AN AMMONIA STILL FOR SMALL GAS WORKS.

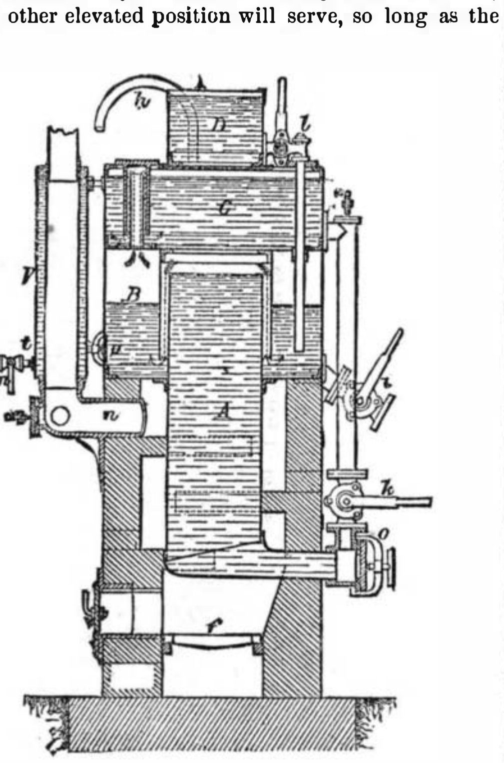
The accompanying illustration represents an apparatus designed by Herr J. Gareis for the distillation of ammonia from the ordinary ammoniacal liquor of gas manufacture, and is taken from the *Journal fur Gasbeleuchtung*. The arrangement is intended for small gas works, being compendious in design, cheaply constructed, simple and economical in working, and reliable. The smallest example, for treating one cubic meter, or 220 gallons of liquor per 24 hours—a class of apparatus that has a long time been in regular use—produces 40 kilos of sulphate per cubic meter of liquor of 2·25° Baume, with an expenditure of 30 kilos of acid, 4 kilos of lime, and about 50 kilos of coke for fuel. A larger apparatus for 2 cubic meters, or 440 gallons of liquor daily, gave 5,547 pounds German (5,714 pounds English) of sulphate from 59·280 cubic meters (13,042 gallons) of liquor of 2° Baume.

The principle of the arrangement is clearly shown in the drawing. The boiler comprises four distinct parts, A, B, C, and D, of which A and C contain the pure liquor to be distilled. The section, B, contains liquor with the addition of milk of lime, for setting free the fixed ammonia. D is the lime box.

The division, A, is heated directly by fire in the furnace, *f*, whence the smoke as well as hot gases escape through the chimney, *n*. The steam and ammonia developed from the liquor in A, pass together in the direction shown, to the bottom of the division, B, where they meet with the liquor mixed with lime. A constant boiling is maintained in this compartment, whereby the heavy particles of lime are prevented from settling to the bottom. The steam and gases from B escape through the pipe as shown, and find their way to the bottom of the division, C. In this a partial condensation of the steam takes place, with consequent beating of the liquor; while the incondensable ammonia escapes through the pipe, *h*, for conversion either into liquor ammoniæ or sulphate.

When, through long continued boiling, all ammonia has been driven off from the contents of B, the cock, *i*, is opened, and the vessel is thereby emptied. The cock, *k*, is then opened, and the liquor from C is admitted to the lower part of the division, A, while the liquor previously contained in this division overflows into B, until the working level is reached. This cock may then be closed, and the required quantity of milk of lime run into B by opening the cock, *l*, communicating with the lime tank, D; the necessary proportion being found by experience. The division, C, must now be filled with fresh liquor from the store tank, and the operation then goes on as before. The change of liquor herein described is made about every four hours, when the apparatus is in regular working. The drawing shows how the fresh liquor, before being admitted to the division, C, may be warmed by passing through an annular jacket, V, surrounding the furnace chimney; the supply of cold liquor being taken into the bottom of this jacket through the pipe, *t*, fitted with the cock, *m*.

