(No Model.) 3 Sheets—Sheet 1.

W. T. FORBES.

APPARATUS FOR EXTRACTING OILS WITH THE AID OF SOLVENTS.

No. 436,227. Patented Sept. 9, 1890.

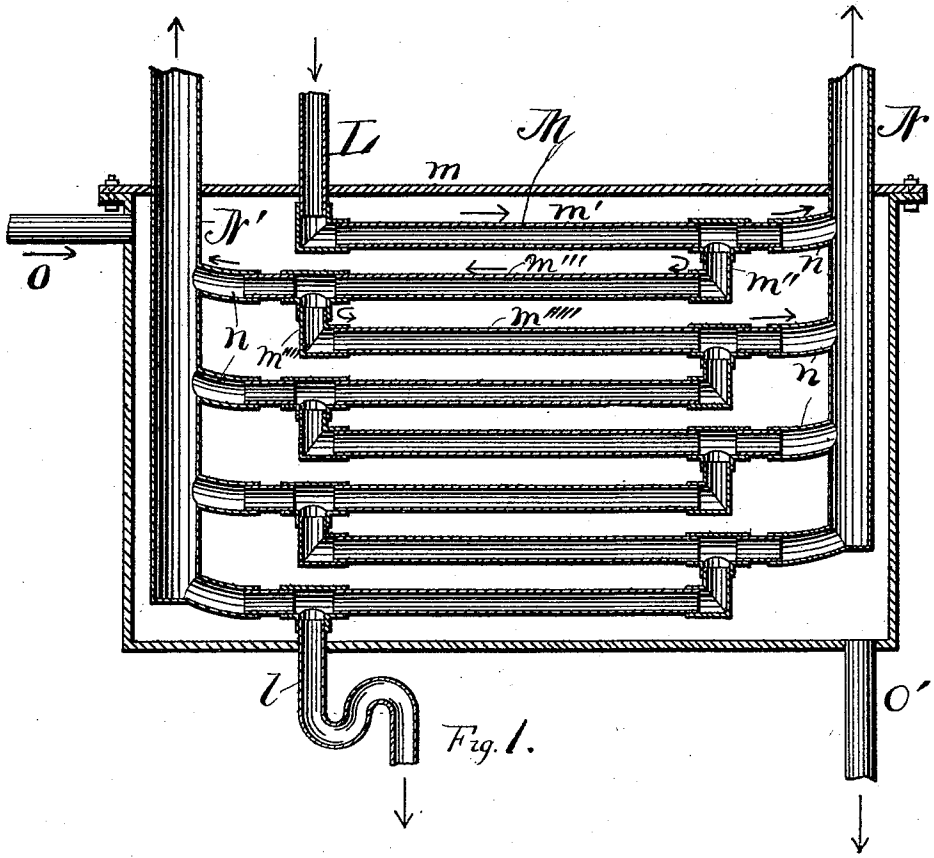


Fig. 1.

