(No Model.)

H. WARDEN.

COOLING PETROLEUM DISTILLATES.

No. 266,930. Patented Oct. 31, 1882.

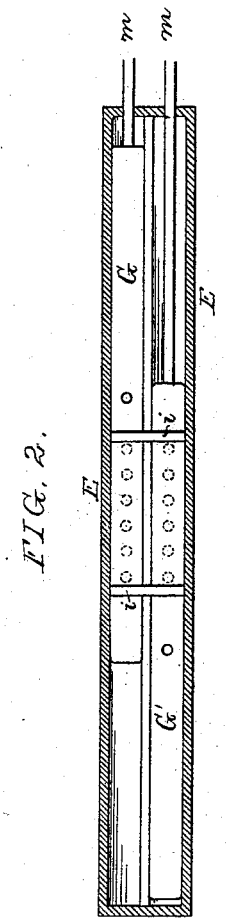

FIG. 2.

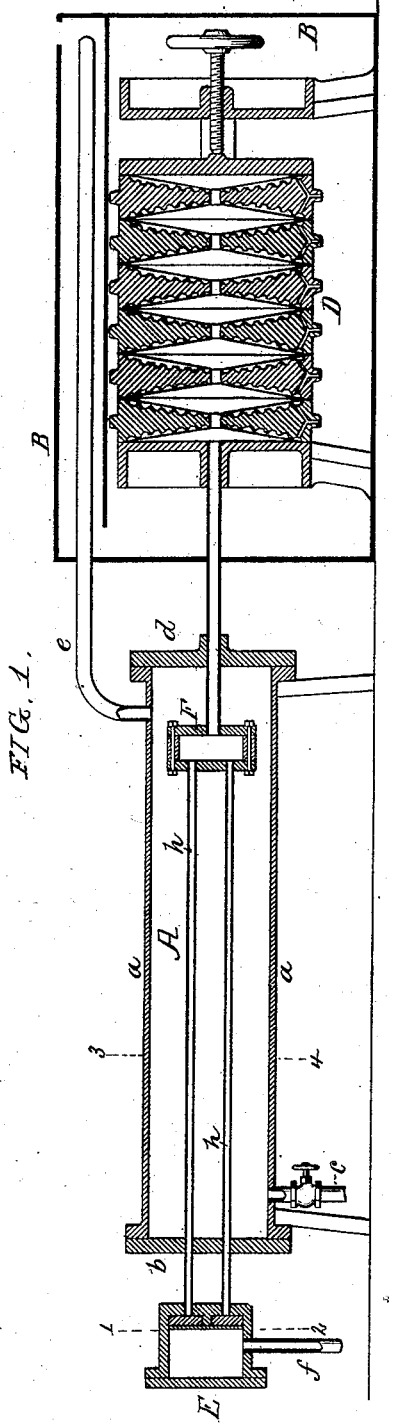

FIG. 1.

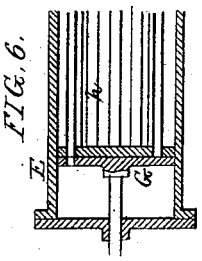

FIG. 6.

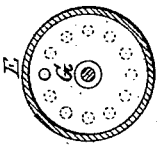

FIG. 5.

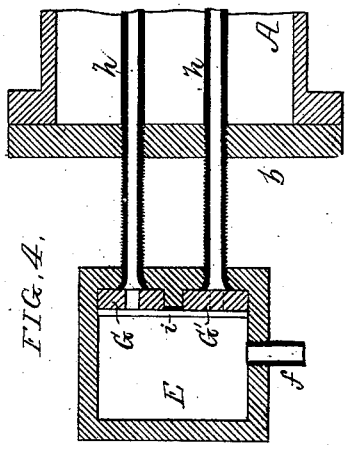

FIG. 4.

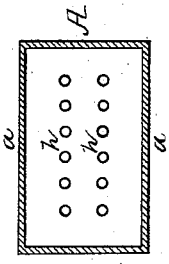

FIG. 3.

Witnesses:
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by his attorneys
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UNITED STATES PATENT OFFICE.

HENRY WARDEN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE ATLANTIC REFINING COMPANY, OF SAME PLACE.

COOLING PETROLEUM DISTILLATES.

SPECIFICATION forming part of Letters Patent No. 266,930, dated October 31, 1882.

Application filed September 4, 1882. (No model.)

To all whom it may concern:

Be it known that I, HENRY WARDEN, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Cooling Petroleum Distillates, of which the following is a specification.

My invention consists of a process of and apparatus for cooling the paraffine distillates from petroleum-stills, the process consisting in forcing the said distillates through a series of short refrigerating-tubes in such order or succession that after using one or more of the series as a passage or passages for distillates while the others of the series are closed such use is discontinued long enough for the cooling of the said tube or tubes before they are again brought into service—a mode of operation which insures an intermittent but otherwise uninterrupted flow of the distillates through the tubes of the refrigerating-chamber.

