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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 832.

For the Week Ending December 12, 1891.

Price 10 cents. For sale by all newsdealers.

FAILURE OF THE DYNAMITE CRUISER VESUVIUS.

This novel type of war boat is declared by our best naval advisers to be of little use in her present condition, and it is recommended that she be altered into an ordinary torpedo cruiser.

The striking success which attended the experiments of Lieut. Zalinski in New York harbor, 1887, in throwing projectiles charged with dynamite from pneumatic guns located on shore, led to the belief that similar weapons might be successfully used on shipboard; and the government, anxious to possess itself of an arm that appeared to be at once novel and formidable, hurried forward the construction of the Vesuvius. She was launched in 1888.

The Vesuvius is a steel ship of 725 tons displacement, 252 feet long over all, and 26½ feet wide. She is without masts, and practically unarmored. She draws a maximum of nine feet of water; the mean draught is eight and one-half feet. Her engines, which have been illustrated and described by us, are of four-cylinder, triple-expansion type. They actuate twin screws, and give a speed of about twenty knots an hour. Her model is characterized by very fine lines, engines 4 000 horse power.

In the forward part of the ship the three pneumatic guns that form her armament are placed. These are built into the ship. Their muzzles are carried forward and project above the deck near the bow. They are 15 inches in diameter, fifty-four feet long, made of thin cast iron, not rifled, the vanes upon the projectile being relied on to give any desired axial rotation.

The full-sized shell for this gun is 14¾ inches in diameter, and its body is about seven feet long. Back of the body is a tail fitted with spiral vanes, which secures its alignment and rotation. The body is made of thin drawn brass tubing, and will hold 600 pounds of high explosive, dynamite or gelatine, the whole weighing about 1,500 pounds when charged. This is the largest shell the guns are adapted to fire, and the effects of such a heavy charge of explosive can only be surmised. Should one explode in the air over a ship, the effects of the concussion on her crew would probably be very disastrous. According to the opinion of students of torpedo practice, the submarine explosion of such a shell within 20 feet of a ship would destroy it.

The air by which the projectile is driven is compressed under a pressure of 2,000 pounds per square inch into tubular reservoirs.

No attempt has ever been made to test the guns with a full charge of the explosive, by reason of defects in the mechanism which render dangerous the operations of loading and discharge.

The naval bureau considers this vessel in no respect fitted as a gun platform for artillery of this description, even if the latter proved of any military value. It will be readily appreciated that, unarmored as the Vesuvius is, her stores of high explosives and a large portion of the length of her guns are completely exposed to the fire of rapid-fire ordnance. The effect of a single shell from a 1-pounder sent into her magazine of high explosives may be imagined.

The vessel, as is well known, possesses only indifferent steering qualities, and, this being the case, it is probable that two torpedo boats of the type of the Cushing, armed with an automobile torpedo and with rapid-fire guns of smaller caliber, would very much overmatch her. It is considered, therefore, that the question of the value of the guns for war purposes should receive an early conclusion.

It is believed that the range of efficiency of the Vesuvius would be greatly increased by turning her into a torpedo cruiser. Her displacement is such that, with her dynamite guns removed and a battery of considerable power placed for fore and aft fire, supplementing the larger calibers of rapid-fire guns with a number of 6-pounders, this vessel would then become a formidable antagonist for any of the unarmored types.

Her tubes, however, would be useful should they pass the necessary test for shore stations, or perhaps for a moored battery in harbor defense. The number of these weapons ordered for the land fortifications at New York, Boston, and San Francisco will also give opportunity to thoroughly investigate their value under more favorable circumstances than exist on board the Vesuvius.

HEAVY GUNS AND THE BEST ARMOR.

As the result of the efforts made during the last half dozen years, the position of the country as to means of offense and defense has been vastly improved. Not only have we the fine new vessels of the white squadron, with many other and more formidable ships approaching completion, but in the manufacture of heavy guns and armor we have about passed the experimental stage, and in several private establishments, as well as in the government shops, are now turning out both guns and armor believed to be equal to or better than any made heretofore in Europe. The experiments which have been made in the testing of armor and armor-piercing projectiles, in trials of smokeless and other powders, and as to the service possibilities of various types of guns and gun carriages, have been carried out with great thoroughness, and the work of production is now being pushed in American shops and by our own skilled mechanics.

