2 Sheets—Sheet 1.

H. C. ROSE.

APPARATUS FOR DISTILLING PETROLEUM.

No. 195,652. Patented Sept. 25, 1877.

Fig. 1.

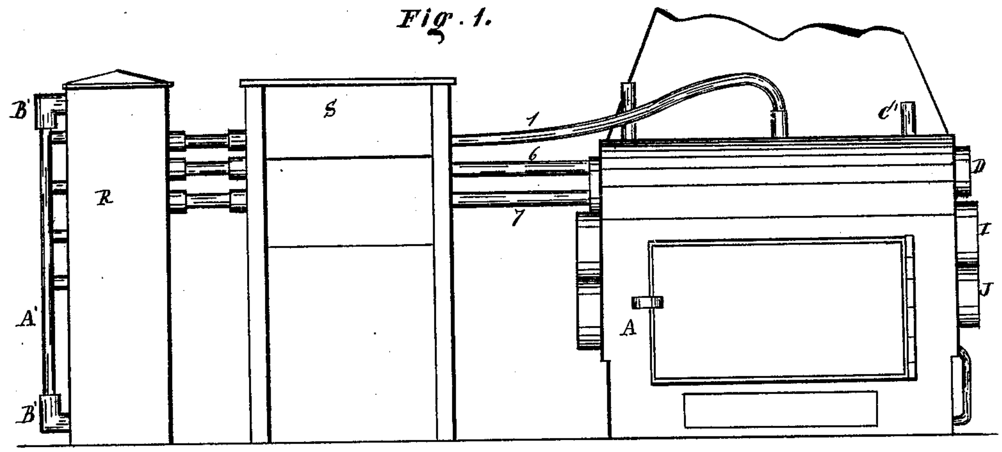

Fig. 2.

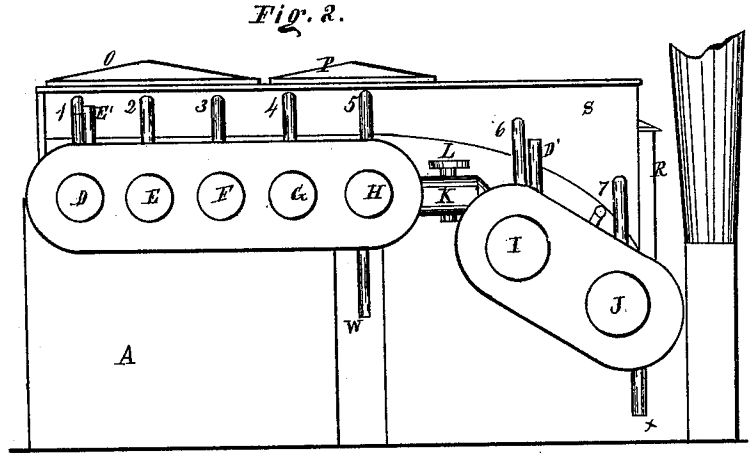

Fig. 3.

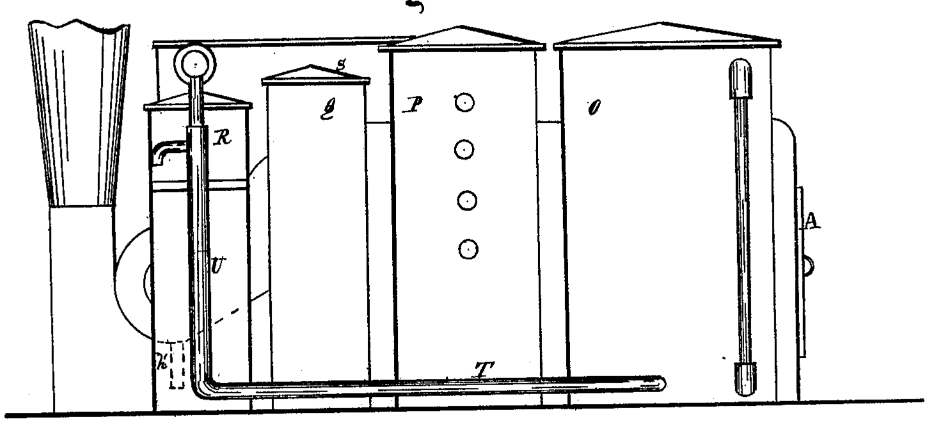

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Fig. 4.

