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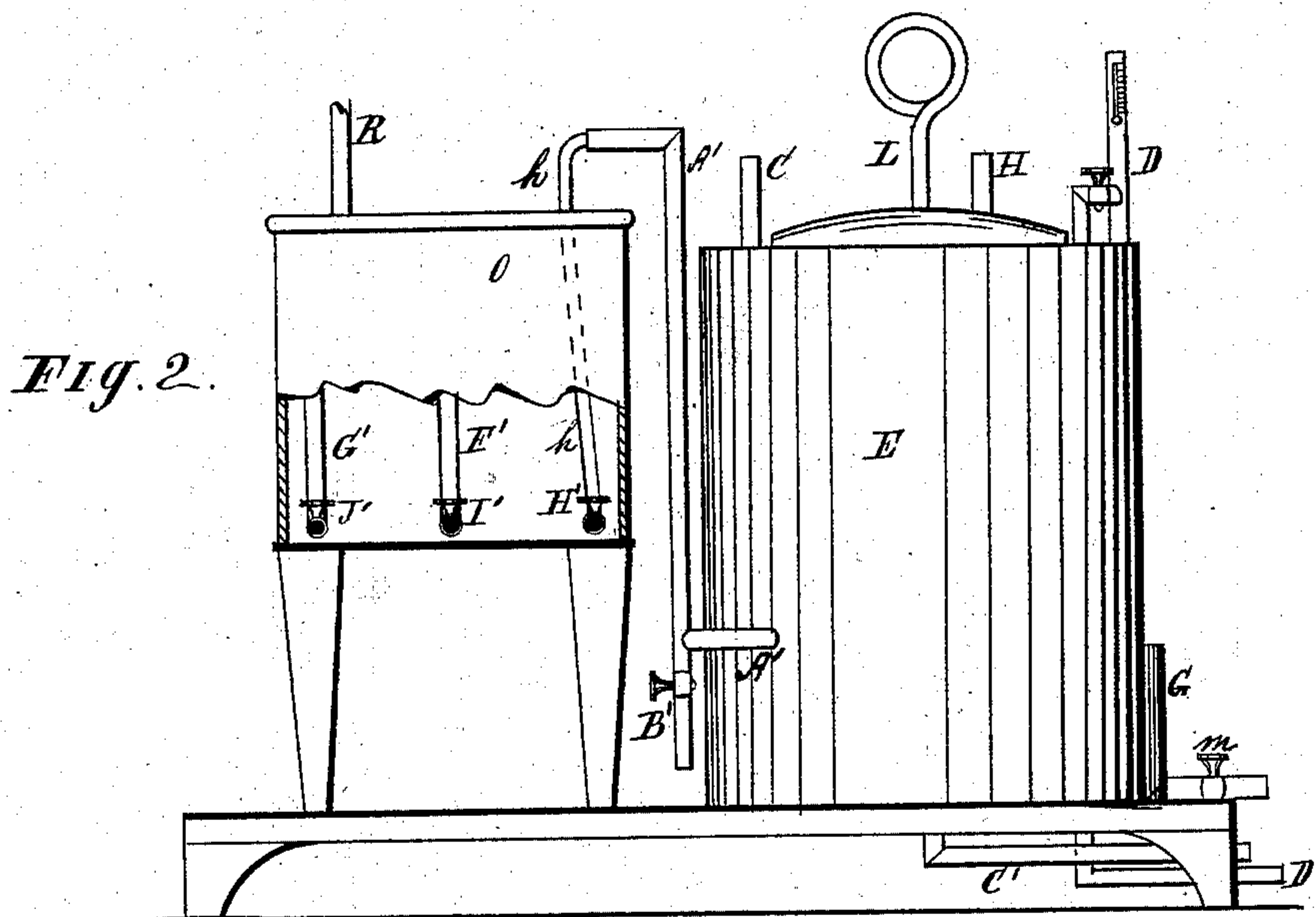
