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FRAGER'S WATER METER.

In 1872, M. Frager introduced to the notice of water-supply companies a new water meter, which was very favorably received, and which from that time to the present has been extensively used by the companies supplying water to various of the larger towns and cities of France. Recently the inventor has greatly modified the construction of the apparatus, so that it is exceedingly simple, moderate in price, and is not influenced in its correct working by variations in pressure. The operation of this meter, which is shown in the annexed cuts, is as follows:

The water enters the meter through the inlet pipe, which empties at the top of the distributing box. It traverses a sieve, which serves to remove the larger impurities, and exerts its pressure against the slide valves, T and T′. This pressure is transmitted to the measuring cylinders, C_1 and C_4, from the cylinders, C_2 and C_3, through the orifices, O_1 and O_4, which stand open. Since, at the same instant, the orifices, O_2 and O_3, are in communication with the outlet pipe through the intermedium of the ports of the slide valves which cover them, the spaces, C_2 and C_3, are in a state of discharge, and the pistons, P and P′, which separate these chambers from the first, tend to displace themselves toward the left. The piston, P′, abutting against the end to the left, by the extremity of its rod, remains immovable; but P moves forward toward this same end, and, striking against it, admits a cylinderful of water into C_1, at the same time expelling a like quantity of water from C_3. Before reaching the limit of its travel, it displaces the slide valve, T′, which uncovers the orifice, O_3, and covers up the orifice, O_4. As a consequence of these displacements the pressures are reversed in the cylinder, C_1; C_2 is charged; C_4 is discharged; and the piston, P, shoved toward the right end, drives a second cylinderful of water into the discharge pipe. Before stopping at the end of its travel, it displaces the slide valve, T′, which uncovers O_2 and covers O_1. Owing to this displacement, the pressures are reversed in the cylinder, C_1, and C_3 is charged, while C_1 is emptied. The piston, P, moves toward the right, driving a third cylinderful of water into the discharge pipe, displacing, on arrival at the end of its travel, the valve, T, and thus causing the expulsion of a fourth cylinderful of water by the piston, P′.

The different parts of the mechanism have now returned to their starting point, except the ratchet wheel, R, which has moved forward but one tooth, while the apparatus has been distributing the four cylinderfuls of water. This ratchet wheel actuates the clockwork which registers the quantity of water that passes through the meter. The movements just described take place as long as the inlet cock remains open.

It only remains to add a few complementary details.

Each piston, toward the end of its travel, actuates the valve which distributes the water into the other cylinder. To effect this the piston rod carries two cams, H_1 and H_3, or H_2 and H_4, which alternately act on the friction roller at the lower extremity of the controlling lever, L or L′; the latter moving on the axle, A or A′. The eccentric head of this axle is situated under the port of the slide valve (in a compartment separated from the one which operates to distribute the water) in such a manner that it pushes along the valve and carries it around the axle, now over the right orifice, and then over the left one. The mechanism which transmits motion to the clockwork is

[*Continued on page* 114.]