In the recent report of Commodore Folger, chief of the Bureau of Ordnance, an interesting account is given of the armor tests conducted during the year, and the report says the bureau considers that two important results have been achieved: First, a better plate, of American manufacture, has been produced than the department was able to purchase abroad a year ago; secondly, it has developed a new principle in the manufacture of armor, of American origin, which will furnish greater protection to the vital parts of a vessel of war than any other system hitherto employed. It has been established definitely that armor of excellent quality may be produced by the rolling process, and that forging by means of the hammer is not absolutely necessary. The report strongly urges the establishment of a national gun factory on the Pacific coast similar to that in Washington.

The expenses of the bureau for the year are estimated at $4,780,291, of which $4,186.250 is to be applied toward the armament of new vessels authorized to be built. The number of guns required to arm the new vessels is placed at 347, ranging in caliber from 4 to 13 in. The guns completed number 155, of which 117 were 6 in. caliber; 294 sets of forgings have been ordered, and 246 have been delivered. Although none of the ships authorized to be built requires guns of 16 in. caliber, it is believed that such guns may be needed, so the necessary plans have been made, and authority is sought for construction of one of them. It is believed that the difficulties experienced abroad with these large guns can be overcome.

The trials of smokeless powder, invented and manufactured at the torpedo station, are said to have resulted so satisfactorily that it is believed that within a very short time the use of gunpowder will be entirely abandoned in calibers of six inch and below it, being replaced by one of the smokeless powders. An order for 50,000 pounds of gun cotton, the best known high explosive for naval use, has been placed with the Duponts on condition that a complete plant be erected. The condition has been accepted, and with the assistance of the naval experts a plant capable of turning out 1,000 pounds a day will be in operation in two months. After describing successful trials made with emmensite, the report says: "It is the bureau's intention to recommend the adoption of a relatively short gun of large caliber, using powder as the propulsive charge and firing a projectile containing a charge of emmensite, or gun cotton, for a feature of the armament of vessels, with a view of utilizing an aerial or submarine torpedo effect at ranges where the question of accuracy of fire is absolutely eliminated."

After recounting the efforts made to secure an effective automobile or fish torpedo, the report says: "The present state of work, in connection with automobile torpedoes and their accessories, is such as to justify the belief that the installation of outfits on board vessels will commence early in the coming year, and that our navy will soon be equipped with torpedo outfits equal, if not superior, to those possessed by foreign nations." Touching the submarine gun now approaching completion, the report says: "A further consideration of the subject of submarine artillery inclines the Bureau to the belief that it will prove a valuable and important adjunct to our defensive armament, particularly when mounted on board of vessels intended especially for ramming. It seems possible that the chances of the ram being able to reach her antagonist with destructive effect will be quadrupled by the addition of this weapon to her means of offense."

Under the head of armor it is announced that negotiations are in progress to cause the plate to be delivered by the Bethlehem Company for the double turret monitors and the Maine and Texas to be of nickel steel. The armor ordered from Carnegie, Phipps & Co. is to be of the same material, the department supplying the nickel; 800 tons of ore for that purpose were purchased last year.

Public School Finances.

The public school finances of thirty-one States have now been published by the Census Bureau. The census bulletins Nos. 54, 98, and 141 contain these interesting statistics. They give the number of pupils enrolled, amount expended on salaries and miscellaneous accounts, and total expenditures. These are given in sum totals and reduced to sums expended per capita of pupils enrolled, and the total expenditures are also reduced to sums per capita of population. Many other tabulations of the money employed in the various functions of the public school system are also given. To all interested in education and the much-debated public school system these figures will be of the highest interest. Curious instances of the wide range of expenditure occur. Alabama is given as expending but $1.85 per capita of pupils against Massachusetts' $17.27 and Colorado's $16 40. The total expenditure per capita of population does not fluctuate so widely, Alabama spending $0.37 against $4.08 in Colorado.

Decisions of the Courts Relating to Patents. Supreme Court of the United States.

