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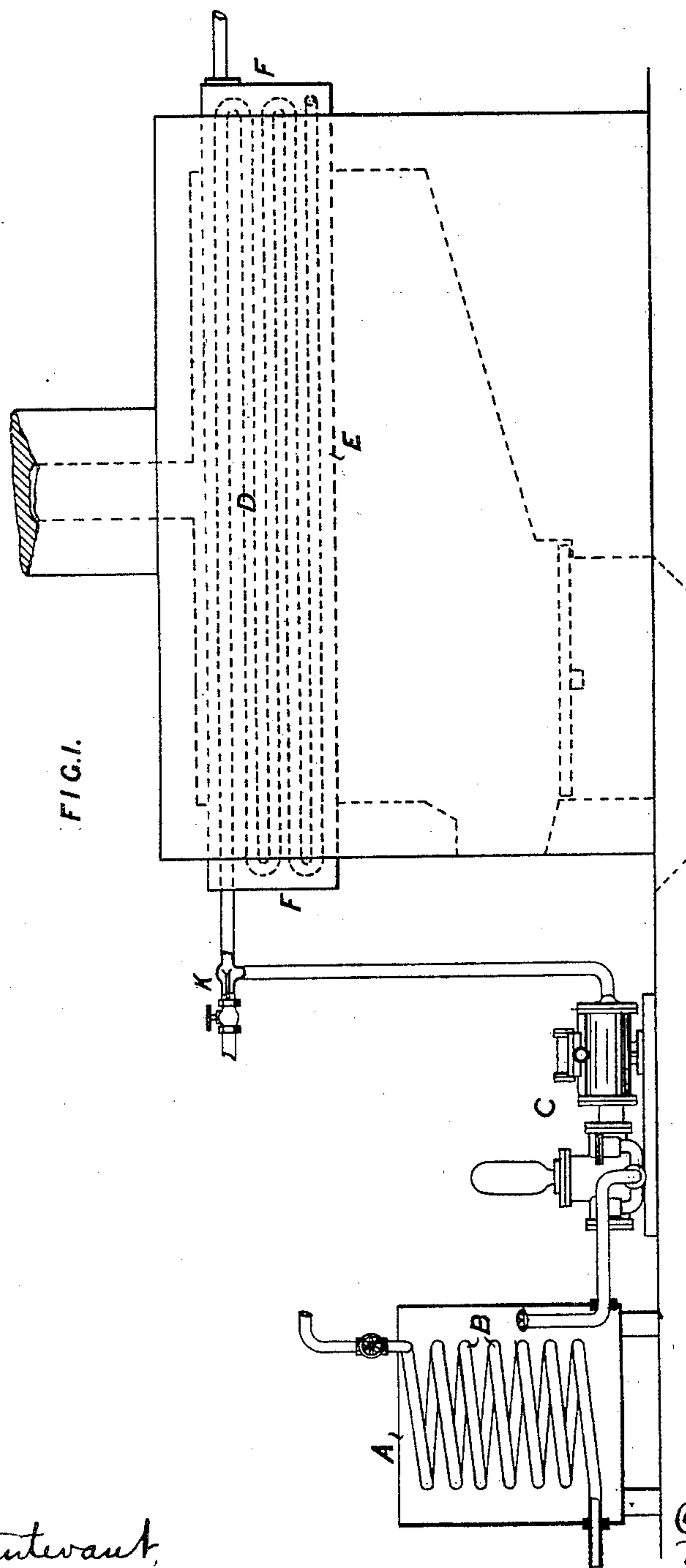
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C. M. PIELSTICKER.

DISTILLATION OF HYDROCARBON OR OTHER OILS.

No. 477,153.

Patented June 14, 1892.



Witnesses
Chas. S. Sturtevant,
Stephen J. Jarmus

C. M. Pielsticker
By Atty.
Frankland Jarmus.

(No Model.)