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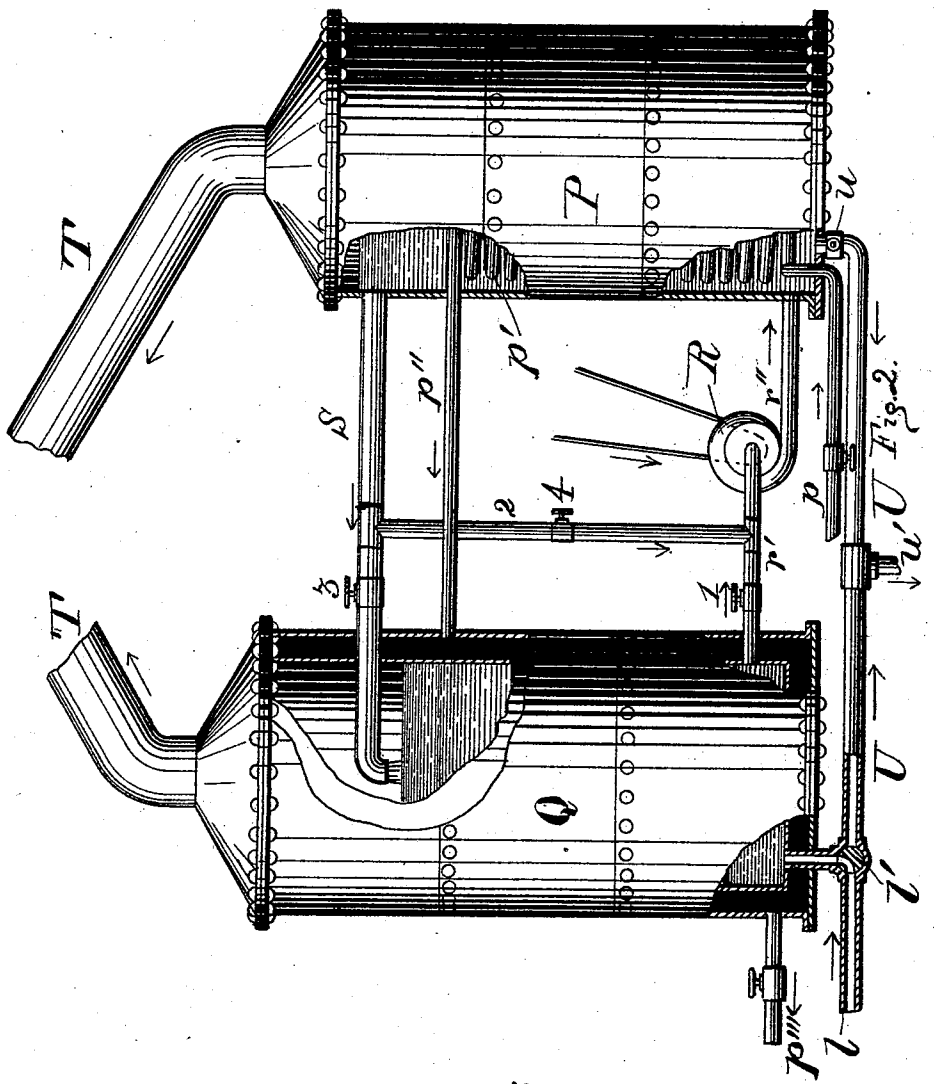
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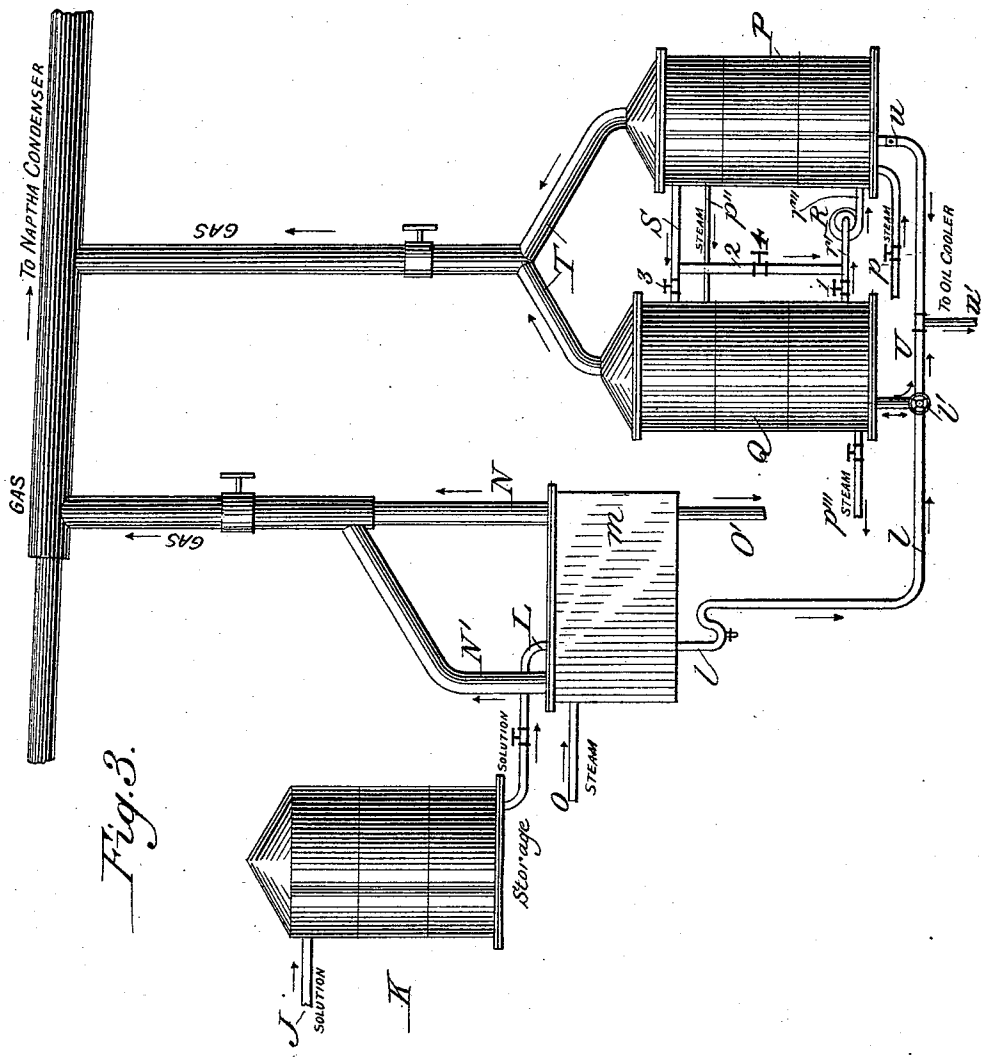


