## AN AMMONIA STILL FOR SMALL GAS WORKS.

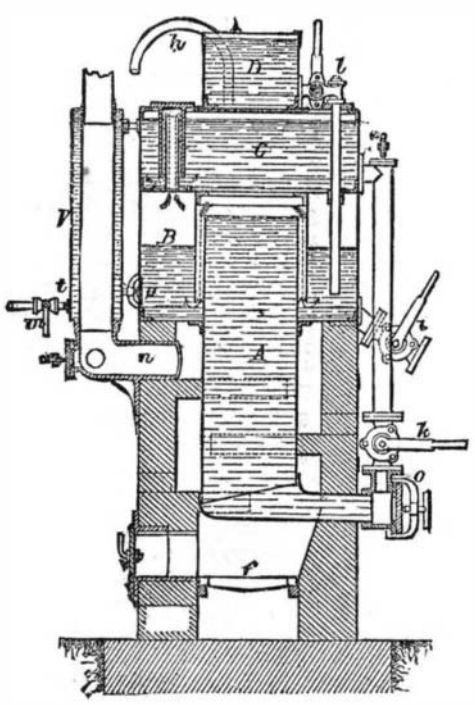
The accompanying illustration represents an apparatus designed by Herr J. Gareis for the distillation of ammonia from the ordinary ammoniacal liquor of gas manufacture, and is taken from the *Journal fur Gasbeleuchtung*. The arrangement is intended for small gas works, being compendious in design, cheaply 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 heating 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

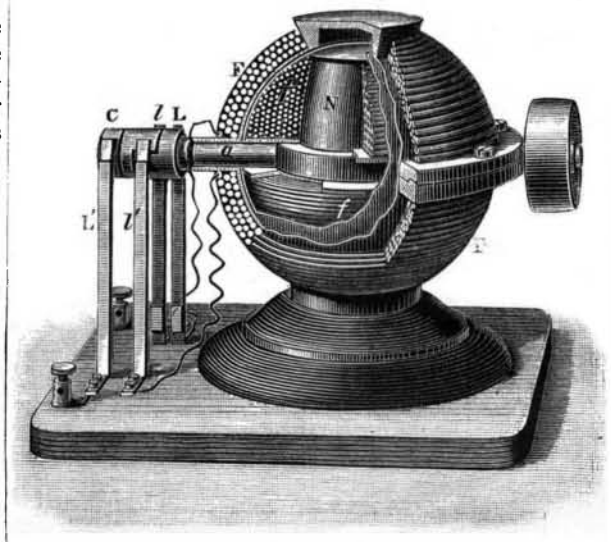


IMPROVED AMMONIA STILL.

contents will run into the division, B. Neither is direct heating, 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.

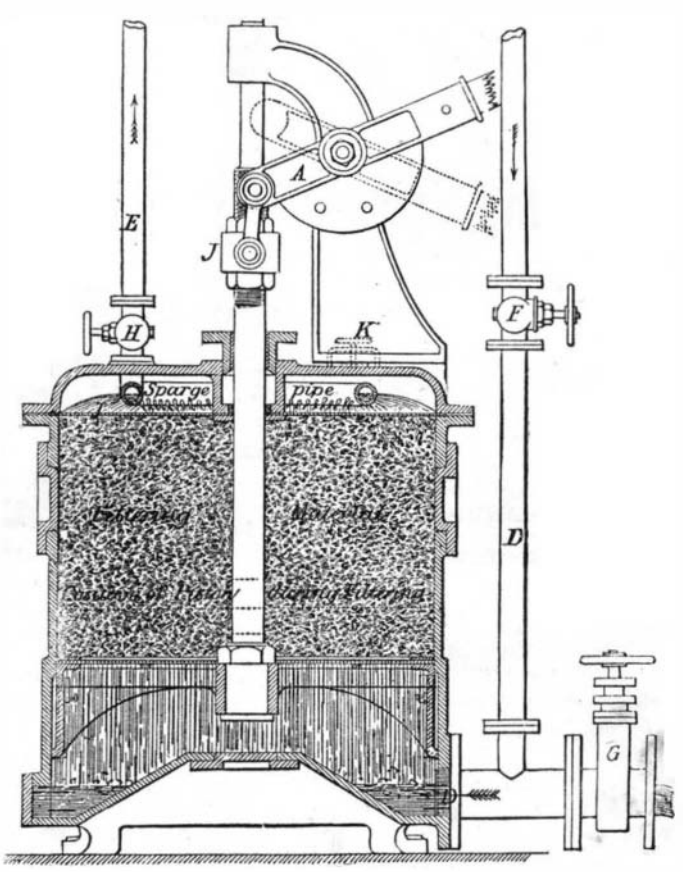
It will be seen that although Mr. Jablochkoff's bobbin differs from those just described in the peculiar and original arrangement of its bobbins, it likewise utilizes the idea of producing changes in the direction of the current in a part containing no iron.

