No. 759,064. PATENTED MAY 3, 1904.

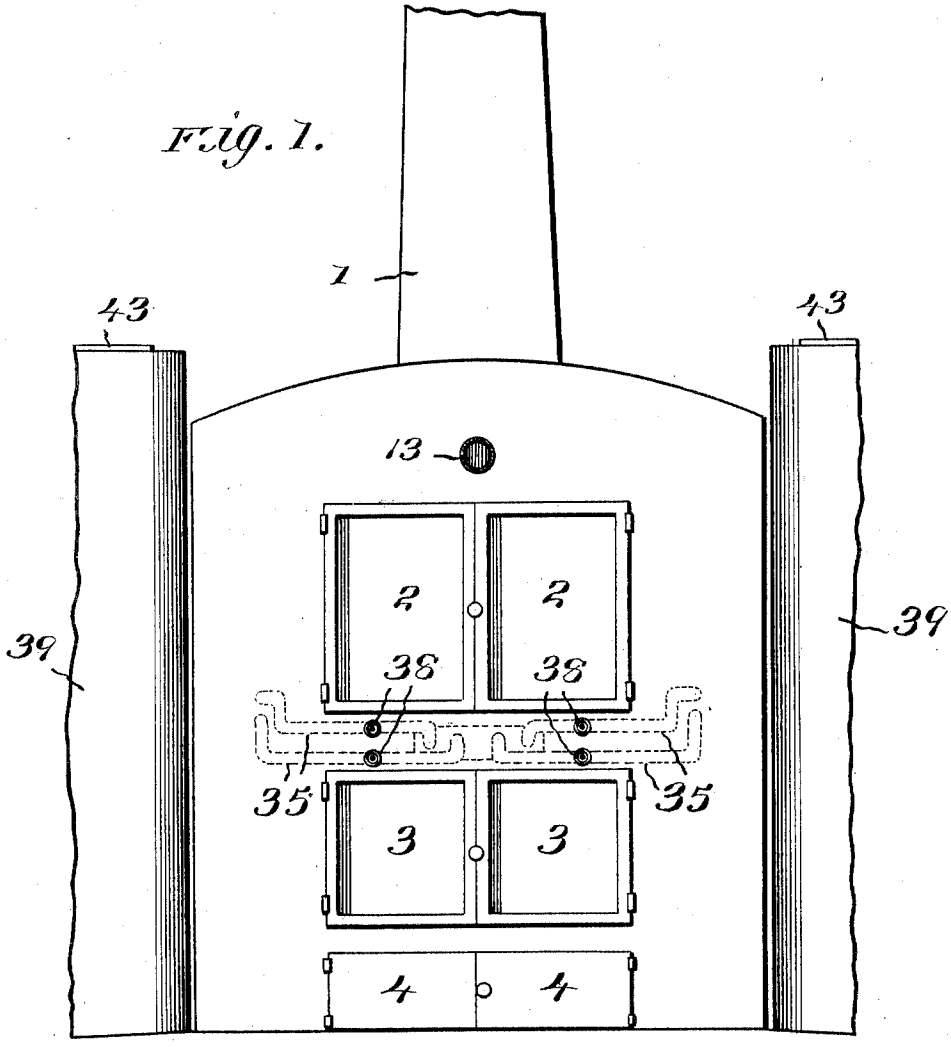
A. C. BETHUNE.

SUPERHEATER.

APPLICATION FILED NOV. 4, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1.