Fig. 3.

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UNITED STATES PATENT OFFICE.

WALTER T. FORBES, OF ATLANTA, GEORGIA.

APPARATUS FOR EXTRACTING OILS WITH THE AID OF SOLVENTS.

SPECIFICATION forming part of Letters Patent No. 436,227, dated September 9, 1890.

Application filed January 24, 1890. Serial No. 337,994. (No model.)

To all whom it may concern:

Be it known that I, WALTER T. FORBES, a citizen of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Apparatus for Extracting Oils; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to improvements in apparatus for extracting oil from oleaginous material with the aid of a suitable solvent, notably naphtha.

The invention has for its object the construction of a device which will separate the oil from the solvent in such a manner that the latter will be almost absolutely expelled from the former and be left in such a condition as to readily be used again.

In the accompanying drawings, in which similar letters and figures of reference designate corresponding parts, Figure 1 is a central vertical section showing the primary naphtha-eliminating coils, and showing the same steam-jacketed. Fig. 2 shows the secondary gasifying receiver or eliminator and illustrates a device for further purifying the oil to be operated in conjunction with the secondary naphtha-eliminator, and also shows a system of piping whereby the said eliminator may be operated alone when the nature or condition of the oil admits. Fig. 3 is a view of the complete apparatus, with the exception of the steam-generator, naphtha-gas condenser, and refined-oil cooler or storage-tank, and of which may be used any form desired, as their functions in no way affect the operation of the specific improvements for which a patent is sought in this present instance.

Referring to the drawings, *m* and P are the primary and secondary naphtha-eliminators, respectively, and Q is the auxiliary receiver, the action of which is to further purify the oil when found necessary after the operation of the other devices for the purpose.

For convenience of description this device will be described in the order of parts as they come into use in perfecting the product; but I do not wish to be understood as setting up the necessary order on all the parts, as the primary and secondary eliminating receivers might be reversed in order, although at present the order in which they are shown in Fig. 3 is the preferable one.

The storage-tank K may be of any construction desired, and of a capacity equal to several times the amount of the oil obtained from one charge of the extractor.

The pipe L, Fig. 1, leads from the storage-tank K to the coils M, having at some intermediate point a cock for adjusting the capacity for discharge into the said coils.

The coils M in the primary eliminator are constructed as follows: The pipe L, entering the casing *m* at a suitable position, connects with the pipe *m'*, which passes in an approximately horizontal direction and connects with a manifold N in a suitable manner, having at a short distance from said manifold a downwardly-extending connection *m''*, which connects with the pipe *m'''*, which passes into the manifold N', having likewise a downwardly-projecting connection *m''''* with the pipe *m'''''*, which also connects the manifold N, all of which parts may be duplicated to any desired extent for the purpose of obtaining greater heating-surface. To prevent a short-circuit in the coil, it is preferable that the stems *n* enter the manifolds N N' at a slight upward inclination, which will obviously prevent any possible overflow of oil into said manifolds. The pipe O carries live steam into the casing *m*, while the pipe O' carries away the steam and water of condensation. The casing *m* may be set in brickwork, if desired, to prevent the radiation of heat therefrom, and it is obvious that in the construction (shown in Fig. 1) of this casing the cover may be removed and the coil lifted and repairs be made thereon. The manifolds N N' connect with a pipe leading to the naphtha-gas condenser. The desired amount of naphtha and oil, the latter being held in solution in the former, is admitted through the pipe L to the coil M, the proper amount being about half the capacity of the pipes forming said coil, and will pass by its own gravity

through the pipes m', m'', m''', m'''', and m''''', and so on through the coils, and being heated will evolve naphtha-gas, which will pass in the space above the solution in the coils to the nearest stem n, thence to the manifold N or N', and so on to the condenser. The fact that there are several connections with the manifold from the coil obviates all danger of the reabsorption of the gas after being condensed by the solution which has but just entered the coil M. The oil passes out of the coil M through the pipe l.

