2 Sheets—Sheet 1.

A. KREUSLER.

APPARATUS FOR DISTILLING PETROLEUM.

No. 50,368. Patented Oct. 10, 1865.

Fig: 2.

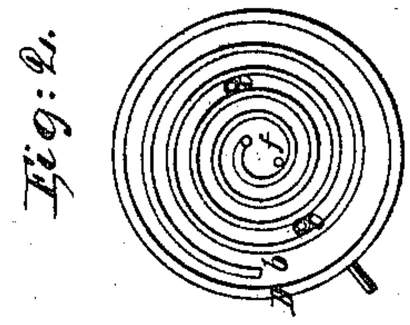
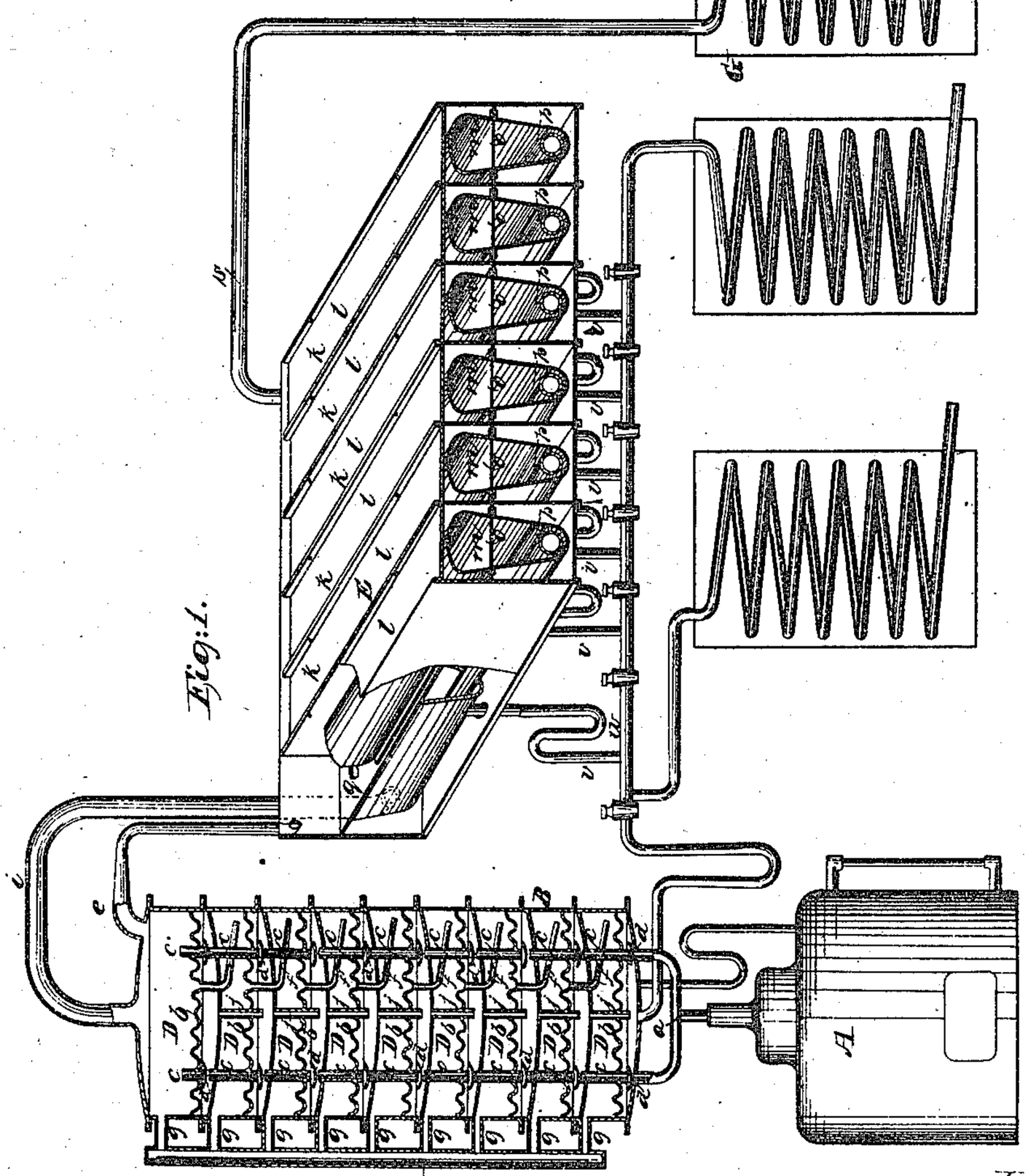


Fig: 1.



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Attys

2 Sheets—Sheet 2.

A. KREUSLER.

APPARATUS FOR DISTILLING PETROLEUM.

No. 50,368. Patented Oct. 10, 1865.