The necessary cleansing of the boiler, A, is provided for by the movable cover, *o*, secured merely by a crossbar and screw. The section, B, is cleaned when required through the manhole, *p*. The compartment, C, may be cleaned by removing the small lime tank, D. It is not necessary that this tank should always be fixed on the top of the still itself, since any other elevated position will serve, so long as the

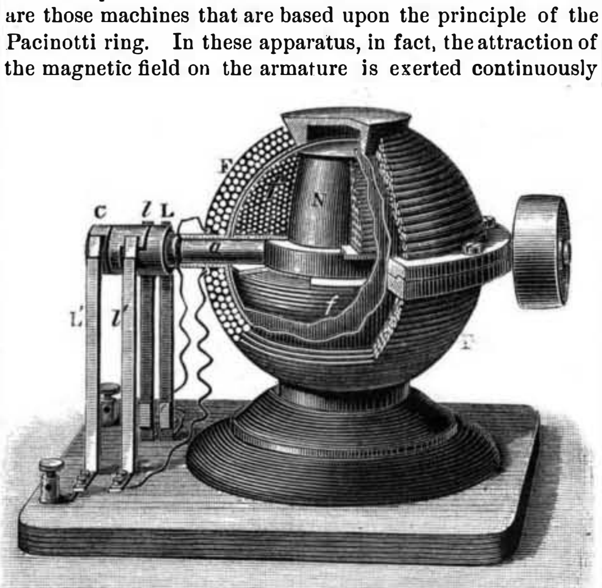


IMPROVED AMMONIA STILL.

contents will run into the division, B. Neither is direct beating, by means of a furnace as shown, essential to the proper working of this arrangement. All that is necessary for the successful use of the apparatus is that the raw liquor shall be stored so that it will run into the vessel, C, and that the lime tank is charged with a sufficiency of liquid. Any kind of saturation tank or fishing box may, of course, be used to receive the evolved ammonia. The cost of the apparatus as illustrated, in Germany, for 1 cubic meter of liquor per 24 hours, is about £75; for 2 cubic meters of liquor, about £115; and for 3 cubic meters, about £150. The arrangement appears to be particularly neat and simple, and to be well adapted for the class of establishments mentioned by the designer. Although nothing is said about constant working in the original description, it would appear upon inspection of the drawing, that at least a regular flow of liquor might be permitted, even if the admission of milk of lime were intermittent. The small space occupied by the still is not the least advantageous of the several peculiarities which it presents; although this very compactness may form a ground of objection to many engineers. It must be remembered, however, that the design is not put forward as a plan for treating liquor on a large scale, but is intended to meet the case of small establishments where the ammonia has not hitherto been recovered on the premises.—*Journal of Gas Lighting.*

ELECTRIC MOTORS WITH INDUCTORS CONTAINING NO IRON.

It is at present demonstrated that the best electric motors are those machines that are based upon the principle of the Pacinotti ring. In these apparatus, in fact, the attraction of the magnetic field on the armature is exerted continuously



BURGIN'S SPHERICAL MOTOR.

and without any changes of polarity that are capable of giving rise to retarding effects as a consequence of the magnetic inertia of the iron core. By reason, however, of the high price of ring machines, it is as yet advantageous, for small powers, to make use of motors in which there is a reversal in the direction of the current. In the construction of motors on this principle, the fact (indicated for the first time by Deprez in 1878) is taken into consideration that the iron cores of the movable parts should be reduced as much as possible, in order to suppress in a great measure the prejudicial effects due to the slow magnetization and demagnetization of the iron; and, in the majority of the present motors, there is employed as a movable armature Siemens' double T iron bobbin, which was pointed out by Deprez as very well realizing the conditions just mentioned.

With this system we diminish in a great measure the effects due to the magnetic inertia of iron; but we do not eliminate them completely, and the idea of entirely suppressing such prejudicial actions has given rise to a series of apparatus all based upon the same principle, and which the motor recently constructed by Mr. P. Jablochkoff gives us an occasion to pass in review.

In order to avoid remanent magnetism, Mr. Dering, about thirty years ago, devised an apparatus called the *Galvanometric Motor.* This consisted of a certain number of galvanometric helices, all of the magnetized bars of which reacted upon the same axis, and reversals of the current occurring at every half revolution of the bars, in the wire of the inducting helices. The motor contained no piece of soft iron capable of intervening through its remanent magnetism.

In 1879 Mr. Deprez constructed, with the same end in view, a machine of which some idea may be had by imagining one of his motors in which the permanent magnet was replaced by a flat rectangular galvanometric helix, so constructed as to embrace as perfectly as possible the curve of the bobbin. The changes of direction in the current took place in the galvanometric helix, and, the poles of the bobbin always remaining of the same name, there were no longer any contrary actions due to remanent magnetism. This apparatus gave so poor results that its inventor did not deem it worth while to publish a description.

In 1881, Mr. Burgin exhibited at the Palace of Industry an apparatus called the *Spherical Motor*, based upon the same idea. The field magnet consisted of a spherical shell, around which were rolled horizontally the copper wires, F F.