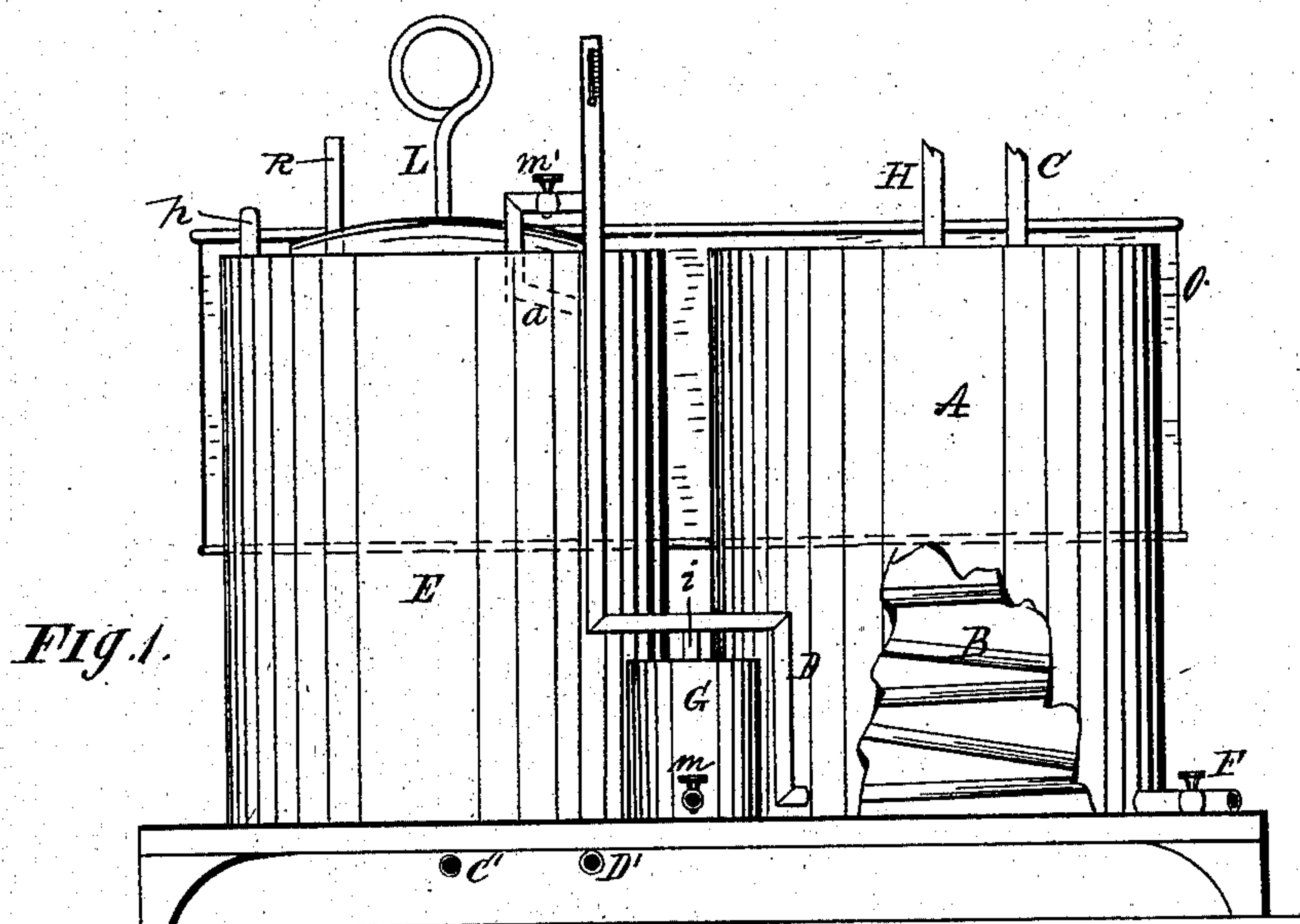
2 Sheets—Sheet 1.

