

(No Model.)

7 Sheets—Sheet 1.

A. SMITH.
DISTILLING WOOD.

No. 374,636.

Patented Dec. 13, 1887.

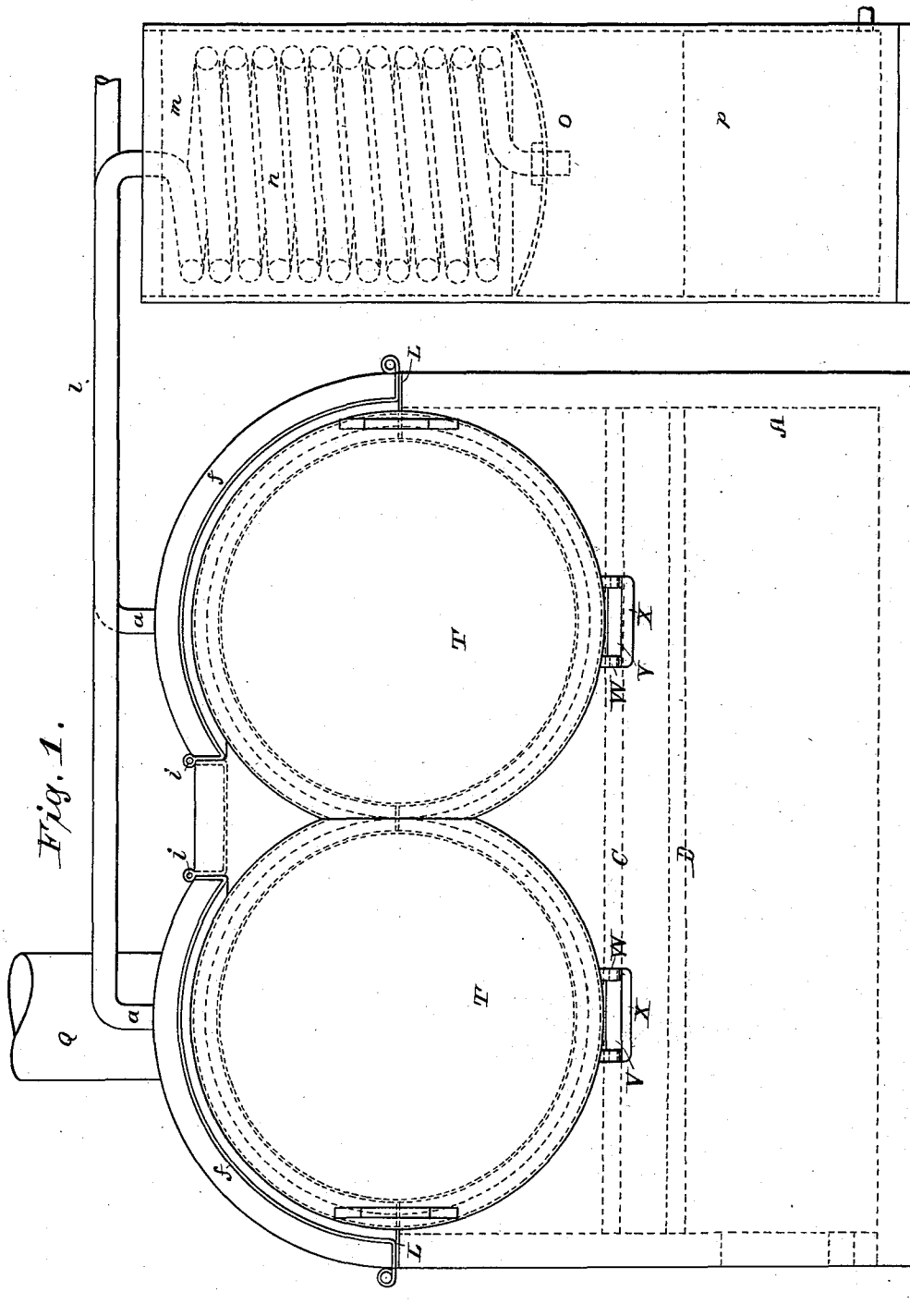


Fig. 1.

