APPARATUS FOR DETERMINING THE DEGREE OF MOISTURE OF STEAM.

In order to determine the degree of moisture of steam (that is to say, the quantity of water carried over by a given weight of steam) and the pressure of steam in the boiler or the steam chest, Messrs. Boye, of Bergen (Norway) and Müller, of Dresden (Saxony), have constructed an apparatus, the principles of which consist in causing the dilatation of a definite volume of steam, and keeping its temperature constant until it passes from the state of saturation to a superheated condition, and observing the volumes at the beginning and end of the operation. The apparatus is shown in the accompanying cut in section through the axis of the middle, the mercurial pressure-gauge, *d*, and the lever being turned 90 degrees.

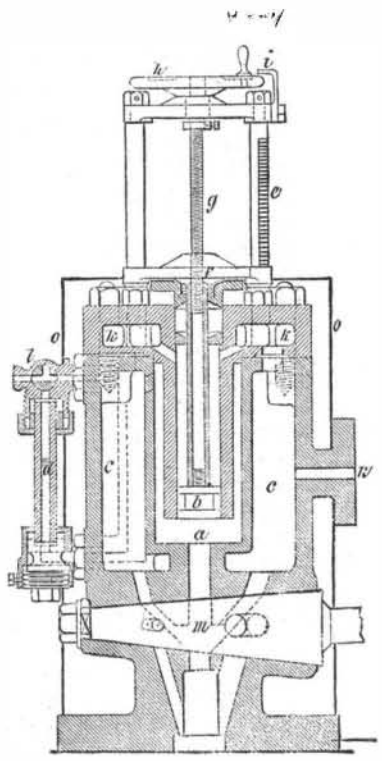
A given volume of steam from the boiler is let into the space, *a*, through the cock, *m*, and the piston, *b*, is then raised by means of the hand wheel, *h*, and the threaded shaft, *g* (which is movable in a nut, *f*, fixed on the hollow rod of the piston), so as to dilate the said steam. During this time the temperature of the latter is kept constant in the space, *a*, by means of a jacket, *c*, which surrounds it, and in which constantly circulates fresh steam. When the piston has been raised so far that the steam no longer contains any moisture, or has passed from the saturated to the superheated state, there occurs in the space, *a*, a diminution of pressure that brings about a variation in the level of the mercurial column, *d*, that communicates on the one side with the space, *a*, and on the other with the jacket, *c*.

The travel described by the piston and indicated by the displacement of the crosspiece, *f*, on the scale, *e*, gives the percentage of increase in volume of the space, *a*. The pitch of the screw on the shaft, *g*, is calculated in such a way that every revolution of the latter shall correspond to an increase of one per cent in the original volume of the space, *a*. The circumference of the hand-wheel, *h*, is divided into one hundred parts, so that the index, *i*, permits of estimating a hundredth of a revolution or 0·01 per cent of the volume, *a*.

To prevent cooling of the steam and leakages through the piston, the cover, *k*, is provided with compartments that communicate with the jacket, *c*, and steam is likewise let in over the piston.

The three-way cock, *l*, placed over the mercurial column, *d*, allows the jacket, *c*, and the space, *a*, to be put in communication either singly or jointly with the external air, and the jacket, *c*, and space, *a*, to be connected. This cock serves likewise for moderating the too violent oscillations of the mercurial column. The cock, *m*, has two systems of conduits perpendicular to each other.

The steam is first led through the cock, *m*, in such a way that *a* and *c* communicate with the boiler; then the cock is turned so that the steam shall only circulate in the jacket, *c*. By turning the cock, *m*, 45°, it shuts off the entrance of steam to *a* and *c*. A metallic pressure-gauge is fixed at *n*, on the jacket, *c*, so that the pressure in the boiler and dome or in the jacket may be determined when necessary. An external boiler plate casing, *o*, prevents the cooling of the jacket, *c*. The difference between the moisture of the steam in the boiler and in the steam chest that may be determined by this apparatus indicates whether the steam ports are in a good state.



APPARATUS FOR DETERMINING THE DEGREE OF MOISTURE OF STEAM.

SANITARY ARRANGEMENTS IN THE RESIDENCE OF MR. CORNELIUS VANDERBILT.

The water supply apparatus in the house of Mr. Cornelius Vanderbilt is marked by its extensive, elegant, and substantial character.