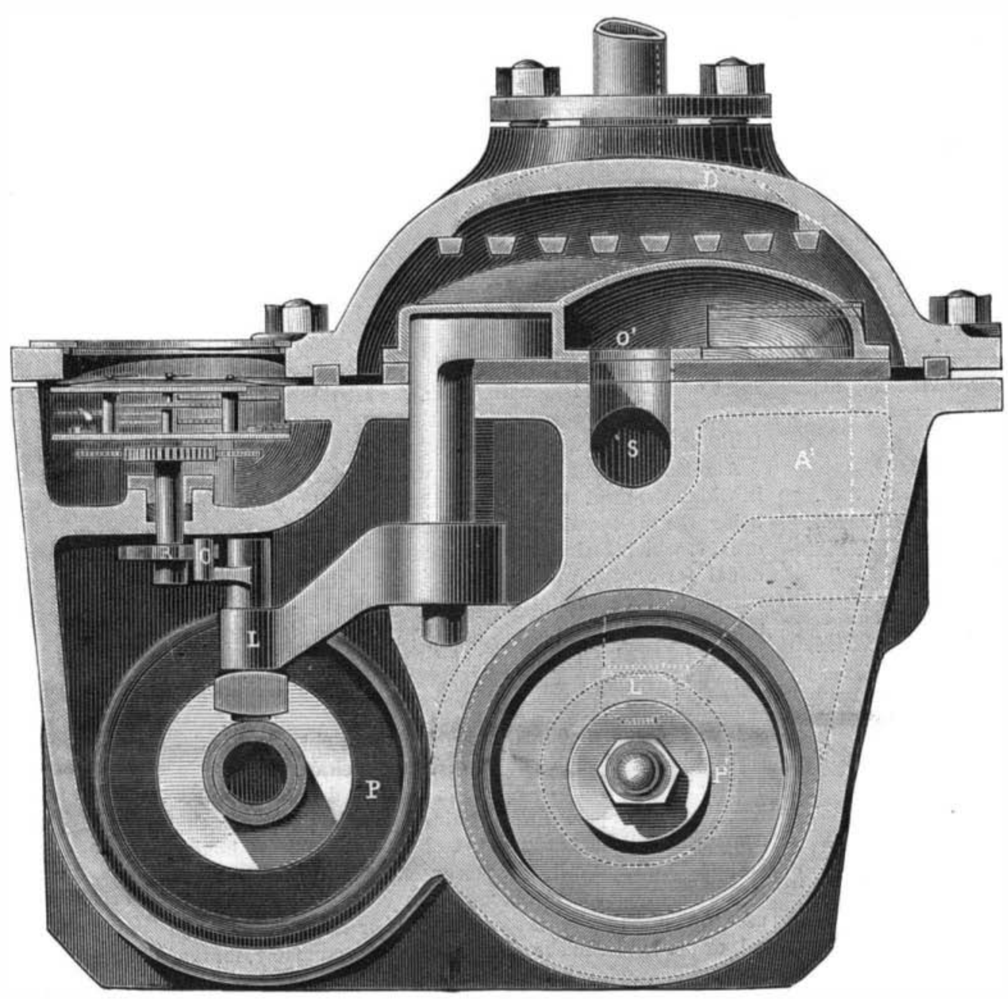

Fig. 1.—VERTICAL SECTION.

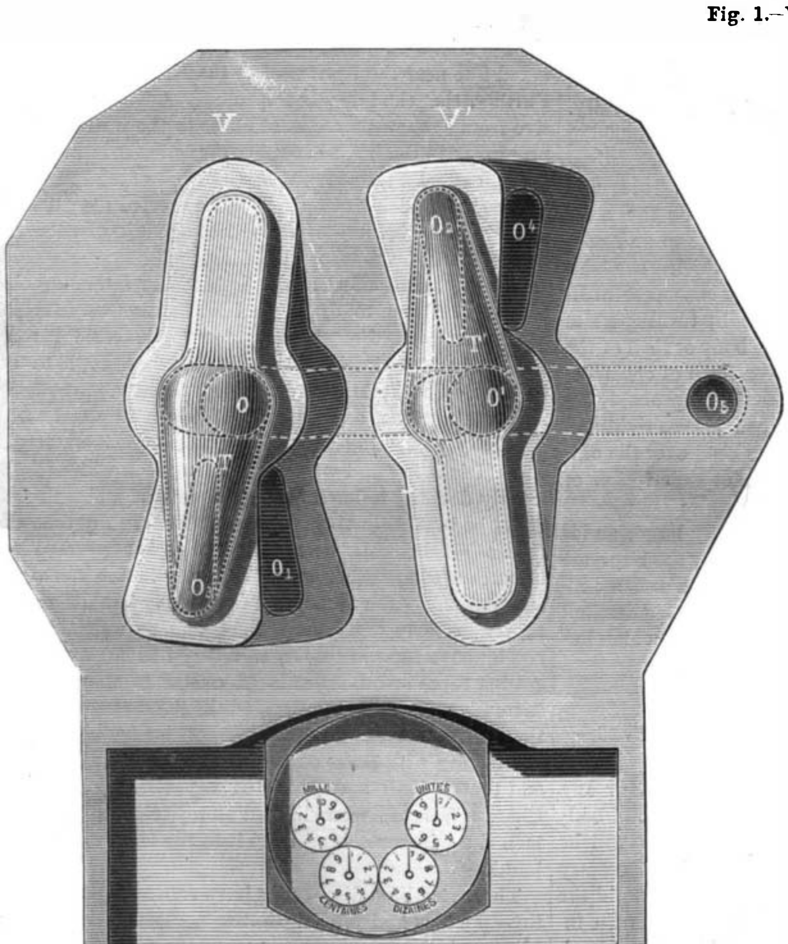

Fig. 2.—PLAN OF THE APPARATUS.—THE DOME REMOVED TO SHOW DISTRIBUTION.

