

**THE MANUFACTURE OF SODA.**

Soda is now universally manufactured from chloride of sodium (common salt), which is first converted into sulphate of sodium, and is then treated with powdered chalk and coal. Leblanc has introduced the following proportions for this mixture: 100 parts sulphate of sodium, 104 parts of carbonate of calcium, and 39 parts of coals.

If in solution, the sulphide of calcium and the carbonate of sodium can remain without acting upon each other. The results of the operation are variable mixtures of carbonate of sodium, caustic soda, sulphate of calcium, and lime. As the proportions of the carbonate of calcium are varied, the results obtained vary more or less likewise, but generally the quantity of lime used is greater than the quantity given in the theoretical formulæ.

The process of making soda may be divided into four distinct successive stages:

1. The reduction of the sulphate of sodium into a sulphide  $\text{Na}_2\text{SO}_4 + 2\text{C} = \text{Na}_2\text{S} + 2\text{CO}_2$ .

2. The double decomposition of the sulphide of sodium and the carbonate of calcium:  $\text{Na}_2\text{S} + \text{CaCO}_3 = \text{Na}_2\text{CO}_3 + \text{CaS}$ .

3. The production of oxide of sodium, due to the partial reduction of the excess of carbonate of calcium, by the coals:  $2\text{CaCO}_3 + 2\text{C} = 2\text{CaO} + 4\text{CO}$ . (The quicklime acts upon the carbonate of sodium during the lixiviation.)

4. The production of oxide of sodium, in case an excess of carbonate of calcium is not used, due to the action of the coal on the carbonate of sodium:  $\text{CO}_2\text{Na}_2 + \text{C} = 2\text{CO} + \text{Na}_2\text{O}$ .

It is evident that by varying the proportions of the coals and lime, more or less caustic salts and caustic soda may be obtained. The latter branch of industry has been greatly developed in England, particularly since the adoption of the rotating soda furnaces. In France, where the latter are used but very sparingly, the soda salts contain only from 2 to 10 per cent of caustic soda. The first rotating furnace was built in 1853, by Messrs. Elliot & Russel, and has since been considerably perfected by Messrs. Stevenson, Williamson & MacTear.

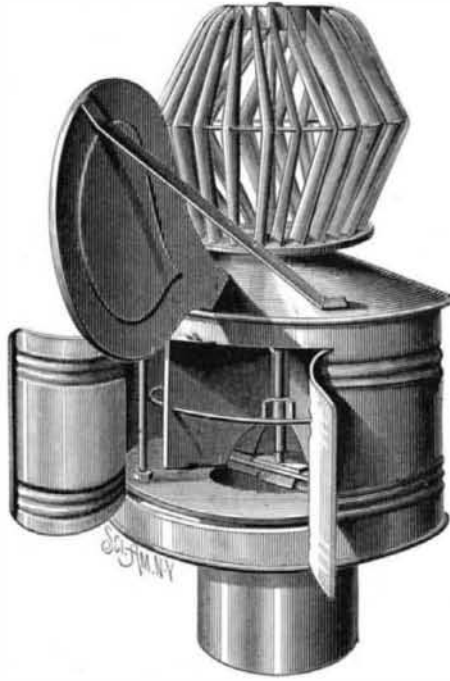
The furnace as it is generally constructed and as exhibited at the Universal Exhibition of 1878, in Paris, consists of an enormous cast iron cylinder lined with fire brick, and arranged to rotate on the longitudinal horizontal axis, as shown in Fig. 1 of the annexed engravings, which we have taken from *La Nature*. The flames of an adjoining furnace pass into the cylinder at one end and escape at the other, passing through and heating the mass contained in the same. The cylinder is provided with several openings for filling and discharging it. These openings are closed by means of cast plates furnished with locking devices. The revolving furnace does not require any stirring and mixing of the mass as is necessary in the reverberatory or ordinary soda furnace, and it permits of operating much more rapidly.