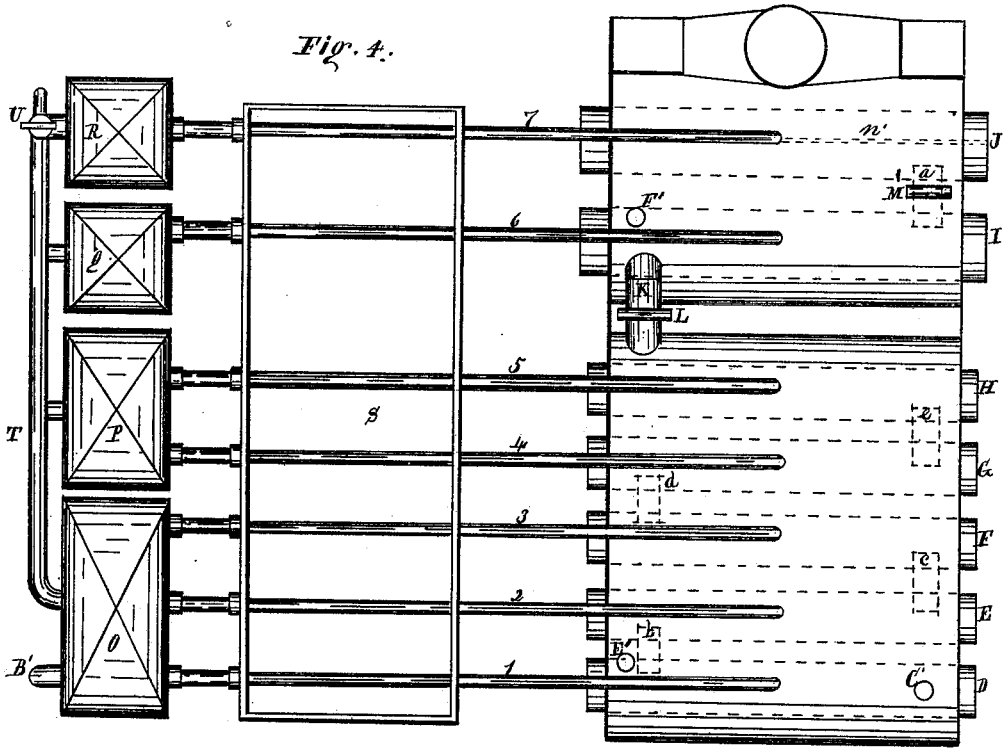
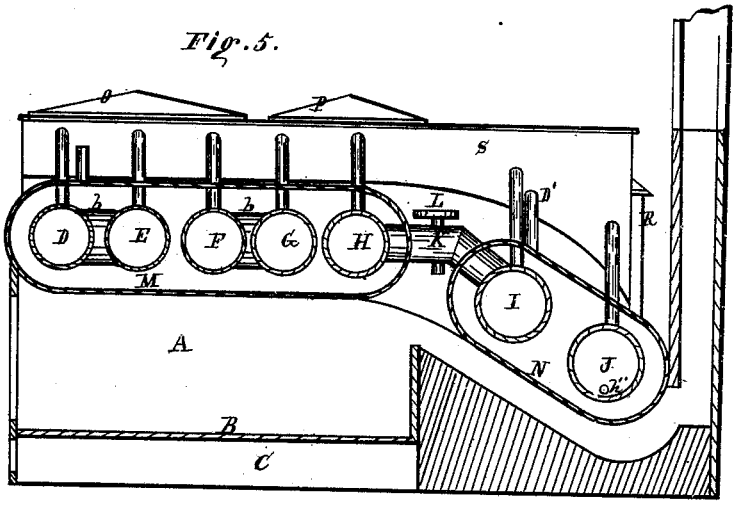


Fig. 5.



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UNITED STATES PATENT OFFICE.

HENRY C. ROSE, OF CLEVELAND, OHIO, ASSIGNOR TO THE REPUBLIC REFINING COMPANY, OF SAME PLACE.

IMPROVEMENT IN APPARATUS FOR DISTILLING PETROLEUM.

Specification forming part of Letters Patent No. **195,652**, dated September 25, 1877; application filed January 24, 1877.

To all whom it may concern:

Be it known that I, H. C. ROSE, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented a new and useful Improvement in Oil-Stills, of which the following is a description, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a front elevation of the still. Fig. 2 is a side elevation. Fig. 3 is a view of the opposite side of Fig. 2. Fig. 4 is a plan view. Fig. 5 is a vertical section.