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,



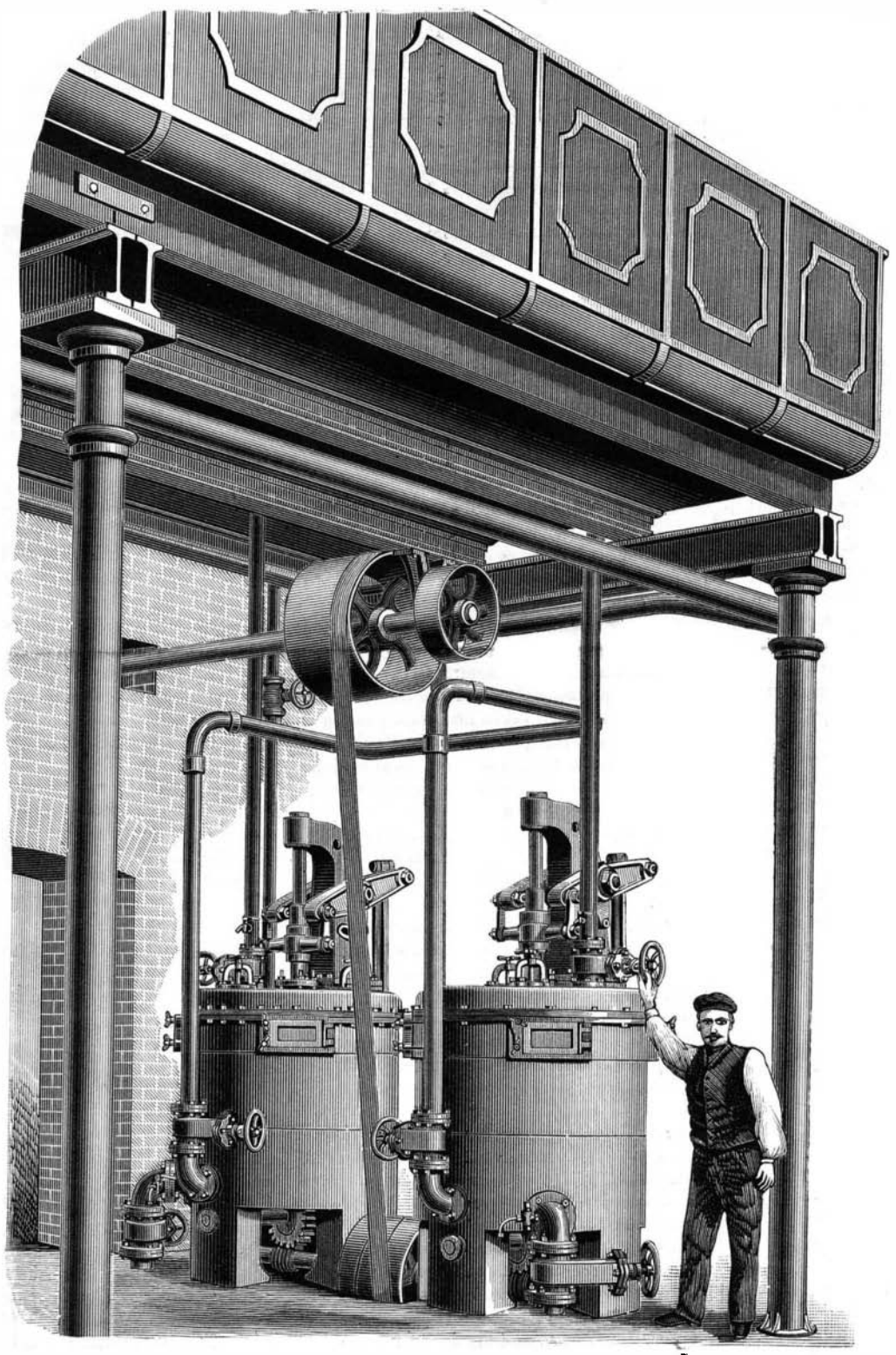

IMPROVED SPONGE FILTERS.

