(No Model.) 3 Sheets—Sheet 1.

H. HALVORSON.

APPARATUS FOR DISTRIBUTING CRUDE PETROLEUM.

No. 305,182. Patented Sept. 16, 1884.

Fig. 1.

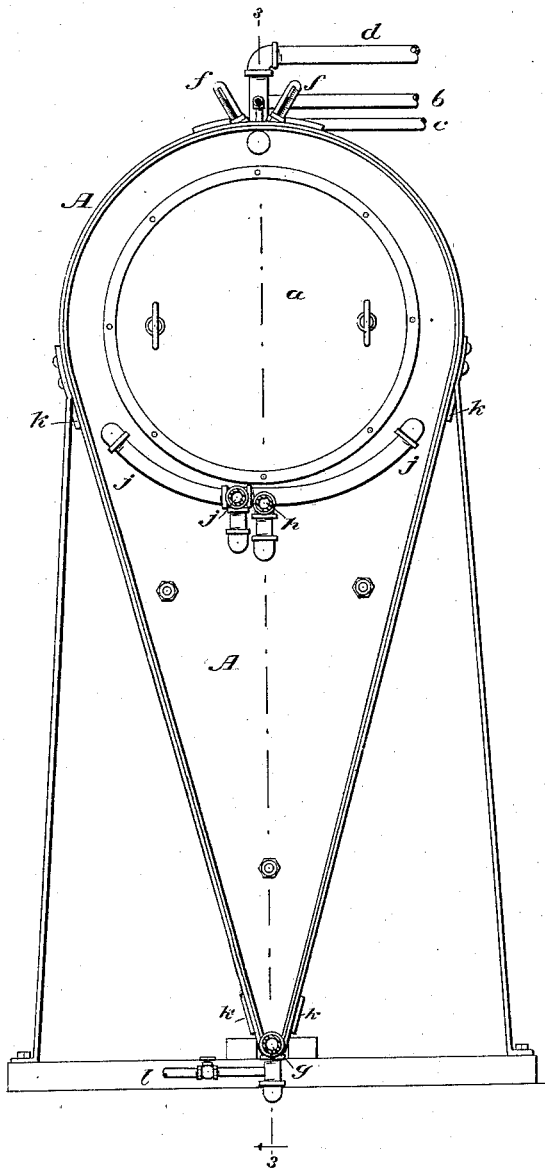
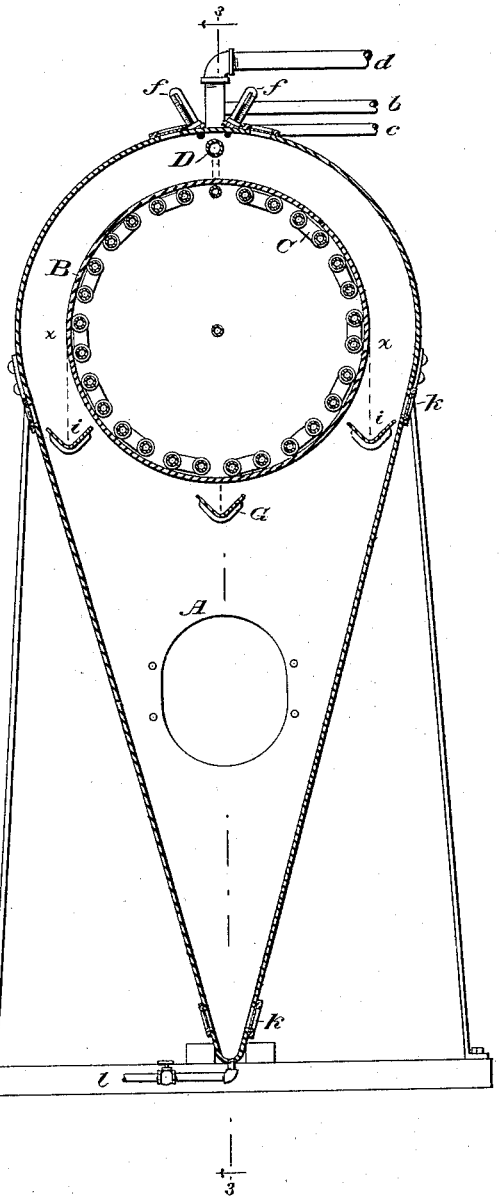