WITNESSES

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By his Attorneys

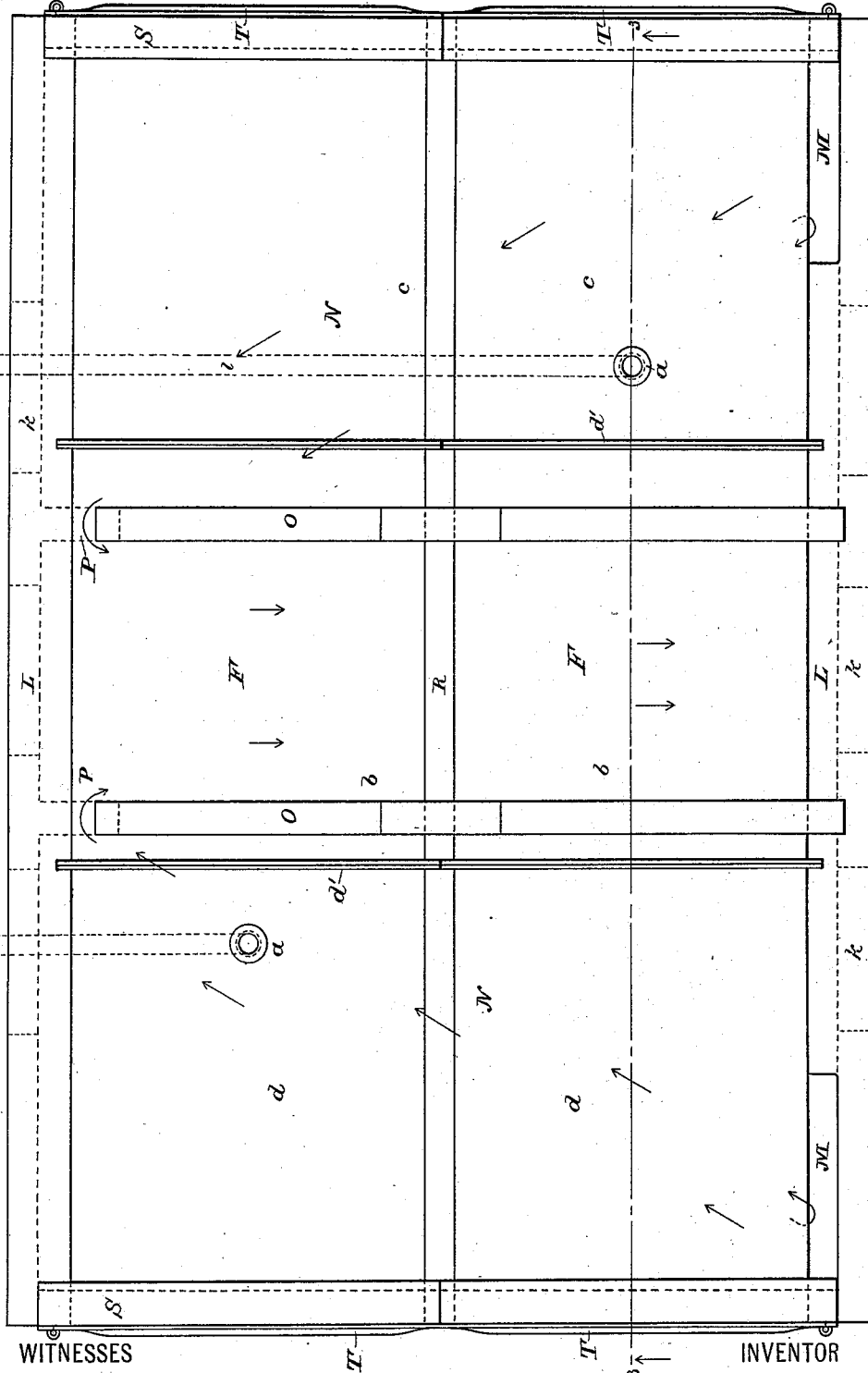
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Fig. 2.



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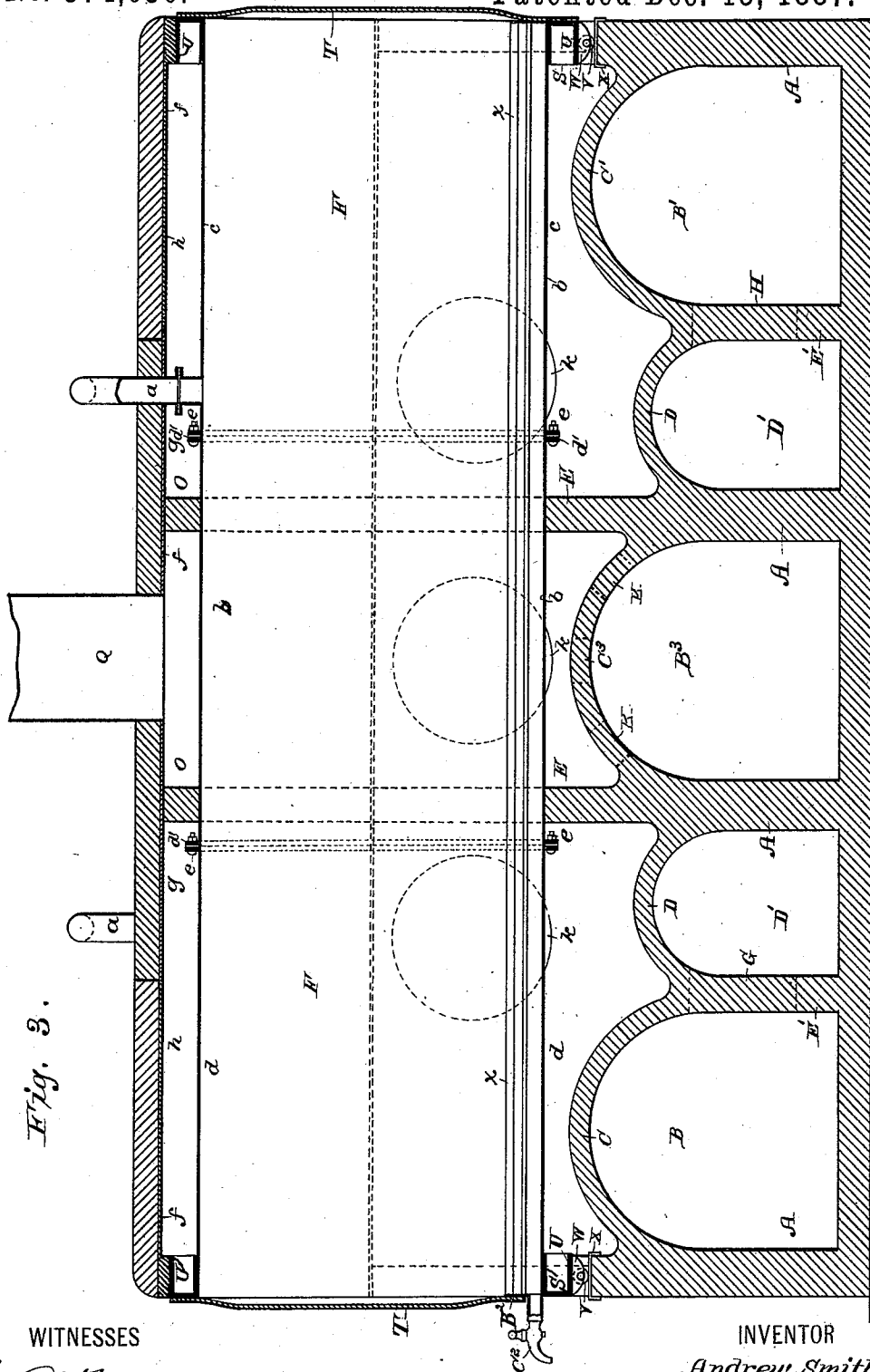