ADAMS *v.* BELLAIRE STAMPING COMPANY *et al.*

Decided November 16, 1891. Mr. Justice Field delivered the opinion of the court.

The claim of a patent for an improvement in lanterns was for securing a removable lantern top to the upper part of the guard by means of a hinge connecting it thereto, and on the side opposite the hinge a removable fastening or spring catch, which when detached allowed the top of the lantern to open and swing back upon the hinge. Upon an action for infringement, *Held* invalid for want of patentable novelty.

An aggregation of old devices, each working out its own effect, without securing some new and useful result as the joint product of the combination, does not constitute a patentable invention. (Quoting Hailes *v.* Van Wormer, 20 Wall., 353, and Pickering *v.* McCullough, 104 U. S., 310.)

Where the question is upon the patentable character of the invention, evidence that it had practically superseded all other devices of its kind and tending to establish novelty is not material. Where there is no invention, the extent of use is not a matter of moment.

PATENT CLOTHING COMPANY, LIMITED, *v.* GLOVER *et al.*

Decided November 16, 1891. Mr. Justice Brewer delivered the opinion of the court.

The claim of an original patent was for an inelastic bridge or check piece arranged across the crotch of pantaloons, whereby the strain is received by this bridge or check piece, instead of at the angle of the crotch itself. The reissue contained two claims, and in an action brought for its infringement it was successfully contended by the defendant in the lower court that the reissue was broader than the original patent. *Held* that this is an immaterial question, because both the original patent and the reissue are invalid for want of patentable novelty.

The idea of the patentee was to add to the strength of the thread the strength of a piece of cloth, and this he did by a strip crossing the crotch as a bridge, and running up along the button and button hole strips, and fastened to them respectively.

But this was no new idea. It is as old as pantaloons themselves. It has been illustrated in the experience of every boy, for in his sports he not infrequently tears his pantaloons, and his good mother, not content with sewing the torn ends together, and thus holding them by the direct strength of the thread, is wont to place underneath a piece of cloth, and fasten it to the main body of the garment for some distance on either side of the tear. In this way the whole strain, which otherwise would be solely on the threads closing the tear, is largely borne by the new cloth underneath. Surely when this idea is so well known, and been so practically illustrated for generations, it cannot be that there was any exercise of the skill of an inventor in applying the same process to any part of the pantaloons.

The Electrical Atom.

At the recent dinner of the Institution of Electrical Engineers, London, Professor William Crookes, the president, said:

We have happily outgrown the preposterous notion that research in any department of science is mere waste of time. It is now generally admitted that pure science, irrespective of practical applications, benefits both the investigator himself and greatly enriches the community. "It blesseth him that gives, and him that takes." Between the frog's leg quivering on Galvani's work table and the successful telegraph or telephone there exists a direct filiation. Without the one we could not have the other.

We know little as yet concerning the mighty agency of electricity. "Substantialists" tell us it is a kind of matter. Others view it, not as matter, but as a form of energy. Others, again, reject both these views. Professor Lodge considers it "a form, or rather a mode of manifestation, of the ether." Professor Nikola Tesla demurs to the view of Professor Lodge, but thinks that "nothing stands in the way of our calling electricity ether associated with matter, or bound ether." High authorities cannot even yet agree whether we have one electricity or two opposite electricities. The only way to tackle the difficulty is to persevere in experiment and observation. If we never learn what electricity is, if, like life or like matter, it should remain an unknown quantity, we shall assuredly discover more about its attributes and its functions.

The light which the study of electricity throws upon a variety of chemical phenomena—witnessed alike in our little laboratories and in the vast laboratories of the earth and the sun—cannot be overlooked. The old electro-chemical theory of Berzelius is superseded, and a new and wider theory is opening out. The facts of electrolysis are by no means either completely detected or co-ordinated. They point to the great probability that electricity is atomic, that an electrical atom is as definite a quantity as a chemical atom. The electrical attraction between two chemical atoms, being a trillion times greater than gravitational attraction, is probably the force with which chemistry is most deeply concerned.