Fig: 5.

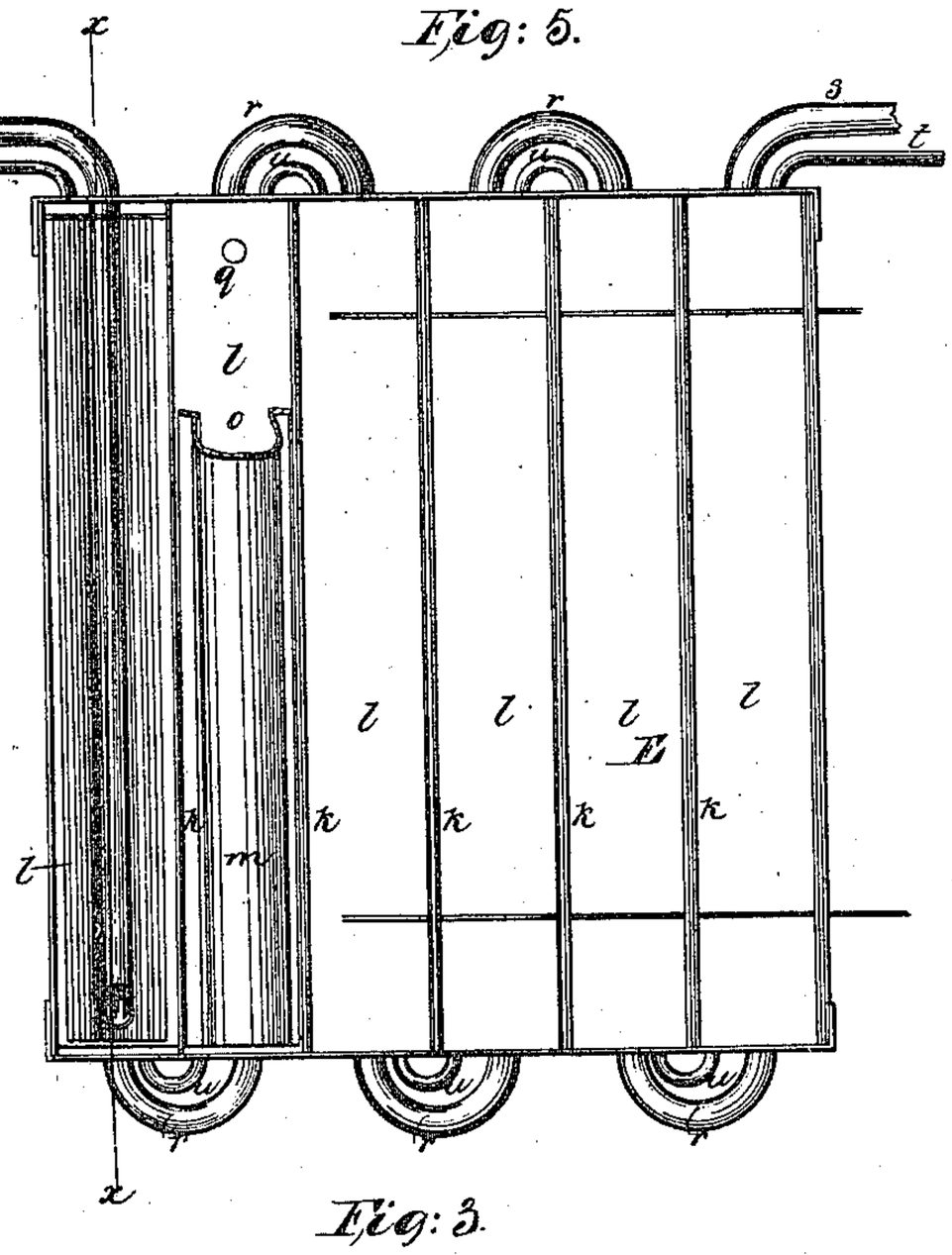


Fig: 4.