Fig. 3.

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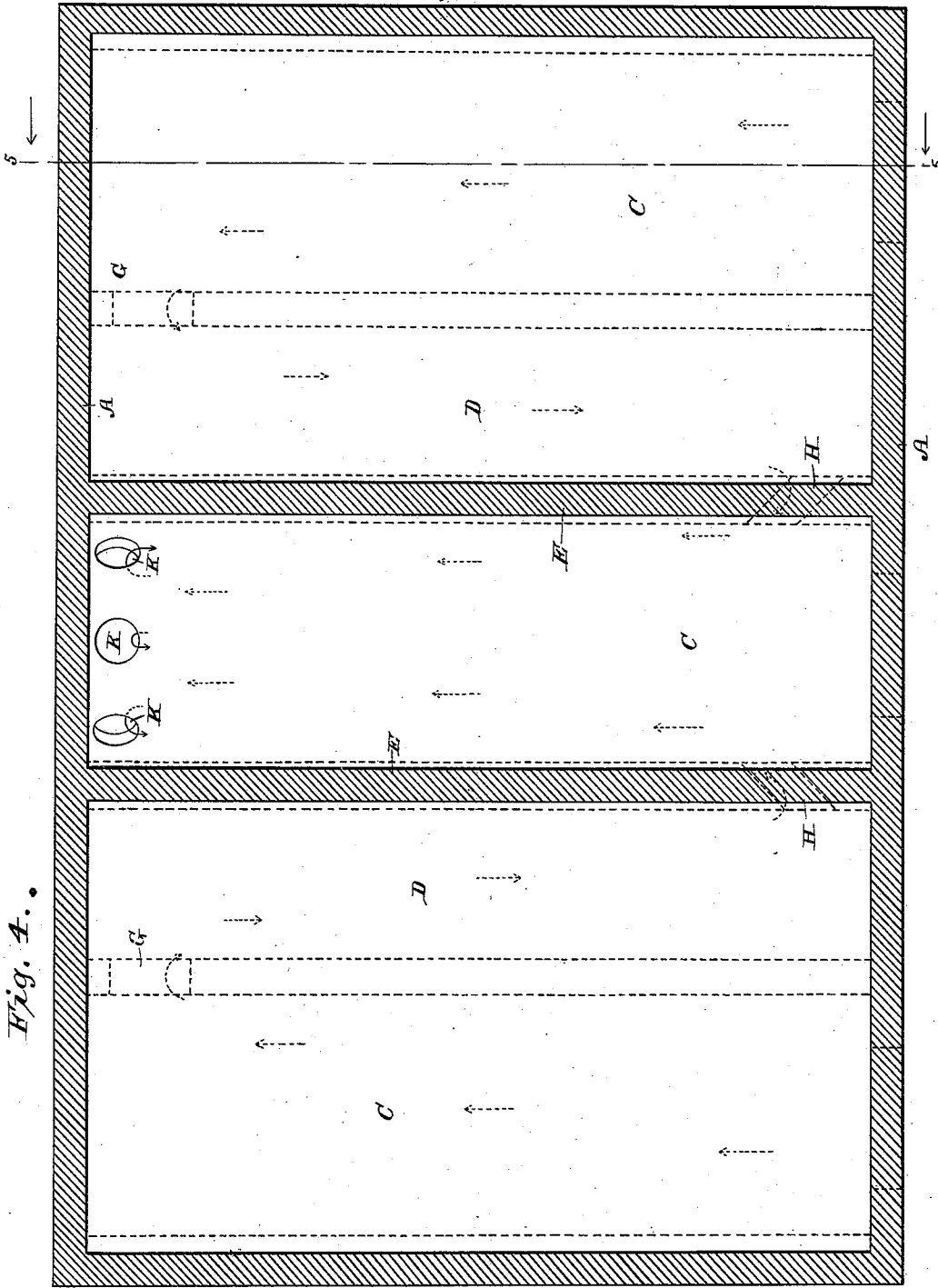


Fig. A.