It has been computed that, in a single cubic foot of the ether which fills all space, there are locked up 10,000 foot tons of energy which have hitherto escaped notice. To unlock this boundless store and subdue it to the service of man is a task which awaits the electrician of the future. The latest researches give well founded hopes that this vast storehouse of power is not hopelessly inaccessible. Up to the present time we have been acquainted with only a very narrow range of ethereal vibrations, from extreme red on the one side to ultra violet on the other—say from 3 ten-millionths of a millimeter to 8 ten-millionths of a millimeter. Within this comparatively limited range of ethereal vibrations, and the equally narrow range of sound vibrations, we have been hitherto limited to receive and communicate all the knowledge which we share with other rational beings. Whether vibrations of the ether, slower than those which affect us as light, may not be constantly at work around us, we have until lately never seriously inquired. But the researches of Lodge in England, and Hertz in Germany, give us an almost infinite range of ethereal vibrations or electrical rays, from wave lengths of thousands of miles down to a few feet. Here is unfolded to us a new and astonishing universe—one which it is hard to conceive should be powerless to transmit and impart intelligence.

Experimentalists are reducing the wave lengths of the electrical rays. With every diminution in size of the apparatus the wave lengths get shorter, and could we construct Leyden jars of molecular dimensions the rays might fall within the narrow limits of visibility. We do not yet know how the molecule could be got to act as a Leyden jar, yet it is not improbable that the discontinuous phosphorescent light emitted from certain of the rare earths, when excited by a high tension current in a high vacuum, is really an artificial production of these electrical rays, sufficiently short to affect our organs of sight. If such a light could be produced more easily and more regularly, it would be far more economical than light from a flame or from the arc, as very little of the energy in play is expended in the form of heat rays. Of such production of light, nature supplies us with examples in the glow worm and the fireflies. Their light, though sufficiently energetic to be seen at a considerable distance, is accompanied by no liberation of heat capable of detection by our most delicate instruments.

By means of currents alternating with very high frequency, Professor Nikola Tesla has succeeded in passing by induction through the glass of a lamp energy sufficient to keep a filament in a state of incandescence without the use of connecting wires. He has even lighted a room by producing in it such a condition that an illuminating appliance may be placed anywhere and lighted without being electrically connected with anything. He has produced the required condition by creating in the room a powerful electrostatic field alternating very rapidly. He suspends two sheets of metal, each connected with one of the terminals of the coil. If an exhausted tube is carried anywhere between these sheets, or placed anywhere, it remains always luminous.

The extent to which this method of illumination may be practically available, experiments alone can decide. In any case, our insight into the possibilities of static electricity has been extended, and the ordinary electric machine will cease to be regarded as a mere toy.

Alternating currents have at the best a rather doubtful reputation, but it follows from Tesla's researches that as the rapidity of the alternation increases they become not more dangerous, but less so. It further appears that a true flame can now be produced without chemical aid—a flame which yields light and heat without the consumption of material and without any chemical process. To this end we require improved methods for producing excessively frequent alternations and enormous potentials. Shall we be able to obtain these by tapping the ether? If so, we may view the prospective exhaustion of our coal fields with indifference. We shall at once solve the smoke question, and thus dissolve all possible coal rings.

Electricity seems destined to annex the whole field not merely of optics, but probably also of thermotics.

Rays of light will not pass through a wall, nor, as we know only too well, through a dense fog. But electrical rays of a foot or two wave length of which we have spoken will easily pierce such mediums, which for them will be transparent.

Another tempting field for research, scarcely yet attacked by pioneers, awaits exploration. I allude to the mutual action of electricity and life. No sound man of science indorses the assertion that "electricity is life;" nor can we even venture to speak of life as one of the varieties or manifestations of energy. Nevertheless, electricity has an important influence upon vital phenomena, and is in turn set in action by the living being—animal or vegetable. We have electric fishes—one of them the prototype of the torpedo of modern warfare. There is the electric slug which used to be met with in gardens and roads about Hornsey Rise, there is also an electric centipede. In the study of such facts and such relations the scientific electrician has before him an almost infinite field of inquiry.

The slower vibrations to which I have referred reveal the bewildering possibility of telegraphy without wires, posts, cables, or any of our present costly appliances. It is vain to attempt to picture the marvels of the future. Progress, as Dean Swift observed, may be too fast for endurance. Sufficient for this generation are the wonders thereof.