Like letters of reference refer to similar parts in the several views presented.

The nature of this invention relates to an apparatus for the distillation of hydrocarbon oil, the construction and operation of which are substantially as follows:

In the accompanying drawings, A represents a furnace, of which B, Fig. 5, indicates the grates, and C the ash-pit. Transversely across the top of the furnace is arranged a series of cylinders, D, E, F, G, and H, the number of which, however, may be more or less, according to the required capacity of the apparatus. Parallel with and anterior to the said series of cylinders are arranged the auxiliary cylinders I J, which also may be more or less in number. Said auxiliary cylinders are connected to each other by a transfer-pipe, (indicated by the dotted lines *a* in Fig. 4,) and which are also put in connection with the cylinder H (of the series referred to) by a pipe, K, Fig. 2, provided with a stop-cock, L.

The series of cylinders from D to H are connected to each other by transfer-pipes, as indicated by the dotted lines *b*, *c*, *d*, and *e*, Fig. 4, and to the auxiliary cylinders by the pipe K alluded to.

The two arrangements or systems of cylinders described are incased in steam-jackets, respectively, M and N, Fig. 5, whereby they are excluded from direct contact with the fire of the furnace, of which furnace the jacket forms the roof, as is seen in the drawings.

O, P, Q, and R, Figs. 3 and 4, are air-tight reservoirs or receiving-tanks, in which terminate the vapor-pipes 1, 2, 3, 4, 5, 6, and 7, respectively, as follows: The vapor-pipes 1, 2, and 3 terminate in the reservoir O, and pipes 4 and 5 terminate in reservoir P, and the pipes 6 and 7 terminate, respectively, in the reservoirs Q R. The opposite ends of said vapor-pipes extend to, and are put in open connection with, the cylinders above described, and shown in the drawings, in which it will be seen that said pipes, in passing from the cylinders to the reservoirs, pass through a water-box or cooler, S. The ends of the cylinders are to be closed by screw heads or plugs, so that they can be removed for the convenience of access to the inside of them.

That part of the vapor-pipes between the reservoirs and the cooler or water-box may be made of glass, through which may be watched the fluids passing through them.

The reservoirs alluded to have an open connection with each other by a pipe, T, arranged near their base, as shown in Figs. 3 and 4. The end of said pipe T terminates in a pump, U, the purpose of which will hereinafter be shown. The upper and lower ends of the reservoir O are put in connection with each other by a glass tube, A′, Fig. 1, secured thereto by elbows B′. Access is had to the inside of the cylinder D, for the introduction of oil therein, by an induction-pipe, C′, Fig. 1, and to the steam-jackets, respectively, by pipes E′ and F′, for a purpose presently shown.

Having described the construction and arrangement of the apparatus, the practical operation of the same is as follows: Crude petroleum is introduced into the cylinders D, E, F, and G, Fig. 2, through the induction-pipe C′, Fig. 1, the crude oil being previously heated not less than 212° Fahrenheit. The oil so heated, upon entering the cylinder D, flows naturally through said cylinder to the transfer-pipe *b*, Fig. 4, whence it enters the cylinder E, through which it continues to flow onward until it reaches the second transfer-pipe *c*, Fig. 4, where it enters the cylinder F, through which it flows on to the next transfer-pipe, *d*, through which it enters into the cylinder G, continuing onward through the next transfer-pipe, *e*, and through the cylinder H to the pipe or connection K, Figs. 2, 4, and 5, where it discharges into the cylinder I, where its further

flow may be interrupted by closing the cock M′; or the flow of the stream of oil may be continued through the pipe *a*, Fig. 4, into the cylinder J.

It will be readily seen that the heated oil, in entering and flowing through the cylinder D, emits a vapor, which naturally rises into the vapor-pipe 1, Fig. 2, wherein it condenses and flows to and into the tank O, Fig. 4. This vapor being the first elimination from the crude oil is the lightest or most volatile. When the stream of oil enters the second cylinder, E, a further elimination of vapor takes place, which vapor enters the vapor-pipe 2, where it condenses and flows toward and into the tank or reservoir O; or it may flow into a separate tank when it is desirable to keep the product of each vapor-pipe separate from the products of the other.