Both in the reverberatory and revolving furnaces the raw soda forms hard lumps, if the proportions of Leblanc, as given above, are adhered to, and these lumps can only be lixiviated with the greatest difficulty. Mr. MacTear avoided this difficulty by adding about five per cent of quicklime to the mass, thereby obtaining a product that could be very easily lixiviated, for the lime expands as it comes in contact with the water and breaks the lumps into small pieces. A factory in Glasgow, using MacTear's improved revolving furnace and the above improvements in the process, produces fifty tons of soda in twenty-four hours.

The lixiviation is carried on in the apparatus and according to the continuous method of James Shank, as shown in Fig. 2 of the annexed engravings. A and B are vats or tanks containing the lumps of raw soda, and are provided with perforated false bottoms; CC are pipes which convey the lye from one tank to the other; by this means it is gradually concentrated and the soda is gradually and thoroughly lixiviated. The lye is evaporated in furnaces, heated by a separate fire or by the waste heat of the soda furnace, until it has the consistency of sirup, which mass is then placed in large crystallizing vessels, subdivided by perforated plates, like sieves. The carbonate of sodium settles on the sieve plates, whereas the impurities are contained in the concentrated lye. In order to obtain the commercial product the carbonate of sodium must be calcined. Mr. Thelen has constructed an apparatus in which the lye is evaporated and the crystals are collected mechanically as rapidly as they are formed.

**A NEW VENTILATOR.**

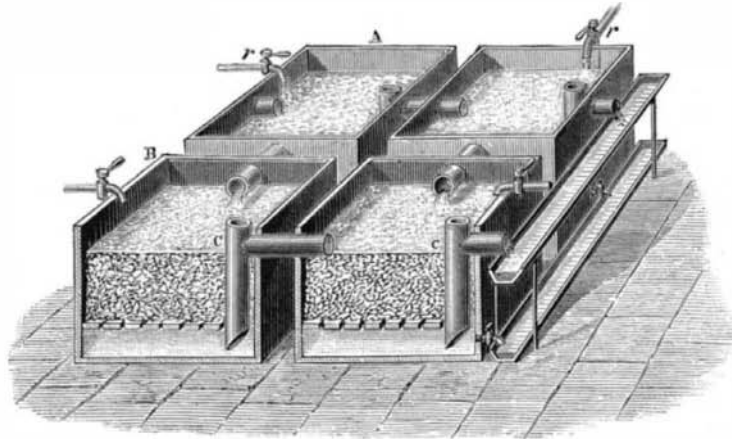
In comparing the various methods of ventilation, Surgeon General John S. Billings, U. S. Army, who has made ventilation a life study, and other eminent authorities, agree as to the power, capacity, and cheapness of the exhaust fan for the purpose of ventilation. Tall chimneys are useless for the purpose of ventilation without heat when the difference



**THE WING VENTILATOR.**

between the internal temperature of the house and the temperature of the external air is insufficient to produce a current, and when they are doing their average duty they are far more inefficient than is generally supposed.

From the reports on ventilation in the Barnes Hospital



**FIG. 2.—APPARATUS FOR LIXIVIATING SODA.**

Washington, D. C., for 1876, the chimneys there used showed an average current of less than 200 feet per minute when the fan was not in use. The current is usually much less than this. In the record of ventilation of the Boston City Hospital, December, 1877, and January, 1878, the average velocity of the air passing through ventilators was about 100 feet per minute. In the Brooklyn school buildings—generally supposed to be well ventilated

—it is found upon examination that many of the ventilating shafts are absolutely without currents, while some of the buildings, provided with what have been considered efficient ventilators, show a current ranging from 30 to 170 feet per minute, with the rooms heated, and in many of the churches and public buildings in this and other cities it is found that the ventilating flues are, in the majority of cases, either entirely dead or with a downward draught, sometimes being found entirely sealed to stop a downward draught of cold air. This array of facts indicates that the question of ventilation has been hitherto unsatisfactorily dealt with. The ventilator represented in the accompanying engraving is constructed on scientific principles, and is well calculated to fulfill the requirements of an efficient ventilator.