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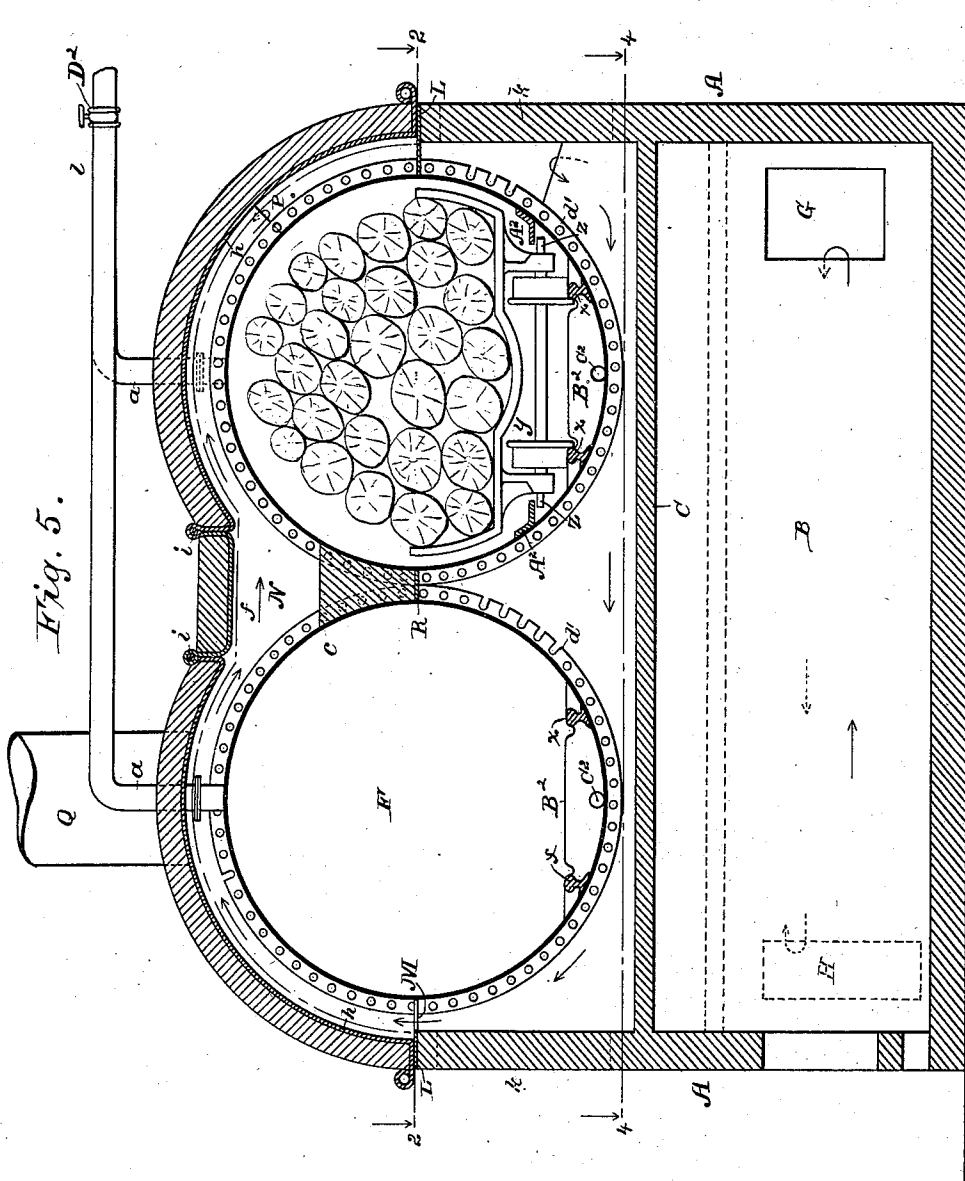
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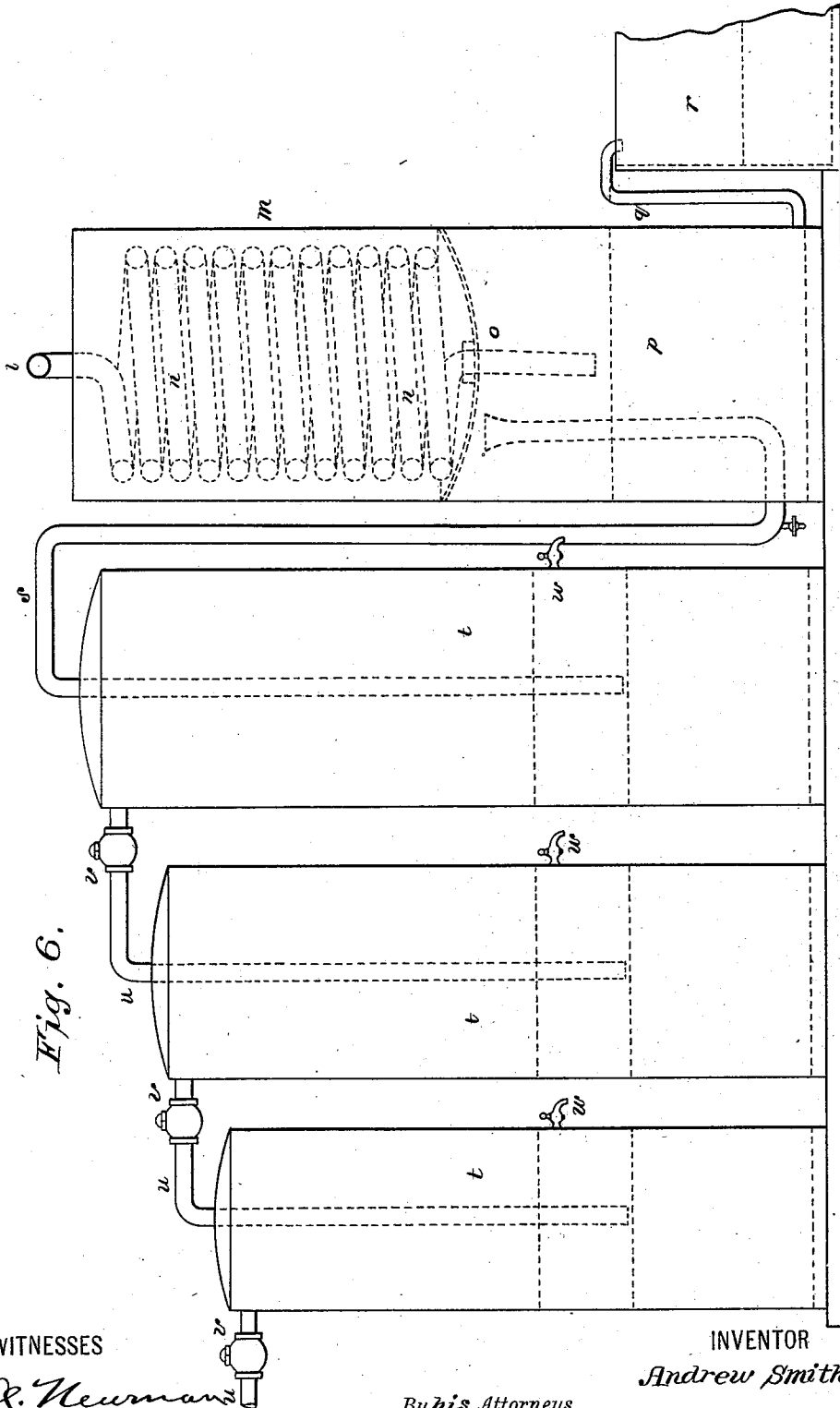


