

THE NEW YORK FIRE DEPARTMENT.

Although the single swing of a pendulum only measures a second of time, yet each one of these periods may be so intimately and directly connected with events of such vital interest as to become of the greatest importance. It is doubtful if there be any moment, in any calling, in which so many movements bearing immediately upon the result are crowded as in the fire department when an alarm is received. The ease with which an incipient fire can be extinguished, and the fearful rapidity with which it spreads and gets beyond control, compelled the adoption of every device and method that would in any way lessen the time intervening between the alarm and the arrival at the fire. Consequently each fraction of a second is carefully guarded lest it escape before having seen the performance of some step tending toward the accomplishment of the main object. The seeming confusion, the apparent mixing up of men, horses, and machinery, is the outcome of persistent study aided by a thorough acquaintance with the wants, and with even the minutest detail that could be made subservient.

All the fire alarm boxes in this city are connected by wires with the headquarters of the fire department, and are all numbered. When the hook in a box is turned down, the alarm is made only at the headquarters, where the operator, by the aid of a switch board, instantly sends the number of that particular box to every fire company in the city. In each company's house, near the door, are placed the gongs, recording apparatus, telephone, etc. (The position of the various instruments, the location of the engine and stalls, and of the poles by which the men descend from the upper floors, and the method of hanging the harness so that it may be placed upon the horses in less than a second, are all plainly shown in our view of the interior of the quarters of Engine Company 33, on Great Jones Street.) The first alarm is sounded upon a small gong, familiarly known as the joker, and the first stroke sets in motion a train of mechanical movements which, though in operation but an instant, produce most strange results, and change a scene of quiet into one of startling activity and of absorbing interest to the stranger who chances to be present. The first impulse of electricity passing over the wires attracts the armature of a magnet, which releases a small weight sliding on a rod placed beside the gong. This weight strikes the arm of a lever that permits the fall of a heavy weight located below the floor, and which is so connected as to withdraw the bolts holding the halters of the horses, who dash forward to their places under the harness. The same impulse of electricity has sounded the alarm upon gongs in the sleeping apartment on the second floor and in the reading rooms on the third floor, and the men come sliding down the brass rods. The time of receiving the alarm is recorded by a small clock that is stopped at the first stroke. Before the gong has ceased ringing the harness has been dropped and clasped, the driver is belted to his seat, and the men are waiting for the doors to be rolled back.

So far each company in the department has gone through these operations, since all are compelled to hook up at every alarm. The boiler of the engine is directly connected with a coil of pipe in an ordinary egg-shaped stove placed in the basement. Low down upon the rear of the engine are two pipes which are attached by telescope joints to two pipes leading up from the coil. When the engine is to go out, two valves which prevent the escape of water from the boiler are closed by moving a lever, and a rod pressed down through a hole in the floor. This rod operates four valves; two which close the pipes leading through the floor, and two which open pipes leading to a small tank in the ceiling, in order that the coil may be supplied with water during the absence of the engine. The rod also raises the lid of the stove to deaden the fire.

The strokes upon the joker might be compared to a series of dots and dashes sounded quickly—thus, two strokes and a pause, three strokes and a pause, and five strokes would indicate that the alarm came from box numbered 235. These strokes are repeated two or three times by the joker, and are then told off, but much more deliberately, upon the large gong. This arrangement is to save time, and while the men are hitching up they are counting the strokes, and if there is any doubt about the number they wait until the signal is given by the big gong. But it generally happens that the engine is on its way to the fire before the second gong has begun its work. After the exact number has been ascertained, all those companies which are expected to respond to that number start for the scene of the fire, while the other companies, after waiting a short time, unhook the horses and place the apparatus in the condition it was before the alarm was struck. We thus see that one stroke places the entire force of the department on the alert, and fifty-four engine companies (nine of which are double companies, and are provided with an extra engine and a large number of men), seventeen hook and ladder companies, and the two water towers are ready to turn out at every alarm. Many of the companies are frequently out of their houses in three, four, or five seconds, and at the last horse show in Madison Square Garden, this city, Engine Company 33 hitched up once in 1¾ seconds, once in 1½ seconds, and once in 1¼ seconds—or three consecutive times in less than 2 seconds.