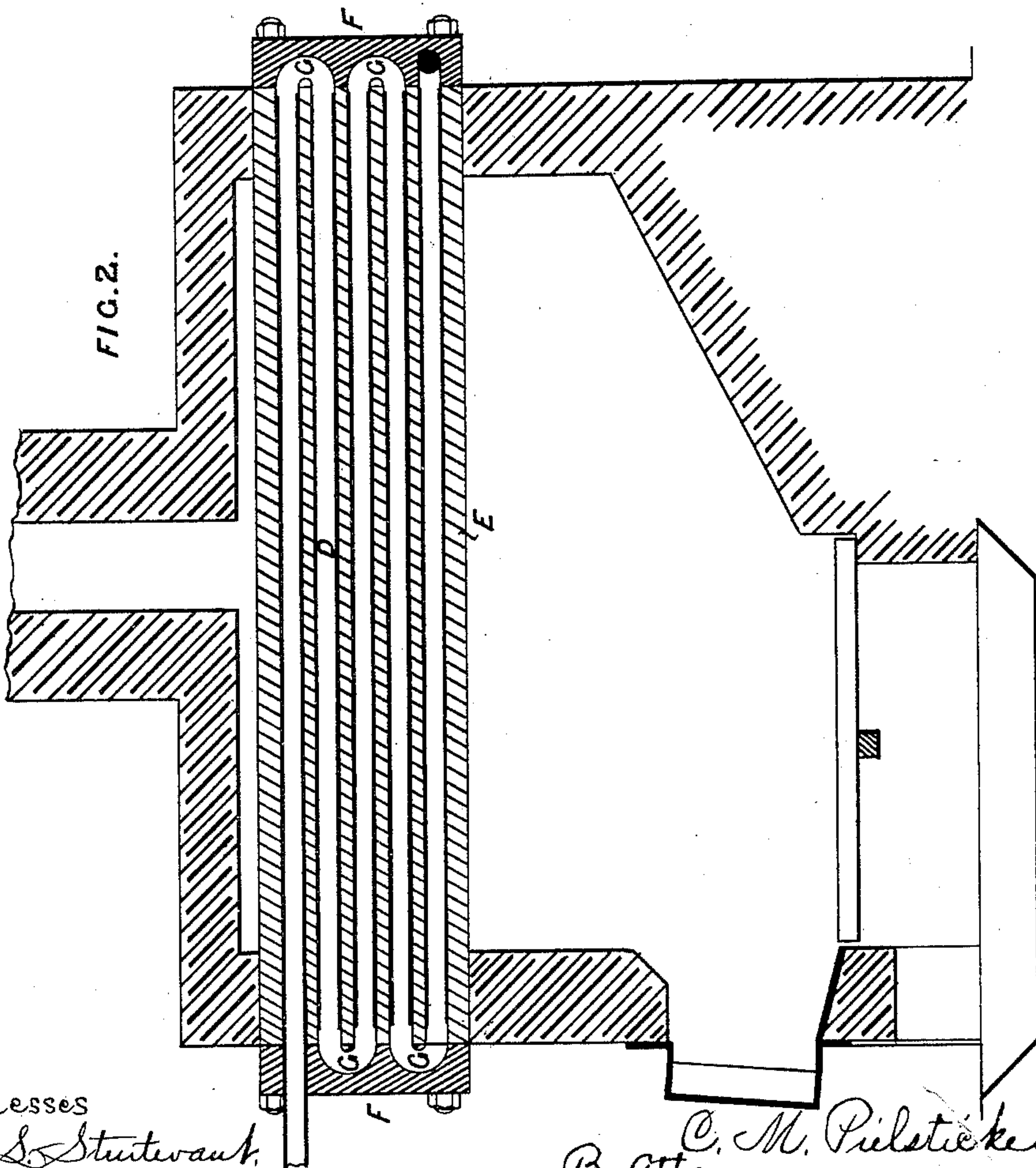
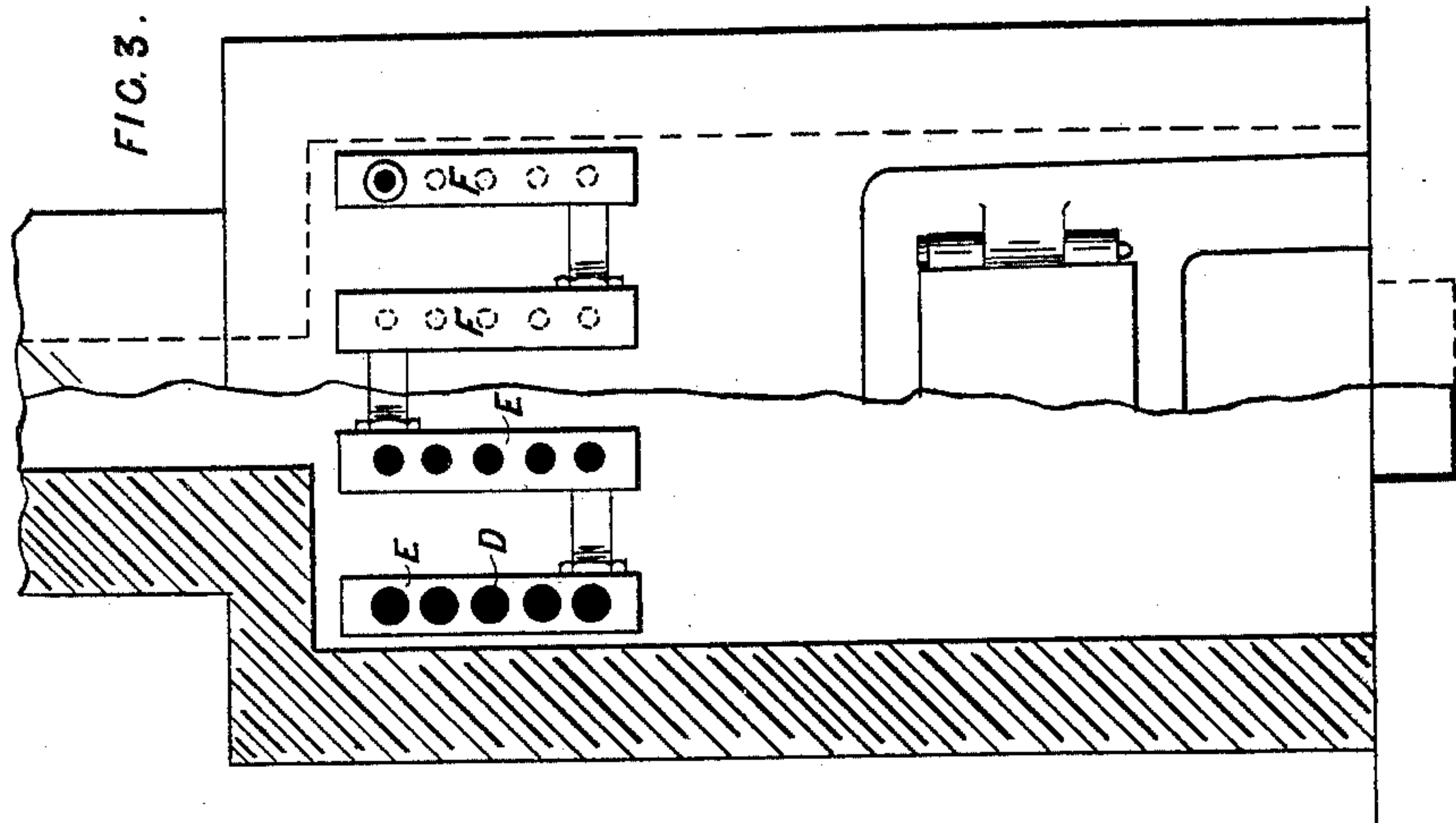
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