Photomicrography.

The importance of modern photography as applied to microscopic objects is forcibly brought out by the following remarks made by Prof. Robert Koch, the eminent bacteriologist, who employs photography with great success to bring out the most minute parts of organic and inorganic bodies.

Prof. Koch likens the negative plate to a human eye not blinded by a sharp light nor tired out by long-continued examinations.

"The negative," says Prof. Koch, "frequently shows very fine bodies and parts, which are afterward discovered by the microscope on the object itself, but only after very hard work and under the most favorable conditions regarding light, etc.

"Accurate measurement of but faintly visible objects is almost impossible under the microscope, but on the finished negative the task is rendered comparatively easy. The photographic picture of a great many objects is frequently of more importance than the object itself. If I gave to somebody a prepared specimen for viewing certain parts of the same under the microscope, for instance, lymph vessels containing bacteria, then I am not certain that the party has found the right spot, and if this is the case, I am not positia that he is viewing the part under the same light and conditions as I did. A photograph, however, gives the microscopic picture exactly in the same light, the same enlargement, etc., as I viewed it at the time of focusing it.

"It is very simple to explain the photogram to a number of persons at the same time, as one can point with the finger to a particular part, or measure it with the compass, or compare it with other similar photographs placed alongside of it, in short, you can do almost anything in order to come to an understanding over a disputed part."

Colorado Oil.

A recent paper on "The Florence Oil Fields of Colorado," by Geo. H. Eldridge, of the United States Geological Survey, says:

The locality is situated on the Arkansas River near Canoro City, and 30 miles from Pueblo, Col. The oil-bearing zone occurs in the Pierre formation, the lowest strata of the Montana group of cretaceous rocks, which is here about 4,000 feet thick. The most productive wells are 1,155 feet below its top, or 2,000 feet from the surface. There is then about 350 feet of barren ground, and then more oil is found. Below this is again 350 feet of barren ground, and finally, at the bottom of the zone, there are some small wells. The oil seems to have originated in the Pierre rocks. The percentage of producing wells to the number bored is 57½, and the wells yield from 5 barrels up to 250 barrels per day. The total yield of the district in 1890 was about 1,200 barrels per day, but the wells could yield 2,000 barrels per day of 31° Baume oil. Out of 300,000 barrels of crude oil there was produced last year 100,000 barrels of illuminating and 5,000 barrels of lubricating oil.

"The Thrift."

"The Thrift" is a species of banking association, instituted under the auspices of the Pratt Institute, of Brooklyn, N. Y., for the purpose of encouraging people in economical habits, and to train up the young especially in the right use of money. The central office is in the Pratt Institute. It includes an investment branch, in which interest is given on account of regular installment deposits, at the rate of about 6 per cent per annum; a deposit branch giving interest on deposits made at any time under stated regulations; and a loan branch, designed to encourage the acquirement and building of homes, somewhat as in building and loan associations. The security includes a first mortgage on the property and assigned life insurance equal to one-half the amount of the loan. An explanatory circular has been issued, explaining more at length the workings of the association, and it is evident that its capacity for good is very great.

To Harden Iron all Through.

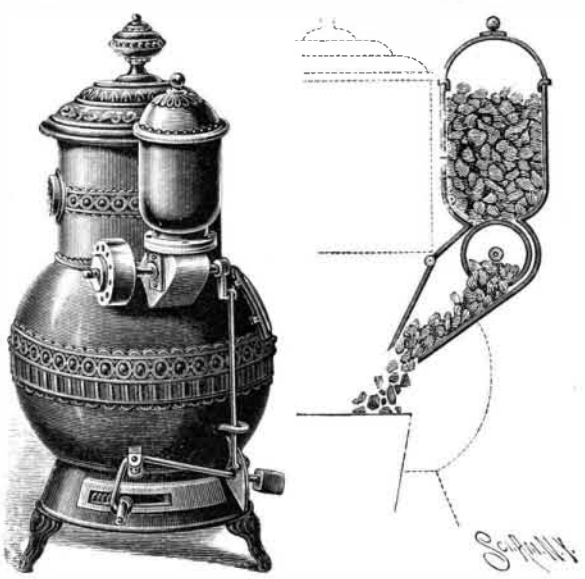
Ox hoofs and leather are soaked in French nut oil, and are then burnt, pulverized, and mixed with sea salt and potash. The following proportions are used: 30 per cent of hoofs, 30 per cent of leather, 30 per cent of sea salt, 10 per cent of potash. This product is said to harden iron all through.