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

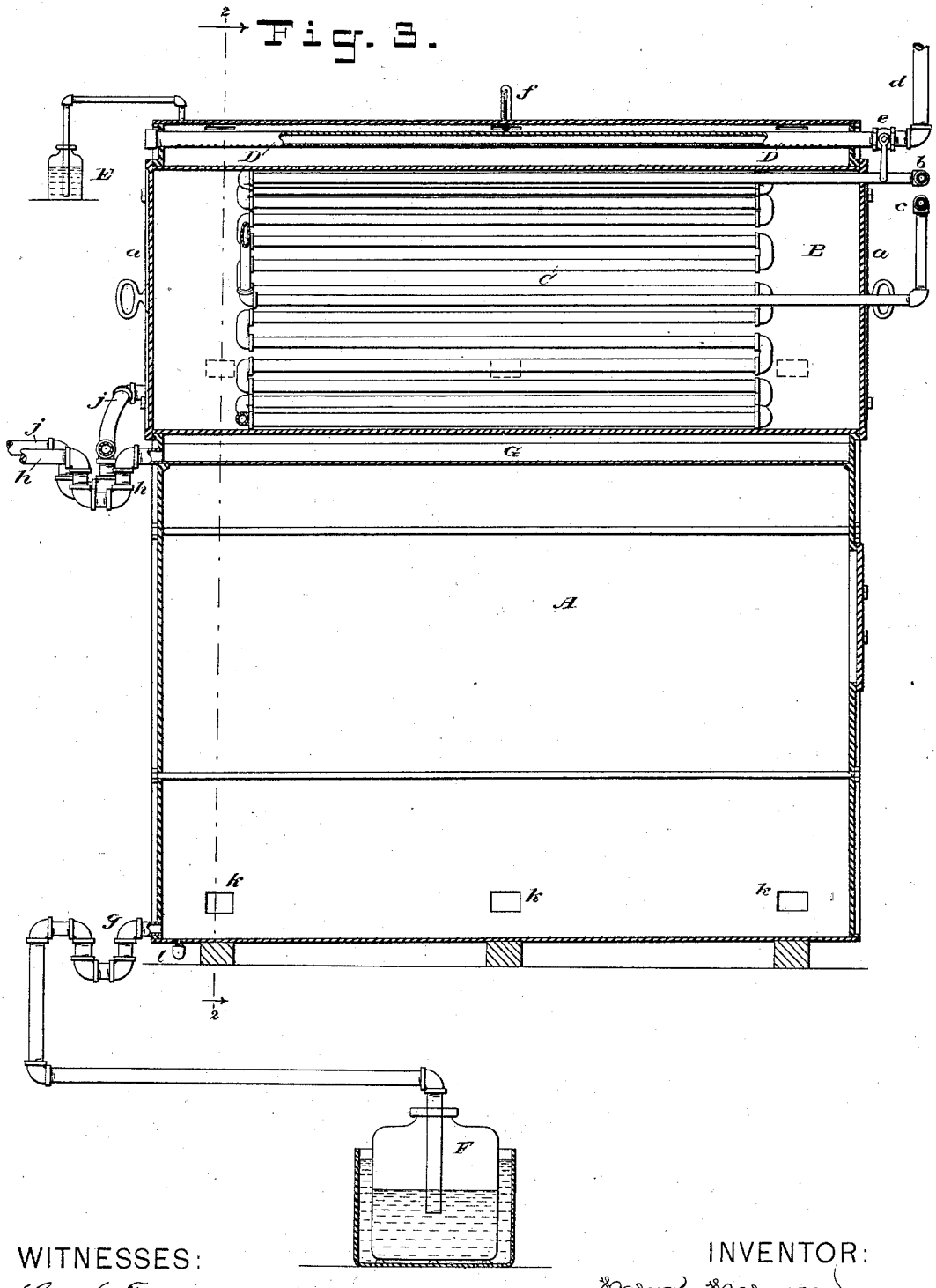

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Fig. 4.

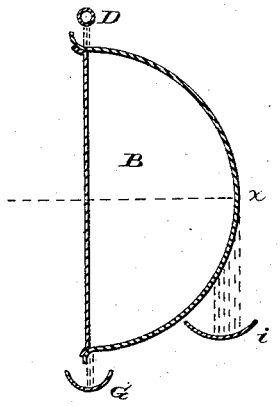


Fig. 5.