The most important item in the time question is getting the horses in harness. The horses are placed in stalls as near the pole as practicable, and are kept bridled. The harness is attached to the engine, and is raised to such a height that the horse has no difficulty in passing to his place beneath it. It is suspended from a Y-shaped frame of tub-

ing, at each end of which is pivoted a downwardly curved hook, upon which the harness rests. The reins pass through a catch in the center of the frame, so that by pulling them the hooks are released and the harness allowed to fall upon the backs of the horses. The collars are binged at the middle, and one free end is provided with a holt which enters a socket in the other end, in which it is held by a spring catch. The hinge is made wide so as to prevent lateral movement and insure the entrance of the bolt when the ends are brought together.

The forward fire engine shown in the illustration is from the Clapp & Jones works, and is what is known as second-class. The plunger is 4¾ inches in diameter, and the engines (double) are 8 by 7 inches. The boiler is 64 inches high, 35 inches in diameter, has 120 drop water pipe tubes and 40 smoke flues. It is capable of throwing three streams, two side ones 2½ inches, and a center one 3¼ inches in diameter. It is not necessary to notify the engineer of the amount of water required, since the quantity can be controlled by the man in charge of the nozzle. In the nozzle is a conical shaped plug that can be moved longitudinally by turning a screw collar, and by this means a stream can be obtained varying from the size of a pin to the full capacity of the pipe. In case the nozzle is reduced or is completely shut off, the engine is relieved of all liability to serious strain by the action of an automatic relief valve designed by Mr. Pallett, of Engine 24. This valve is placed beside the pump, to which it is connected at two points, one above and the other below the plunger. The connecting passage is interrupted by a valve held upon its seat by a spring in such a way that the pressure necessary to raise the valve can be regulated at will. When the full power of the engine is required the valve is screwed down, but for ordinary work it is set at about eighty pounds. As soon as the water pressure in the pipes is increased beyond this point, by partially closing the nozzle, the valve is lifted and communication made between the top and bottom of the pump chamber; when the nozzle is completely closed, the valve is raised clear of the passage, and the pump churns the water round and round. The engineer is relieved of all care, and the control of the water is placed in charge of the one who best knows the quantity required. The spray nozzle consists of a cylinder, one portion of which is thickly studded with small holes, and upon which slides a collar wide enough to cover the perforated section when a spray is not desired.

The sleeping quarters of the officers and men are on the second floor. Through the floor, in locations so as to be most quickly used, are three openings, in the center of each of which is a smooth brass rod leading to the floor below. Upon the third floor are the billiard room, lockers, drying room, which has a zinc floor, and, together with the bath-room, is heated by a furnace in the basement, and feed room. Hay and grain are raised from the rear. The grain bins are connected with the lower floor by tubes, and the hay is passed down through chutes, so all the dust is confined to one small room.

When fighting a fire, it sometimes becomes essential to throw a powerful stream into the upper stories of a building, and to give the most satisfactory results the nozzle should be elevated and brought in close proximity to the window. This is accomplished by the water tower (shown in several positions in the upper view), which consists of a large pipe so mounted upon trunnions that it can be quickly raised to a vertical position. The lower end of this pipe is connected by a flexible pipe that extends under and to the rear of the truck, where it terminates in four 3 inch inlets, each of which may be coupled to a hose leading from an engine. Each inlet is furnished with a swinging valve, operated by the pressure of water in the pipe. Various lengths of pipe can be screwed upon the upper end of the trunnion pipe, giving the following lengths: single, 29 feet, long single, 36 feet, two short lengths, 43 feet, two long, 50 feet. Between the end of the pipe and the end of the nozzle is inserted a short piece of flexible pipe that moves between two side flanges. Projecting from each side of the nozzle is a stud that enters a groove in the flange. The nozzle is connected by a light wire rope with a small drum placed on the body of the truck, from which location all the movements of the tower are guided. By winding up this rope the nozzle will be depressed and will deliver water in a downward direction. The short connecting pipe bends upon a curved frame that prevents wrinkling. The elasticity of the pipe and the force of the water are sufficient to raise the pipe when the rope is unwound. To stay a long length of pipe there is a stout wire rope extending from the top to a drum at the base. This rope is extended by braces hinged to the lengths. The vertical pipe may be moved upon its own axis. The stream may be delivered at any height below a certain limit, and may be directed up or down or to either side.

A distributor to be attached to the end of a hose consists of two curved hollow arms, one at each side of the closed end of the pipe. Upon the hub of each of these is a pinion engaging with a gear on the pipe. When water under great pressure is sent through these arms, they are rapidly revolved upon their own axes and at the same time about a common axis, so that they send a shower of water in all directions.