The Great Railway Station, Jersey City.

The new terminal station of the Pennsylvania Railroad, Jersey City, N. J., opposite New York City, has the largest train shed in the world, surpassing that of the St. Pancras terminal of the Midland Railway, in London. It is 652 feet 6 inches long, 256 feet wide, 86 feet clear height at the center, and 110 feet from rail level to top of skylight. The structure consists of twelve pairs of main roof trusses, 252 feet 8 inches between centers of end pins, with the lower chord or tie rod running across under the platforms. The trusses are of riveted connection, and are hinged at each foot and at the apex to allow for contraction and expansion. The ends are filled in with glass, and half of the roof area is of glass, with wire netting inside to prevent the fall of glass in case of breakage. Along the apex of the trusses is a large skylight, with open sides for ventilation, and there is also a skylight along each side of the main arch. The radius of the outer line of the main arch trusses is 215 feet at the sides and 150 feet at the middle, while the inner line is 125 feet radius at the middle, 162 feet 6 inches at the sides and 45 feet to the platform level. There are twelve tracks, arranged in three double-track and six single-track lines, with platforms 12 feet 2 inches to 22 feet wide. The station is approached by a four-track plate girder deck elevated viaduct, which has already been described, as well as the complete switch and signal and interlocking plant. A station and office building will be erected, the former having waiting, refreshment, and ticket rooms, etc., and the latter a five-story building for the general offices of the New York division of the road. The railway platforms are about on a level with the upper decks of the new ferry boats connecting with New York across the river.

A FEEDER FOR STOVES AND FURNACES.

A device designed to automatically feed a desired amount of fuel at regulated intervals to a stove or furnace, and which will also shake the grate to prevent the accumulation of ashes, is shown in the accompanying illustration. It has been patented by Mr. William Jones, of No. 2551 Bloomington Avenue, Minneapolis, Minn. The hopper has a lower opening leading into a chute which delivers into the fire pot, the inner end of the chute being closed by a swinging door when the coal is not passing, so that gas from the fire pot cannot escape by this channel. A shaft extending through the upper portion of the chute carries a cylindrical bucket, turning immediately beneath the mouth of the hopper, and which has on one side an opening admitting coal from the hopper, the coal being discharged from this opening down the chute when the bucket is turned over, as shown in the sectional view. A tongue pivoted in the lower portion of the hopper extends over the edge of the opening to prevent the coal in the bucket from clogging and facilitate the rotation of the bucket. On one end of the bucket shaft, within a suitable casing, is a clock-work mechanism to turn the shaft, the mechanism being operated by a simple form of spring motor which can be easily adjusted to run as fast or slow as desired, according as the feed is to be regulated, this being effected by sliding in or out the blades of a fan, thus causing an increased or diminished air pressure. It is preferred that the bucket be not too large, and be made to turn comparatively often, thus supplying small quantities of coal at frequent intervals. On the other end of the bucket shaft is a crank connected by a rod with a block engaging the longer

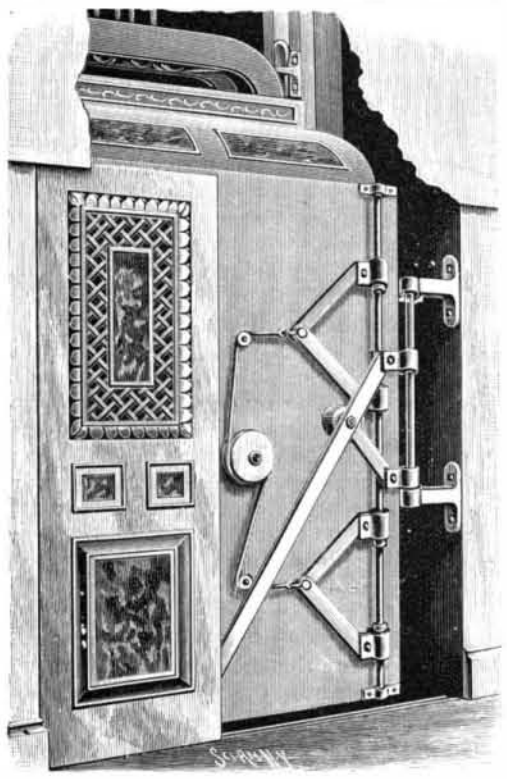


JONES' FEEDER FOR STOVES AND FURNACES.