D. ROGERS.

PROCESS OF AND APPARATUS FOR REDUCING THE GRAVITY OF  
PETROLEUM OIL.

No. 284,332.

Patented Sept. 4, 1883.



Witnesses,  
J. B. Burridge,  
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att'y

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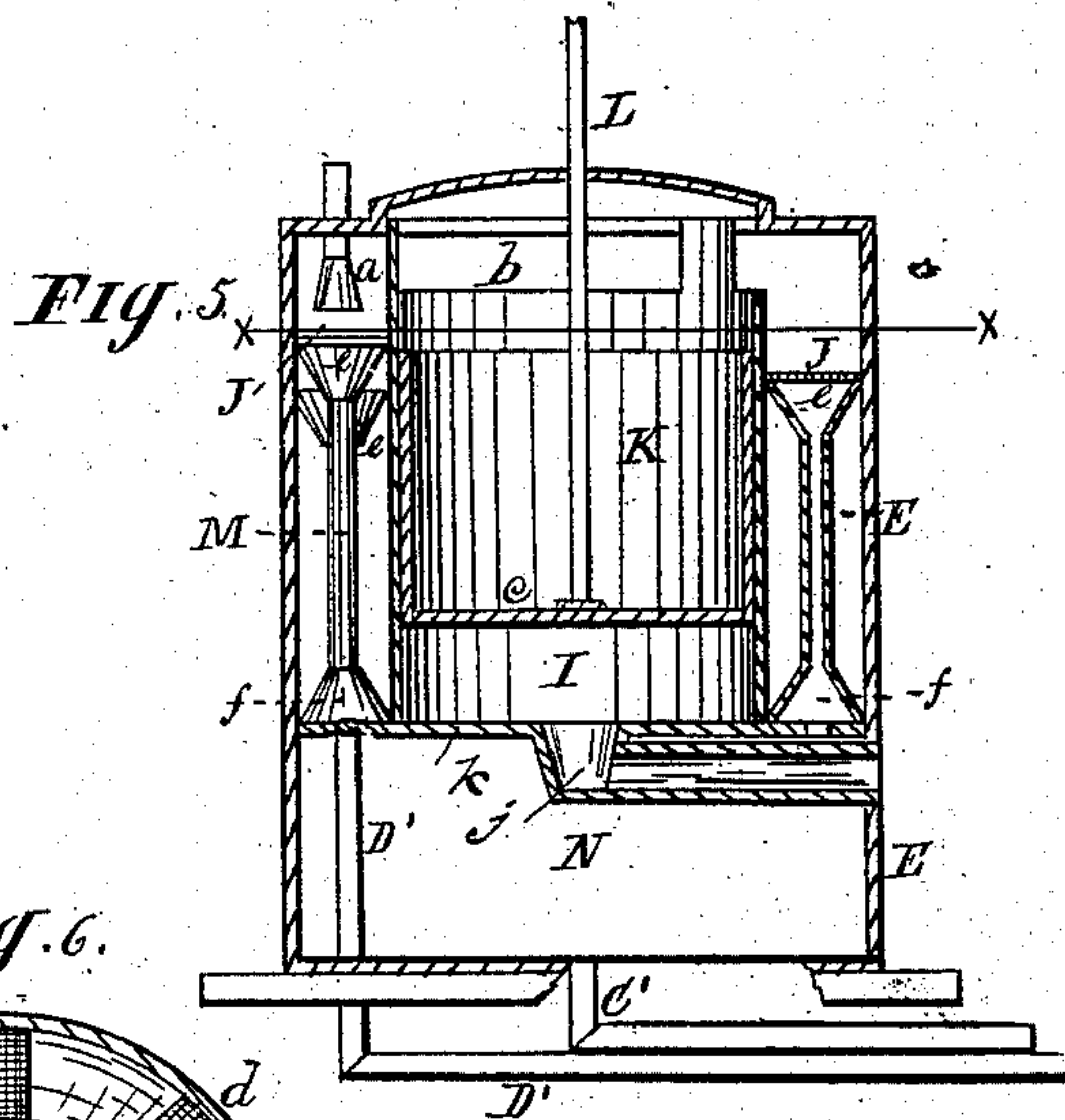