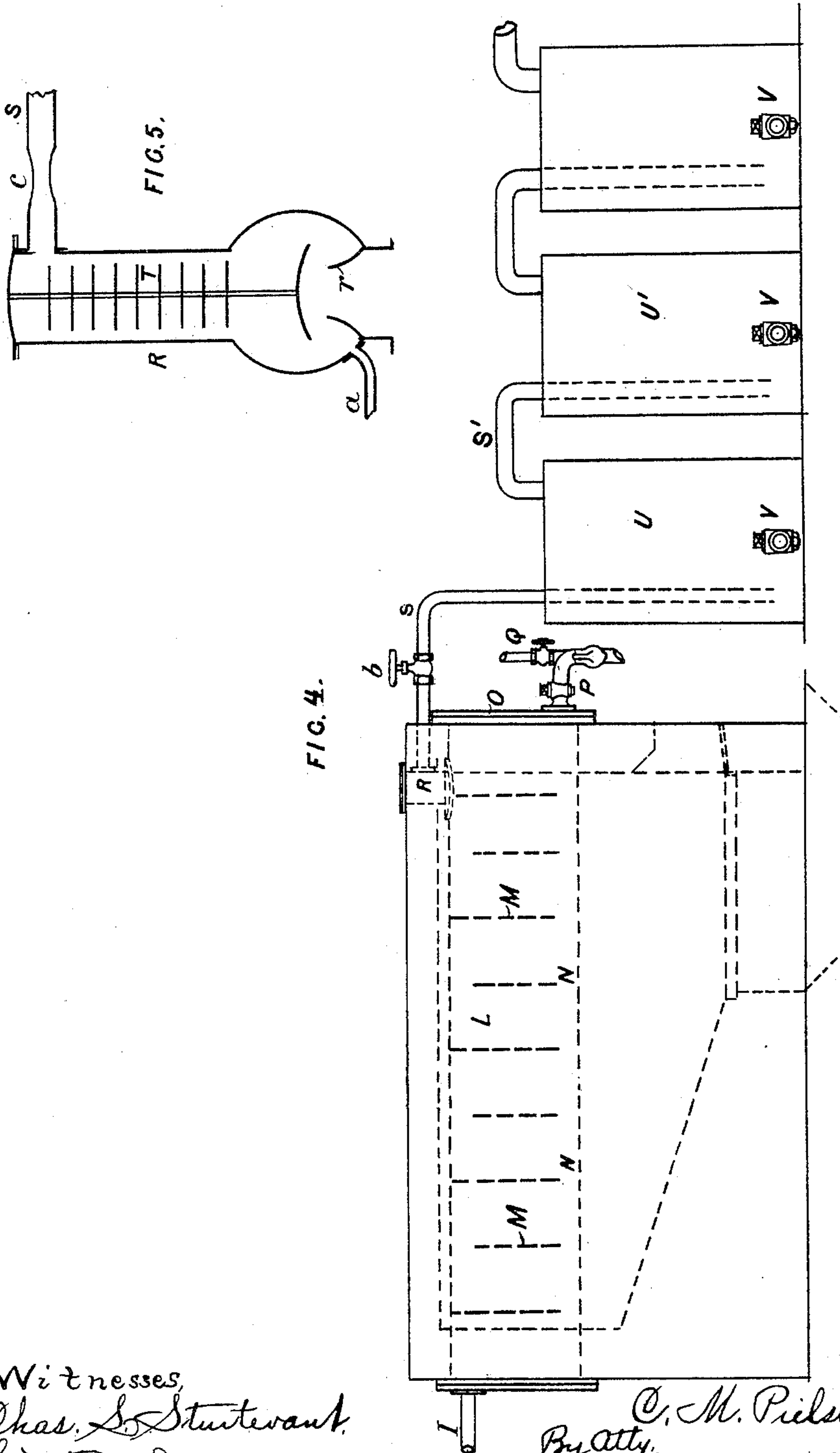
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