In the accompanying drawings, Figure 1 is a vertical section of the apparatus for carrying my invention into effect; Fig. 2, a transverse section on the line 1 2; Fig. 3, a transverse section on the line 3 4; Fig. 4, an enlarged sectional view of part of Fig. 1, and Figs. 5 and 6 views illustrating a modification of my invention.

A refrigerating-chamber, A, is formed by a casing, *a*, having at one end a cover, *b*, and at the opposite end a cover, *d*. I prefer to make this chamber of the quadrangular shape shown in Fig. 3; but it will be seen hereinafter that it is not necessary to adhere to this form of chamber. The refrigerating-gas is introduced into the chamber A through a pipe, *c*, furnished with a suitable valve, and is discharged from the chamber through a pipe, *e*, into a casing, B, containing the filter-press D.

The filtering-press combined with a refrigerating-chamber forms the subject of a separate application for a patent, and therefore need not be described here. It will suffice to remark that the refrigerating-gas, after it has performed its cooling duties, is compressed and returned to the refrigerating-chamber A.

At one end of the chamber, and preferably outside the same, is the distributing-box E, into which the paraffine distillate from a petroleum-still is forced through a pipe, *f*, by suitable pumping appliances. Near the opposite end of the refrigerating-chamber, and in this instance within the same, is the receiving-box F, connected to the distributing-box by a series of tubes, *h*, which are arranged in the present instance in two sets of six each, as shown in the transverse section, Fig. 3.

Within the box E are two slide-valves, G G′, the first appertaining to the upper set of tubes *h* and the second to the lower set of tubes, these slide-valves being maintained steadily in their places and in contact with their seats by vertical bars *i*, or other appropriate appliances. To each valve is attached a spindle, *m*, passing through one end of the distributing-box, suitable mechanism, which may be varied to suit the views of the constructer, and hence not necessary to be illustrated in the drawings, being used for operating the valves. In adjusting the valves care should be taken that not more than one tube *h* of the series shall form at one time a communication between the distributing-chamber E and receiving-chamber F, the valves being so adjusted at intervals of a minute, or thereabout, that first one tube and then the next shall form a communication between the two chambers. The object of this may be described as follows: Should there be a single communication in the form of a zigzag or coiled tube between the two chambers, the desired cooling of the paraffine distillate might be effected; but this distillate is of such a character, especially when cooled or partly cooled, that great pressure must be exerted to force it through the tortuous passage presented by a zigzag tube. The distillate will certainly pass through the long tube as long as there is no cessation in the flow; but should this flow be discontinued it will be impossible to force the cooled distillate through the tube by any available pressure. By a series of short straight tubes, and by forcing the distillate through each tube in succession, all the other tubes being closed, excepting that which forms for the time being the communication between the two boxes, there is no difficulty in forcing the distillate from box to box, and at the same time obtaining the desired refrigerating effect, for it must be remembered that after one tube has been used as a refrigerating communication and after it has been closed it remains closed and

is exposed to cooling influences, and is not again brought into service until all the remaining tubes, one after the other, have been used as passages for the distillate.

It may be remarked that after one tube used as a communicating medium has been closed it remains filled until the tube is again brought into use. This distillate, thoroughly cooled, is discharged into the box F, and thence into the filter. In other words, all the tubes excepting the one in use contain distillate in a quiescent condition, the tube in use forming a passage for the distillate between the two boxes.

It is not essential to adhere to the form of refrigerating-chamber shown, or to the arrangement of tubes, or to the kind of valves used. As an example of a modification which might be used, I may refer to the diagrams, Figs. 5 and 6, in which the refrigerating-chamber is cylindrical and the series of tubes arranged in a circle, the valve consisting of a flat disk containing a single opening, and secured to a spindle by turning which the said opening can be adjusted to coincide with every tube in succession.

I have stated above that only one tube at one time forms a passage between the two boxes, and this would generally be the case when the refrigerating-chamber contained but twelve tubes, as shown; but a chamber might be made of a size sufficient to contain a much larger number of tubes, in which case two, or even more, of the series might be in use at one time.

I claim as my invention—

1. The mode herein described of cooling the paraffine distillates of petroleum, the said mode consisting in forcing the distillates through a series of short refrigerating-tubes in the succession or order herein described, for the purpose specified.

2. Cooling apparatus in which are combined the following elements, namely: first, a refrigerating-chamber containing a series of tubes; second, a distributing-box connected to the tubes; third, a valve or valves contained in the box for determining which of the tubes shall communicate therewith; and, fourth, a receiving-box communicating with all the tubes and having an outlet, all substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY WARDEN.

Witnesses:
HARRY DRURY,
HENRY HOWSON, Jr.