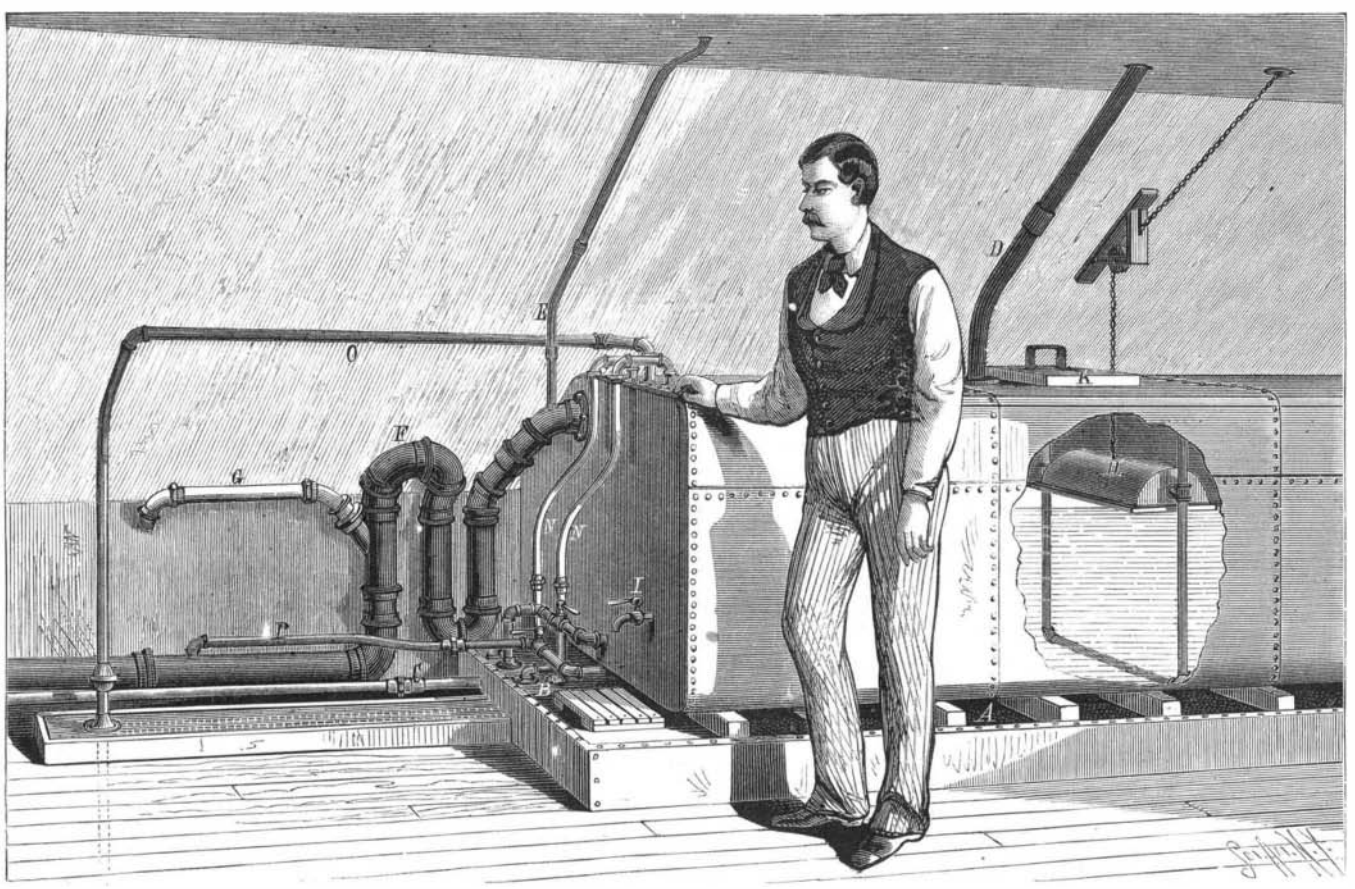
The water supply, the distribution of which we shall first describe, is partly from Fifty-seventh street, on which the house fronts, and partly from Fifty-eighth street, to which the lot extends in the rear. That from the former will be through a 3-inch iron pipe. Just inside the house wall, in the cellar, it will enter a meter, from which a 3-inch brass pipe will run to the pumps and a 2-inch pipe to a distributing reservoir. The tank pump will be run by a hot air engine, and force the water through a 2-inch brass pipe to the tank on the fifth floor just under the roof. A sketch of this tank and its connecting pipes will be seen below on this page. It is a closed tank of about 1,300 gallons capacity below the overflow, made of riveted plates of wrought iron. It rests on wooden beams raised about an inch above the surface of the lead safe, A, by small blocks of wood covered with lead. Grooves in the safe converge to an outlet, B, to remove the water of condensation. This outlet is connected with a 1¼-inch brass pipe, C, to be discharged over the lower elevator tank or over a sink. The 2-inch brass supply pipe, D, coming up on the other side of the bowling alley which occupies the center of this floor, is carried over the ceiling and down into the tank as shown. A half inch branch, E, taken from it above the ceiling, will supply the deep trap on the 4-inch iron overflow, F, which is connected with the sewer. The 2-inch iron vent pipe, G, runs out through the roof. The side of the tank is broken away to show the copper float, H, which slides up and down on the pipe rods, being connected by a brass sash chain, running over the ceiling in a wooden trough on pulleys and down through a brass pipe to an indicator in the engineer's room. A manhole, at K, gives access to the interior of the tank. The down supply from the tank is through the 1¼-inch brass pipe, L, passing through the lead-lined and lead-covered trough, M, through which the two three-quarter inch relief pipes, N N, from the hot water reservoirs, also pass. The lead-lined trough has a waste outlet like safes under fixtures. In all cases horizontal pipes under floors are carried in this way, but the whole amount of such piping is very small, the fixtures above the basement being arranged in tiers, one above another. From the point where the supply pipe, L, turns down, a 1¼-inch air pipe, O, is returned to the tank, to prevent "air binding." The 1¼ brass pipe, P, discharging into the overflow, is for emptying the tank. A self-closing faucet, R, is inserted in the end of the tank for drawing water for use on that floor, there being no other tap; beneath it is a wooden rack on which to rest a pail.