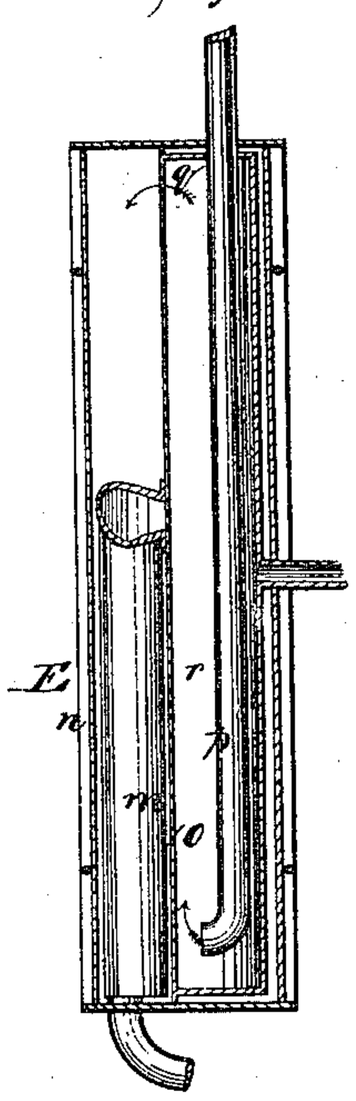
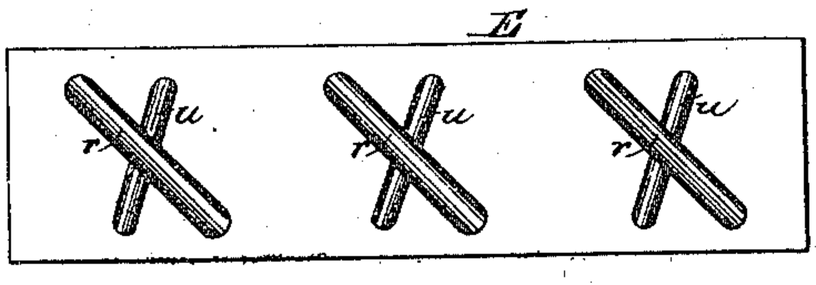


Fig: 3.



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UNITED STATES PATENT OFFICE.

A. KREUSLER, OF NEW LEBANON, NEW YORK.

IMPROVED APPARATUS FOR DISTILLING PETROLEUM.

Specification forming part of Letters Patent No. **50,368**, dated October 10, 1865.

To all whom it may concern:

Be it known that I, A. KREUSLER, of New Lebanon, in the county of Columbia and State of New York, have invented a new and Improved Distilling Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a perspective view of this invention, partly in section. Fig. 2 is a detached plan or top view of one of the corrugated partitions in the evaporator. Fig. 3 is an end view of the separator. Fig. 4 is a longitudinal vertical section of the same. Fig. 5 is a plan or top view of the same.

Similar letters of reference indicate like parts.

This invention relates to an apparatus, constructed and arranged as hereinafter set forth, which is particularly intended for refining petroleum, and which is so constructed that the process of distillation can be continued without interruption, and the oils of different specific gravity or density can be separated while the process of distillation is carried on. Furthermore, the apparatus is so constructed that the naphtha and lamp-oil, or the light constituents of the petroleum, are evaporated by the heat of the vapors of the heavy oil, and only the heavy constituents have to be distilled by direct heat. By this arrangement a great saving in fuel is effected.

A represents a still, made of boiler-iron or any other suitable material, which is heated by the direct action of a fire or by superheated steam, and which is charged with the petroleum to be distilled. The vapors generated in the still rise through the pipe *a* into the evaporator B. This evaporator is made in the form of a cylinder, or in any other suitable form or shape, of iron or copper, and it is composed of a series of nine (more or less) compartments, D. The bottoms of these compartments are made of corrugated plates *b*, with spiral grooves, as shown in Fig. 2 of the drawings, and their tops are slightly concave, except that of the uppermost compartment, which also forms the top of the evaporator. The vapors which rise from the still A through the pipe *a* on entering the evaporator pass up through pipes *c*, and in order to cause said vapors to come in contact with the whole surfaces of the corrugated plates caps *d* are placed under the inlet-openings of said pipes, as clearly shown in Fig. 1. As soon as the heavy oils in the still begin to evaporate a stream of heated petroleum is passed through the pipe *e* into the top of the evaporator. The petroleum thus introduced is discharged in the spiral groove of the upper plate, *b*, and after passing through this groove to its inner end it discharges through a pipe, *f*, into the outer coil of the spiral groove in the next plate, and so on until it reaches the corrugated plate in the bottom of the evaporator. While passing through the spiral grooves of the several plates *b* the petroleum is exposed to the action of the heated vapors rising from the still, which action is intensified by the caps *d* under the pipes *c*, as previously stated, and the petroleum thus introduced is vaporized. The vapors thus generated in the spiral grooves of the plates *b* find their way through the branch pipes *g* into the stand-pipe *h*, and thence into the upper part of the evaporator, where they unite with those coming from the still, and are conducted together through the pipe *i* to the separator E.

The fluid condensed between the corrugated plate *b* and the adjoining concave tops of the compartments consists of heavy oils. It gathers at the lowest parts of the concave tops, and thence through the pipes *j* to the bottom of the evaporator, whence it escapes through a suitable pipe to the condenser for paraffine or heavy oils.