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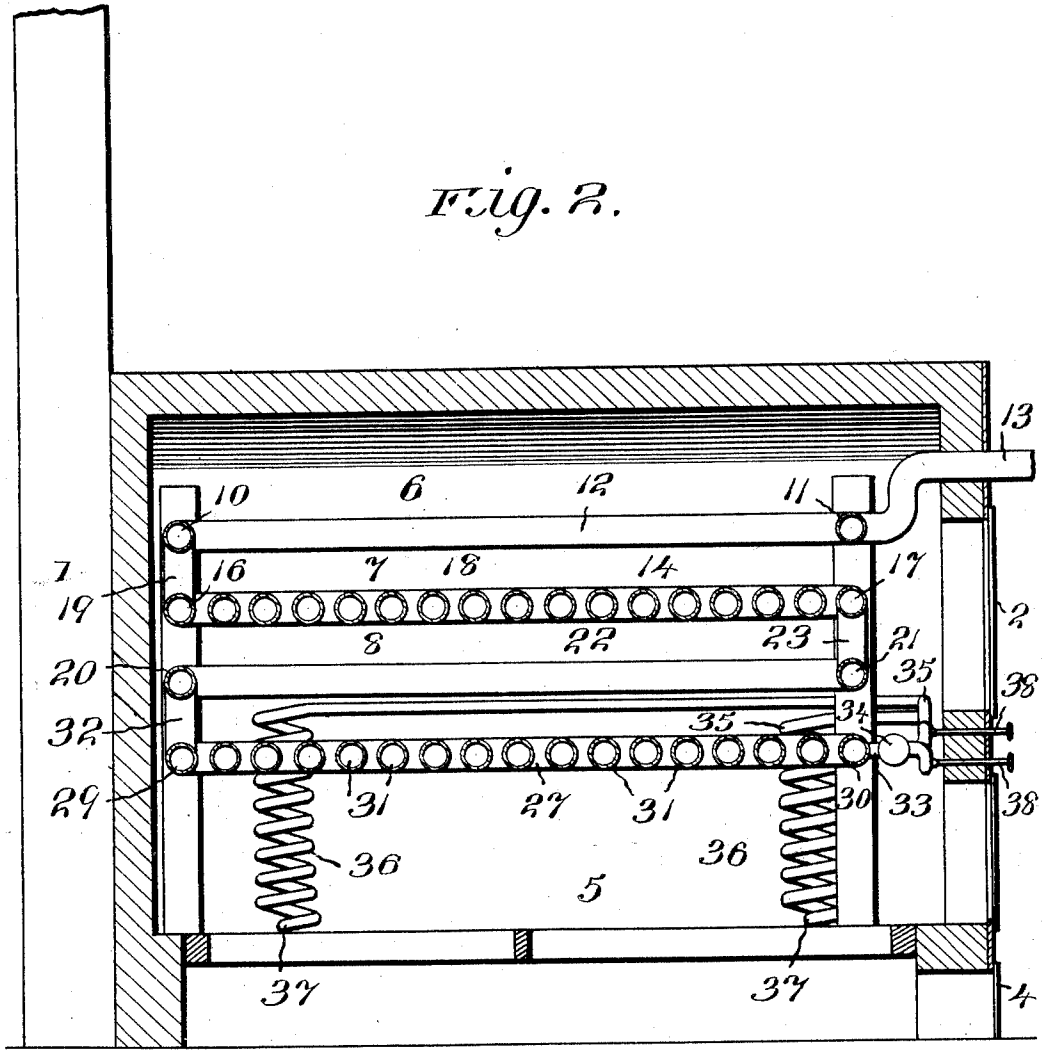
NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.



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NO MODEL. 4 SHEETS—SHEET 3.