Returning to the Fifty-seventh street meter, the distributing reservoir before mentioned will be a vertical iron cylinder about 5 feet high by 15 inches in diameter. The 2-inch supply from the meter will enter the bottom (from which also will be taken a 1-inch sediment pipe), and six distributing pipes leave one side, between a point 4 inches from the bottom and the middle—the upper part to serve as an air cushion. One 1½-inch branch will supply the fixtures of the kitchen which is in the front of the basement, passing on its way to them around the grease traps under the sinks, as will afterward be described. Another 1½-inch branch goes up through the house to the third floor to supply bath room fixtures. The four other branches will be each 1¼ inches in diameter. One will supply the street washers, the fixtures in the front basement, and the steam heating boilers; another the fixtures in the cellar; another the slop sinks; and the last, two fountains.

The supply from Fifty-eighth street is through a 1½-inch lead pipe. This also will pass through a meter, after which it will enter a vertical lead cylinder, 4 inches in diameter, similar to the larger one of iron and for the same purpose. One 1-inch lead branch will supply a fountain and street washer, and a 1½-inch brass pipe the fixtures of the laundry, which is in the rear of the basement. Before reaching any fixtures, this latter branch passes through about one hundred feet of brass pipe in the drying room adjoining the laundry. This is arranged in twelve horizontal lines, one above another, and connected by return bends, like some forms of steam radiators, and has a drip trough below it; it is designed to condense and remove the moisture from the drying room.

These two supplies from the different streets may be connected with each other by opening a stop cock. The two hot water supplies—kitchen and laundry—may also be connected. These will be described in detail after the boilers and ranges are set and connected.

The method of distributing to the bath rooms is as follows: As before stated, these fixtures are arranged one above the other. In a passage way to the bath room on the second floor, three sets of three pipes each come through the floor beside the wall; one set is for cold water, another for hot water from the kitchen boiler supplied from the tank, and the third from the kitchen boiler supplied from the street pressure. The outside pipes of each set (being, respectively, the street pressure cold and the tank cold; the tank hot and its return circulation; and the street pressure hot and its return circulation) are connected with each other about three feet above the floor, and from the middle of this connection, having a stop cock on each side, the third pipe of each set is taken to supply the bath room fixtures directly opposite, the middle pipes being the distributers (of cold—either tank or street pressure—tank hot and street pressure hot) to that floor, and going no higher. The two hot water pipes also are connected, so that either source of hot may be drawn from as well as either cold. The same method is repeated on the floor above, but the street pressure pipes (except the boiler circulation pipe, which is extended to the tank for relief) go no higher. All the water supply pipe in the house is of brass, tinned outside and inside, and all in sight above the cellar is nickel plated.



TANKS AND CONNECTING PIPES IN THE RESIDENCE OF MR. CORNELIUS VANDERBILT.

Solidified Petroleum.

The authors solidify petroleum, in which state it only burns like tallow. They effect the solidification by mixing crude petroleum (after having undergone the first distillation) with 25 per cent of the purified juice of plants belonging to the family of the *euphorbiaceæ*. The two ingredients are put in a boiler fitted with an agitator, and heated together to about 50°, agitating the whole till the mass becomes a uniform milky fluid. When arrived at this state the mixture is distilled again and refined in the ordinary manner, when it solidifies, and may be used equally well for lighting or as a lubricant.—*MM. Frézon, Dumont, and Francou.*

THE cost of the French squadron of evolution in the Mediterranean is estimated at $29,000,000. The pay of the officers and crew is $4,000 a day.