Water tower No. 2 is located in the same house with Hook and Ladder Company 3, on Thirteenth Street. Few people have any conception of the number of implements forming the equipment of a hook and ladder company, and fewer people still have any understanding of the uses of these tools. The truck here referred to carries the following tools, the use

of which we briefly mention: Two Bangor extension ladders, one 65, the other 45 feet long, so constructed that they may be made any length up to the extreme; two ladders 55 feet long, one 33 feet, one 25, one 20, one 15, one 12, one hook 20 feet long, one 15, one 12, two 10, and six 6 feet long. Two Babcock fire extinguishers, used upon small fires when required. One battering ram weighing 64½ pounds, and formed with a thick wooden section terminating in an iron shoe at one end and having a short rod at the other; this is manned by six men; its use is apparent. Six tubular hand lamps. Four rubber buckets. Seven forcible entrance tools. The iron shutters and doors upon the buildings of this city, being secured upon the inside, are most serious obstacles placed in the way of firemen, who, in order to effect a quick entrance, are supplied with crowbars and jimmies made of the best steel and after the most approved pattern. One 10-pound steel maul. Four cotton hooks, four hay forks, and two shovels for the removal of loose material. Four axes for cutting through floors, roofs, and partitions, and two picks for entering walls. One crow bar, ten wrenches and belts, including a gas pipe wrench for shutting off the gas when necessary; one roof rope 125 feet long; two horse blankets; one whip. One respirator, by which the wearer is enabled to enter dense smoke and to encounter noxious vapors. One distributor, described above. One four way connection. One length 3¼-inch combination hose. One copper pipe 3¼ inches. Three nozzles. One iron pipe holder. One calcium light with oxygen and hydrogen tanks and fittings. This is found most useful in lighting up the scene of operations. Two danger flags, to signal trains upon the elevated railroads, one patent horse shoe, one butting stick, one brass gong, two cushions. One cellar pipe, 1½-inch nozzle, which is used to direct a stream to any part of a cellar, up or down, when thrust through a lower window, and which is of the utmost advantage in situations where the ordinary nozzle could only be made to deliver a downward stream. One cross bar and chain. Three scaling ladders of the following lengths and weights: 16 feet 35 pounds, 18 feet 39 pounds, and 14 feet 27 pounds. These are wooden poles backed with a strip of iron and having steps at about every fourteen inches. To the upper end is secured a right angled arm which is notched upon the under side and which ends in an angle piece. The books so formed are long enough to extend to the inner side of the widest window sills. The ladder is raised and the hook thrust through the window when the fireman ascends. Another ladder may be handed to him and by him hooked in the second window, and another in the third window, until a string of ladders reaches the roof, or he may support himself upon the sill, raise the ladder he came up by to the second window, and so on to the roof. One life line 150 feet long and three coils of life saving rope. The total weight of the tools is 2,718 pounds, and these together with the twelve men who go with the truck, and the truck itself, weigh 9,756 pounds.

Welding Fluxes.

We do not know that the following welding fluxes are any better than the welding material used generally by watch makers and silversmith, but they have been patented in England, so we publish them.

1. A welding material composed of 25 parts by weight of borax, a paper or metallic support, and 60 parts of metallic filings of the same nature as the metals to be welded, and made by first melting the borax; second, immersing the support in the fused borax; third, smoothing the same by passing it through pressure rollers; fourth, sprinkling its two faces with the metal filings; fifth, heating the sheet in an oven; sixth, passing through pressure rollers.

2. A welding material composed of borax and of metallic filings of the same nature as the metals to be welded, mixed with the fused borax, and in the proportions substantially as set forth, and then rolled out into sheets of about one sixteenth of an inch thick.

3. The welding sheets coated with a layer of gum lac or other appropriate varnish.

The following compound has been frequently offered as a trade secret: Take copperas, 2 oz.; saltpeter, 1 oz.; common salt, 6 oz.; black oxide of manganese, 1 oz.; prussiate of potash, 1 oz. Pulverize these ingredients and mix with them 3 lb. of nice welding sand.

A Lucky Inventor.