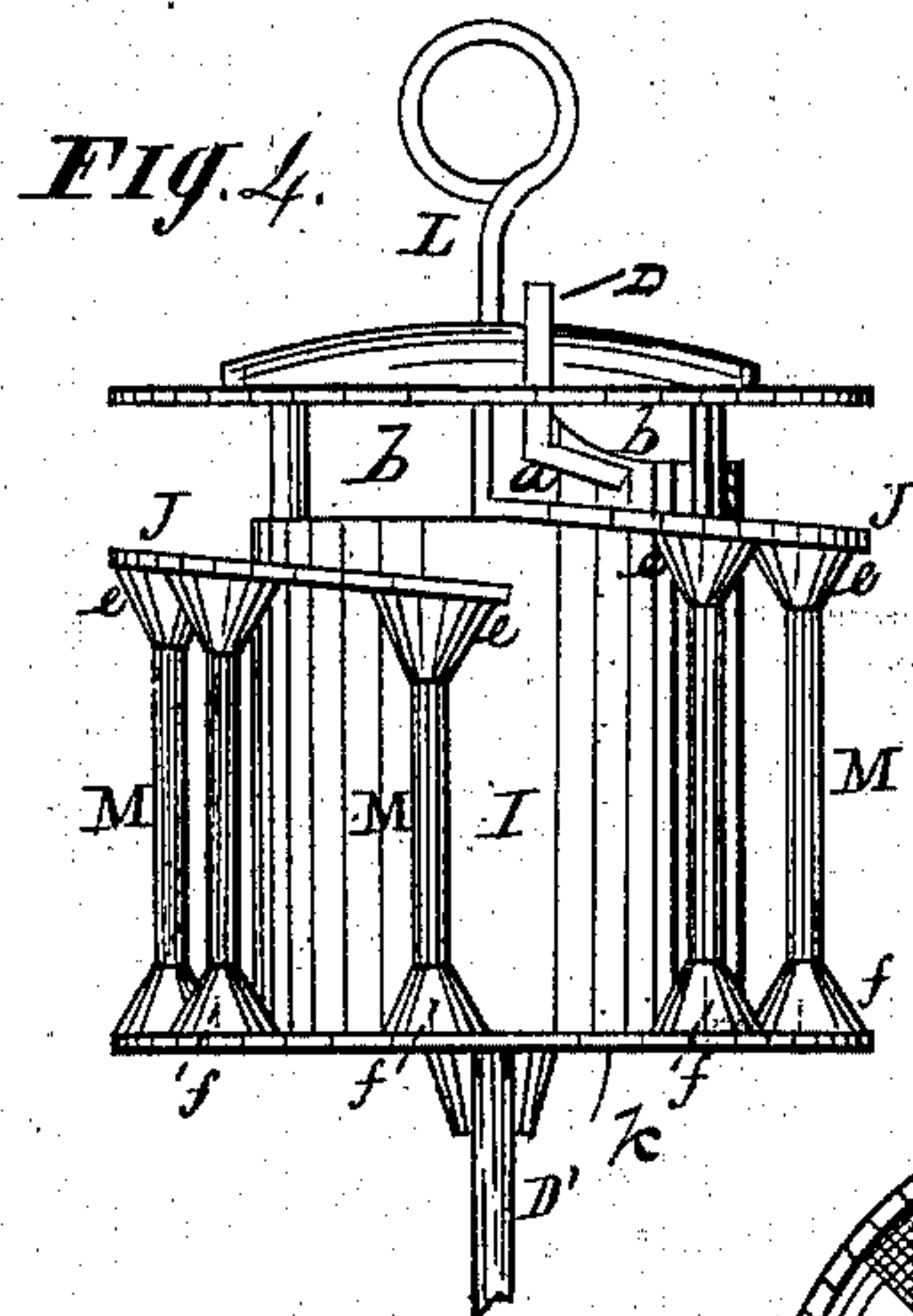
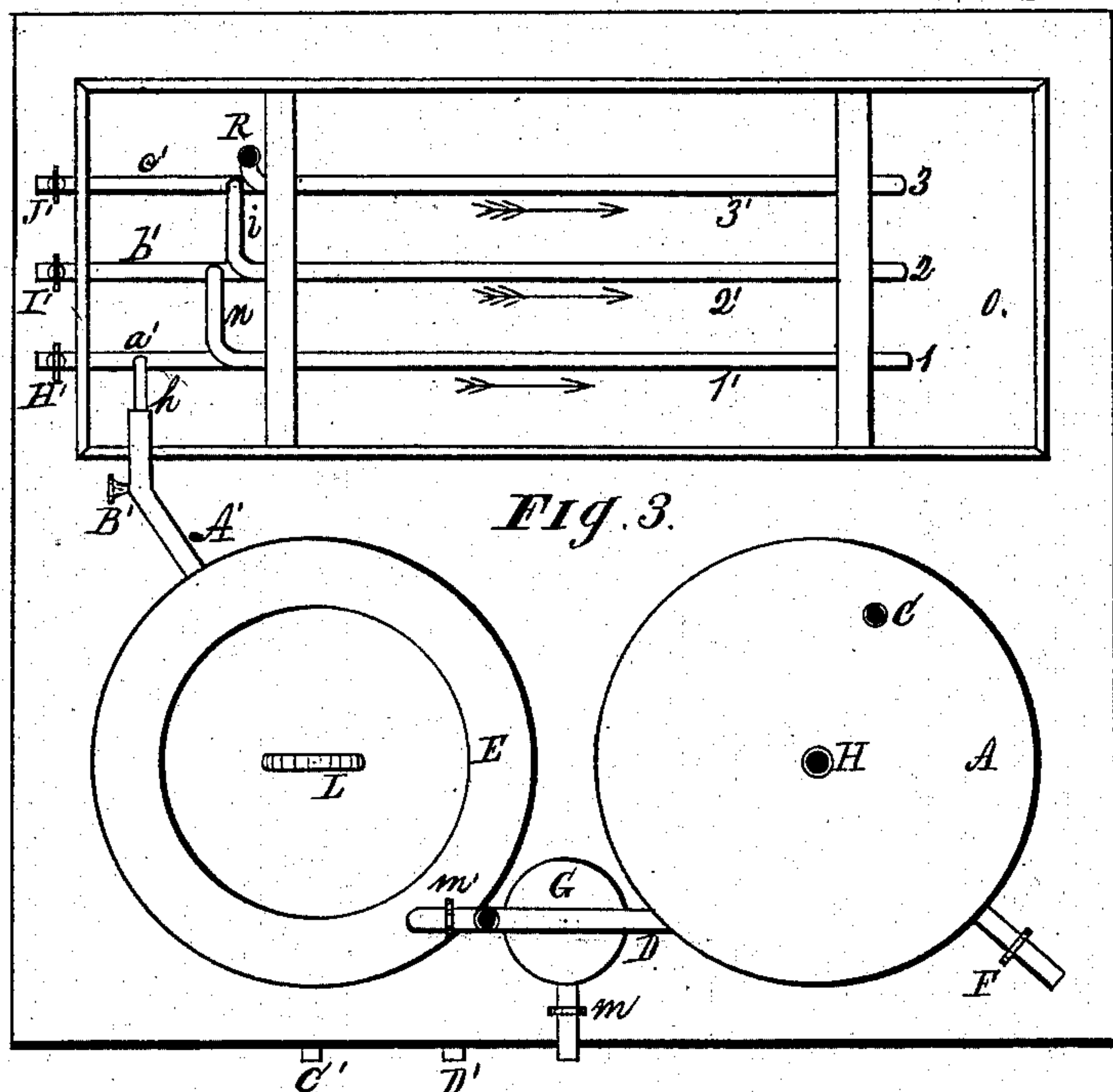
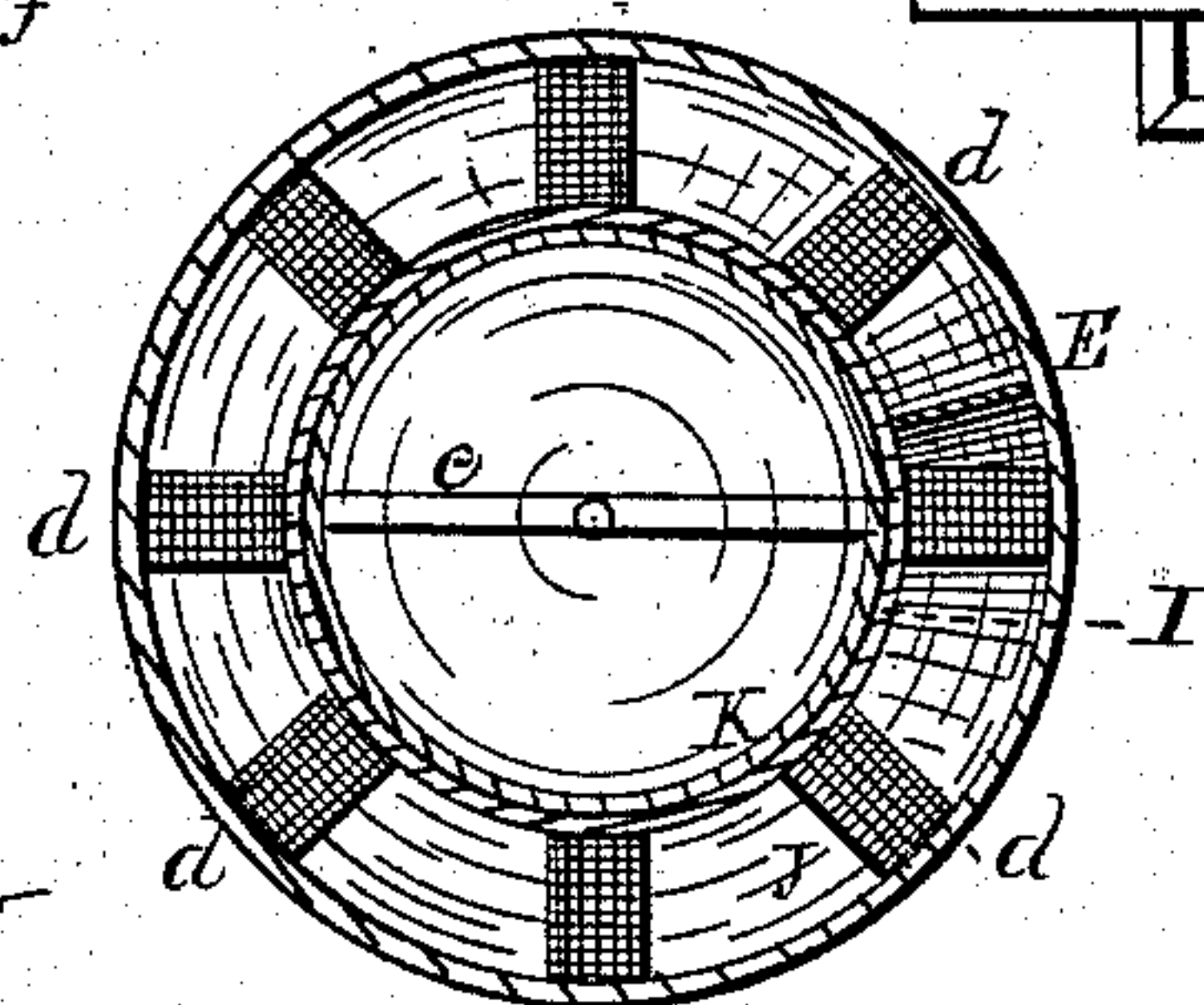


