

W. A. NORTON.
FURNACE.

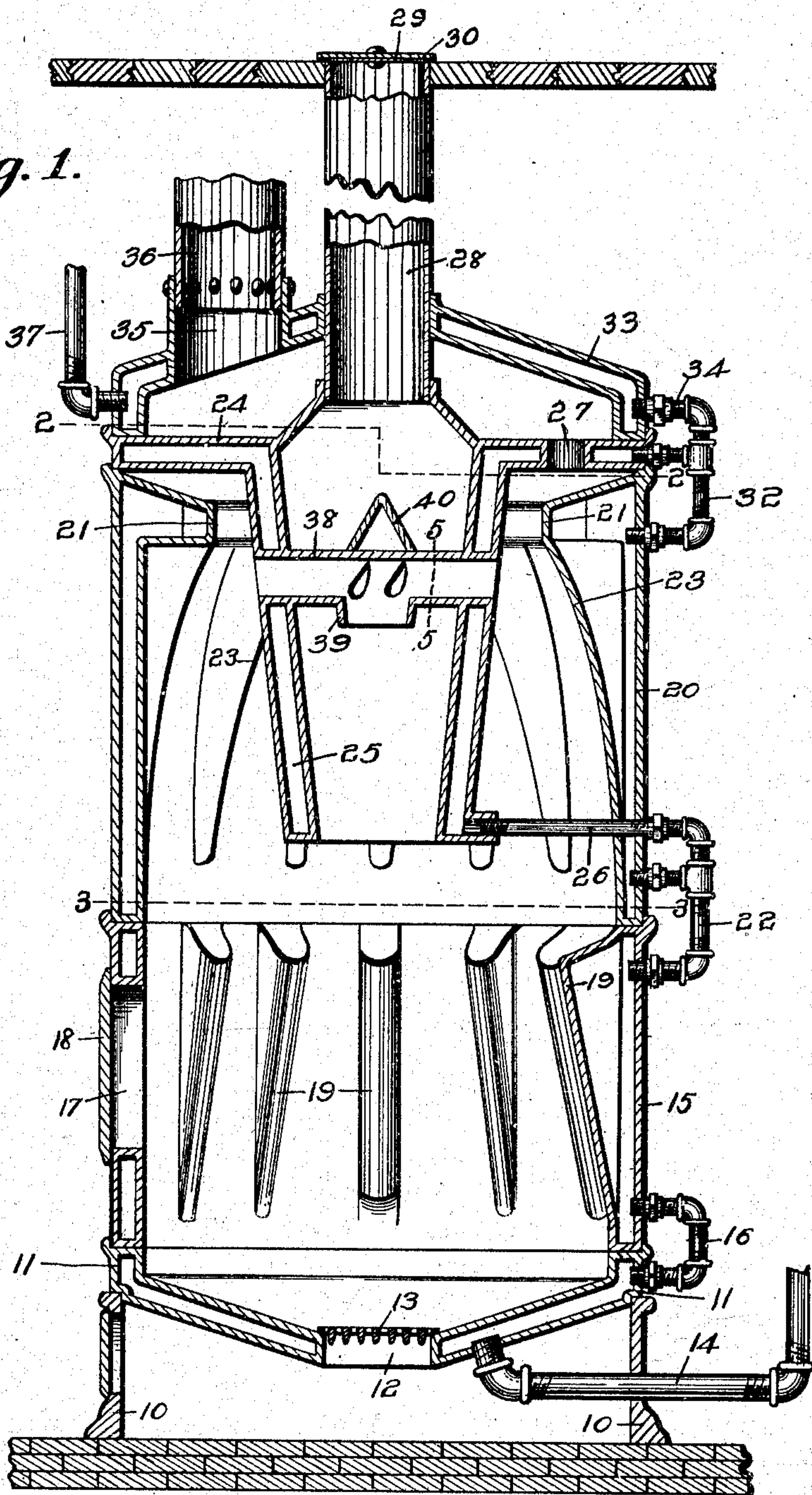
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952,047.

Patented Mar. 15, 1910.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses.