The ventilator shaft used in connection with this device is enlarged as it extends upward, so that each successive story of a building may discharge into it without interfering with the proper ventilation of the lower stories. The cowl into which the ventilating shaft discharges is large and nicely pivoted, so that it turns easily with the wind. Its flaring mouth gives it peculiar advantages over the ordinary form of cowl, so that this of itself is a very efficient ventilator; but the chief merit of this device lies in the arrangement of the fan and its propelling wind wheel seen at the top of the cowl.

All the parts are made to work very freely and with but little friction. The fans are arranged so as to swing around the inner periphery of the casing, leaving an undisturbed central core, while the enlarged hood and vertical position of the fans offer no resistance whatever to the upward current of air in case the fan should not be in motion. In motion they force the air out through the lateral opening, thus producing a vacuum, aiding the natural draught or creating one where there was none.

With the Wing fan ventilator it is found after many tests that when the wind is not strong enough to run the fan, the peculiar form of the cowl, its enlarged size, and prompt action in shifting itself to windward, will give a regular current of from 100 to 200 feet per minute; while with a fair to brisk wind to run the fan the velocity will go up to 300 and 400 feet, while with a strong wind it often records over 500 feet, and has in several cases reached over 600 feet per minute. Six tests made November 20, 1879, at St.

Denis Hotel, where there is a 24 inch shaft capped with a Wing ventilator, showed an average of 438 feet, being an actual exhaust of fully 100,000 cubic feet of foul air per hour. December 22, 1879, in public school branch of 15, Brooklyn, six tests showed a current of from 225 to 357 feet per minute, with 8 12-inch pipes leading into two large pipes of 24 inches each, showing an exhaust of over 146,000 cubic feet per hour, with only a light wind and no fires. Later same day the one in Brooklyn *Eagle* building showed a current from 230 to 270 feet per minute. November 20, 1879, the Irving House, where there are two of these ventilators, one over each tier of water closets, gave a current of 525 feet, there being a good breeze.

The inventor gives us an instance in which eggs put last summer in a cold storage house provided with his ventilators had kept until winter perfectly, while those in similar houses without the ventilators had failed to keep in good condition, showing clearly the need of fresh dry air, even in the preservation of eggs. For smoky chimneys or to prevent down draught this ventilator is particularly adapted.

Mr. Wing furnishes us with the names of a large number of persons using his ventilator, and has shown us some very flattering testimonials in regard to its efficiency.

