

W. RYDER.
Apparatus for the Continuous Distillation of
Hydrocarbon Oils.

No. 214,199.

Patented April 8, 1879.

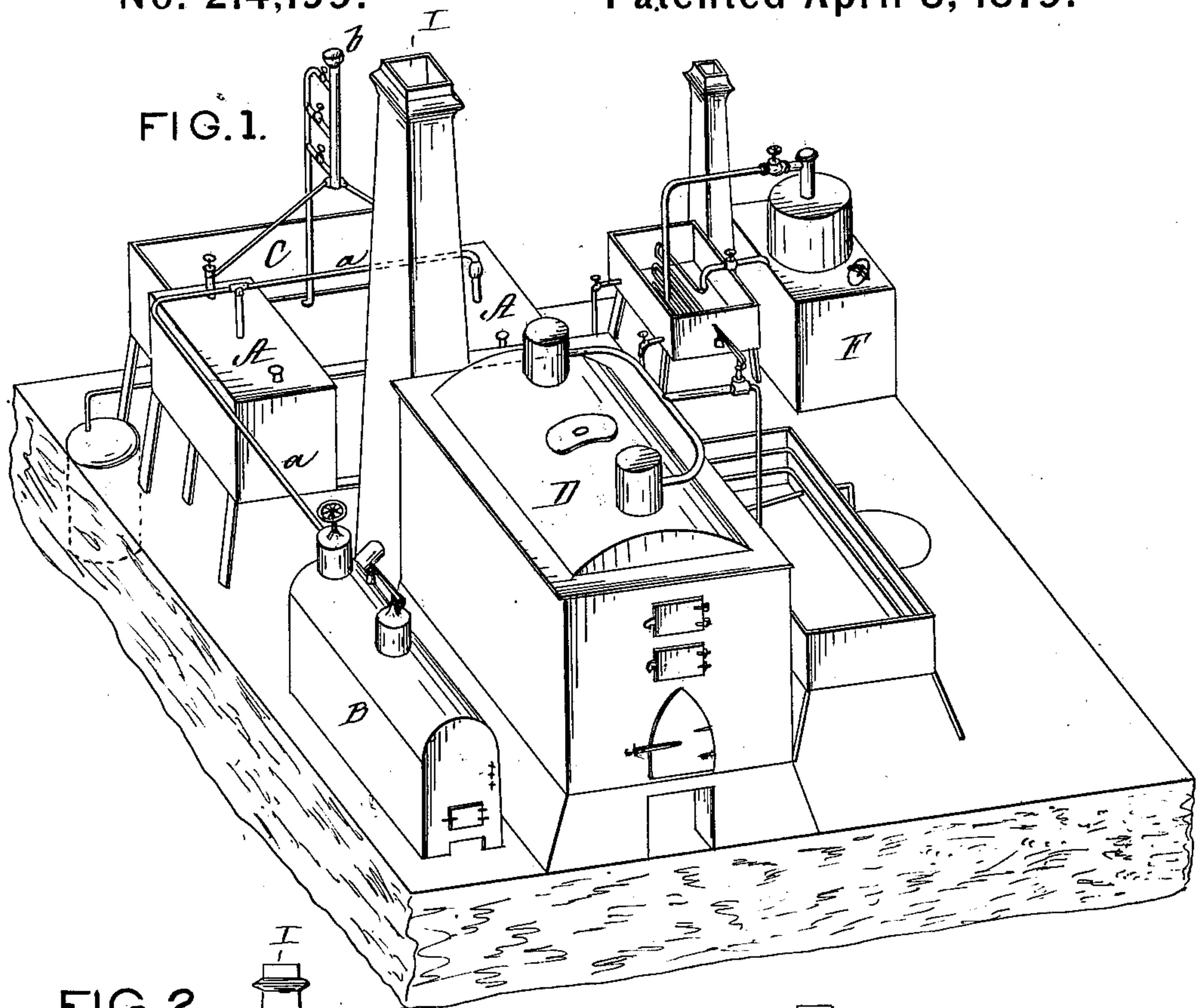
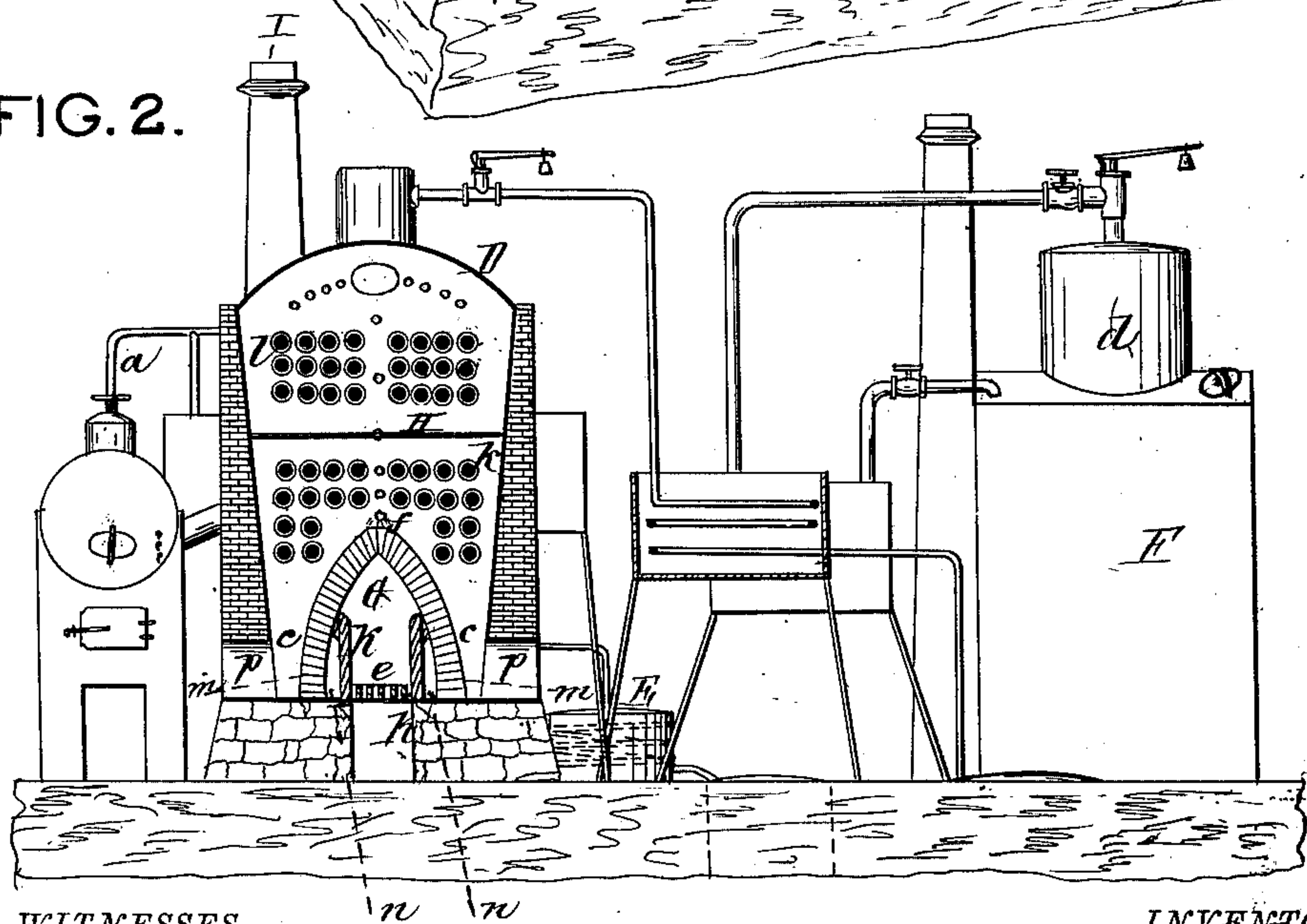


FIG. 2.