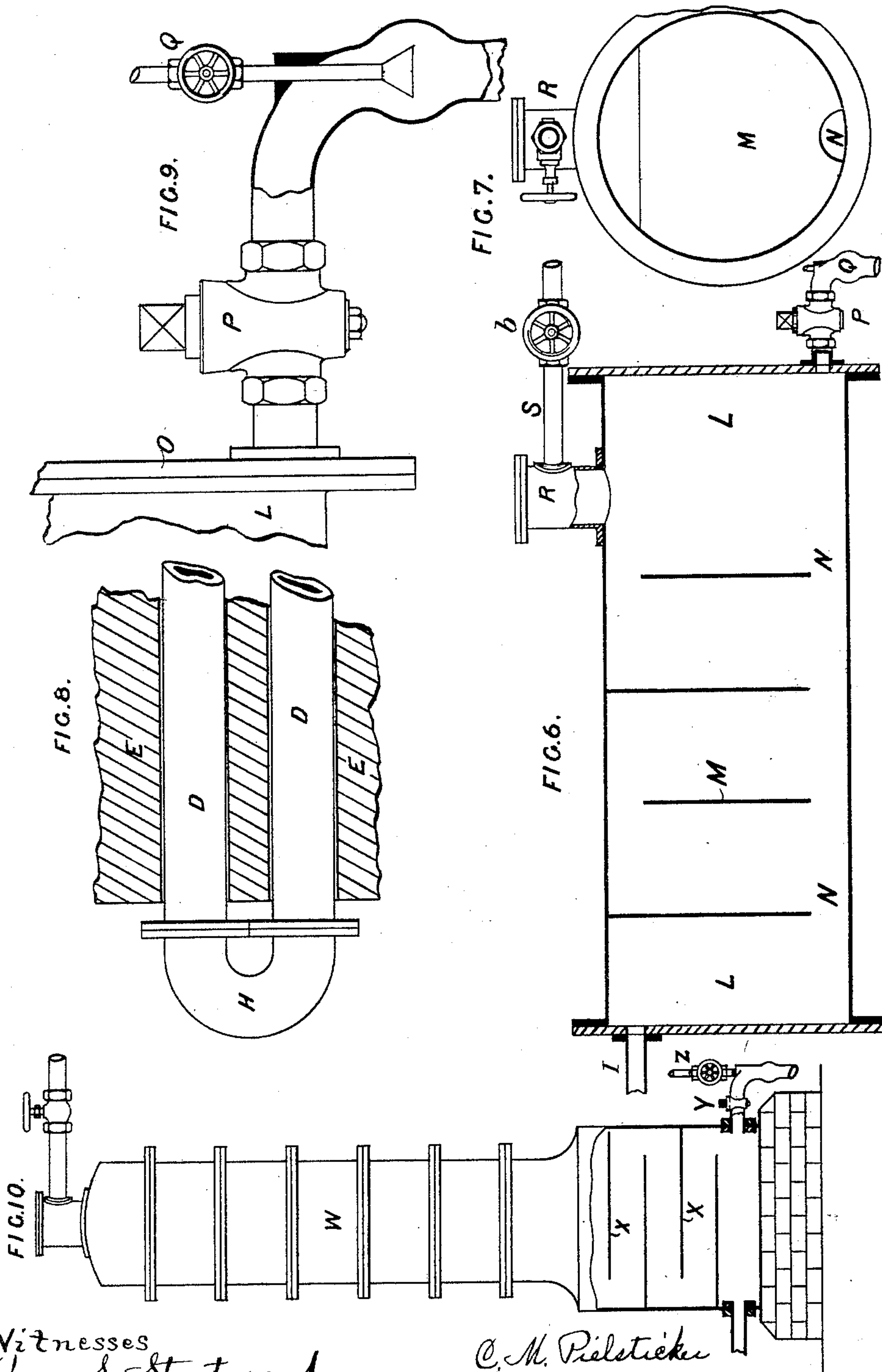
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