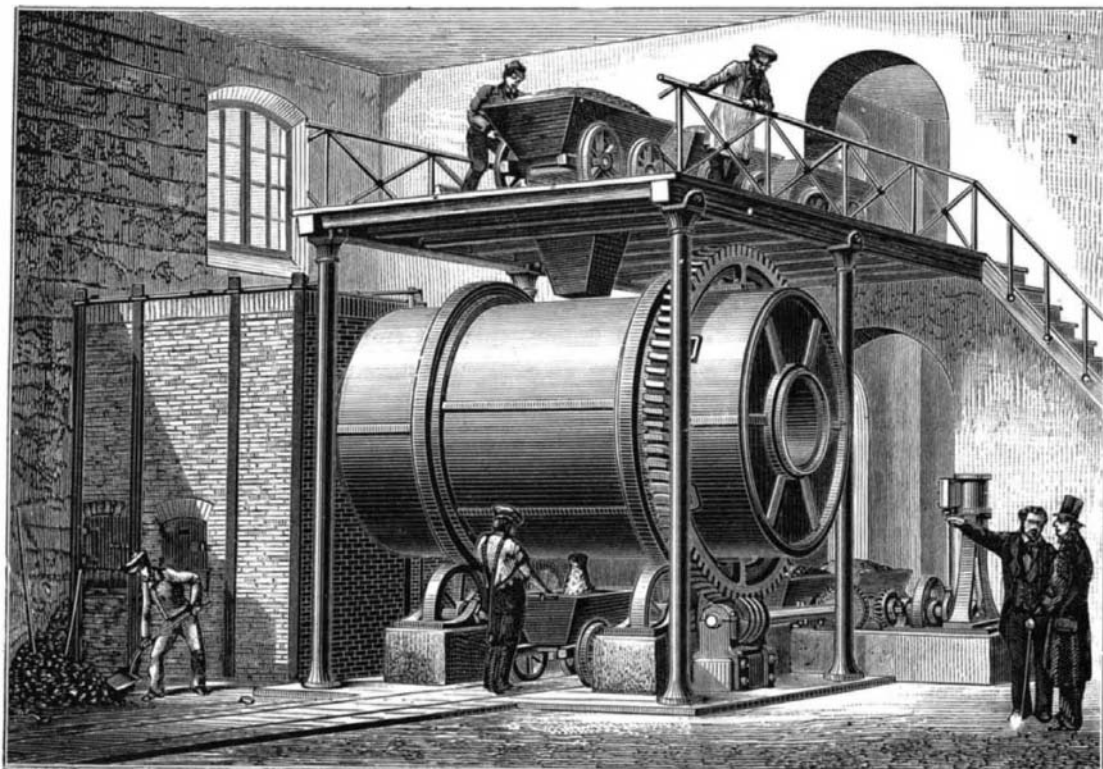
For further information address Mr. L. J. Wing, or the Simonds Manufacturing Company, 50 Cliff street, New York city.

**MISCELLANEOUS INVENTIONS.**

An improvement in apparatus for drawing and preserving malt liquors, patented by Mr. John Neumann, of New York city, is designed for the purpose of drawing malt and other liquors from a barrel or other vessel, without the admission of air or gas thereto, so that the liquor remaining at any time in the barrel will be prevented from becoming stale.

An improvement in snap hooks has been patented by Mr. John B. Hampton, of Pomeroy, Ohio. This invention relates to an improvement in fastening buckles, loops, and hooks to harness, bridles, etc., and the object thereof is to enable the connection to be made without stitching or riveting.

An improvement in swivels for bridle rein loops, patented



**FIG. 1.—REVOLVING FURNACE FOR THE MANUFACTURE OF SODA.**

by Mr. John B. Hampton, of Pomeroy, Ohio, consists of a bar adapted to be fastened to the bridle by rivets, having a slot through it and on either side thereof underneath a transverse recess for the reception of the studs projecting from either side of the end of the loop, which are passed through the slot in the plate, and then turned so as to rest in the said recesses, and thus form a swivel joint.

Mr. James McMurray, of East Portland, Oregon, has patented an improvement in cooking utensils. The object of this invention is to provide kettles, saucepans, and other cooking vessels with straining and steaming attachments, which shall be so constructed that they may be readily applied to the said vessels, and attached and detached, as required, and which shall be simple in construction and inexpensive in manufacture.

An improved machine for washing and beating silk and other threads and yarns when in the skein, has been patented by Mr. George Morlot, of Paterson, N. J. It is simple in construction and convenient and effective, removing all loose fibers and foreign particles, and forcing the water into and through all parts of the thread.

An improved tire shrinker has been patented by Messrs. George H. Stroud and John A. Shuman, of Sugar Run, Pa. The object of this invention is to provide a tire shrinker that will work effectually, and yet require no great exertion of power. It consists in combining with a movable plate and jaws a forked connecting rod, pivoted to the jaws, and a lever operated disk.

An improved brake for baby carriages, patented by Mr. William F. Wallberg, of Brooklyn, N. Y., is so constructed as to lock the wheels automatically whenever the handles are released, so that it will be impossible for the carriages to start forward accidentally.