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

adopted in washing a soapy sponge; it is first allowed to absorb water until the pores are filled, and then the water is squeezed out, carrying a part of the mud with it, the process being continued until the effluent water is clear.

A very successful installation of these filters is now in operation at the works of Messrs. Garton, Hill & Company, saccharum manufacturers, Battersea, London, where it is supplying feed water for eight boilers, each 30 feet by 7 feet. Two filters of the largest size are employed, and when the five remaining boilers that will be required when the works are complete have been put down, will run night and day. At the present time, when the river is particularly muddy, the effluent water from the filter is bright and clear, and as far as appearance goes, is similar to the company's water, which is also drawn from the Thames, though of course at at a higher part of the river, and has been submitted to an elaborate process of settling, and filtration by sand beds. The immense quantity of mud eliminated by the filter is made manifest as soon as the cleaning process is commenced, when it pours out in a thick stream, gradually becoming clearer and clearer until the turbidity ceases. It is not contended that sponge has any power to extract the soluble impurities contained in water, or to counteract the ill effects of contamination by sewage. All that is claimed for the filter is that it will rapidly cleanse large quantities of muddy water sufficiently for every manufacturing purpose and for feeding boilers both on shore and in river boats, and that with a very small amount of care it will remain in good working order for years. Large numbers of these filters have been delivered both at home and abroad, one firm having already ordered nine for use on river steamers in Demerara. These filters are made in five sizes, the smallest of which will pass from 100 to 150 gallons per hour, and the largest 2,000 to 3,800 gallons.

The construction of the filter is clearly shown by the illustrations, one being a vertical central section, showing the parts as they appear while the filter is being cleaned, and the other a perspective view of the double installation at the saccharum works. The apparatus consists of a cast iron copper lined cylinder fitted with a piston, formed of a circular grating covered with wire gauze. The filtering medium is contained between this piston and a perforated plate, I, which forms the face of a collecting chamber constructed in the cylinder cover. The piston rod is coated with gun metal, and passes through a stuffing box to a guide fixed on the cover. Between the gland and the guide it is provided with a crosshead, J whose position can be adjusted by means of a screw thread on the rod. This crosshead is connected by two links to a double lever, A, by which the piston can be raised and lowered in cleansing the sponge. The agency for operating the lever varies according to circumstances and the size of the filter. In the annexed section a hand lever is shown, while in the installation at Messrs. Garton, Hill & Company's works a connecting rod couples the lever to a crank disk driven by a worm and worm wheel and fast and loose pulleys. In some cases it is more convenient to dispense with the lever and to employ a steam cylinder mounted upon the guide bracket after the manner of a steam hammer cylinder. In order that there may be no liability of the apparatus to set fast, even it be neglected, the metallic contact between the piston and the cylinder is made as narrow as possible, and wooden guiding strips are fitted to the outer ends of the strengthening ribs. The water to be cleansed enters at the lower part of the filter at D, and rising through the piston and the compressed layer of sponge, escapes by a pipe, E, from the chamber formed in the cover, to the tank where it is to be stored, the propelling force being preferably the action of gravity. When the filter is to be cleaned, the supply of dirty water is cut off by closing the valve, F; the mud cock, G, and air inlet, K, are opened, and a portion of the filtered water allowed to flow back to waste, while at the same time the piston is slowly raised and lowered.



IMPROVED SPONGE FILTERS FOR BOILERS.

A FISH of solid gold, of the bullion value of $2,500, is reported to have been dug up in Ober-Lausitz, the border land between Saxony and Silesia. Its surface is said to be incised with mythological figures, wrought after archaic Greek patterns.

### How to Split a Sheet of Paper.

Many people who have not seen this done might think it impossible; yet it is not only possible, but extremely easy, as was explained in this paper, several years ago, and recently described in the *British and Colonial Printer and Stationer*, which is as follows: Get a piece of plate glass, and place on it a sheet of paper; then let the latter be thoroughly soaked. With care and a little dexterity the sheet can be split by the top surface being removed. But the best plan is to paste a piece of cloth or strong paper to each side of the sheet to be split. When dry, violently and without hesitation pull the two pieces asunder, when part of the sheet will be found to have adhered to one and part to the other. Soften the paste in water, and the pieces can be easily removed from the cloth. The process is generally demonstrated as a matter of curiosity, yet it can be utilized in various ways. If we want to paste in a scrap book a newspaper article printed on both sides of the paper, and possess only one copy, it is very convenient to know how to detach the one side from the other. The paper when split, as may be imagined, is more transparent than it was before being subjected to the operation, and the printing ink is somewhat duller; otherwise the two pieces present the appearance of the original, if again brought together. Some time ago, the *Stationer* says, the information of how to do this splitting was advertised to be sold for a considerable sum.