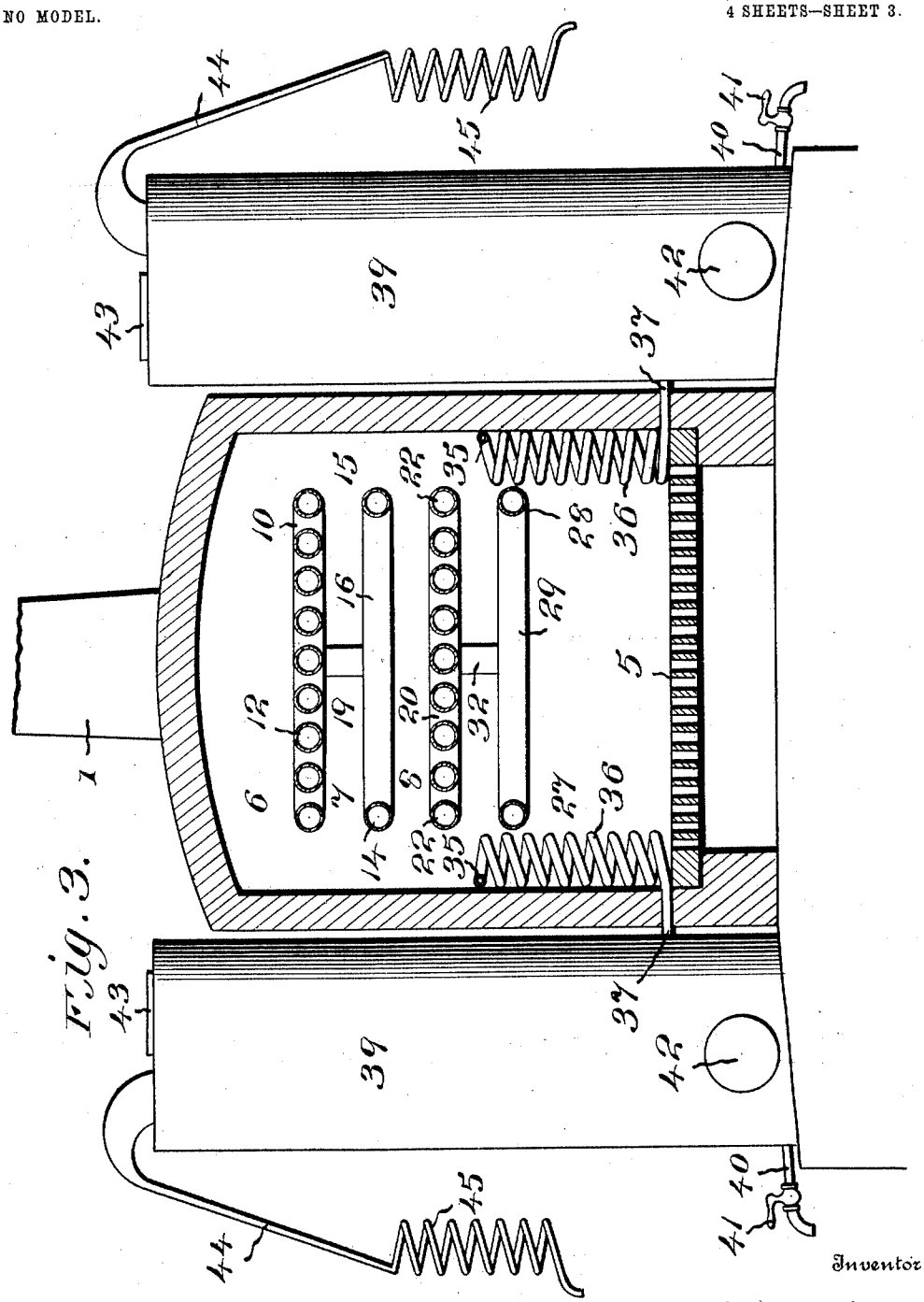

Fig. 3.

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NO MODEL. 4 SHEETS—SHEET 4.