Fig. 6.



Witnesses.

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# UNITED STATES PATENT OFFICE.

DAVENPORT ROGERS, OF GALION, OHIO.

PROCESS OF AND APPARATUS FOR REDUCING THE GRAVITY OF PETROLEUM-OIL.

SPECIFICATION forming part of Letters Patent No. 284,332, dated September 4, 1883.

Application filed July 11, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, DAVENPORT ROGERS, of Galion, in the county of Crawford and State of Ohio, have invented certain new and useful Improvements in Processes of and Apparatus for Reducing the Specific Gravity of Petroleum-Oil or its Distillates, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part hereof.

The object of this invention is to obtain an oil from petroleum suitable for lubricating purposes, and in which the specific gravity is reduced and the cold-test retained, the object thus being the direct opposite of that of my invention in United States Letters Patent No. 211,055, dated December 17, 1878; and my present invention consists in heating crude material to a point just below the point of active vaporization, and separating its light from its heavy portions by subjecting it in a thin stream—that is to say, in bulk form—to continuous currents of air under pressure, and condensing such light portions, while the heavy portions are run off as separated, the heavy or main products being a lubricating-oil of heavy specific gravity, high fire-test, and retaining the cold-test or freezing-point of the original material, as hereinafter specifically set forth and claimed.

In the drawings referred to, in the several figures of which like parts are similarly designated, Figure 1 is a front elevation of an apparatus for practicing my invention, a portion of the shell of the heater being broken away to show the coil therein. Fig. 2 is a side elevation of the same with a portion of the condenser broken away. Fig. 3 is a top plan view thereof. Fig. 4 is an elevation of the internal mechanism of the separator. Fig. 5 is a vertical section of the separator; and Fig. 6 is a section on the line *xx* of Fig. 5, looking down.

The heater A may be a cylindrical tank, and has a steam-inlet pipe, H, and an outlet, F, for steam and water of condensation, and also has an oil-inlet, C, which is continued as a coil, B, within the heater. This coil B is extended from its bottom turn through and out of the heater, and across up to and opens in a separator, E, through its top. Between the heater and separator is arranged a cylindrical tank, G, having communication with pipe D through a branch pipe, *i*, which tank becomes, as hereinafter explained, a trap to relieve the

material being treated of its water and foreign matter of heavier gravity in passing from the heater to the separator. This trap has a draw-off cock, *m*, near its bottom. The pipe D terminates within the separator in the shape of a flaring nozzle, *a*, (see Figs. 1, 4, and 5,) inclined from the pipe at an angle. Furthermore, said pipe has a cock, *m'*, for controlling the supply of oil to the separator, and also has an attached thermometer.

The separator is composed of an outer shell or cylindrical metal tank closed at both ends, within which is a concentric cylinder, I, and within this cylinder I is a closely-fitted concentric cylinder, K, open at both ends, and provided with a lifting-rod, L, attached thereto by a cross-bar, *c*. The cylinder I has openings *b* made in its upper end, whereby communication may be established between the interior of the cylinder I and the annular space between said cylinder and the external shell of the separator E, the extent of such communication being governed by the covering (more or less) of said openings by the cylinder K, which is movable by the lifting-rod, and serves as a cut-off, and the contents of said cylinder I find an exit through the pipe *j*, suitably located and arranged. In the annular space or chamber between the outer shell and the inner cylinder, I, is arranged an inclined plate, J, which may wind about the cylinder I spirally, and is of the width of said annular chamber. The upper end of this plate is just under the mouth *a* of the pipe D, the said mouth being preferably inclined toward said plate to discharge and spread its contents upon said plate. This plate, furthermore, has at intervals throughout its length openings *d*, covered with wire-cloth; or foraminous openings otherwise made may be provided, and beneath these openings are funnel-shaped tubes *e*, extended as pipes M, which pipes end again in inverted funnels *f*, arranged over openings in a diaphragm or division-plate, *k*, which forms the bottom of the annular chamber and the cylinder I, the said funnels *f* being in communication by the openings in plate *k* with an air-chamber, *n*, in the lower end of the separator E. Air under pressure is supplied to said chamber *n* by a pipe, C', and flows in constant currents through the funnels *f*, pipes M, and funnels *e*, up through the plate J, and out through the openings *b*, cylinder I, and tube *j*. The outlet *j*



is continued as pipe A' to the condenser O, but has first a branch or trap, B', with a cock. The pipe A' connects with a pipe, h, which in turn leads to a coil of pipe a', having one or more bends and returns, 1 1', and a draw-off cock, H', within the condensing-tank. This coil may be connected by cross-pipe n with a second and similar coil, b', having bend and return 2 2' and draw-off cock I', and this second coil be similarly connected to a third coil, c', having bend and return 3 3' and draw-off cock J', and this last coil may terminate in an open pipe, R. These coils are simply a condensing-coil provided at intervals with cocks to draw off the condensed matter according to its gravity.