An improved signal lantern, patented by Mr. Thomas S. Easterbrook, of Toledo, O., consists of a lantern globe having two opposite quarter sections colored, and the two intermediate ones uncolored, which globe is set in a lantern frame that has attached to it two quarter section metallic plates that are set opposite each other, so that by turning the globe the colored sections or lights of the globe may be covered by the plates and the uncolored or white lights only be shown, or the colored light be shown and the white be covered.

An improvement in window blind fasteners has been patented by Mr. William H. B. Allen, of Cambridge, Mass. This invention consists in a blind or shutter fastener operating to retain the blind open or closed and fitted for convenient manipulation. The inventor makes use of a pivoted catch and lever hung on the stile of the blind, which locks with the hinge staple to hold the blind in either position.

An improvement in dumping carts has been patented by Mr. George B. Wiestling, of Mont Alto, Pa. The object of this invention is to furnish carts, wagons, cars, and other vehicles so constructed that their bodies may be raised vertically, and also set in inclined positions, to facilitate the dumping of their contents.

#### The Eclipse of the Sun.

The line of totality of the eclipse of Sunday, January 10, crossed Central California and Southern Nevada, and penetrated nearly to the Great Salt Lake in Utah. Only in California, however, could favorable observations be taken, because the eclipse occurred so near sunset. Prof. Frisby, of the United States Navy, was sent, with a corps of observers, armed with powerful instruments, to the Pacific coast, and Prof. Davidson, with another corps of observers and a 6½ inch equatorial telescope, more powerful than the one Piazzi Smyth lugged up the Peak of Teneriffe, went into the Salinas Valley, which furrows the coast range, about 200 miles south of San Francisco, and within from 15 to 25 miles of the Pacific. Besides these, many private observers made elaborate preparations for observing the eclipse from various points within the line of totality. Apparatus for photographing the eclipsed sun was plentifully provided.

The first report came from Fresno, about 150 miles southeast of San Francisco, and within ten miles of the line of totality. The weather was perfectly clear. The first contact was visible at 2:45 P. M., and at 3:53 the observation became total.

As the last ray of sunlight disappeared, a corona of clear white light, entirely encircling the moon, flashed into view, brilliant at the edge of the moon and paling toward the outer limit of the halo. Next along the border, on the lower left third of the moon, appeared an irregular fringe of brilliant, sparkling primitive red and purple light, while at the top of the moon there was a bright yellow triangle of light equal in height to one-sixth of the diameter of the disk; a similar but smaller triangle appeared at the center of the right side of the moon, and from the upper and lower right side broad faint rays were projected. This appearance lasted thirty-one seconds, the corona remaining one minute longer. The sun disappeared behind the coast range before the eclipse had entirely passed.

The only other dispatch from parties of observation, up to Jan. 14, came from Prof. George Davidson, of the Coast and Geodetic Survey, stationed at Mount Santa Lucia (5,700 feet above the sea), just south of Monterey, Cal., and but a short distance from the Pacific Ocean. Prof. Davidson says:

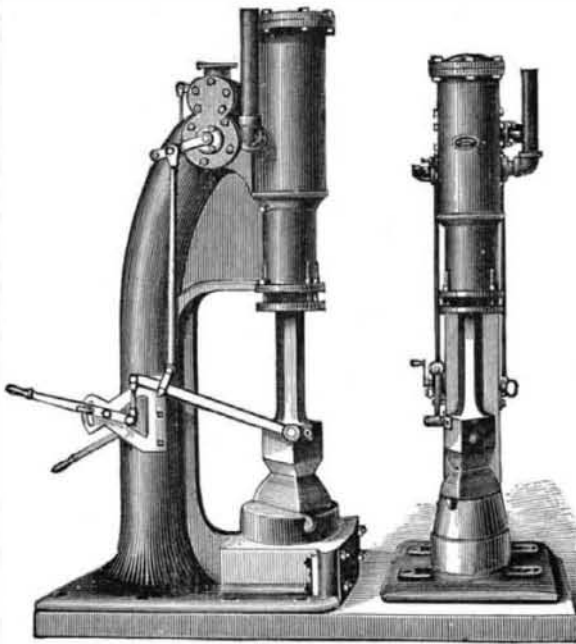
"After five days of fierce winds, rain, sleet, and snow, with a temperature of eleven degrees, the weather cleared on Sunday, and we had good observations both at the beginning and the ending of the totality. The totality lasted thirty-two seconds. The shadow was seen coming over the

Pacific Ocean. There was a brilliant corona and red flame. Latitude and transit observations were obtained.