The purpose of the separator E is to separate the mixed oil-vapors according to their specific gravity, and to conduct them separate to the different condensers. This object is effected by the difference of the temperature which is required for keeping the different oils in a state of vapor. The boiling-point of lubricating-oil, for instance, may be 490°, whereas that of lamp-oil is 290° Fahrenheit, and, consequently, if the vapors of these two oils are mixed and introduced into a condenser whose condensing-fluid is kept at a temperature of 290° the vapors of the lamp-oil will escape uncondensed, whereas that of the lubricating-oil will be condensed. The construction of my separator is based on this law. It consists of a

square or oblong box, made of copper or any other suitable material, and divided by a series of longitudinal vertical partitions, *k*, into six (more or less) compartments, *l*. Each of these compartments incloses a chamber, *m*, with sides converging toward the bottom, and with a rounded top and bottom. Horizontal partitions *o* divide said chambers into two compartments, and through each chamber extends a a pipe, *p*, near its bottom.

If desired, the partitions may be provided with spiral grooves, and the pipes *p*, which extend throughout the entire length of the chambers, are or may be turned up at their inner ends, as shown in Fig. 4 of the drawings.

No communication exists between the interior of the chambers *m* and the surrounding compartments *l*, and the lower compartments of said chambers communicate with the upper compartments through holes *q*, which are as far as possible removed from the inner ends of the pipes *p*. The pipe *i*, through which the vapors escape from the evaporator, connects with the pipe *p* in the first chamber *m*, and after having passed through this pipe said vapors discharge under the partition *o*, and then they pass up through the hole *q* into the upper parts of the chamber *m*, which communicates by a pipe, *r*, with the pipe *p* in the next-succeeding chamber *m*, &c., until they finally discharge through the pipe *s* into the last condenser, G. At the same time a constant stream of crude petroleum is forced through the separator by means of a suitable pump and by the pipe *t*. This pipe passes in near the bottom and at one end of the last compartment *l*, and, after circulating through this compartment outside of the chamber *m* contained in it, it discharges through a curved pipe, *u*, into the next-adjoining compartment, and so on until it finally discharges through the pipe *e* into the top of the evaporator, as previously explained. While passing through the separator the crude oil is constantly in contact with the hot sides of the chambers *m*, and thereby it is heated, so that when it reaches the evaporator it lacks but little additional heat to cause it to vaporize. At the same time the vapors circulating through the chambers *m* are partially condensed, a portion of their heat being absorbed by the oil passing on their outside, and as the current of the oil on the outside of the chambers *m*, moving in a direction opposite to that of the vapors in the chambers, the oil in first compartment, or that nearest to the evaporator, will be hottest, and condenses the vapors of such liquid only the boiling-point of which is higher than the temperature of the surrounding oil, whereas those vapors which are formed at a temperature below that of the surrounding oil escape uncondensed to the next-succeeding chamber *m*. The same process takes place in every chamber, and it will be easily understood how by these means the various oils of different density are separated; or in other words, in the first chamber all the heavy oils will be condensed, and in the subsequent chambers the lighter oils. By the pipes *p* and partitions *o* such part of the light oils which condense with the heavy oils are re-evaporated, that portion of the fluid which condenses in the lower sections of the chambers *m* coming in contact with the heated pipes *p*, and that portion which condenses in the upper sections being made to collect in the spiral grooves in the partitions *o*, so that said fluid is deprived of all the lighter oils which may have condensed with it before it is allowed to pass off through the pipes *v*, and so to the condensers. Suitable stop-cocks in the pipe *w* serve to control the current of the condensed oil, and to cause the same to divide itself in any desired proportion in the several condensers. The pipes *v* are made with siphons to prevent the escape of gas.

By this apparatus the distillation of petroleum can be carried on without interruption. The light and heavy oils are separated during the process of distillation; and, furthermore, the process is conducted with great economy of fuel, the heat set free during the condensation of the vapors being employed for heating the newly-introduced oil.

If desired, this apparatus may also be used for the distillation of alcohol or other spirituous liquids.

I claim as new and desire to secure by Letters Patent—

1. The combination of an evaporator, B, and separator E, constructed and operating substantially as and for the purpose set forth.

2. The corrugated plates *b*, with spiral grooves, in combination with the induction-pipe *e*, pipes *f*, vapor-pipes *c*, and caps *d*, constructed and operating substantially as and for the purpose described.

3. The compartments D, arranged one above the other, in combination with pipe *j*, branch pipes *g*, stand-pipe *h*, and escape-pipe *i*, constructed and operating substantially as and for the purpose described.

4. The condensing-chambers *m*, arranged in the interior of the compartments *l* of the separator, in combination with the pipes *p* and *r*, partitions *o*, and holes *q*, and with the pipe *t* and connecting-pipes *u*, constructed and operating substantially as and for the purpose set forth.

5. The use of a series of adjoining condensing-chambers, arranged substantially as herein described, for the purpose of separating the condensed liquids of different specific gravity.

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Witnesses:

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