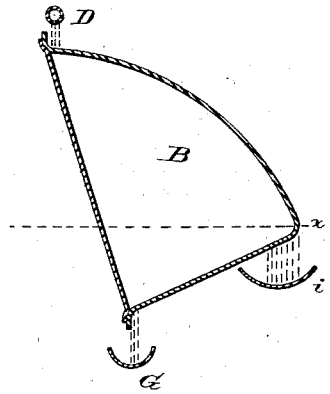
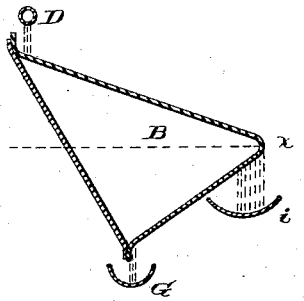


Fig. 6.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR DISTRIBUTING CRUDE PETROLEUM.

SPECIFICATION forming part of Letters Patent No. 305,182, dated September 16, 1884.

Application filed January 16, 1884. (No model.)

To all whom it may concern:

Be it known that I, HALVOR HALVORSON, a citizen of the United States, residing at Nashua, in the county of Hillsborough and State of New Hampshire, have invented an Apparatus for Dividing Crude Petroleum, of which the following is a specification.

In a pending application of mine I have pointed out that crude petroleum as it comes from the wells contains or comprises two distinct liquids or bodies, which may be separated at normal or low temperatures and without subjecting the crude oil to distillation. These two divisions or elemental oils I have called, for the sake of distinction, "primary" and "secondary" oils. The former cannot be distilled without decomposition but the latter may be subjected to the ordinary process of fractional distillation. In my present application I show and describe an apparatus for effecting this division of the crude oil into primary and secondary oils.

Before proceeding to describe my apparatus as illustrated in the accompanying drawings, I will briefly set forth the principles upon which its operation is based, so far as I have been able to understand them. When the crude oil is mixed with a proportion of benzine, the latter appears to separate the particles or globules of the primary oil from the secondary oil, owing, perhaps, to an affinity between the two former. When this mixture of the crude oil and benzine is allowed to flow in a thin sheet or film down an inclined surface, the separation of the primary oil is effected or the conditions of separation determined. Now, if we allow the film to continue its flow along the under side or surface of an inclined plate, it will be prevented from dripping off only by the forces of adhesion and cohesion. These forces act more powerfully on the secondary oil than on the mixture of primary oil and benzine, and the latter will drip off almost as soon as the liquid film passes from the upper inclined surface to the lower inclined surface, while the secondary oil will flow on down until the lowest point is reached, when it will drip off. Thus by arranging troughs under the dripping-points I am enabled to collect the two oils separately, the primary being still mixed with the benzine, from which it may be recovered by distillation. If, however, the process be carried on in the open air, the benzine may pass off wholly or in part as a vapor; and the higher the temperature the more freely it will be vaporized.

In Figures 1, 2, and 3 of the drawings I have shown my apparatus in the form I prefer to construct it, Fig. 1 being a front or front end elevation; Fig. 2, a transverse vertical section on line 2 2 in Fig. 3, and Fig. 3 a longitudinal vertical mid-section. Figs. 4, 5, and 6 are diagrams designed to illustrate modified forms of the separating and capillary surfaces.

Let A represent a tight casing or shell, preferably arched at the top and terminating in a wedge at the bottom, as shown. This shell may be of sheet metal.

B is a drum or cylinder, also of sheet metal by preference, and which is or may be provided with removable heads *a a* to give access to its interior. The ends of cylinder B find a bearing in the ends of the casing A. The cylinder may be provided with a warming or heating apparatus, C; but this is not necessary ordinarily, as the process may be carried on at normal temperature, or by simply warming the room in which the apparatus is mounted. The apparatus shown is a steam-coil provided with an inlet-pipe, *b*, and an outlet-pipe, *c*.

D is a perforated pipe, or it may be a trough, arranged over the crown of the drum B and extending its entire length. This pipe is supplied by a pipe, *d*, with the oil to be divided, and said pipe D delivers it in fine jets, streams, or spray to the crown of B. A cock, *e*, is or may be provided to regulate admission of the oil to the pipe D.

f f are thermometers by which the temperature is ascertained. These are not absolutely essential.

E is a safety liquid seal to prevent the accumulation of gaseous pressure in the casing A. The lower wedge-like portion of the casing may be refrigerated, if desired, or when circumstances render it necessary.