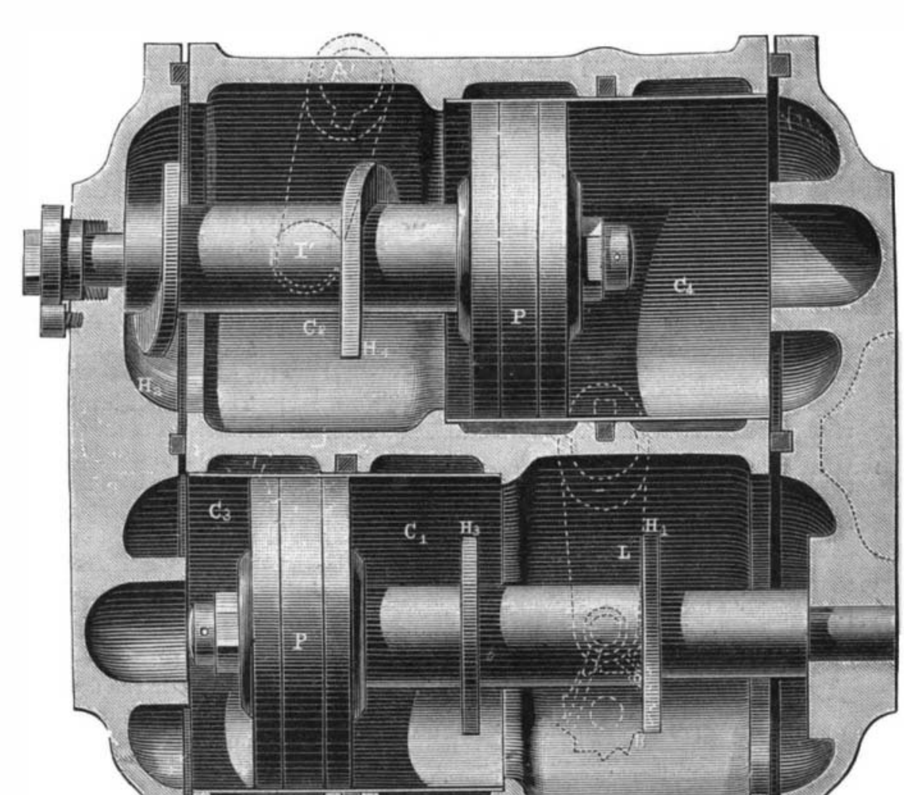

Fig. 3.—HORIZONTAL SECTION THROUGH THE AXIS OF THE PISTONS.

FRAGER'S WATER METER.

FRAGER'S WATER METER.

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also very simple. The lever, L, carries a pawl, Q, moving about a vertical axle. When the lever is placed toward the left the pawl engages with the ratchet, R, and causes it to move forward one tooth in pivoting itself around its own axis. When the lever turns backward the catch of the pawl becomes disengaged, and is carried back to its starting point by the action of the center of the ratchet wheel on the tail of the pawl. The ratchet wheel itself moves the clock work by means of an axle, which, after passing through a stuffing-box, enters the clockwork case. Finally, the meter is provided with an ingenious arrangement which allows the fact to be ascertained at any moment as to whether the apparatus is water-tight. To effect this object, the cams, H_2 and H_4, of the piston, P', are made helicoidal in shape, so that if the piston rod (and consequently the cams) be revolved about half a turn to the left, the cam, H_2, in consequence of its peculiar shape, is thrown out of the way and no longer engages the lever, L', to a sufficient degree to displace the slide valve, T. The piston, P, will then remain pressed close up against the left end of the cylinder, and the piston, P', against the right end. The meter will thus stop working, and the flow of water will cease entirely if there be no leak. To set the meter in operation again, it is only necessary to move the stoppage eccentric back to its first position, when the helicoidal flange of the cam, H_2, acting on the lever, L', and displacing the slide valve, T, will put the apparatus in motion. If, after bringing back the stoppage eccentric to its proper position, it be immediately turned to the left, the apparatus begins operating and stops anew after distributing four cylinderfuls. It is easy then to ascertain: (1) Whether the meter has any leaks; and (2) whether the capacity of the four measuring cylinders is in proper accordance with the clockwork.