Fig. 6.

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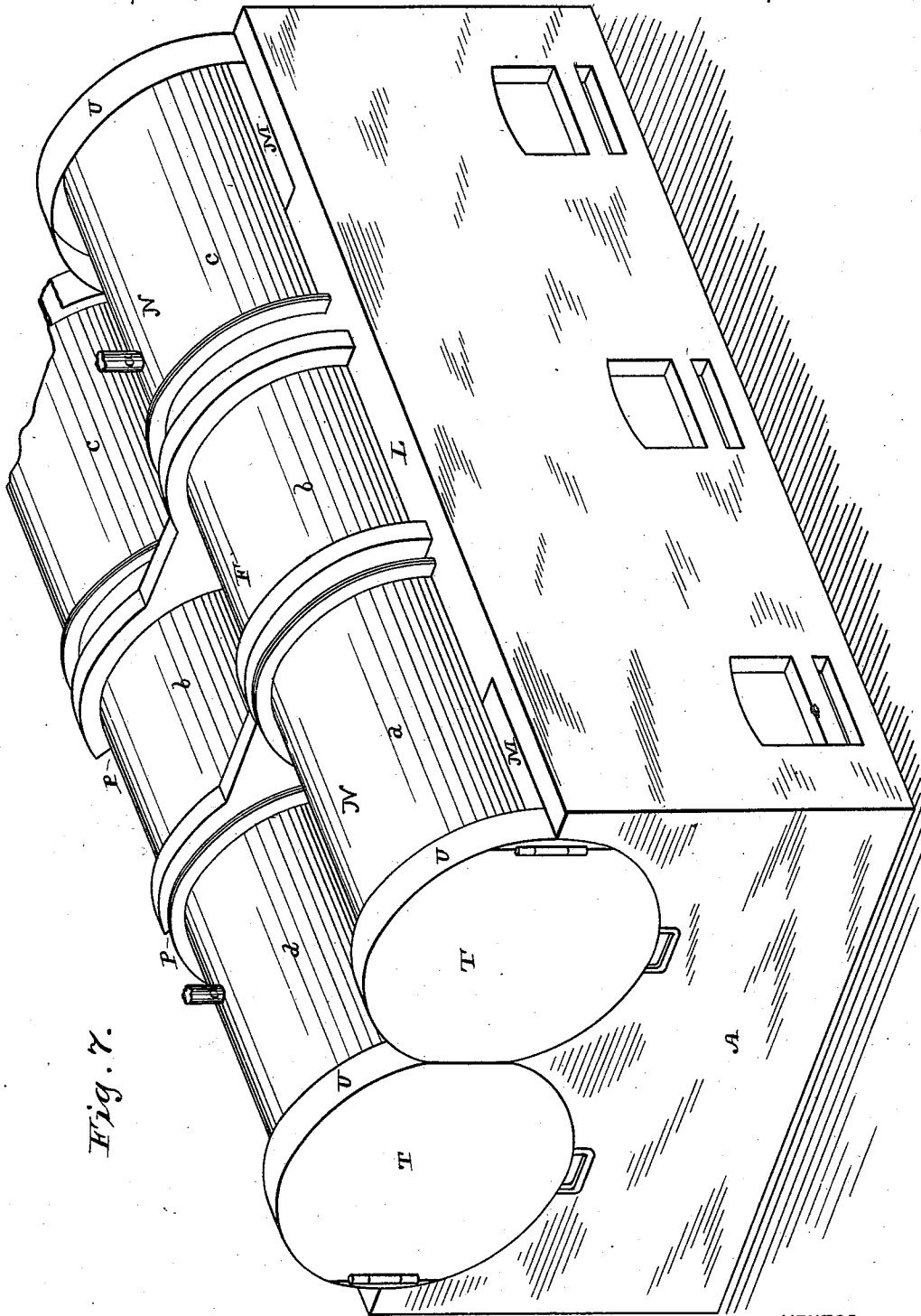


Fig. 7.