The *Milling World* says that George Westinghouse, before he invented and perfected his well known air brake, was regarded by a number of his then acquaintances with something approaching pity, because of his alleged lack of "gumption." His air brake was a success, and his friends began to think there was something in him after all. His automatic engine added to his fame and bank balance, and he mounted higher in the esteem of his former friends. A few weeks ago a valuable well of natural gas was struck on his premises at Homewood, near Pittsburg. The well is 1,580 feet deep, and the flow of gas is tremendous, the roar being almost deafening and scarcely endurable to the citizens of the neighborhood. Two other wells are being put down by Mr. Westinghouse, and he estimates that his profit therefrom will soon amount to \$1,000 a day. We don't know what he wants of those wells, as he is not in straitened circumstances, but if some of those former friends, adds the *World*, don't just about bow down and worship him ere long, we'll miss our guess.

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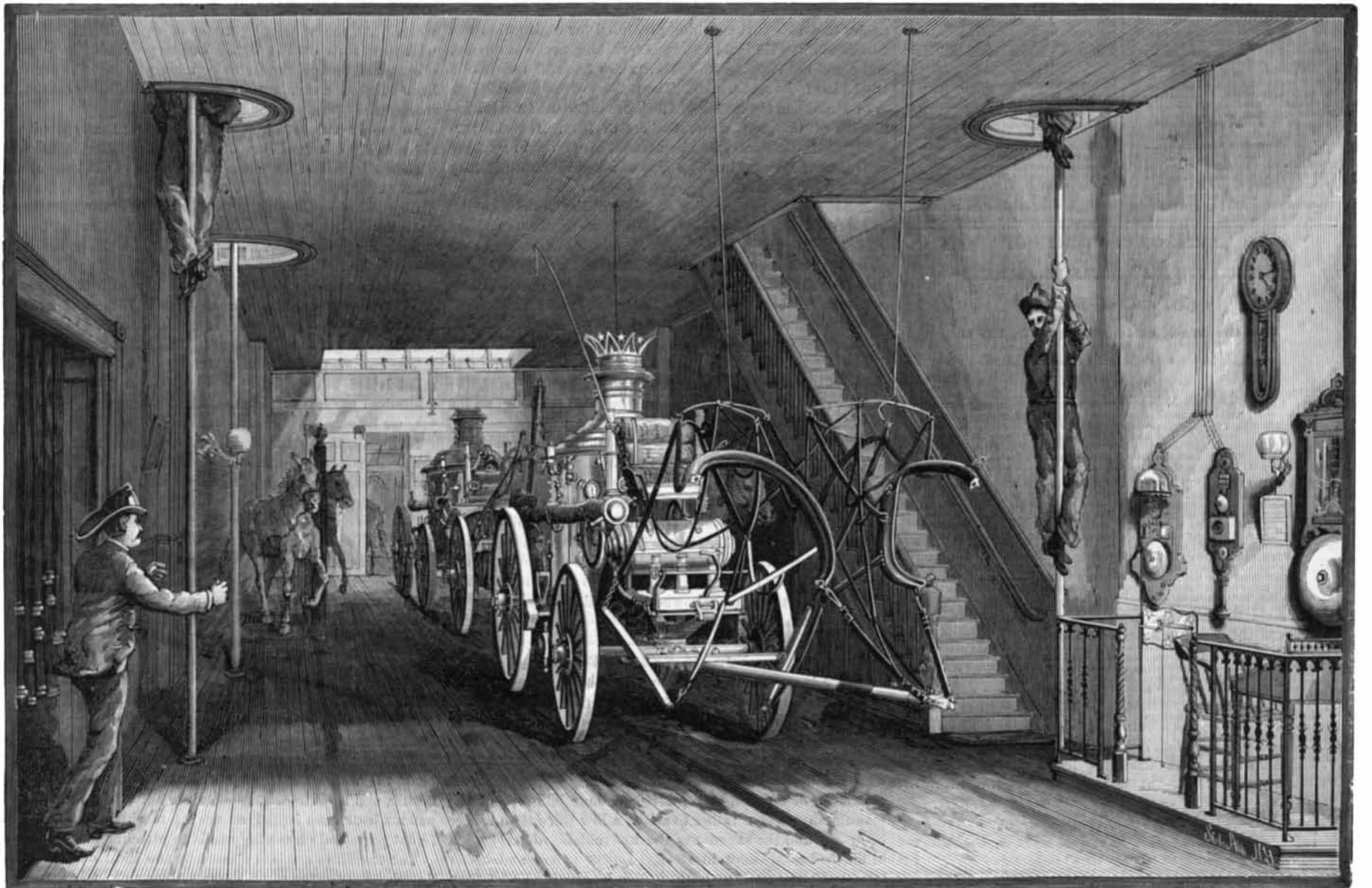
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NEW YORK FIRE DEPARTMENT.—THE WATER TOWER.