The United States Naval Observatory party, under Prof. Frisby, at the same station, are said, in a dispatch from Soledad, to have made successful observations. The first contact was within one and a half seconds of computed time.

#### IMPROVED STEAM HAMMER.

The annexed engraving represents two sizes of an improved steam hammer invented by Mr. David Bell, of Buffalo, N. Y. These hammers are very simple in construction and substantially built. The single column standard, the cylinder, and the bed piece are cast in one piece. The die block is cast separately and fitted in the bed plate.



BELL'S IMPROVED STEAM HAMMER.

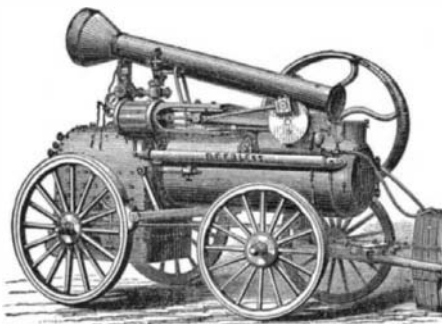
One of the hammers shown in the engraving has an eight inch cylinder and eighteen inch stroke, and the other has a ten inch cylinder and twenty-two inch stroke.

All the parts are very strong, and it is self and hand acting, and takes steam at both ends of the cylinder. The ten inch cylinder at ordinary steam pressure will strike a blow of from four to five thousand pounds. The stroke is perfectly automatic and can be made light or heavy as desired.

The hammer was shown by Mr. Bell at the Exhibition of the Mechanics' Institute held in Buffalo some years ago. The judges reported that it was the best hammer for forging and general blacksmith work on exhibition. Since that time he has made several improvements upon it, so as to perfect the invention, and it is now being used in six of the largest machine shops in Buffalo and also in other parts of the country, and all who have had experience with it pronounce it the best hammer in use.

#### THE PEERLESS PORTABLE STEAM ENGINE.

The annexed engraving represents a portable engine for agricultural and other purposes, which, in general design, completeness in construction and operation, ranks among the best of its class. It is built with a view to strength, compactness, durability, and efficiency.



THE PEERLESS PORTABLE STEAM ENGINE.

The boiler, which is of the locomotive type, has a fire box of unusual length, and so arranged that the fire is completely surrounded by water. The tubes, which are lapwelded, vary in number in different sizes of the engine, from twenty to fifty-five; in size from two inches to two and a quarter inches; in length from twenty-eight inches to fifty-two inches.

The smoke box, fire door, ash pan, steam blower, smoke stack, and other adjuncts, are neatly and conveniently arranged, and the boiler is provided with the necessary appurtenances, such as steam and water gauges, blow-off cocks, etc. The engine cylinder and the steam chest are combined in one casting, which is bolted at one end to a flange on the end of the frame or bed plate. This arrangement permits of the free expansion of the cylinder, as it rests upon a bracket attached to the boiler, and the boiler is free to expand and contract without straining either the engine or itself.

The saddle or bearings for the crank shaft are of the kind used in first class stationary engines, and are arranged to adjust from four sides, upper, lower, right, and left, with

improved simple arrangement by which the bearings can be adjusted by persons who are inexperienced in the use of machinery, cannot be made too tight, and therefore can never be ruined from this cause. The bearings are made very large, and will run a long time before any adjustment is necessary. The support between the boiler and these bearings is cast hollow, through which all the water while cold, used to feed the boiler, must pass on its way to the pump, absorbing the heat which would otherwise cause the bearings and journals to become very hot. This valuable improvement, covering the new feature of a water passage between the boiler and the crank shaft bearings, for the purpose of keeping the journals and bearings cold, is secured by letters patent. When the water is not required in the boiler, the flow is kept up by opening a valve and allowing the water to return to the tank from which it was taken, thus keeping the bearings always cold, and never allowing the pump to become dry, but always working and ready to supply the boiler with water when required.