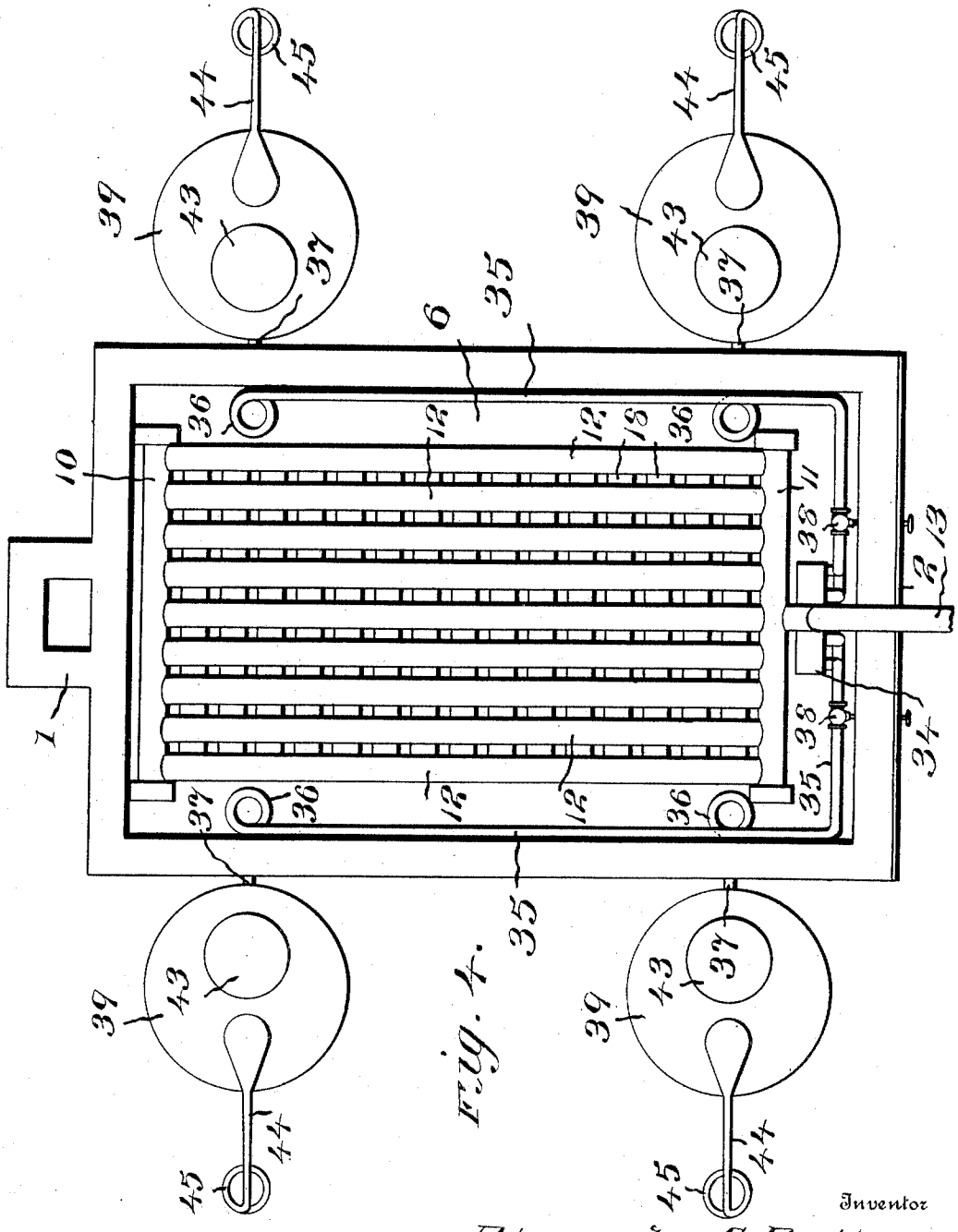

Fig. 4.

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UNITED STATES PATENT OFFICE.

ALEXANDER C. BETHUNE, OF BISCOE, NORTH CAROLINA.

SUPERHEATER.

SPECIFICATION forming part of Letters Patent No. 759,064, dated May 3, 1904.

Application filed November 4, 1903. Serial No. 179,821. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER C. BETHUNE, a citizen of the United States, residing at Biscoe, in the county of Montgomery and State of North Carolina, have invented new and useful Improvements in Superheaters, of which the following is a specification.

My invention relates to improvements in apparatus for the distillation of wood and similar products; and the object is to construct and provide an improved means and apparatus for separating the volatile and gaseous elements or ingredients of wood from the solid and indissoluble constituents.

Another object is to provide a construction or apparatus for the purposes intended which is of simple and durable make and which is certain and efficient to accomplish the purpose at reduced cost.

Still another purpose is to deliver the reducing agent of distillation into the retorts at an increased temperature to separate the spirits and lighter oils and at the proper time to apply heat direct to the retorts to release the heavier and more obdurate elements, all as will be hereinafter fully disclosed, and the novelty asserted particularly pointed out and distinctly claimed.

I have fully and clearly illustrated my improvements in the annexed drawings, to be taken as a part of this specification, and reference being made thereto Figure 1 is a front view in elevation of the furnace, showing the position of the retorts at the sides and the stems of the valves for regulating the flow of steam to the retorts. Fig. 2 is a longitudinal vertical central section through the main superheater-pipes and showing one set of superheating-coils. Fig. 3 is a vertical transverse section through the furnace and system of pipes, showing the arrangement of the retorts and the still pipes and coils. Fig. 4 is a plan view of the complete apparatus, the roof of the furnace being removed to disclose the interior.

In the drawings similar elements and parts appearing in the several illustrations are designated by the same reference notations.

It will be premised that the system of pipes, the steam-chest, and the coils leading into the retorts are inclosed within a suitable heating or furnace inclosure, so that the elements and parts will be protected against detrimental radiation and the required temperature readily attained and constantly maintained. Suitable fire-boxes are placed under the retorts to effectually apply direct heat to promote and attain the separation of the heavier constituents of the wood. The fire-boxes under the retorts have not been illustrated in the annexed drawings, because they may be of any suitable and well-known construction.

Referring to the drawings, A designates a furnace of rectangular construction provided with an arched roof and having a smoke-stack 1 to provide the desired draft. The front wall of the furnace is provided with an opening closed by doors 2, whereby access may be had to the superheating system of pipes within. Doors 3 are also provided opening into the combustion or fuel chamber, and the ash-pit has doors 4. Suitable grate-bars 5 are laid over the ash-pit, on which the fuel is placed. Within the furnace is suitably mounted a system of pipes constituting the main superheater for the steam. This superheater consists of a horizontally-positioned plurality of pipe-frames laid in vertical series one above the other at proper distances apart and communicating with each other. The pipe-frames are designated 6, 7, 8, and 9. The uppermost frame 6 consists of head-pipes 10 11, connected by longitudinally-disposed pipes 12, each in communication with the heads, as shown. A steam-pipe 13, leading from the steam source, opens into the head-pipe 11 and supplies steam to the system. The pipe-frame 7 of the system consists of opposite side pipes 14 15, end pipes 16 17, communicating with the end of the side pipes, and a plurality of parallel cross-pipes 18 in communication with the side pipes, and at the rear end of the frame is a vertical pipe 19, opening from the head-pipe 10 into the end pipe 16. The pipe-frame 8 of the system is made up of head-pipes 20 21, connected by longitudinally-disposed parallel pipes 22, communicating with the head-pipes, and at the front end of this pipe-frame is a vertical pipe 23, leading from the end pipe 17 into the head-pipe 21. The pipe-frame 9 is a duplicate