The operation is as follows: The oil to be treated is conducted from an elevated tank (not shown) by the inlet-pipe C into the coil B of the heater, and, steam having been previously let into said heater, the oil in said coil is heated to a point just short of vaporization. The oil thus heated passes into the tank G through the pipe D and its branch i, and as such tank is filled the heavier foreign matter will settle to the bottom or be trapped, and, displacing an equal volume of oil, will compel such oil to flow on into the separator, and so on continuously. The oil enters the separator through the flaring nozzle a, and is by it directed and spread upon the plate J in a stream or in bulk, and flows thus down such plate. While the oil is flowing over the plate J air is forced into the chamber N through pipe C', and, entering the funnels f, is compressed thereby and directed into the pipes M, whence it is spread out under and through the oil by the foraminous-mouthed funnels e, fractionally separating the lighter hydrocarbons therein from the heavier, and carrying such lighter matter through the openings b into the cylinder I and out through pipes j A' into the condenser, wherein it is condensed, and its successively lighter portions drawn off through the cocks H' I' J' as oils of varying light specific gravity. The heaviest portion of the separated matter passing over through pipe A' is trapped and let out at B'. The heavy or main product of the oil, thus deprived of its most volatile elements, runs down the plate J, and, falling on the bottom plate, k, runs into and through pipe D' to suitable receivers. (Not shown.) The area of communicating openings between the annular air-chamber and the chamber I, governable by the sliding gate or cut-off K, effects the retarding or increasing the separation, as may be desired. Thus when the cut-off is down, leaving the whole extent of opening, the heavier portions of the separation are carried over into the cylinder I along with the lighter portions, thereby effecting a very rapid separation; but the hydrocarbon carried over will, nevertheless, be of a heavy specific gravity. When the slide is drawn up, less heavy hydrocarbons will be carried over with the light, and less and less as the area of the openings is diminished, the quantity of

the heavier portions carried over being dependent upon the sufficiency of the force of the currents of air used for effecting the separation to carry the particles over the cut-off.

The apparatus shown and described in my Patent No. 211,055 is in some respects similar in construction to this; but the mode of operation and product of the two are entirely dissimilar and directly opposite. In the patent the product obtained was an illuminating-oil of light specific gravity, light color, and high fire-test, and it was obtained by running the whole product from the still together, and afterward separating the light hydrocarbons and gas and returning the light hydrocarbons to the oil. In this present improvement the result desired is a heavy-gravity lubricating-oil that will not chill or freeze in cold weather; and I obtain it by keeping the heat to which it is subjected below the point where destructive distillation begins, destructive distillation being the occasion of the ruin of the cold-tests in all the lubricating-oils manufactured in the ordinary way. By the process herein described I am enabled to retain the cold-test of the original material, although the specific gravity is reduced, and I accomplish this reduction by fractional separation.

What I claim is—

1. The process of reducing petroleum or its distillates, consisting in heating the same to a point just below active vaporization, then subjecting the heated oil in a thin continuous stream to the action of a series of independent currents of air, thereby fractionally separating the light from the heavy portions of the oil, immediately removing the mixed light separations and condensing the same, and allowing the heavy portions to run off, whereby the specific gravity is reduced, the fire-test raised, and the original cold-test retained, substantially as specified.

2. The separator E, having the partition k, dividing the tank into two air-chambers, as described, in combination with cylinder I, provided with openings b, valve-cylinder K and device for sliding the same, inclined plate J, provided with perforated portions, as described, and located between cylinder I and the walls of the tank E, air-pipes M e f, vapor-outlet, oil inlet and outlet pipes, and an air-inlet pipe connected with the lower air-chamber, as set forth.

3. The combination, with the heater A, its coil B, inlet and outlet pipes thereto, trap G, connected with the outlet-pipe, the separator E, composed of the air-chamber N, cylinder I, valve or cut-off K, inclined plate J, air-tubes e M f, nozzle a, and air inlet and outlet pipes, and an oil-outlet, and a condenser, substantially as shown and described.

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

DAVENPORT ROGERS.

Witnesses:

R. W. JOHNSTON,  
B. COLLINS.