The apparatus is easily taken apart and put together again, and, as regards construction, is exceedingly strong. With the exception of the piston packing (which is rubber), all the parts are of metal. There is hardly any need of speaking of the applications which may be made of the water meter. But there is one, however, which we consider proper to dwell on, since it offers to manufacturers a means of controlling the operations of their generators and engines. It is the measurement of the feed water.

By a special arrangement, the meter may be placed on the supply pipe of the feed pump. There is a safety valve provided for the prevention of accidents, and a check valve for preventing back flow from the boiler. From the very construction of the apparatus, it is able to work equally well with either hot or cold water. The exact knowledge of the quantity of water vaporized by the boiler allows, by comparison with the weight of coal consumed during the same time, of ascertaining with the greatest certainty the cost per pound of steam, and of determining the choice of coal. Besides this, if the revolutions of the driving shaft of the engine be counted, the expense of steam per revolution of the flywheel may be estimated; and thus the movements of the engine can be regulated so as to prevent that increase in the consumption of fuel which follows an excess of speed. The use of the water meter and of the revolution counter results then in a considerable reduction in the expense of fuel, while at the same time it allows the behavior of the boilers and engine to be ascertained at any moment.

Boiler Explosion in Brooklyn.

Just before noon, February 16, two of the three large boilers of the Brooklyn City Flour Mill exploded with great violence. The mill was situated at the foot of Fulton street, in close proximity to the terminus of many city railroads and to the landing place of the Fulton Ferry; and though the neighborhood is usually thronged with people not more than a dozen persons were injured by the flying boilers and timbers. The engineer was killed. The exploded boilers were horizontal, 7 feet in diameter and 21 feet long. They were made in 1861, and were under the charge of the Hartford Steam Boiler Inspection and Insurance Company at the time of the explosion. The boiler house, a one-story brick structure, about 25 x 50 feet, was entirely destroyed. It contained three boilers, one, built ten years ago, was thrown seventy-five feet, but remained unbroken; the other two were ruined. One of them, it is said, was hurled straight upward as high as the third story of the main mill building. The mill was owned by a company, of which General N. W. Slocum is president, and the Jewell Brothers are managers.

APPARATUS FOR EXTRACTING AMMONIA FROM GAS LIQUORS.

IN the SCIENTIFIC AMERICAN SUPPLEMENT, No. 281, of May 21, 1881, we give a description of an apparatus constructed by Dr. H. Grüneberg, for extracting ammonia from gas liquor. This apparatus appears to have been based upon the prior invention patented by Messrs. Elwert and Müller-Pack, Sept., 1874, and now assigned to Brustlein, Sury & Co., New York, of which we now present an engraving

The patented apparatus has a long and successful past to testify in its favor, having been in use since 1874 in various large gas works, especially in Europe, where universal and entire satisfaction is expressed concerning its economy, efficiency, and purity of product.

The patented apparatus of Messrs. Elwert and Müller-Pack shows two tubular horizontal boilers (14x3), one placed above the other, constructed so as to allow the emptying of the upper into the lower boiler by means of a connecting pipe with cock. Each boiler has the capacity of one ton of gas liquor and from 90 to 120 lb. of milk of lime. Both ends of each boiler are provided with manholes, to enable easy access for cleansing purposes, once in two or three weeks. Only the lower boiler is heated directly, and a bent tube runs up from its dome (steam drum) and down again to the upper boiler, where it continues along the bottom of same, being perforated on its horizontal part with numerous holes. From the dome of the upper boiler a pipe leads through a preliminary condenser, the condensed liquor being brought back to the upper boiler by means of a pipe, and then through a cooling worm or refrigerator, out of which a pipe conducts into a vessel provided with a safety-tube, where the vapors condensed by the cooling coil are collected, and are sucked back to the upper boiler each time the latter is charged with crude liquors and lime.