in construction of pipe-frame 7, comprising parallel side pipes 27 28, end pipes 29 30, and cross-pipes 31. At the rear of pipe-frame 9 is a vertical pipe 32, opening from the head-pipe 20. It will be readily perceived that the admitted steam traverses the pipe-frames of the system in succession and that the steam as it progresses from one frame to the other is retarded by reason of each frame having but a single escape-pipe to the other, so that the charge of steam in each is greatly superheated before entering the steam-chest and also in its course to the retorts.

In the middle of the end pipe 30 of the lowermost pipe-frame 9 is secured a pipe 33, the outer end of which enters the steam-chest 34, located adjacent to the front wall of the furnace and which may be of any capacity desired to efficiently supply any number of retorts used. In the front face of the steam-chest 34 are let the requisite number of steam-pipes 35, one for each retort, and are laid adjacent to the front and side walls of the furnace, and at their longitudinal terminations are respectively formed with downwardly-extending coils 36, the pipes being extended horizontally from the terminal coil through the wall of the furnace and opening into the retorts, substantially as shown at 37. It will be perceived that the superheating of the steam is continued throughout the system and is delivered to the retorts without reduction of temperature, a desideratum essential to success in the process. Turning-plugs 38 are arranged in each steam-pipe 35, provided with stems projecting through the front wall of the furnace, as shown, whereby the amount of steam desired or required may be regulated, or the steam may be entirely shut off in its course to the retorts.

39 designates the retorts into which the steam-pipes 37 lead and by which the steam-pipes supply steam to them, the pipes entering the retorts adjacent to the lower ends, substantially as shown. The retorts consist of suitable metal cylinders of such capacity as may be required, and at the lower part of the cylinders, adjacent to the bottoms thereof, are provided drain-pipes 40, through which the depositions and heavier products may be drawn off as occasion may require. The drain-pipes 40 are provided with turning-plugs 41 for the usual purpose. The retorts are placed for convenience and to save space along and adjacent to the side walls of the furnace, as shown in the drawings, and the number of the retorts may be more or less, as the capacity of the furnace may require. Closely adjacent to the lower end of each retort is a manhole, through which the charge and bulky depositions may be removed, and to each of these manholes is fitted and detachably secured a closing cap or cover 42, and in the head or cover of each retort is a manhole through which the charge may be made, covers 43 being provided therefor, as shown. In the heads of the retorts are fixed pipes 44 of the usual style in distillation, which terminate in worms or coils 45, which may be immersed in suitable condensing vessels in the usual manner.

By the use of my invention in practice the volatile spirits or products are freed by the application of the superheated steam alone and without the wood being decomposed, the products rising through the retorts and passing through the pipes 44 to the worms for condensation. Then by the application of direct heat to the retorts the heavier products of creosote and tar-oil are liberated. By the preliminary mode of treating the wood with the superheated steam I produce spirits and light oils free from the odors of creosote and tar.

To utilize my improved apparatus, steam is let into the main superheater and into the steam-chest and thence subsequently flows to the retorts, the retorts having been previously charged with wood and the furnace fired to produce the superheating. The steam as soon as raised to the required temperature is let into the retorts and the process of distillation proceeds, the products rising in the retorts, thence through the still-pipes into the worms, and there subjected to condensation, as stated.

Having thus fully described my invention, what I claim is—

1. A superheating apparatus, constructed of a furnace, and communicating pipe-frames disposed one above the other within the furnace, said frames comprising alternating longitudinal and transverse pipes, and one of them having an inlet for steam, a steam-chest, and a connection between the same and another one of the pipe-frames, and pipes connecting with the steam-chest and extending substantially parallel with the front and side walls of the furnace, said pipes being provided with communicating coils leading outwardly through the furnace.

2. A superheating apparatus, constructed of a furnace, and communicating pipe-frames disposed one above the other within the furnace, said frames comprising alternating longitudinal and transverse pipes, one of which is provided with an inlet for steam, a steam-chest, and a connection between the same and another one of the pipe-frames, a coil leading outwardly through a part of the furnace, and a communicating connection between said coil and the steam-chest.

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

ALEXANDER C. BETHUNE.

Witnesses:
J. V. ADAMS,
L. A. BETHUNE.