It will readily be seen that the vapor eliminated in cylinder E of the series D E F, &c., is heavier or less volatile than that eliminated in cylinder D, and that eliminated in F will be still less volatile, and so on to the end of the series.

The cylinder I is placed below the level of those preceding, in order that the accumulation of oil in it shall not check or interrupt the flow through the pipes D E F, &c. The cylinder J is in like manner placed below the level of cylinder I, in order that all the contents of the latter may be discharged into the former when it is desirable to do so.

The object of both cylinders is to reduce the bulk of heavy residual oil, which flows from the series of cylinders D E F, &c., through the transfer-pipe K, by eliminating such volatile parts as may remain after the passage of said oil through the heated cylinders D E F, &c.

The object of the cock M′ in Fig. 4 is to cut off the connection between the cylinders I and J. This may be done while the oil in the cylinder I accumulates until it is nearly or quite full, when the connection may be opened and a part or all of the oil be permitted to pass into J, where a further distillation may be carried on until nothing remains in it but coke, which may be taken out by removing the screw heads or plugs from the ends of the cylinders. When it is not desirable to continue the distillation to the point where the residuum remains hard or cokey, the heavy residual oil may be drawn from the eduction-pipe *h′*, Fig. 3.

Into the steam-jacket inclosing the cylinders is introduced superheated steam through the pipes E′ and F′, Fig. 4, these being the inlets of the jackets. W and X, Fig. 2, are pipes which form the outlets of the jackets. These may be supplied with pet-cocks to permit water to discharge from the steam-jackets. By thus filling the steam-jackets with steam superheated to 300°, or hotter, a vaporization of the oil in the cylinders is effected.

It will be noticed that the steam in the jacket does not come in contact with the oil in the cylinders, nor with the vapor or liquid in the vapor-pipes connecting with the cylinders. By this arrangement oil-vapors alone (which are much more easily condensed than steam) enter into the vapor-pipes, and through them into the reservoirs or receiving-tanks O, P, Q, and R, the use of which will now be described.

Before beginning to run the still the reservoirs or tanks are to be partially filled with water, which remains there *en masse;* then, when the oil is permitted to enter the still, the pump U is started for the purpose of removing a portion of the water in the tanks, in order to make room for the oil flowing into them through the pipes 1 2 3 4, &c.

A further use of these tanks is the entire condensation of the lightest products of distillation, which, by the manner of condensing and receiving now commonly used, are lost into the atmosphere, and the accumulation of which near the ground often endangers life and property.

These tanks may be few or many in number, and of any desirable capacity to receive the products of one day's distillation or more. The water pumped from these tanks may be carried to an ordinary water-tank, and used over and over again.

The steam-jackets may be covered on the top with asbestus, or with other non-conducting substance, and in the furnace underneath a small slack-coal fire may be made to prevent condensation of the steam, and a consequent lowering of the temperature of the oil in the still-cylinders.

The small perforated steam-pipe *h″*, Fig. 5, (also indicated by the dotted lines *n′* in Fig. 4,) may be charged with steam for the purpose of assisting in vaporizing the residual oil in the cylinders I and J. It may be used when it is desirable to continue the distillation until coke is formed.

I am aware boxes, chambers, cylinders, and condensers, variously formed and constructed, wherein terminate the vapor-pipes from the still, have been used. Hence I do not broadly claim such mechanisms separately.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of the distilling-cylinders D to H, more or less in number, forming one continuous pipe or cylinder of uniform diameter, or nearly so, with the jacket M, and provided with the vapor-pipes 1 2 3, &c., substantially as and for the purpose set forth.

2. In combination with the distilling-cylinders, the inclosing-jacket M, substantially as and for the purpose set forth.

3. In combination with the distilling-cylinders I and J, surrounded by the jacket N, the cylinders D to H, surrounded by the jacket M, and provided with the vapor-pipes 1 2 3, &c., substantially as and for the purpose set forth.

4. In oil-stills, one or more receiving-tanks,

charged with water in volume, wherein terminate the still-worms or vapor-pipes, said tanks being connected with exhausting apparatus, and in combination with said vapor-pipes, substantially as and for the purpose set forth.

5. The combination of the cylinders D to H, jacket M, vapor-pipes 1 2 3, &c., the cylinders I J, jacket N, condensing-box S, and tanks O P Q, &c., substantially as and for the purpose set forth.

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Witnesses:
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