operated by hand.

A cloth beam for looms has been patented by Messrs. Harrison Underwood and Sharles Schweizer, of New York city. It is made in two corresponding semi-cylindrical parts, attachable to and detachable from a revolving shaft, and having an outer casing, the beam being to wind cloth upon as it is woven, and from which it is to be afterward removed.

A head protector for horses has been patented by Mr. Martin F. Corley, of La Salle, Ill. It is formed of felted fabric, having its sides notched, and with attaching cords, being so made as to soon take the shape of the horse's head, and retain and distribute moisture thereon without dripping, to protect horses from the effect of the sun's rays when desired.

A buckle has been patented by Mr. Nils J. Kjellstrom, of East Cambridge, Mass. It is a cam lever buckle, in which the plate on which the strap or band is to be pressed has on its upper surface a series of grooves, whereby a strap can be quickly clamped, the hold being more secure as any strain is increased, and the device being simple in construction.

A dough kneading machine has been patented by Mr. Joseph G. Tourangeau, of Quebec, Canada. In combination with a supporting frame is a cylinder having a door or opening, and means for raising it, a beater frame within the cylinder and shafts for operating it, whereby the dough may be kneaded and the cylinder raised and rotated to discharge the dough.

A combined plumb, level, and rule has been patented by Mr. John Morrison, of St. Louis, Mo. The rule is made in hinged sections, with a graduated straight edge pivoted to one section, the tool being one which can be used for general measuring or conveniently adjusted for leveling and plumbing, while it can be folded to a size convenient for carrying in the pocket.

A fire escape has been patented by Mr. Daniel B. Kimball, of Syracuse, N. Y. It is portable, and comprises a suitable frame upon which is mounted a series of cog wheels and a clock escapement, to govern the speed of the escape belt from a drum, the belt having a suitable attachment by which a person may be supported while being lowered from a building.

A photographic camera has been patented by Messrs. William H. Lewis and Erastus B. Barker, of New York city. This invention covers novel parts connected with the camera box and bed section, over which the bellows portion of the camera works, also a novel detachable diaphragm for making stereoscopic pictures, and a means for securely holding the camera in its stand, and for its ready detachment.

A "swing back camera" has also been patented by Mr. William H. Lewis, the patent covering novel means of attaching the back, whereby it may be released and fastened on both sides of the camera by operating the fastening device from one side only of the instrument, thereby saving time and being much more convenient.

A secondary battery or accumulator has been patented by Mr. James Pitkin, of Clerkenwell, Middlesex Co., Eng. The element is constructed of a central plate or support of metallic lead, against which the spongy lead or peroxide is held by perforated plates of ebonite, the lead plate having ribs cast on its faces which divide up the faces of the plate into cells into which the active material is packed, the object being to prevent the latter from becoming detached from the plate or support, and to avoid liability of short circuiting.

Special.

"ANOTHER HOUSEHOLD NECESSITY."

In a recent number of this paper we published a reporter's interview with Mr. Joseph Wild, the venerable and estimable head of the firm of Joseph Wild & Co., of 82 and 84 Worth Street, New York, in which he related his experience in the use of the remedial agent known as "Compound Oxygen," administered by Drs. Starkey & Palen, of Philadelphia, which he heartily indorsed. An error in the heading of the article gave to Mr. Wild the credit of being the inventor of "Linoleum," which, as the letter below will show, Mr. Wild hastens to disclaim.

JOSEPH WILD & CO.,
82 & 84 WORTH ST. AND 11 & 13 THOMAS ST.,
NEW YORK, May 13, 1886.

DRS. STARKEY & PALEN, 1529 Arch St., Philad'a, Pa.

DEAR SIRS: The article entitled "Another Household Necessity—Mr. Wild, the inventor of Linoleum, notes a discovery as valuable as his own," published in the SCIENTIFIC AMERICAN of May 8, is misleading, as stating that Mr. Joseph Wild was the inventor of Linoleum. It should have stated that Joseph Wild & Co., 82 & 84 Worth St., New York, are the owners of the patent in the United States and sole manufacturers of Linoleum in the United States. Please insert the above in the papers that have had the mistaken advertisement.

JOSEPH WILD.

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.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
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Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) B. A. W. asks: 1. Why are boilers tested with cold water and pump? A. Because it is convenient and safe. 2. Will a boiler be safe at more pressure of steam than it was tested with by cold water? A. No; it should not be used at more than 50 per cent of the test pressure. 3. Which is best—a square box boiler or a cylindrical one? A. Cylindical boilers are generally best, cheapest, and most durable. 4. Does a tub of water weigh any more with a live ten pound fish in it in suspension than with no fish in it? A. Weighs the same, provided the tub is brimming full in both cases.

(2) A. C. desires a receipt for a preparation to restore the gloss of elegant bindings in different colors. A. Take of Canada balsam and clear white resin, of each six ounces, oil of turpentine 1 quart; dissolve.

(3) L. M. asks: Is there any cheap way of making white a straw hat which lost its whiteness from wear, and how do the straw hat makers bleach their hats, or the straw of which the hats are made? A. The following receipt is a simple and inexpensive one: Obtain a deep box, air tight if possible; place at the bottom a stone; on the stone a flat piece of iron red hot, or a pan of charcoal, on which scatter powdered brimstone; there should be hooks in the box on which to hang the hat; close the lid, and let the hat remain a night. Another receipt for bleaching straw is to soak the goods in caustic soda and afterward to use on them chloride of lime or javelle water. The excess of chlorine should be removed by hyposulphite of soda, called anti-chlor. In first method, the hat should be moistened, as a dry fabric will not bleach.