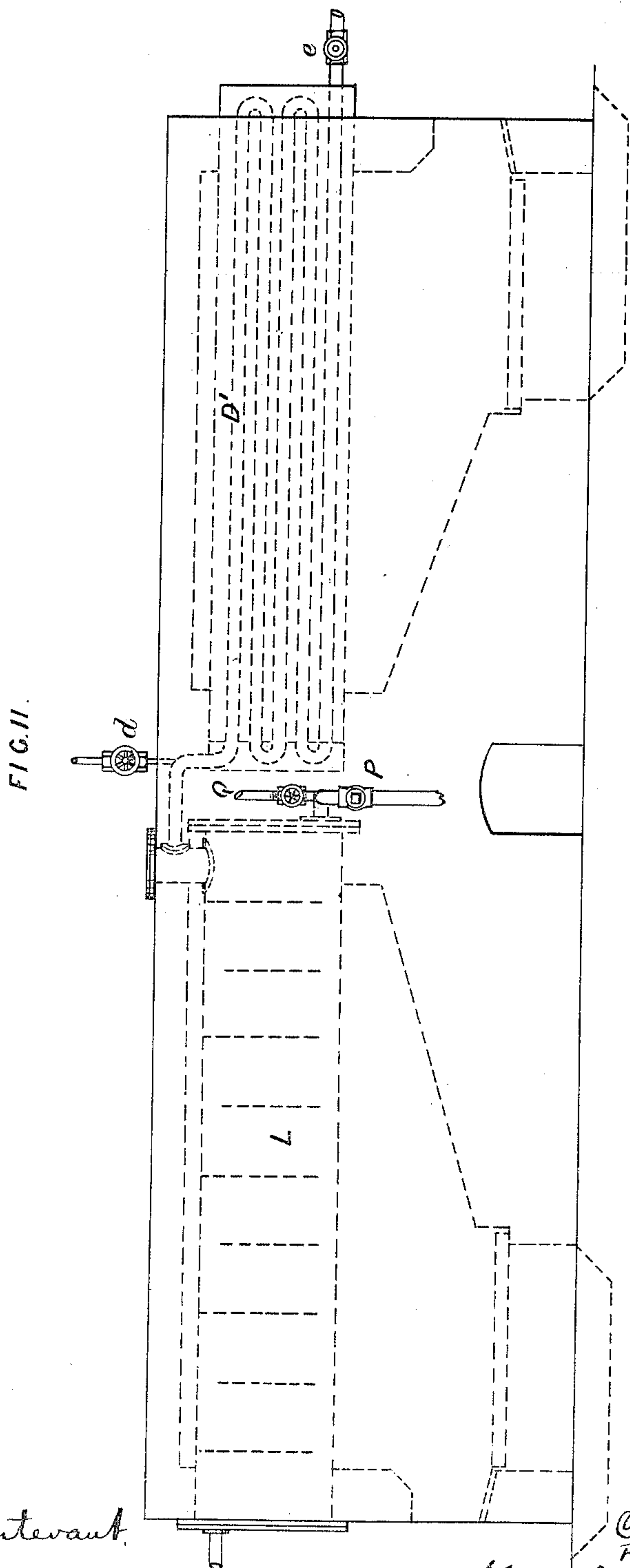
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UNITED STATES PATENT OFFICE.