WITNESSES

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FIG. 3.

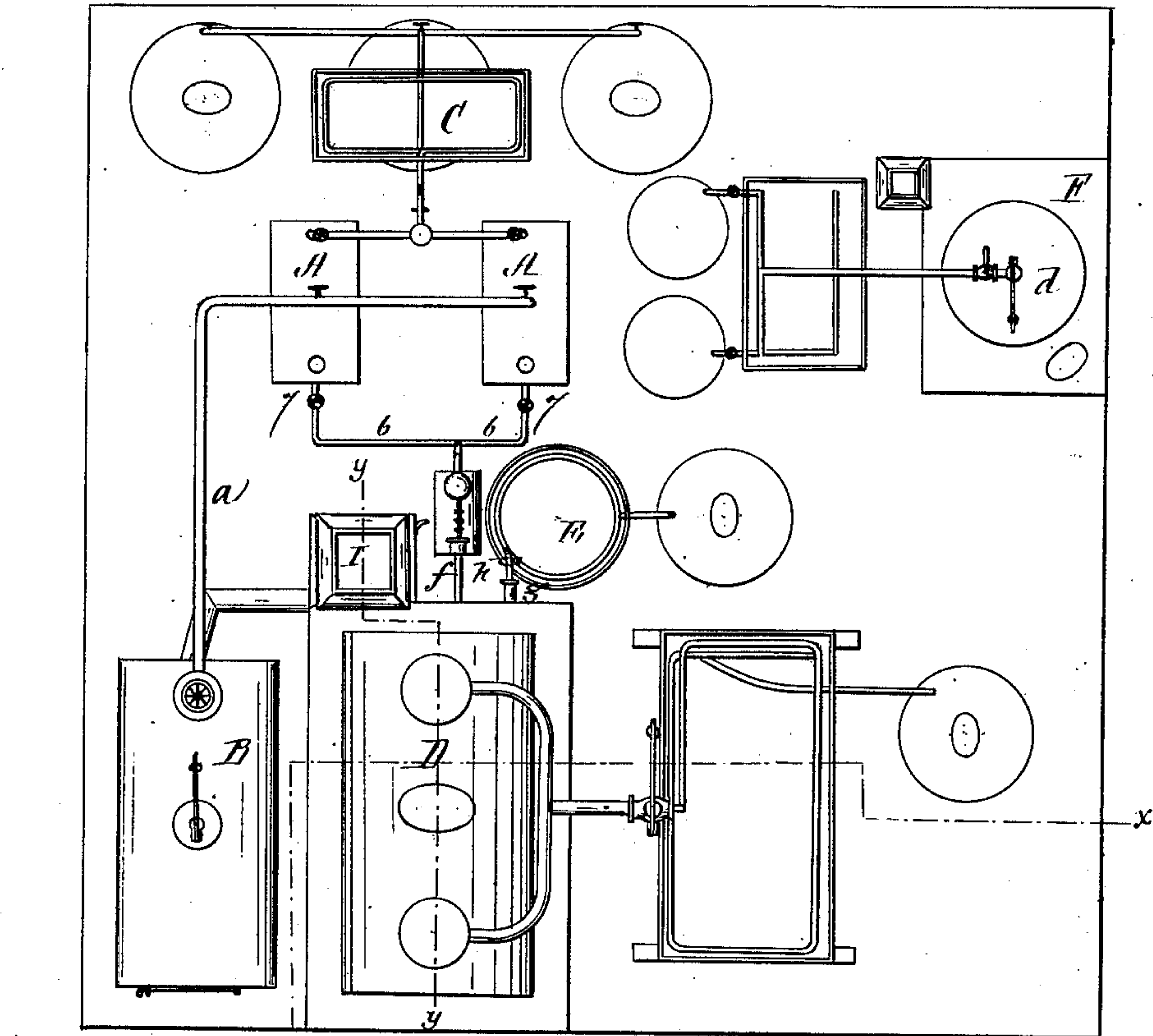
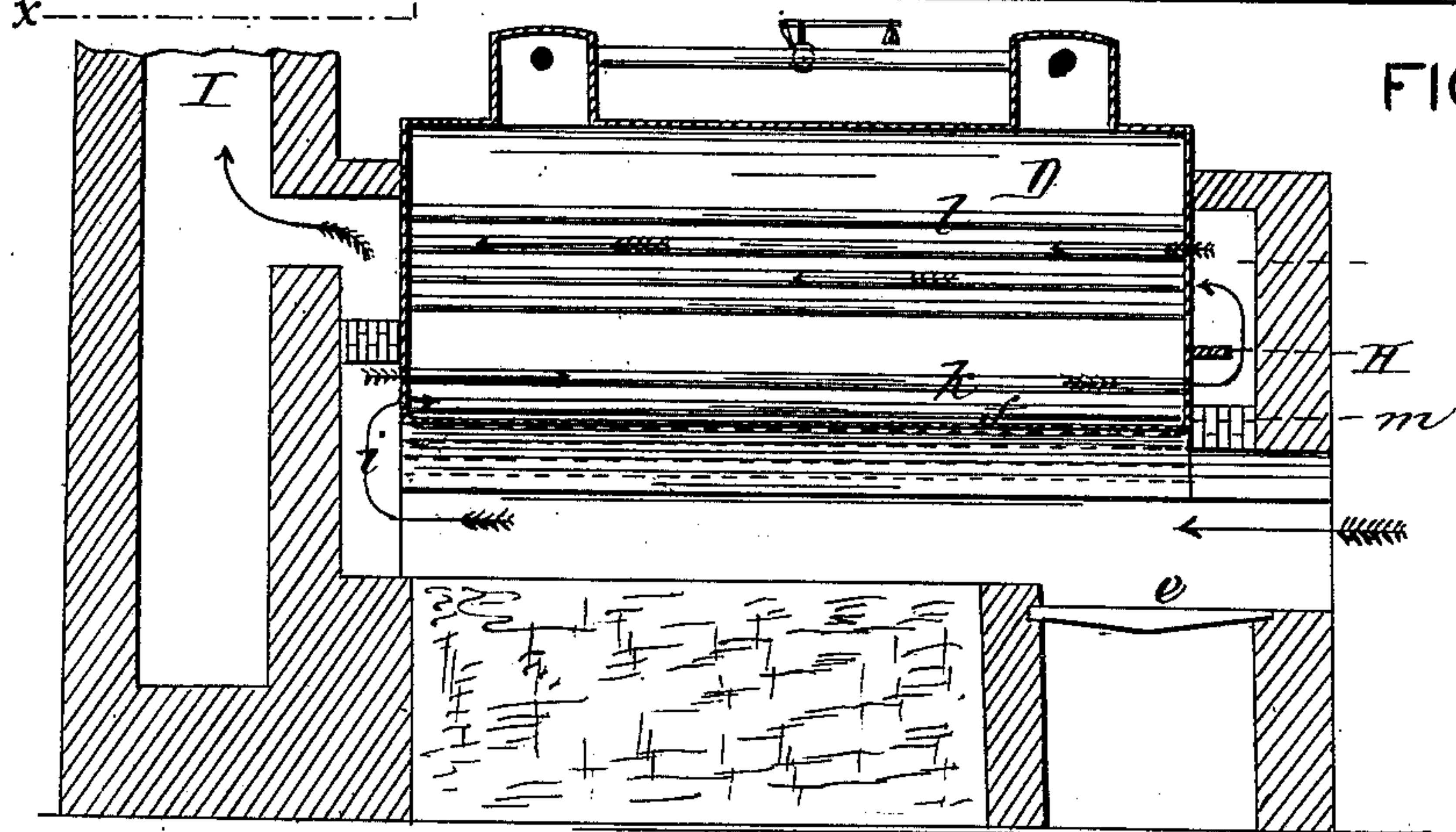