arm of a bell crank to operate a grate-shaking attachment. The grate does not tip, but oscillates, and has a laterally extending jointed arm supported in a longitudinal slot, this arm being connected with the short arm of the bell crank. The longer arm of the bell crank has at its free end a weight, and this arm is designed to be raised and dropped by the revolution of the bucket shaft, causing the oscillation of the grate from the connection of the latter with the short arm. To give the grate more of a vibrating movement, a spring is arranged at one end of the slot through which the arm of the grate extends, the opposite pressures of the spring and the weight acting to increase the movement of the grate, whereby it will be effectively shaken, to keep the fire free from ashes, each time a charge of fuel is delivered into the fire pot.

AN ELEVATOR DOOR OPERATING DEVICE.

The improvement shown in the accompanying illus-



BUTLER'S ELEVATOR DOOR OPERATOR.

tration is designed to automatically close the door of an elevator shaft, in conjunction with an ascending or descending car. It forms the subject of a patent issued to Mr. Louis W. Butler, of No. 1 Broadway, New York City. Upon the front of the car, and held slightly out from it by end and intermediate bearings, is a vertical rod, upon which slide four sleeves, arranged in pairs, to which the ends of levers are pivoted, the levers of each pair of sleeves being pivotally connected. The sleeves bear at their inner ends against the intermediate bearings, and when the levers are pressed toward the rod the sleeves of each pair slide up and down, the levers tending to assume a vertical position. The levers are normally held in their triangular position, as shown, by a spring-actuated drum pivoted on a stud, a cord or chain wound around the drum and passing over guide pulleys being connected at one end with the upper set of levers and at the other end with the other set of levers. Upon the inner wall of the elevator shaft, and preferably a slight distance above the shaft opening, is held another rod, on which slides the sleeve of a door-shifting rod, the lower end of which is pivoted to the rear edge of the door near the bottom, while on the inner side of the rod a friction roller is journaled upon a stud, and the rod is pivotally connected by a link with a lower sleeve on the rod held on the shaft wall. In operation, as the car moves up or down, in passing a closed doorway, the friction roller easily presses in the levers sufficiently to allow the car to pass without moving the door. When the car stops at a floor the friction roller stands between the two sets of levers, and the door may be readily opened. When the car commences to ascend, the door being open, the shifting lever will be in a nearly vertical position, and the friction roller on the lever will then contact with the upper lever of the lower set and travel out on its inclined surface to force the door to a closed position. If the car is going down, the contact will be upon the lower lever of the upper set, the door being closed by a similar movement in both cases. The tension of the spring in the drum connected with the levers is such that, should any one entering or leaving a car be caught between the door jamb and the door, no serious injury will be inflicted, as the door may be readily forced back against the tension of the spring.

The Rain-Making Experiments.