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UNITED STATES PATENT OFFICE.

ANDREW SMITH, OF WILMINGTON, NORTH CAROLINA, ASSIGNOR OF ONE-HALF TO LUDWIG HANSEN, OF SAME PLACE.

DISTILLING WOOD.

SPECIFICATION forming part of Letters Patent No. 374,636, dated December 13, 1887.

Application filed March 2, 1887. Serial No. 229,439. (No model.)

To all whom it may concern:

Be it known that I, ANDREW SMITH, of Wilmington, in the county of New Hanover and State of North Carolina, have invented a certain new and useful Wood Distilling and Preserving Apparatus, of which the following is a specification, reference being had to the accompanying drawings.

The object of my invention is to provide a simple, efficient, portable apparatus adapted for distilling wood, and to produce creosote-oil, or to be used for drying and creosoting wood in all forms in any usual manner.

Heretofore, so far as I am aware, separate apparatus has been provided for distilling wood and producing creosote-oil and for treating the wood by forcing the oil into it, and no portable apparatus has been suggested. It is very desirable to provide an apparatus the heavy metallic parts of which may be put up in sections and used for a given time in a given location until the supply of wood is exhausted or so reduced as to be inconvenient or expensive to obtain and then taken down and the metallic parts moved and used again in some other locality. It is very desirable, also, to avoid the building of two independent apparatus and to provide a single apparatus adapted both for distilling wood and for the production of creosote-oil, and also for the treatment of wood with the oil afterward, because in this way the expense of treating and preserving wood, which is the principal object of my apparatus, is very materially reduced.

In the accompanying drawings, illustrating my invention, Figure 1 is a view of my apparatus showing one end of the retorts. Fig. 2 is a plan view with the covering of the retorts removed, drawn on the line 2 2 of Fig. 5. Fig. 3 is a vertical section on the line 3 3 of Fig. 2. Fig. 4 is a horizontal section on the line 4 4 of Fig. 5. Fig. 5 is a vertical cross-section on the line 5 5 of Fig. 4. Fig. 6 is an outline view of the apparatus for receiving and condensing the heated products from the retorts. This drawing (Fig. 6) is only intended to be diagrammatical. It is not made to a scale and is only for the purpose of illustrating the nature and operation of the condensing apparatus. The relative proportions of the parts

may be changed *ad libitum*, and their relative positions may also. Fig. 7 is a perspective view of my apparatus with the cover removed.

Referring to the letters upon the drawings to aid in describing my apparatus in detail, A indicates the masonry walls, in which I provide three furnaces or fire-chambers, B B' B², of ordinary construction.

C C' C² indicate arches, preferably of brick or fire-brick, which extend over the furnaces entirely across the structure, and are connected at their opposite ends to the main walls A. D D also indicate similar arches, preferably a little smaller than the arches C; but the size may be varied. These arches D D cover combustion-chambers D', through which the products of combustion from the furnaces B and B' pass on their way to the furnace B². Instead of two of these arches D there might be several.

E E indicate masonry walls or partitions, which serve as supports for the united sections of retorts F F, of which there may be either one or more, but preferably two.

Flues or openings for the passage of the products of combustion are provided in the supporting-walls E' of the arches C C' and D at G and H, as shown. These flues H and G are in direction horizontal and parallel with the retorts F, the flues G being on one side of the furnace structure and the flues H being on the opposite side near the ends of the arch-supporting walls. (See Fig. 4.) The result of this arrangement of the flues is that most of the products of combustion go to and fro across the furnace structure under the arches, as indicated by the arrows in Fig. 4. The flues H in the partition-walls E E are inclined in the direction of the draft from the central fire-box, which is important, because then the current of heated products of combustion from the right and left furnaces is directed under the central arch, C², so as to join and travel in the same way with the products of combustion from the central furnace. These inclined flues, therefore, are practically useful, because they facilitate the draft.

The purpose of the furnaces, combustion-chambers, and arches C C' C² and D D, with their connecting flues or passages for the products of combustion, is to cause a circulation

of products of combustion back and forth to a considerable extent underneath the arches before the said products rise into contact with the retorts, by which circulation and retarding of the escape of the said products more perfect combustion and more perfect heating of the retorts are secured.

K K indicate flues or passages for the products of combustion from the several furnaces up through the central arch, C³, into the space directly underneath the retorts, where they will come in contact with the lower portions of the retorts.