The engine and boiler can be mounted on a strong substantial truck or wagon, as represented, or on sills. All the parts are interchangeable, and none but the best materials are used, and the workmanship is of the best.

Further information may be obtained from the Geiser Manufacturing Company, Waynesboro, Franklin county, Pa.

#### MECHANICAL INVENTIONS.

An improvement in speed-accelerators has been patented by Mr. James Schofield, of New York city. The object of this invention is to convert slow or slight motion into rapid or extended motion by the intervention of ropes or chains and sheaves, for the purpose of propelling boats, vehicles, machinery, and the like. The invention consists, essentially, of a sliding carriage containing several sheaves, and fixed on a reciprocating rod, while over said sheaves and sets of corresponding standing sheaves fixed opposite, and at a distance, a rope or chain is passed back and forth in such a manner that a slight movement of the carriage will produce a very extended or accelerated movement of the bight of the rope or chain, or of objects attached to it.

An improvement in vehicle-wheel hubs has been patented by Mr. Lucius S. Edleblute, of Cincinnati, Ohio. This invention is an improvement in the class of metal wheel-hubs in which the spoke tenons or butts are clamped between flanged collars, one of which is adjustable on the axle-box to adapt it for convenient adjustment or removal, and it pertains to a peculiar construction and arrangement of parts which cannot be clearly described without an engraving.

Mr. Benjamin Slusser, of Sidney, Ohio, has invented an improved elevator for warehouses and other buildings, constructed with a view to securing greater safety against the sudden fall of the elevator platform from the breakage of the rope, and to provide against persons falling through the hatchways in the several floors. The invention consists in a novel automatic clutch for arresting the descent of the platform in the event of the sudden breakage of the rope, and in the peculiar means for opening and closing a set of automatically operated trap doors for the hatchways, which are opened above and closed after the platform in rising, and also opened below and closed above the platform in descending, so that at no time is the hatchway left open.

Mr. Lovren E. Hogue, of Sandy Lake, Pa., has invented an improved injector in which the lifting and forcing tubes are so constructed and arranged with regard to each other that the pressure may range from forty to one hundred and fifty pounds without requiring any change in their adjustment, the said construction and arrangement enabling the quantity of water to be so graded that three or more different quantities of water may be injected into the boiler.

#### The New Industrial Art School.

The new free school for workers in metal and wood was opened January 13, at No. 31 Union Square, under the management of the trustees of the Metropolitan Museum of Art. The object of the school will be to teach carvers in wood, engravers on gold, silver, steel, and other metals, and others how to design artistically, so as to do away with the old-fashioned method of designing from copy, and in this way to enable the workers to obtain higher prices for their work. The project had been long before the trustees of the Metropolitan Museum of Art, and the establishment of the school is due in great measure to the efforts of Messrs. Robert Hoe, Jr., William L. Andrews, W. E. Dodge, Jr., and Edward C. Moore and Professor Thomas Egleston. The school will be open from 7:30 to 9:30 P. M. The first class will be for workers in wood, and the above named gentlemen have invited workmen from the art establishments of the city who possess a knowledge of drawing and who wish further instruction to attend. A class for workers in metals has also been organized. The students will be allowed to copy from models brought from the collections of the museum. Many manufacturers have promised to do all they can toward making the school a success.

The industrial importance of schools of this nature can scarcely be over-estimated. Wherever they have been undertaken they have shown themselves the most efficient aids in raising the character of industrial art and the social and financial condition of the artisan. It is to be hoped that the young artisans of New York will be prompt to avail themselves of the privileges now offered them.