NEW YORK FIRE DEPARTMENT.—INTERIOR VIEW OF A MODEL ENGINE HOUSE,—[See page 85.]

The Panama Canal.

The London *Graphic*, of July 19, thus comments on this great engineering enterprise: If ever this channel of communication is completed, it will have, like the Suez waterway, far reaching consequences. The British public, however, do not show much interest in the affair, and therefore seekers after trustworthy information are driven to the official reports recently issued by the Government of the United States. From these documents we learn that, though the canal itself is scarcely begun, much useful preliminary work has been accomplished. Surveys have been made, the route has been cleared of trees and bushes, cottages and barracks have been built, and hospitals established. Admiral Cooper states that the undertaking is so gigantic that it is difficult to believe that it can be finished by the allotted time, 1888, but he admits that the work already done is of a solid and substantial character.

Recently there have been serious disturbances both at Panama and Aspinwall, chiefly between the native Colombians and the imported laborers, some 12,000 or 14,000 in number, from Jamaica. As these latter are, of course, British subjects, it is quite possible that our Government may be drawn into some difficulty. Finally comes the question whether the canal, if finished, will prove a commercial success. It is reckoned to cost 120,000,000 dollars, and will probably cost a great deal more. Will the tolls which are levied on the ships which pass through be likely to yield a fair interest upon this enormous capital? That the Suez Canal was at first a failure and is now a success does not answer the question, because the circumstances of the two cases are not analogous. There is no region in the Western world to which the Panama Canal will be such a convenient short cut as the Suez Canal is to the countries of Southern Asia. To Australia the Panama Canal will merely afford an alternative route of doubtful advantage; neither Mexico nor Peru raises much produce as compared with India or China; and the western coast of North America is already united with the eastern by several lines of railway. Altogether, the Panama Canal seems more likely to be useful to America than to the world in general.

Removing Phosphorus from Iron.

Andrew Carnegie, one of Pittsburg's most extensive iron masters, gives the following description, in the *Collier's Guardian*, of how Messrs. Thomas and Gilchrist succeeded in devising their now famous process for eliminating phosphorus from iron. This writer says: "In making steel, ten tons of molten pig iron are run into a big pot called a converter, and hundreds of jets of it are blown up through the mass to burn out the silica and carbon, and finally to make it steel.

"Now, phosphorus has a greater affinity for lime than for iron, when it reaches a certain temperature; and when the air blast brings the mass to the required heat, the million particles of phosphorus, like so many tiny ants disturbed, run hither and thither quite ready to leave the iron for the lime. In experimenting to get rid of the phosphorus, these clever young men (Thomas and Gilchrist) first put a lot of lime in the bottom of the pot as a bait, and into this fly the ants, perfectly delighted with their new home. The lime and the slag float to the top and are drawn off, but mark you, let the temperature fall, and the new home gets too cold to suit these salamanders, although the temperature may be over 2,000 degrees, hot enough to melt a bar of steel in a moment if thrown into the pot. No, they must have 2,500 degrees in the lime, or they will rush back to the metal. But here lay a difficulty, 2,500 degrees is so very hot that no ordinary pot lining will stand it, and of course the pot itself will not stand a moment.

"If ganister or fire brick is used, it just crumbles away, and besides this, the plaguy particles of phosphorus will rush into it and tear it all to pieces. The great point is to get a basic lining—that is, one free from silica. This has at last been accomplished, and now the basic process is destined to revolutionize the manufacture of steel, for out of