CARL MARIA PIELSTICKER, OF LONDON, ENGLAND.

DISTILLATION OF HYDROCARBON OR OTHER OILS.

SPECIFICATION forming part of Letters Patent No. 477,153, dated June 14, 1892.

Application filed November 26, 1890. Serial No. 372,721. (No model.) Patented in England April 28, 1890, No. 6,466, and January 4, 1891, No. 1,308; in France November 26, 1890, No. 209,809; in Belgium November 26, 1890, No. 92,883; in Spain November 26, 1890, No. 11,511; in Italy December 31, 1890, No. 28,644, and in Austria-Hungary June 16, 1891, No. 53,380.

To all whom it may concern:

Be it known that I, CARL MARIA PIELSTICKER, a subject of the Queen of England, residing at London, in the county of London and Kingdom of England, have invented certain new and useful Improvements in the Continuous Distillation of Hydrocarbon or other Oils and Liquids, (for which I have obtained Letters Patent in England, dated April 28, 1890, No. 6,466, and January 4, 1891, No. 1,308; in France, dated November 26, 1890, No. 209,809; in Belgium, dated November 26, 1890, No. 92,883; in Italy, dated December 31, 1890, No. 28,644; in Spain, dated November 26, 1890, No. 11,511, and in Austria-Hungary, dated June 16, 1891, No. 53,380,) of which the following is a specification.

My invention relates to improvements in the distillation of hydrocarbon or other oils and liquids, by means of which the operation of distillation is conducted in a continuous manner.

In the specification to Letters Patent granted to me in Great Britain under No. 1,706 and dated April 10, 1882, I described a method in which the hydrocarbon oil was forced under pressure by means of a force-pump or a steam-injector into a coil open at the other end, in which coil the oil was heated to its distilling-point, the heated oil entering from the coil into a heated retort, in which it was vaporized and again condensed in a cooler connected with the retort. In employing this apparatus it was found difficult to so regulate the temperature of the coil that all the oil at once assumed vapor form on entering the retort, while at other times the coil became so superheated that a portion of the oil became converted into permanent gas. Moreover, the coil, being directly exposed to the action of a high temperature, was burned through in a short time, and finally it was found impossible to clean the coil from the carbon deposited therein from the oil passing through it.

In the improved apparatus, which I will now proceed to describe by reference to the accompanying drawings, the above-mentioned defects have been obviated and a more perfect operation attained.

On the accompanying drawings, Figure 1 is

an elevation showing general arrangement of oil tank or pump and heating-coil; Fig. 2, an elevation showing the arrangement of a retort and condenser. Fig. 3 is an enlarged section through the dome and goose-neck; Fig. 4, a longitudinal section through heating-coil; Fig. 5, an end sectional elevation of the same. Fig. 6 is a longitudinal section through the retort, showing arrangement of baffle-plates. Fig. 7 is a transverse section through the same. Fig. 8 illustrates the methods of connecting the pipes by means of short bends. Fig. 9 is a detail of the tar-outlet from retort fitted with steam-ejector; Fig. 10, a sectional elevation of a column-still; and Fig. 11 is an elevation showing the arrangement of a retort and second heating-coil.