FIG. 4.



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UNITED STATES PATENT OFFICE.

WATSON RYDER, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN APPARATUS FOR THE CONTINUOUS DISTILLATION OF HYDROCARBON OILS.

Specification forming part of Letters Patent No. **214,199**, dated April 8, 1879; application filed February 7, 1879.

To all whom it may concern:

Be it known that I, WATSON RYDER, of the city and county of Philadelphia and State of Pennsylvania, have invented certain Improvements in Apparatus for the Continuous Distillation of Hydrocarbon or other Oils, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a perspective view of an apparatus for refining petroleum, constructed in accordance with my invention. Fig. 2 is a vertical section on line *xx* of Fig. 3. Fig. 3 is a plan. Fig. 4 is a longitudinal section on line *yy* of Fig. 3.

In stills of the ordinary construction for refining petroleum, &c., the carbonaceous and other residuum has been deposited on the surface of that portion of the bottom of the still immediately over that exposed to the direct action of the flame in the fire-chamber, these deposits accumulating so rapidly and becoming so hard as to form a barrier for preventing the full transmission of the heat to the oil in the still, and consequently the top of the furnace (or bottom of the still) is frequently injured or burned so as to be rendered useless. These difficulties have been avoided by the still described in Letters Patent No. 142,515; but its construction is also objectionable, for the following reasons, viz: The sides and top of the fire-chamber or furnace, though formed of straight inclined lines projecting up at the center of the bottom of the still to form side pockets or channels for the lodgment of the residuum, are not of sufficient strength when hot to withstand the great pressure of the oil from above, and are liable to collapse or be forced inward; and, furthermore, in a still of the latter construction no means is provided for removing the residuum without letting the fire go down and uncovering the ports to have access to the interior.

My present invention consists in a furnace having a curved arch-shaped roof, so located as to project up above the level of the bottom of the sides of the still, in combination with a grate placed at or near the level of the bottom of the sides, whereby the desired pockets are formed for the collection of the deposits

without accumulating at points immediately over the fire, the form of the roof of the furnace being such as to afford the greatest strength for resisting the pressure from above and best adapted to allow the heat to be absorbed by the contents of the still, which, in connection with the location of the grate and of cold-air flues of peculiar construction, prevent the top and curved sides of the fire-chamber from being burned, warped, or otherwise injured, the low position of the grate admitting of a large area for the fire-chamber, and being at a convenient height to supply fuel thereto—a feature of importance in this class of stills, where they are necessarily elevated, in order to locate the tar-condenser or drawing-off apparatus below the still.

My invention also consists in a perforated supply-pipe, led longitudinally over the top or crown of the furnace, by which the oil is conducted from a continuous supply in sprays upon the hottest surfaces and immediately vaporized, the carbonaceous matter flowing down the curved roof of the furnace into the pockets or channels at the bottom of the sides of the still; and my invention consists, furthermore, in combination with each of the pockets or channels at the sides of the bottom of the still, of an outlet-pipe, to allow of the drawing-off or escape of the residuary matter before it becomes hard and while the fire is burning, the supply continuously flowing and the still evaporating its oily contents, these outlet-pipes being controlled by stop-cocks, which may be opened periodically, or so regulated as to remain open at all times to allow of the continual flow of the deposit, by which construction I am enabled to run the still continuously, and thus avoid the expense, delay, and injury incident to the construction of stills where the contents are emptied by evaporation and the fire required to be drawn to remove the deposits.

To enable others skilled in the art to understand and use my invention, I will proceed to describe the manner in which I have carried it out.

In the said drawings, A A are two supply-tanks, into which the oil from the cars is pumped, these tanks being heated by steam passing through pipes *a* from the boiler B,

which thus eliminates the naphtha, which is carried up a column, *b*, and taken off in different gravities by a worm-condenser, *C*, into receiving-tanks, the sediment and water in the supply-tanks *A A* having been drawn off from their bottoms. The heated oil, thus eliminated from naphtha, sediment, and water, is pumped or allowed to flow by its gravity into the still proper, *D*, the supply-tanks being provided with separate and independent pipes 6 and stop-cocks 7, to enable them to be used alternately, so that as the heated contents of one tank is supplying the still the other tank is being heated and prepared to supply it thereafter.