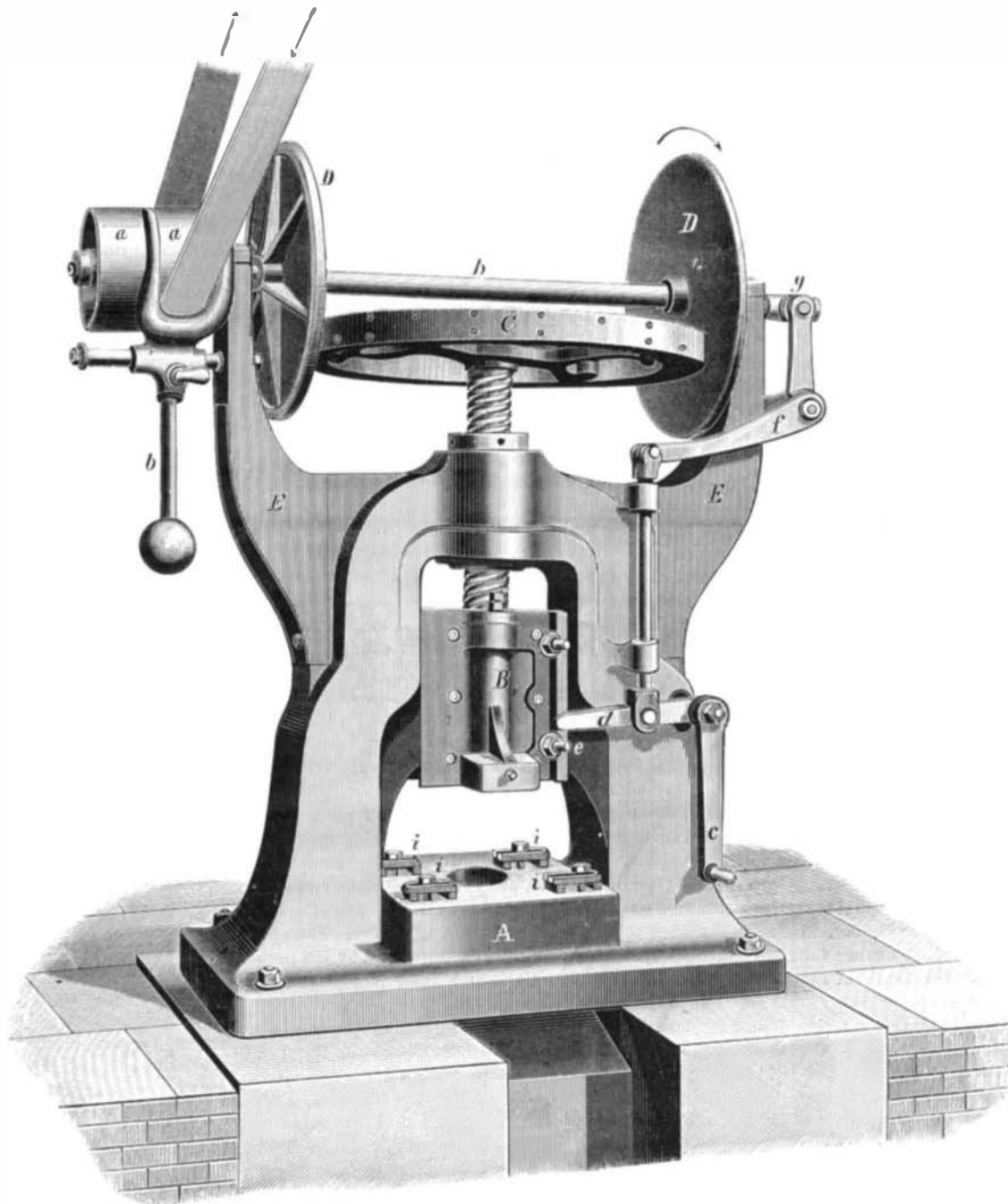
the poorest ores, and even out of the puddle cinder, steel or iron much finer than any now made for rails or bridges can be obtained, and the two young chemists, patentees of the Thomas-Gilchrist success, take their rank in the domain of metallurgy with Cort, Neilson, Bessemer, and Siemens."

Cement for Connecting Glass and Brass.

According to Puscher (*Chemiker Zeitung*), a cement of the kind which stands heat very well and which is not dissolved by petroleum, and is therefore very adaptable for cementing the brass burners on the glass reservoirs of petroleum lamps, is made by boiling 1 part of caustic soda and 3 parts of colophony with 5 parts of water, and kneading up the resin soap thus formed with half its weight of gypsum. Thus prepared, the cement hardens within about three-quarters of an hour. If zinc white or white lead is used in the place of gypsum, the hardening takes place more slowly.

IMPROVED FRICTION SCREW PRESS.