I provide metallic plates L, anchored in the masonry and projecting inward, as shown, to form horizontal partitions along the sides of the retorts. These plates prevent the products of combustion from passing immediately up all along the sides of the retorts to the space above them. In one of these plates, on the opposite side from the flues K K, I provide two flues or openings, M M, for the passage of the products of combustion after heating the lower portions of the retorts up over their tops into the spaces N N. The products of combustion then pass over the end sections of the retorts, and are prevented from going directly over the central sections by masonry partitions O O. These latter partitions do not extend entirely over the retorts, but are cut off on one side, so as to produce flues or passages P P, to admit the products of combustion into the space over the central sections of the retorts, whence they pass across the upper central part of the retorts to the outlet or chimney Q. The arrows show the course of the products of combustion.

R indicates masonry or metal forming a partition extending along between the retorts or on their upper adjacent surfaces, in order to close the space between them tightly, and in order to stay them and furnish a means of fastening for the central part of the jacket or covering, to be presently mentioned. If masonry is used, a thin plate of metal on its top will be sufficient.

S indicates metallic end supports and door-frames for the retorts, and T indicates doors. The doors may either be hinged or pivoted, or arranged to be swung or slid so as to open them in any usual manner, and they may be fastened in place by means of keys and staples, or otherwise, as is well understood, to close the ends of the retorts tightly. The end supports, S, consist of annular castings to be bolted to the ends of the retorts, and provided with flanges U. These flanges serve as supports for the ends of the exterior jacket or covering of the retorts, and on account of the spaces between them and the retorts they prevent the retorts from burning out at the ends, as they would do if the end supports were of masonry resting on the retorts. Under extreme changes of temperature the retorts—which may be very long, in some instances seventy-five feet—will contract and expand lengthwise considerably, so as to injure the

masonry, unless some provision is made to reduce friction and accommodate such movements. I therefore provide underneath the ends of the retorts rollers V, resting between bearing-pieces or stays W, and upon suitable bases or plates, X, resting on the masonry. The flanges U rest upon these rollers, so that the movement of the retorts longitudinally by contraction and expansion is provided for.

a a indicate pipes communicating with the interior of the retorts for use in conveying off the moisture when drying wood, or in conveying off the gaseous products for distillation when creosote-oil is being formed.

b indicates the central section, and *c* and *d* the right and left sections or end sections of the retorts, which are composed of boiler-iron united by means of angle-pieces *d'* and bolts and nuts *e*, so that they may be detached in order to move the sections of the retorts into wooded country away from railroads by means of ordinary land conveyances.

f indicates a metallic jacket or covering for the top of the retorts, which is supported upon the end flanges, U, and upon the partitions O O. This jacket is made in sections of sheet metal, *g* being the central section through which the outlet-pipes are shown as projecting, and *h h* being the end sections. These end sections are hinged to a central rod, *i*, (or it may be to two separate rods,) and are provided with any ordinary means—such, for example, as sliding pins or hooks—to fasten them down in place. The object of having these end coverings hinged in this manner is that they may be raised up so as to expose the surface of the retorts and permit the circulation of air all about the upper parts of the retorts to speed their cooling. In this manner much time is saved in cooling off the retorts after they have been heated and preparatory to using them again. Besides this, ordinary man-holes, *k*, may be provided in the masonry walls, which can be opened both for cooling the retorts and for inspection or repairs.

The man-holes form no part of the invention, and hence are not shown in detail. They are common in masonry furnace structures, and their position is merely indicated in Figs. 2 and 5.

The metallic jackets or coverings can be covered with masonry, asbestos, or any suitable substance, if desired, to prevent loss of heat.

l indicates a pipe (one for each retort) which is detachable from the pipe or pipes *a*. It is employed chiefly when the apparatus is being used to distill wood or to manufacture creosote-oil. When not so used, the pipes *l* may be detached from the pipes *a*, so that in drying wood in the retorts the moisture will pass off into the atmosphere; or, if preferred, the pipes *l* can be used even when drying wood, so that, as in distilling wood, the gaseous products from the retorts will pass through the condenser *m*, containing water surrounding the worm or coil *n*. The gaseous products passing through the worm will be condensed into

a liquid known as "creosote-oil," and delivered through a spout, *o*, into any suitable receptacle, *p*. This receptacle is provided with an overflow-spout, *g*, from which the liquid will be poured into the vat *r*. The gaseous products in the receptacle *p* will rise into its upper part and pass into the pipe *s*, which extends out of the receptacle *p*, and into a receptacle or condenser, *t*, partly filled with water. Each one of a series of these condensers *t* is provided with a pipe, *u*, extending from the first condenser into the second, from the second to the third, and from the third out into the open air, as illustrated. Each one of these pipes is provided with a check-valve, *v*, so that the gas will not escape from either condenser until it is under some considerable pressure. By this means the gas will be more effectually condensed, less of it will escape, and it will be of better quality. The wood-naphtha in liquid form, which will be of fine quality, accumulates on the surface of the water in each vessel *t*, and can be drawn off as occasion may require by means of cocks *w*. By this means I am enabled to get a much larger per cent. of valuable liquid product from the distillation of wood than has heretofore been practicable. Besides this saving or increase of liquid product, I produce an excellent and valuable inflammable gas, which may be used for lighting or heating in any ordinary way.

Two sets of the apparatus just described may be employed, one connected to each retort by means of a pipe *l*, and both delivering creosote-oil into the same vat *r*.

x indicates car-tracks in the interior of the retorts, upon which are run iron cars *y*, loaded with wood to be dried or distilled or with wood to be impregnated with creosote-oil, as the case may be, after which the end openings are closed and the process commences.