From the reservoir succeeding cooling coil a pipe enters a series of four charcoal purifiers, thence into a condensing cistern, and from this again to an additional condenser, from which a pipe opens in the air. The two last condensers are each provided with emptying pipes and safety-tubes.

The action of the apparatus is now as follows: The refrigerator and the two last condensers being filled with cold water, and the charcoal purifiers charged, about one ton of gas liquor and the necessary milk of lime are introduced in the upper boiler, and this boiler emptied into the lower, where the fire is started, the cock of the connecting pipe being closed again. The vapors now arising in the lower boiler will soon have expelled all the air in the apparatus, after which the upper boiler is again charged as at first, and the fire under the lower made active. The vapors now coming from the lower boiler and entering the upper through the bent tube will be forced through the perforations in its horizontal part at the bottom of the boiler, and violently agitate the fluid, thus advantageously substituting an agitator, and the vapors by rising will become purified and enriched with ammonia from the liquid.

The vapors are then conducted into the first condenser, a closed reservoir, which chiefly retains all the scum, and where also some of the ammoniacal salts are condensed, which all flow back to the upper boiler, while the concentrated vapors pass through the refrigerator or cooling-worm, and thence to the second reservoir, where the products of condensation, aqueous vapor, with a portion of the hydrocarbons, free ammonia, and ammoniacal salts, are deposited, but the incondensed vapors escape and enter the charcoal purifiers.

The fluid deposited in the reservoir, which follows cooling-worm, assists toward the end of the operation, when the vapors are more fully charged with ammoniacal salts, in washing the vapors and retaining the salts, and is sucked back to the upper boiler again each time that it is charged with gas liquor, this cold gas liquor producing a vacuum in the boiler, which vacuum at the same time causes a quicker disengagement of ammonia in the lower boiler.

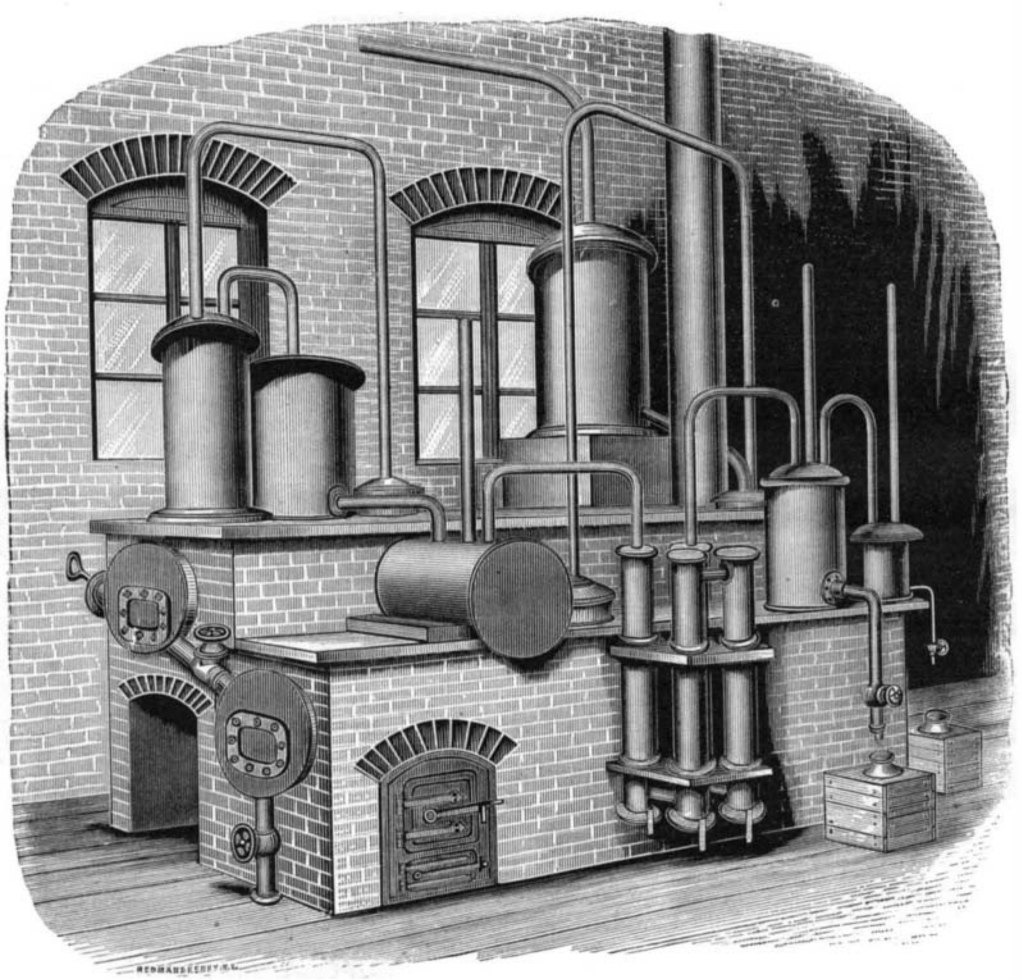
The application of the liquid in the reservoir has also the advantage of washing away any deposit left in the cooling-coil and succeeding pipes, as well as in the pipe directly connecting said reservoir with the upper boiler.