(4) N. N. C.—So-called paste diamonds and other imitations of precious stones are made in much the same way as glass. Cape May diamonds are simply crystals of quartz cut and polished. Yellow stones are sometimes dipped in a dilute solution of aniline violet to make them appear bluish white.

(5) L. O. K. asks: What rate of speed can I expect from a stern wheel pleasure boat 32 feet by 6 feet, two engines each 3½ inches bore by 24 inches stroke, 150 pounds pressure. Draught of hull 12 inches, with sharp bow, well proportioned. Engines work direct (not geared). A. You will get a speed of 6 to 7 miles.

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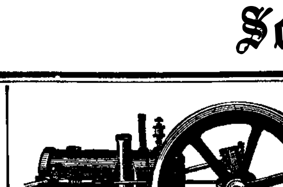

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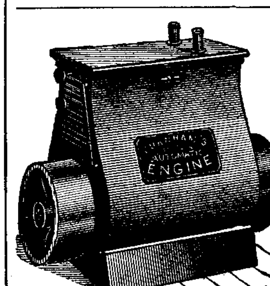

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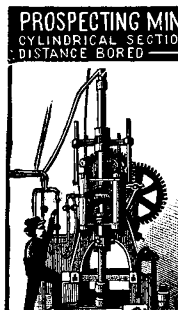

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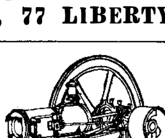

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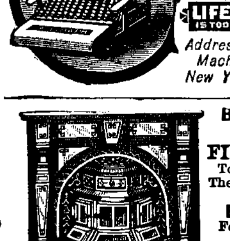

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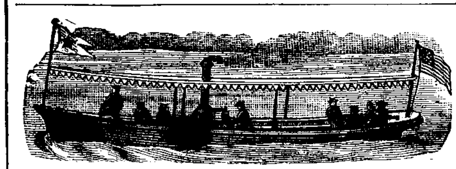

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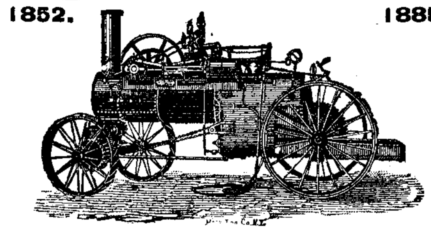

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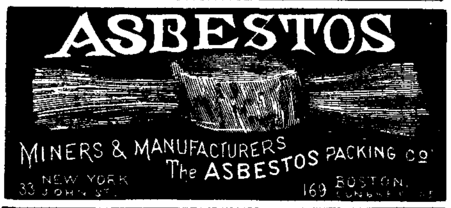

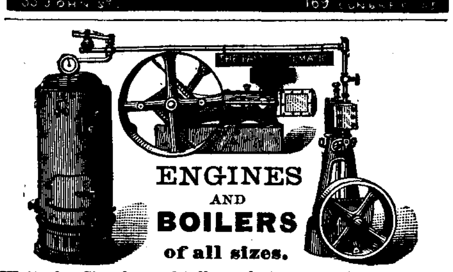

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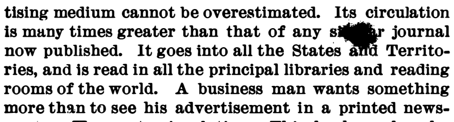

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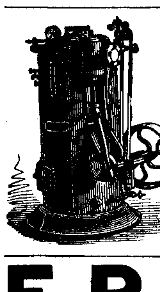

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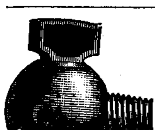

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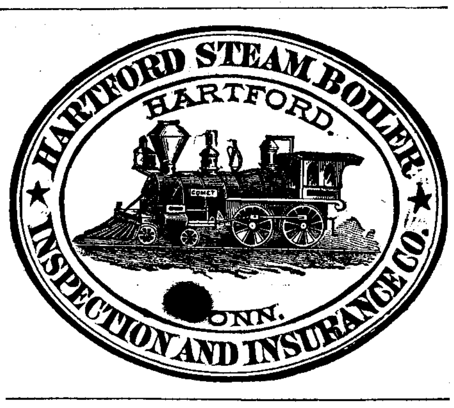

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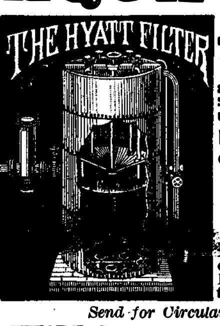

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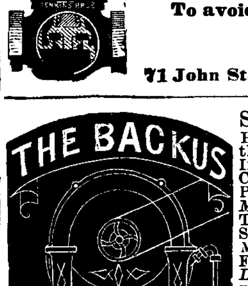

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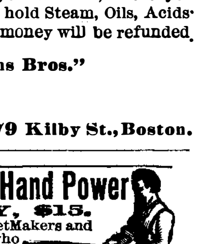

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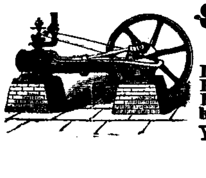

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