In creosoting wood, the retorts being filled with oil, the wood upon the cars is liable to float and raise the cars off the track. In order to prevent this I provide extensions *z* upon the ends of the car-axles, and bars *A*², supported on the tracks or on the bottoms of the retorts and projecting over the ends of the axles, to prevent the cars from being lifted out of place or from jumping the track from any cause.

*B*² indicates a plate, preferably cast as a part of the annular end supports of the retorts. This plate is provided with an opening, in which is set a faucet or cock, *C*², which I employ to draw off the residuum oil when distilling wood, and to draw off the creosote-oil when impregnating wood. Ordinarily my apparatus will be used first to manufacture creosote-oil, and incident thereto, and as a saving, to manufacture naphtha and combustible gas.

The operation of such manufacture is as follows: Iron cars loaded with wood or timber from the forest are run from suitable tracks on a dock or in a yard into the retorts. The end openings of the retorts are then tightly closed

and the furnace fires started. As the retorts are heated, the gaseous products will escape from them through the pipes *l* into the worm *n* within the condenser *m*, and be in a large measure condensed. From the worm they will be delivered through the spout *o* into the receptacle *p*, from which the liquid portion will pass through spout *g* into the receiving-vat *r*. The gases not yet condensed will pass into the pipe *s*, and thence into the first condenser *t*, then on through the series of condensers, which may be of any desired number, where the liquid naphtha will remain, and, finally, the gas will pass off through the last pipe, *u*, either into the atmosphere or into any suitable receptacle. The liquid deposited in the vat *r* will be creosote-oil of proper quality for creosoting wood.

The operation of creosoting wood is as follows: Car-loads of piles, timber, lumber, or wood in any form are run into the retorts, as already described, and the ends of the retorts are tightly closed. Then a fire is started to expel the moisture from the wood, which escapes either into the open atmosphere or into the pipe *l*, as desired. After a suitable heat has been applied to the wood for a sufficient length of time—say from 300° to 400° Fahrenheit, from five to ten hours, according to the size and condition of the wood—creosote-oil is then forced by an ordinary force-pump (not illustrated) into the retorts until they are filled. Then the cock *D*² in the outlet-pipe is closed, and any desired pressure—say from one hundred pounds to the inch upward—is applied to the oil by any ordinary means, preferably hydraulic apparatus. This will cause the thorough impregnation of the wood with the creosote-oil, each cubic foot of wood taking up, say, from ten to twenty pounds of the oil, as may be desired.

By employing the series of furnaces, combustion-chambers, and arches in nests on either side of the central arch, *C*³, and arranged to communicate therewith by means of inclined flues through the partition-walls *E E*, I am enabled to thoroughly heat long retorts arranged at right angles to the furnaces and the direction of the draft. Furthermore, combustion of the products from the right and left furnaces is more perfect, on account of their being delivered under the central arch, *C*³, where the flames from the central furnace serve to ignite them. Consequently the heating of the retorts is better, more economical, and with less waste when the furnaces and retorts are arranged relatively in this manner. Furthermore, it is important in this class of apparatus to arrange the retorts at right angles with the furnaces, as I have done, because there is a liability under the heavy pressure employed of the escape of creosote-oil or inflammable gases out of the end openings in the retorts, however carefully they may be closed and secured. Again, in case of blowing out or giving way of the door-fastenings, the entire volume of oil in a retort might escape. Should

the furnaces be under the ends of the retorts, a very destructive conflagration might ensue, either from occasional leaking or from the escape of the entire volume of oil from the ends of the retorts. It is a great measure of safety, therefore, as well as an excellent means for securing efficient heating of the retorts, to arrange them at right angles to the furnaces and to the direction of draft, as illustrated.

10. I contemplate dividing the retorts into two or more sections, according to convenience, so that either two sections or several sections may be united together and built in masonry of any desired length. In some instances twenty feet might be enough, and again seventy-five or eighty feet in length might be required.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a wood distilling and preserving apparatus, the combination of the furnaces B B' B³, the arches C C' C³ and D D, the walls E E and E' E', with their flues or passages G and H, the central arch, C³, being provided with flues K, and the retorts F F, supported over and at right angles to the said arches, so as to have a space between them and the arches, substantially as set forth.

2. In a wood distilling and preserving apparatus, the combination of the furnaces B B' B³, the arches C C' C³ and D D, the walls E E and E' E', with their flues or passages G and H,

the arch C³ being provided with flues K, the retorts F F, supported over and at right angles to the said arches, and the horizontal partitions L, the one of them on the opposite side from the flues K being provided with flues M, for admitting the products of combustion up over the retorts, substantially as set forth.

3. The combination, with a series of furnaces, arches, and supporting-walls provided with flues for the circulation of products of combustion, as set forth, and a series of retorts resting above the same and at right angles thereto in masonry A, of metallic plates L, forming horizontal partitions, one of them provided with flues M, and the plate or partition R, substantially as set forth.

4. The combination, with a retort provided with a railroad-track, of a metallic car with extensions z upon the ends of the car-axles, and bars A² secured to the retorts and projecting over the ends of the axles, to keep the cars from jumping the track, substantially as set forth.

5. In combination with a retort, the annular end supports, S, secured to the ends of the retort and provided with flanges U and plate B², with cock C², substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

ANDREW SMITH.

Witnesses:

R. G. HEIDE,
LUDWIG HANSEN.