It will be seen that the upper half of the cylinder B forms a double-inclined surface for the film or sheet of oil to flow over in opposite directions, and this upper half I will call

the "separating" surface. The lower or under half of the cylinder provides a double adhering surface, which I will call the "collecting" surface. The line *x x*, which corresponds in this case with the horizontal diameter of B, is the dividing-line between the separating or upper and the collecting or lower surface. The mixture of crude oil and benzine is delivered onto the crown of the cylinder from D and flows in opposite directions. In flowing over the separating-surface the separation is determined, and when the oil reaches the points *x* the mixture of primary oil and benzine, which is the least dense, drips off into troughs *i i* and flows out through a common outlet, *j*, which may be trapped. The secondary oil, which is denser, adheres to the collecting-surface and flows down to the lowermost point of the cylinder, where the two currents meet, and the oil drips off into the trough G, flowing off eventually through an outlet-pipe, *h*, which may also be trapped. The vapors of benzine given off in the separation will condense on the inner wall of casing A and collect in the bottom of the same, where the liquid flows out at a trapped pipe, *g*, and is collected in a refrigerated vessel, F.

In some cases I may dispense entirely with the troughs *i i* and allow the primary oil and benzine to collect in the bottom of the casing, whence the mixture flows to the refrigerating-vessel F; or I may omit the lower wedge-shaped portion of the casing and the trough *i*. In this case the casing A may be cylindrical in section or have any desired form.

In order that the inside of the apparatus may be observed, I may provide the casing with glazed windows or peep-holes *k;* and a drainage-cock, *l*, may also be provided.

The separating and collecting surfaces are conveniently furnished by a cylinder, B; but this form is not necessary. I may employ only a half-cylinder, as shown in Fig. 4; or the separating-surface may be convex and the collecting-surface a plane, as in Fig. 5, the two being connected by a sharp curve or angle at *x;* or both surfaces may be planes, as in Fig. 6.

If it be desired that the separation shall be fully determined by the time the flowing liquid reaches the point *x*, the separating-surface must be sufficiently extended. Otherwise the primary oil may not drip off at the point *x*, but at some point between *x* and the trough G. As this facility of separation is not always uniform, varying with different oils, with different temperatures, and with the amount of benzine employed to some extent, the dripping may not all be effected at the point *x*. Consequently the trough or troughs *i* may be made wide, so as to be sure of catching all. Where a casing is used, this, as before stated, may replace the troughs *i*.

The percentage of benzine to be mixed with the crude oil may be varied greatly, and the precise quantity required to produce the best results will vary with different oils and with the temperature. With my herein-described apparatus I have found twenty per centum to produce good results at normal temperatures—say from 60° to 80° Fahrenheit.

In lieu of dividing the crude oil as it comes from the wells, I may subject the crude oil to the ordinary process of distillation (not destructive distillation) up to about 500° Fahrenheit, to remove some of the lighter constituents, and then divide the residue by means of the apparatus herein described. By my apparatus the process of division is continuous.

I do not herein claim the process and apparatus claimed in my application No. 117,677, filed on the same day with this application.

Having thus described my invention, I claim—

1. An apparatus for dividing crude petroleum, comprising a plate or part having an upper inclined separating-surface and a lower inclined collecting-surface, which surfaces are continuous, as described, means, substantially as described, for delivering the oil to be separated to the upper part of the separating-surface, and means, substantially as described, for collecting the primary and secondary oils separately as they drip off, all arranged to operate substantially as set forth.

2. In an apparatus for dividing crude petroleum, the combination of a plate or part having an upper inclined separating-surface and a lower inclined collecting-surface, which surfaces are continuous, a perforated pipe or trough to deliver the crude oil to the separating-surface, a pipe to supply said perforated trough or pipe, a trough to collect the secondary oil at the bottom, and means, substantially as described, for collecting the primary oil, all arranged to operate substantially as set forth.

3. The combination of the casing A, the cylinder B, or its substantial equivalent, the delivery pipe or trough D, the trough G, and the supply-pipe *d*, all constructed and arranged substantially as set forth.

4. The combination of the V-shaped casing A, the cylinder B, or its substantial equivalent, the perforated pipe or trough D and its supply-pipe *d*, the troughs G and *i*, the outlet-pipe *g* at the bottom of the casing, and the heating apparatus C, all constructed and arranged to operate substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

HALVOR HALVORSON.

Witnesses:
STANLEY MANSFIELD,
ARTHUR C. FRASER.