In the interior of the hollow sphere there revolved around an axis, A, a spherical electro-magnet having for core the mass of iron, N. The flat springs, L L', bore against the solid parts of the commutator in such a way as to send into the wire, *f*, a current always of the same direction; but the springs, *l l'*, through which the current entered the wire, F, rested against the cleft middle part of the commutator, so that at every half revolution the current changed direction in the wire, F. Motion was thus produced by the action of the magnet, N, upon the wire, F, in the same manner as in other motors; but the reversal of the current was effected in a part that contained no iron, and the effects due to the magnetic inertia of that metal were suppressed as in the preceding apparatus.

Finally, very recently, Mr. Jablochkoff has devised a new motor, which he calls the *Ecliptic.* The movable part is formed of a flat bobbin, *b* which is placed obliquely on the axis of rotation. This bobbin is of iron, and the whole thus forms a short electro-magnet. The fixed part is a larger bobbin, B, with a copper frame, arranged obliquely to the axis like the other, but in an opposite direction. The arrangement of the commutator is such that the current always traverses the movable bobbin in the same direction, and that the changes of directions, at every half revolution, take place only in the fixed solenoid. The actions that are exerted between this solenoid and the armature cause a rotation of the latter.

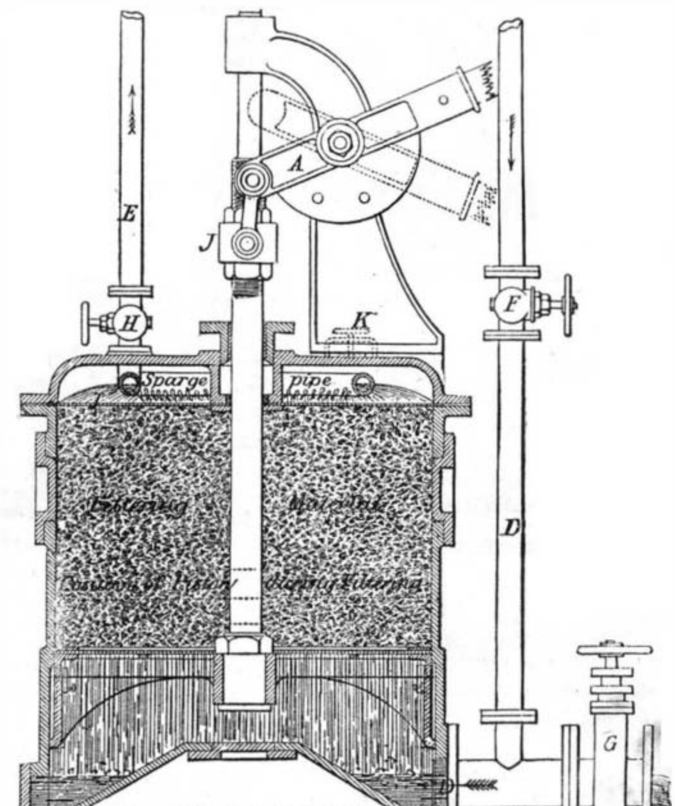
It will be seen that although Mr. Jablochkoff's bobbin differs from those just described in the peculiar and original arrangement of its bobbins, it likewise utilizes the idea of producing changes in the direction of the current in a part containing no iron.

All these apparatus, then, suppress the inconveniences resulting from the magnetic inertia of this metal; but this is no reason why they should be considered an improvement over systems employing iron cores of small dimensions. Although the prejudicial action of iron is, in effect, suppressed, there still remains that of the extra currents produced by the influence of the wire spirals upon each other; and these extra currents inevitably produce a notable contrary effect. Besides, although the iron is no longer there to intervene as a disturbing force, it, on the other hand, no longer lends the solenoid its re-enforcing action, so that what is gained in one direction is lost in another.

It goes without saying that all the apparatus described above are reversible, and may be regarded not only as motors but also as dynamo electric machines. But they evidently present no more advantages from such a point of view, and the fact is, they should be considered, not as practical apparatus, but as interesting arrangements that ingeniously utilize electro dynamic actions.—*La Lumiere Electrique.*

IMPROVED SPONGE FILTERS.

The problem of constructing a filter for steam users and manufacturers that should be able to deal with large quantities of muddy river and canal water, and should at the same time be capable of being easily and efficiently cleaned, has been solved, says *Engineering*, by the Pulsometer Engineering Company, of the Nine Elms Iron Works, by the adoption of an elastic filtering material, which when compressed forms a compact bed through which the water percolates,



IMPROVED SPONGE FILTERS.

but when released immediately expands, freeing itself from the accumulated dirt, and offering little resistance to the flushing current that is then sent through it in the opposite direction. The material employed is sponge contained in a cylinder, and normally compressed between the cylinder end and a piston. While the cleansing operation is being conducted, the piston is alternately raised and lowered, the action on the filtering medium being similar to that ordinarily