The charcoal purifiers absorb all the matters that would impure the alkali, such as the hydrocarbons, and the purified vapor enters the condensing cistern, the pure water therein absorbing the vapor until it has gained the desired percentage of ammonia. The slight residue of incondensed vapor is conducted into the last condenser, where the remainder of the ammoniacal vapor is absorbed.

After about four or five hours the lower boiler will have discharged all its ammonia, when the liquid is let out and the boiler again charged from the upper boiler, which is charged with crude liquor. During this time the purifiers may be repacked, and the liquid ammonia drawn off from the two last condensers, which must again be filled with the necessary quantity of fresh water.

Thus, from one charge, after four hours, about 200 lb. of white volatile alkali, marking 26° Baumé, are gained, perfectly pure, only needing to remain quiet several hours in order to deposit all the lime and magnesia salts caused by the water, if no distilled water is used.

For 100 lb. alkali only 27 lb. of coke are required, and two men can easily run the whole apparatus. The entire process is of course more simplified and becomes more economical the larger the works, and it can safely be said that no apparatus is more efficient and gives purer products. In manufacturing on a large scale an allowance need be made for but one man per apparatus. As each apparatus can perform from five to six operations per day, a set of two apparatus can easily produce over two tons of ammonia daily.



ELWERT & MULLER-PACK'S APPARATUS FOR EXTRACTING AMMONIA FROM GAS LIQUORS.

Mescal and the Useful Agave.

One thing at least peculiar to the American Indian diet is the *mescal*, derived from the roots of a species of century plant. On all the dry hills of the Colorado desert section, a species of this plant is met with, the *Agave deserti*, and when other food resources fail this is never wanting. As an article of diet it is prepared by exposing the thick portion of the plant at the root of the leaves, to a smothered roasting in a pit filled with hot stones and covered over with leaves and rubbish. When sufficiently cooled off the mass of cooked plants is ready for use, being cut in slices, which have a dark mahogany color, and charged with a sugary juice, resembling molasses candy, and if equally clean, quite as palatable. This is greedily eaten, both as an article of diet and luxury, the only disagreeable consequences being a tendency to bowel complaints, especially when exclusively used. It is perhaps a matter of congratulation that none of our Indian tribes have advanced so far in civilization as to learn the art of extracting alcoholic products from this plant, otherwise we might have less to say in praise of their peaceful character.

A better use of this plant is that which is derived from its textile fibers, and here Indian skill and patience are exhibited in the various articles of netting and rope constructed from its leaves. All through the table lands of Mexico this textile fiber is extensively used, and brought into market in substantial fabrics, including bagging, matting, and occasionally fine textile work, colored by native dyes. And this naturally suggests the possibility of new branches of industry for California, where the plants can be grown without irrigation on the driest soil, and the present enormous tax on sacking for the shipment of grain be kept in the country.—*San Francisco Bulletin.*

A Large Tumor.

At the Hospital of the University of Pennsylvania, February 10, Dr. William Goodall removed an ovarian tumor weighing 112 pounds. The patient, 31 years of age, weighed only 75 pounds after the operation. The doctor naively remarked that he had taken the woman from the tumor. There was a fair prospect that the patient would survive the operation.