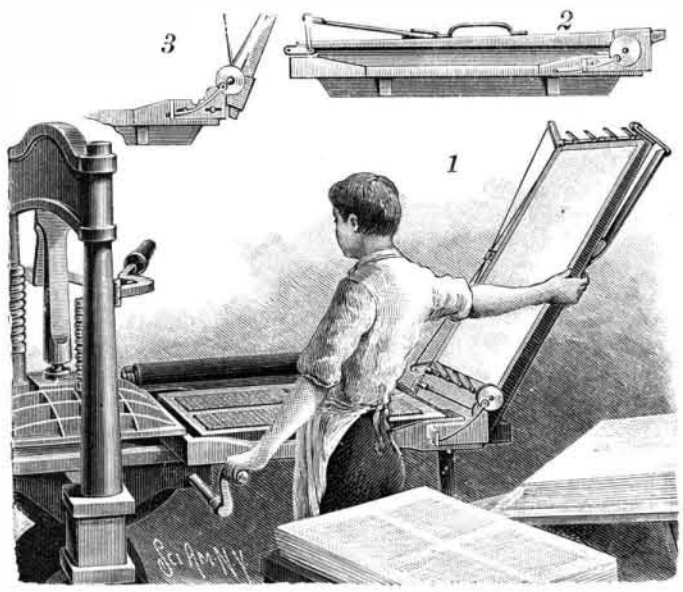
A letter from a citizen of Texas who witnessed the recent Dyrenforth rain-making experiments in that State pronounces them the most veritable humbugs and absurd waste of public money of which it is possible to conceive. He says that the trial party were shrewd enough not to begin operations before the season when, from time immemorial, rain has come down plenty and often in that region. In his belief, too, unwarranted claims and representations were sent out as to the results of the experiments.—*Boston Journal.*

Testing Oil of Turpentine.

G. Vulpius finds that reliable determinations of petroleum in turpentine oil may be made by the following modification of a method proposed by Hinsdale: 1 gramme of the sample and 1 gramme of a pure oil of turpentine are weighed on separate watch glasses, which are then floated on a basin of water maintained at about 80° C. As soon as the pure turpentine has evaporated, both watch glasses are weighed. The weight of the residue from the pure oil of turpentine (small quantity of resin always present in pure turpentine) is deducted from that of the residue in the watch glass which held the sample. The difference is petroleum, which may thus be determined to one-tenth of a per cent.

AN AUTOMATIC FRISKET FOR PRINTING PRESSES.

The improvement shown in the accompanying illustration is designed to facilitate the keeping of a perfect register in doing work on hand presses, while saving the pressman the labor of operating the frisket. It has been patented by Mr. Lorenzo D. Clark, of Fort Jones, Cal. The large view represents a press to which this improvement has been applied, Fig. 2 being a side view of the bed only with the tympan folded down upon it, and Fig. 3 being a partial section of the device in open position. At one side of the bed, adjacent to the tympan, is adjustably secured a shoe, having a vertical offset or ear with a cam surface. Near the lower end of the tympan a shaft is transversely journaled in three bearings, the bearings being so constructed as to admit of adjustment to any size of form. Upon the end of the shaft projecting over the offset of the bed shoe, is a disk, provided with a wrist pin projecting from both its faces, the inner portion of the pin being adapted to ride upon the cam surface of the offset, while the outer end of the pin is connected by a curved link with the ear of the bed shoe. One end of the link is pivoted to the pin, and its other end is bent to form a hook, and has a sliding connection with the ear, whereby the link will draw upon the wrist pin to turn the disk and its shaft when the tympan is being thrown back, but will slide freely in a slot in the ear as the tympan is being put down. Upon the opposite end of the disk-carrying shaft is a head block, with a perforation at each end to receive a connecting rod, the other end of each rod being similarly connected to a head block on the end of a shaft journaled on the tympan near its top. The rods cross each other near their central portion, where they pass through guide sleeves, the crossing of the rods causing the shafts to be rotated in opposite directions, and the upper shaft has at its opposite end a crank arm, which is pivotally connected by a link with a spring, the tension of which is away from the tympan. Each of the shafts at the top and bottom of the tympan is provided with grippers, and as the tympan is put down, after a sheet has been placed in position, the pin on the inner side of the disk engages the cam of the bed shoe, whereby the disk is revolved and both shafts are turned, the tension of the spring then operating to press the grippers firmly upon the sheet. When the tympan is raised, the link connecting the bed shoe with the disk causes the shafts on the tympan to be revolved sufficiently to release the grippers, when the tension of the spring, as the crank arm to which it is connected is carried over the center of its radius, holds the grippers open. It is also designed, where desired, to use guard strips in connection with the gripper



CLARK'S FRISKET FOR HAND PRESSES.

shafts, to prevent the soiling of the sheets, the guards being so placed as to stand out at an angle when the tympan is raised, and not interfere with the work of the pressman.

A MOST important feature of the scientific instruction in the lower grade of schools should be the collection of specimens which should form the subject of object lessons.