A is the oil-tank; *a*, oil-pipe; B, steam-coil; *b*, valve or outlet of retort; C, pump or injector; *c*, contraction or valve in goose-neck; D, heating-coil; *d*, steam-injector to second coil; D', second heating-coil; E, block of iron; *e*, valve on second coil; F, iron cover; G, channels; H, bends; I, inlet to retort; K, steam connection; L, retort; M, baffle-plates; O, movable cover of retort; N, passage at bottom of plate; P, outlet-valve on retort; Q, steam-inlet to valve; R, the dome; *r*, cup inside dome; S, goose-neck; S', second bend; T, baffle-plates in dome; U, small vessel or condenser; U', second vessel or condenser; V, draw-off cocks; W, column-still; X, baffle-plates in column-still; Y, draw-off cock for tar; Z, steam-injector.

The oil to be distilled is contained in a tank A, in which it is heated by means of a steam-coil B or otherwise. From this tank the oil is forced by means of a pump C or otherwise into a coil D, which is formed of a number of iron pipes—say ten feet long and, say, an inch and a half (more or less) in diameter—the ends of which are open and the whole of the pipes embedded or inserted into a solid block of iron or refractory material E, provided with longitudinal channels through their entire length, into which the pipes fit. The ends of the pipes are closed by means of an iron cover F, which is provided with channels to G, so that the pipes D form one continuous coil. In this case the cover F can be easily removed

and the pipes be occasionally cleared of the carbon deposited inside from the heated oil by simply forcing an iron rod through the length of each pipe forming the coil. I may connect the open ends of the pipes D by short bends II, which are also removable for cleaning in a similar manner. This construction of the heating-coil is a matter of great importance, since it is impossible to clear an ordinary coil of the requisite length from any carbon adhering inside. Moreover, the coil being loosely inserted into the block of iron or of refractory material E, the whole length of the coil is permitted free expansion, and the joints are in consequence kept tight.

I have found that by passing the oil through the coil with great velocity I in a great measure prevent the deposition of carbon or heavy matter which would soon choke up the coil. I now find it preferable to attain this object by graduating the diameter of the pipes D, forming the coil. For instance, if the entire length of the coil is two hundred feet I construct the first fifty feet of two-inch pipes, the second fifty feet of one-and-a-half-inch pipes, and the last hundred feet of one-inch pipes. I may, however, decrease the diameter of the coil only toward or at the inlet I into the retort.

Between the force-pump C and the inlet of the coil D a steam connection K is provided for the purpose of emptying the oil contained in the coil D at the end of the operation by a steam-blast into a retort L, into which the other end of the coil D leads; otherwise when the pumping is stopped the oil remaining in the coil D would speedily become carbonized and choke the coil.

Between the pump C and the coil D and between the coil D and retort L expansion-joints may be provided. The retort L is provided with a number of baffle-plates M, causing the oil-vapors to take a lengthened passage through the retort before they can enter the condenser. A passage N is left in the lower part of the baffle-plates in order to allow the flow of the tar or residuum to the draw-off cock.

The end of the retort opposite to the inlet of the oil is closed by a removable cover O. Nearly at the lower end of the cover is fitted a valve P for the removal of the tar or residue during the operation of distilling, a steam-inlet Q being connected with the tar-outlet in order to blow steam when the tar-outlet is opened, which not only assists in the removal of the thick tar or the residue, but more particularly prevents air from entering the retort, which air would form a dangerously explosive mixture with the highly-heated oil-gases inside the retort. It will be evident that since a constant supply of oil is fed into the retort L and the residuum of this oil or other liquid entering the latter by preference from the highest point of the coil, being constantly removed during the distillation, this distillation thus becomes continuous.

A dome R and goose-neck S connect the retort with a condenser. The dome R may be enlarged at its base, forming a sphere, and may be provided at its lower end inside with a cup-shaped projection *r*, into which any oil collects which may condense in the dome R and from which it may be returned into the retort L or into the supply-tank A through the pipe *a*. This dome may be provided with a number of baffle-plates T, which force the vapors to come in contact with the inner surface of the dome R, where the heavier portion of them are caused to condense, and, returning to the more heated surface of the retort, are reduced in gravity and finally distil over and condense in the condenser.