The oil in the still *D* is vaporized without intermission, and the distillate passes continually into a receiving-tank, ready for further treatment.

The residuum is continuously formed and deposited in the pockets *c*, and in its liquid state is constantly drawn off through a worm in a condenser, *E*, whereby it is cooled to such a degree as not to ignite when exposed to the atmosphere; and from this condenser *E* the tar is conducted to a receiver below.

In case the specific gravity of the tar is not sufficiently reduced, it is conducted into a low tar-still, *F*, having a high dome or chamber, *d*, each (the lower portion and the chamber of the still) being provided with an independent worm vaporizing-pipe, whereby two grades of product are obtained.

As this tar-distilling apparatus will form the subject-matter of a future application for a patent to be made by me, it is unnecessary to enter into a further description of it here.

G is the curved arch-shaped fire-chamber, projecting up above the bottom of the sides or pockets *c* of the still into which the residuum collects, and *e* is the grate located at or near the level of the bottoms of such pockets.

f is a pipe perforated on its under side, and extending from the supply-tank longitudinally over and in close proximity to the top or crown of the fire-chamber *G*, whereby a continuous supply of oil is allowed to flow down upon the hottest surfaces, where it is immediately vaporized, and the carbonaceous matter deposited on the curved surface of the sides of the pockets *c*, and allowed to descend to the bottom of the still, where it is drawn off through outlet-pipes *g*, provided with stop-cocks *h*, which may be opened periodically, or so regulated as to be left open constantly, whereby the liquid residuum is drawn off continuously, a continuous supply of oil, a continuous evaporation, and a continuous discharge of the residuum being kept up without drawing the fire.

The draft in front of the furnace carries the

heat under the whole length of the still, then up a flue, *i*, at its back, then through a series of hot-air tubes, *k*, to the front, from which it is carried up under and over a spreader or diffuser, *H*, and back through an upper series of tubes, *l*, to the chimney-flue *I*, thus distributing and circulating the heat throughout the entire mass of the oil. Where the still is not run continuously these tubes are liable to burn out, and cannot therefore be used to advantage, as when the oil leaves them they are unduly exposed to the fire; but as I run my still continuously it is always full, thus protecting the tubes.

Inside each wall *m* of the furnace rises a longitudinal partition, *k*, which not only supports the arch midway at each side, and enables it to withstand the great weight which would be brought to bear on it, but also forms, in connection with the lower portion of the wall *m*, an air-chamber, *n*, for the passage of cool air, which prevents the sediment being unduly heated, another air-chamber, *p*, being formed on the outside of each pocket *c*, for the same purpose, whereby the wall is prevented from being heated to a high degree, and becoming warped, burned, or collapsed.

I am aware that a fire-chamber or furnace having straight inclined sides, and a grate placed above the level of the bottom of the sides or pockets of the distilling apparatus, has been employed, as set forth in Letters Patent No. 142,515; but said apparatus is inoperative, for the reasons herein set forth. To this construction I therefore lay no claim; neither do I claim as my invention the condensers, receiving and supply tanks, boiler, spreader, and hot-air-distributing tubes by themselves, as they may have been used heretofore in connection with other constructions of stills differing materially from mine; but

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

1. The curved arch-shaped furnace *G*, provided with the partitions *K*, forming an air-chamber, *n*, in combination with the air-chamber *p*, outside the still, for keeping the pocket *c* cool, substantially as described.

2. The longitudinal perforated pipe *f*, in combination with a curved arch-shaped fire-chamber, *G*, inner and outer cold-air flues, *n* *p*, and the grate *e*, located at or near the bottom of the pockets *c* of the still, substantially as and for the purpose described.

In witness whereof I have set my hand this 7th day of February, 1879.

WATSON RYDER.

In presence of—

N. W. STEARNS,

CHAS. W. A. STEARNS.