Our illustration, taken from the *Deutsche Industrie Zeitung*, represents a screw press with a flywheel attached, which offers a good substitute for a drop hammer, where certain operations forbid the use of the latter. Power is applied at the pulleys, *a*, which set the friction disks, *D D*, in rotation. By turning the lever, *e*, to the right or left,

**IMPROVED FRICTION SCREW PRESS.**

either one these disks can be pressed against the rim of the flywheel, *C*, which is covered with leather. In this manner the head block, *B*, can be raised and brought down quickly and with a power depending upon the speed and size of machine. The stops, *e*, on the head block disengage the friction disk, *D*, at the proper moment and thus prevent any undue strain which might otherwise occur. The lever, *e*, may be extended below the floor and worked by a treadle, thus leaving both hands free.

COMMENTING on the cholera, which is prevailing to a considerable extent in the south of France, *Nature* says: "Of the future course of the epidemic it is at this stage almost impossible to speak with any authority; but it is very certain that occasional lulls in the number of attacks—occurrences which are immediately reported as indicating a subsidence in the outbreak—cannot be regarded as having much significance in this respect; for it is one of the essential characteristics of cholera, especially in the early stage of an epidemic, to exhibit periodic fluctuations both in the number and in the intensity of attacks."

Henocque's Collodiographic Process.

The applications of ricinated collodion—that is to say, of normal collodion rendered elastic by the addition of a small quantity of castor oil—have up to the present time been reserved for therapeutics; but Dr. Henocque utilizes this product for a very different purpose—that of fixing or transferring and reproducing the delicate imprints of those stylographic tracings whose use is constant in physiological, physical, and meteorological researches, and, in general, in the numerous applications of the graphic method. These tracings are formed by an extremely light styllet upon smoked paper, which is wound around a cylinder or drum that has a continuous or interrupted motion. The styllet, in removing a part of the lampblack, leaves fine white lines, which stand out from the black background and are fixed by means of varnish, so that they may be preserved and reproduced by engraving or typography.

In the process under consideration, the lines are covered with a coat of ricinated collodion, the ether is allowed to evaporate, and the collodion forms a pellicle which contains the lampblack and imprints of the styllet. There is thus obtained a sort of pellicular negative that exhibits transparent lines upon a black ground. This pellicle is separated from the paper by means of water and transferred to a glass plate, to which it adheres upon drying.

This negative may be at once used as a lantern slide for projecting the enlarged image of the tracing upon a screen; or it may be used for reproducing the tracings by the Marion and Pellet process, or the lines may be reproduced upon sensitized paper. In the latter case the lines will be black upon a white background. To obtain the lines in white it will be necessary to convert the collodiographic negative into a photographic one. These operations, thanks to the gelatinobromide process, can be effected by the light of a candle. Finally, the collodiographic negative can be converted into a typographic plate by the Gillot process. This process, which will certainly be improved, already offers a very simple autographic method. It not only permits of the rapid manufacture of pictures for projection, but the author has, moreover, used it for reproducing India ink and crayon drawings that had been made upon drawing paper, or upon paper of the most ordinary kind.—*La Nature*.

Electric Light Patents.

Judge Shipman has just filed his decision in a very important patent suit brought by the Brush Electric Company against users of the Weston electric light apparatus. The defense has been conducted by the United States Electric Lighting Company, manufacturers of the apparatus, and the trial has occupied nearly four years. The testimony taken covers over two thousand printed pages, and the oral argument before Judge Shipman in March last occupied eight entire days. The suit was upon the two principal patents granted to Charles F.

Brush, one for metal plated carbon points, and the other for an electric arc lamp, which, it was claimed, controlled the entire business of electric arc lighting. Before the argument the plaintiffs withdrew the carbon patent, and Judge Shipman now decides that the lamp patent is invalid and void and dismisses the bill, with costs, as to both patents.

Connected Twins.

A most wonderful freak of nature recently occurred in the practice of Dr. J. Q. A. French, of Hillsboro, N. H., in the birth of twin girls, united from armpit to hip by a bone serving as breast bone for the two. Otherwise they were fully and perfectly developed, each having a spinal column, from which the ribs extended to an attachment at the one sternum between them; arms, hands, feet, and legs in every way perfect, and no unpleasant feature about them. Life was extinct before they were both born, although one breathed for several minutes. The mother, Mrs. Thompson, is slowly recovering. The weight of the strangely united couplet was thirteen pounds, and they are preserved for the benefit of those interested in medical science.