### Improvements in Wrought Iron Tubes.

Some improvements in the manufacture of covered wrought iron tubes have recently been made, intended to remove some objections hitherto urged against this kind of pipe, especially when used for hot gases or laid in a damp situation. The inventor, a Mr. Rhodes, proposes to take sheets of asbestos paper or cloth, prepared with a suitable glutinous size. The material is then coiled upon a mandrel, and when set it is removed therefrom; being fit for use as a fireproof lining for metal tubes, or for covering the same, when they are used for ventilating-pipes for gas-burners. Tubes of similar construction are also recommended for chemical works, because of their power of withstanding the action of corrosive vapors and liquids. For outlet tubes of ventilating gas pendants the asbestos layers may be laid of sufficient strength without any metallic covering or lining. Another method of making wrought iron pipes, recently introduced, consists in laying on a mandrel alternate volutes of sheet iron strips and hot asphaltum. The iron is laid in contrary folds, one over the other, and simply bonded together with asphaltum. For 4-inch and 6-inch pipes there are two layers of sheet iron, and more for large tubes, according to diameter and the strength required. The ends of the tubes are finished off with cast iron rings coated with asphaltum, forming a straight butt joint readily covered with a welded iron sleeve, lined with lead at the works, and only requiring to be placed in position and set up when laid. Repeated tests of this form of pipe show that it possesses a bursting strength corresponding so exactly with the tensile strength of the sheet iron employed that the latter may safely be taken as a guide, and the pipe made of any desired strength by increasing the thickness of iron to the required extent. Bends or branches for use with this description of spiral pipe are made of cast iron asphalted. The absence of brazed or riveted joints in the length of this pipe is claimed to be a valuable characteristic.

### Petroleum in 1882, and the Outlook.

The last year has been altogether the most extraordinary one in the history of the oil business. It has exhibited, among other things, these peculiar phases:

1. The largest volume of daily production. 2. The most sudden development of the richest pool ever discovered. 3. The largest and most sudden decline in daily production ever known.

We began the year with a daily production of about 76,000 barrels. By the opening of the Cherry Grove field, we increased this daily output in the month of July to 105,000 barrels, the largest daily production ever reached. In the month of July the Cherry Grove field yielded about 30,000 barrels daily; it then became defined and reached its height. From this time it began to decline, first moderately, then rapidly until the close of the year, when its daily yield was less than 4,000 barrels. The general decline in daily yield, chiefly caused by the decline in Cherry Grove, has continued, until at the end of the year it reached 61,210 barrels.

The average daily production for the year was 82,000 barrels, so it will be seen that the production at the end of the year is considerably below the average for the year. The average daily shipments for the year were about 60,000 barrels. These shipments may be treated as entirely gone to consumption, and in this view they fairly indicate the extent of consumption for the year.

The present daily average production is nearer the daily average consumption than it has been at any time in the past five years. The conditions in the producing field have also undergone a phenomenal change during the year. The Bradford and Richburg fields (which have been by far the largest in area and permanency that we have ever had) now exhibit unmistakable evidence of depletion and exhaustion; and the fewness of the new wells now drilling in these districts can only be accounted for by the fact that new ventures there do not promise to repay the investment. The only districts that can be looked to for supplying the trade for the present year are the Cooper Tract district and the Grandin Lease in Forest County, and the Bald Ridge district in Butler County; but these districts combined cannot, from their known character, be expected to maintain the decline occasioned by the depletion of Bradford and Richburg. Late drilling has already somewhat defined the Cooper Tract and Grandin Lease districts, and indicates the deposits to be limited "pool" deposits; and the Bald Ridge district is already marked by dry holes in close proximity with the best wells, thus showing its spotted and uncertain character.

In our opinion, nothing but the discovery of a new district like that of Bradford, will give us a continued accumulation of stocks and the low prices we have had for several years past; and fortunately for the holders of stocks on such district is at all indicated by any existing development.