The condenser may either be an ordinary coil or a surface condenser, the first bend of which reaches into a vessel U, nearly to the bottom of the latter, in which part of the vapors condenses, the uncondensed portion being led by the second bend S' from the top of the first vessel U to the bottom of the second vessel U', and so on through a series of condensing-vessels, which are all provided with draw-off cocks V, in which the vapors are successively condensed into oil of a number of graduated specific gravities heavier at the beginning of the series and lighter toward the end of the series; or, instead of this arrangement the products of distillation as they pass over from the retort L may be fractionally separated into a number of oils of graduated specific gravities by connecting the heating-coil with a column-still W, which may be similar to that used in the distillation of benzole, the body of which column-still I also divide by baffle-plates X, and a draw-off cock V for the tar or residue with steam-ejector Z. When it is intended to produce still lighter gravity oils, a valve *b* may be placed between the outlet of the retort L and the condenser U, which may be kept open only so far as to create a certain pressure of the gases inside the retort, or such pressure may be created by means of a steam-blast introduced into the goose-neck S and blowing in the opposite direction to the flow of vapors which distil over from the retort, or the goose-neck S may be contracted at some point *c* to a much smaller diameter.

In case the crude oil contains a considerable quantity of water, the latter may be separated from the oil by placing the baffle-plates horizontally into the retort, over which the oil and water flows, presenting in this manner a very extended surface, which is most conducive to rapid evaporation. The coil D and the retort L are kept at the temperature at which only the water distils off, while the oil pumped through the coil and retort is drawn off at the tar-cock Y free from water and in a subsequent operation may be subjected to distillation.

If the manufacture of permanent gas or of very light oil is intended, the retort L is directly connected with a second coil D', similar to the first one D, steam which may previously

have been superheated being in preference simultaneously admitted with the oil-vapors into the second coil D' by means of a steam-injector *d*, provided for the purpose. The second coil may be kept under pressure by means of a valve *e* or otherwise and may be connected with an expansion-chamber or gas holder and condenser of well-known construction.

My apparatus may also be used for the distillation of other liquids besides hydrocarbons—for instance, for fats and oils in the separation of fatty acids and glycerine; also, for the continuous production of distilled water from sea-water or the concentration of brine and alkaline solutions and the concentration of sugar solutions. The concentrated salt, alkaline, or other solution may be drawn off at the draw-off cock at the end of the retort.

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

1. In an apparatus for the continuous distillation of oil, a supply-tank, a coil, connections between the two, means for heating both tank and coil, means for forcing the liquid from the supply-tank through the said coil, a steam jet or blast in connection with said coil, a retort through which the liquid is also forced, said retort being provided with baffle-plates and a draw-off cock, a steam-ejector fitted to said draw-off cock, a second heating-coil in connection with the retort, an expansion-chamber connected with one end thereof, a condenser in connection therewith, and a gas holder or other receptacle.

2. In an apparatus for the continuous distillation of oil, a supply-tank, means for heat-

ing the same, a heating-coil comprising a series of pipes D, blocks E, incasing the same, removable covers closing and connecting the ends of the pipes, said pipes D gradually increasing in diameter from the inlet to the outlet, connections between this heating-coil and the supply-tank, a pump or equivalent device located between the two for forcing the oil through the heating-coil, a retort in connection therewith, a steam jet or blast attached to the heating-coil, a draw-off cock attached to the retort, a steam-ejector fitted to said cock, and a condenser in connection with the retort.

3. In an apparatus for the continuous distillation of oil, a supply-tank, means for heating the same, a heating-coil comprising a series of pipes, blocks of cast-iron or refractory material incasing the same, and removable covers closing and connecting the ends of the pipes, connections between said tank and coil, a pump or equivalent device located between the two, a retort in connection therewith, a draw-off cock for said retort, and a condenser in connection with the retort.

4. In the herein-described apparatus, the combination, with the retort and condenser, of a dome R, attached to the retort, having an annular cup at its base, and a pipe connection between the upper part of said dome and the condenser and having a contracted portion, substantially as described.

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