The pipe l, Fig. 2, is a continuation of the pipe bearing the same reference-letter in Fig. 1, and the oil passing through said pipe, the valve l' being open to allow it, will enter the steam-jacketed receiver Q and will flow through the pipe r', centrifugal pump R, pipe r'' into the steam-coiled receiver P, the flow of the solution through the pipe l being continued until the oil in both receivers P and Q shall be slightly above the level at which it is shown in Fig. 2 in the receiver Q, when the operation in the primary receiver will be stopped and the valve l' be closed. During the filling of the receivers P and Q the same have been heated by live steam passing into the coil p, thence by the pipe p'' to the steam-jacket of the receiver Q, and thence exhausted through the pipe p''', or, if desired, sent through a steam-trap to the steam-generator, and the said heating of the two receivers will be continued until the operation of the elimination of the oil has been completed. The next step to be performed in the operation is the starting of the pump R, which pump, as is shown in Figs. 2 and 3, is set between the receivers P and Q, and is preferably of the kind known as "centrifugal," for the reason that a pump of such class will allow the passage of the solution through it by gravity when it is at rest. The starting of this pump will lower the solution in the receiver Q and raise it in the receiver P until it shall overflow through the pipe S back into the receiver Q, where it will agitate and cause a free evolution of naphtha-gas from the solution therein contained. The upward current of the solution in the receiver P is an assistance in the evolution of the gas by the heat, and all parts of the said solution are in turn exposed in their hottest condition at the top of the said receiver. The pipes T, extending from the upper ends of the receivers P and Q, join a pipe leading to the naphtha-gas condenser, where it will be returned to its liquid condition. When the operation as just described has been completed, test showing absence of naphtha in the oil, the valves u and l' are opened to the pipe U and the oil carried from the receivers through the pipes u' and U to the cooling storage-tanks, after which, as above described, the flow of solution is started from the tank K through the coils M and into the receivers P and Q, and the operation hereinbefore described repeated.

If from the character or condition of the oil the functions of the receiver or eliminator Q should be deemed superfluous to the full finishing of the oil, elements 1, 2, 3, and 4 may be employed. (See Fig. 2.) The pipes S and r' are connected by the pipe 2, having a valve 4, which pipe, when said valve is open, will allow a flow of the solution from the pipe S to the pipe r; and it is obvious that when the valves 1 and 3, respectively, in the pipes r' and S are closed the pump R will cause the oil to flow through the elements S, Q, r' R, and r'', opening an exterior circuit from the top of the eliminating-receiver P to its bottom independent of the receiver Q.

The condenser for liquefying the gas collected from the various parts of the device as well as the steam is preferably in the form of an immersed worm, that being the simplest and most effective for the purpose, and after condensation any suitable devices may be used for the separation of the naphtha and water resulting from the action of this condenser.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a device for separating a solution of oil and its solvent into its component parts, the combination of the casing m, having steam supply and exhaust pipes, and the vaporizing-coil sustained within said casing and consisting of the manifolds N and N', and the pipes and fittings m', m'', m''', m'''', and m''''', all arranged substantially as and for the purpose specified.

2. In a device for separating a solution of oil and its solvent into its component parts, the combination of the casing m, having steam supply and exhaust pipes, and the vaporizing-coil consisting of the manifolds N and N', and the elements m', m'', m''', m'''' and m''''', having upwardly curved or inclined stems for the purpose of preventing overflow of liquid into the manifolds N and N', substantially as set forth.

3. In a device for separating a solution of oil and its solvent into its component parts, the combination of the receiver P, containing a steam-coil p', connected at its lower end with a supply-pipe p, the receiver Q, provided with a steam-jacket connected with the upper end of the coil p', and having an exhaust-pipe p''', the supply-pipes l and U, the pipes r' and r'', connecting the lower parts of the receivers, the intermediate pump R, the pipe S, connecting the upper parts of said receivers, and the pipe 2, connecting the pipes S and r', substantially as and for the purpose specified.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

WALTER T. FORBES.

Witnesses:

A. P. WOOD,

W. S. WATSON.