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3 SHEETS—SHEET 2.

Fig. 2.

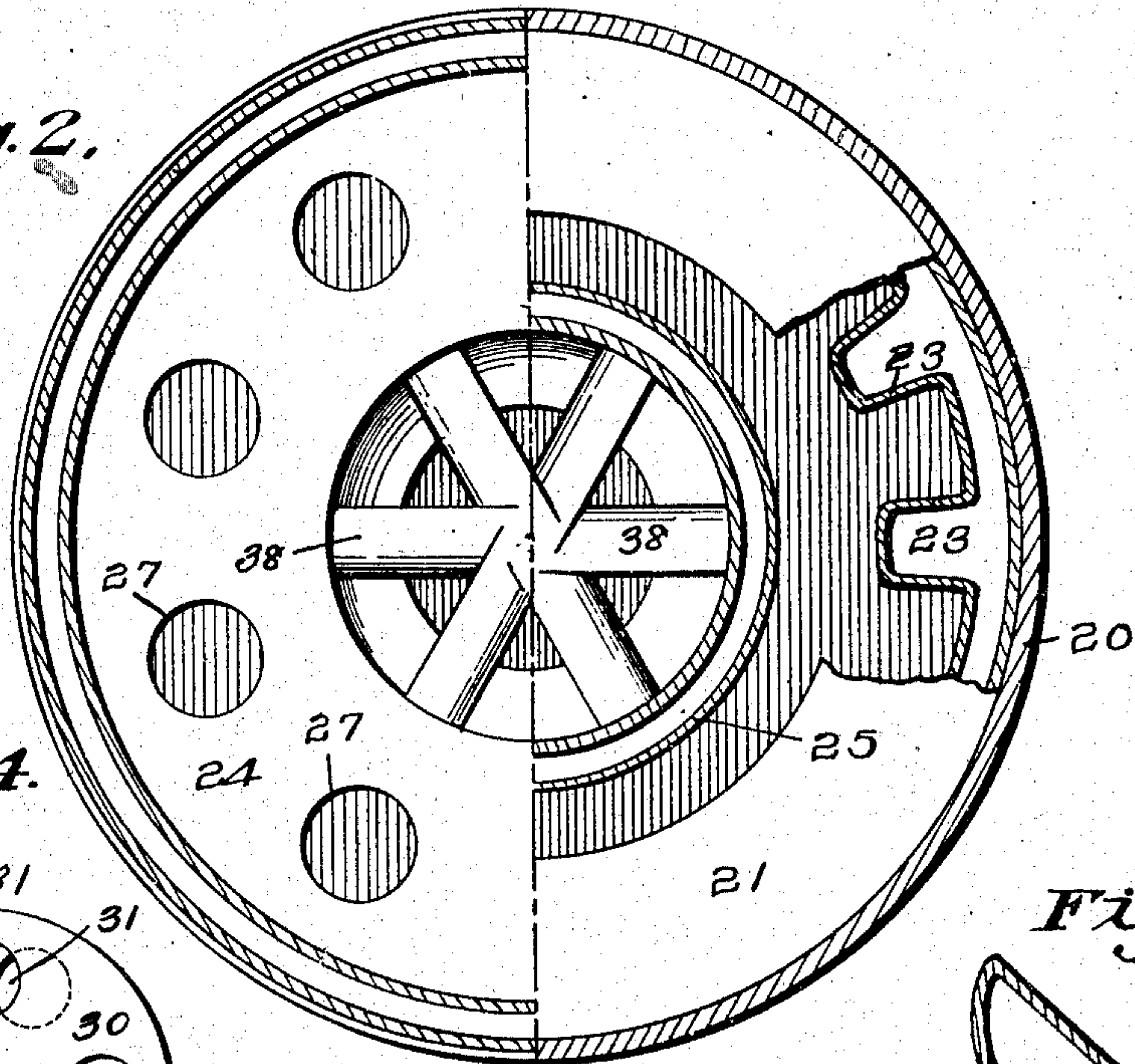


Fig. 4.

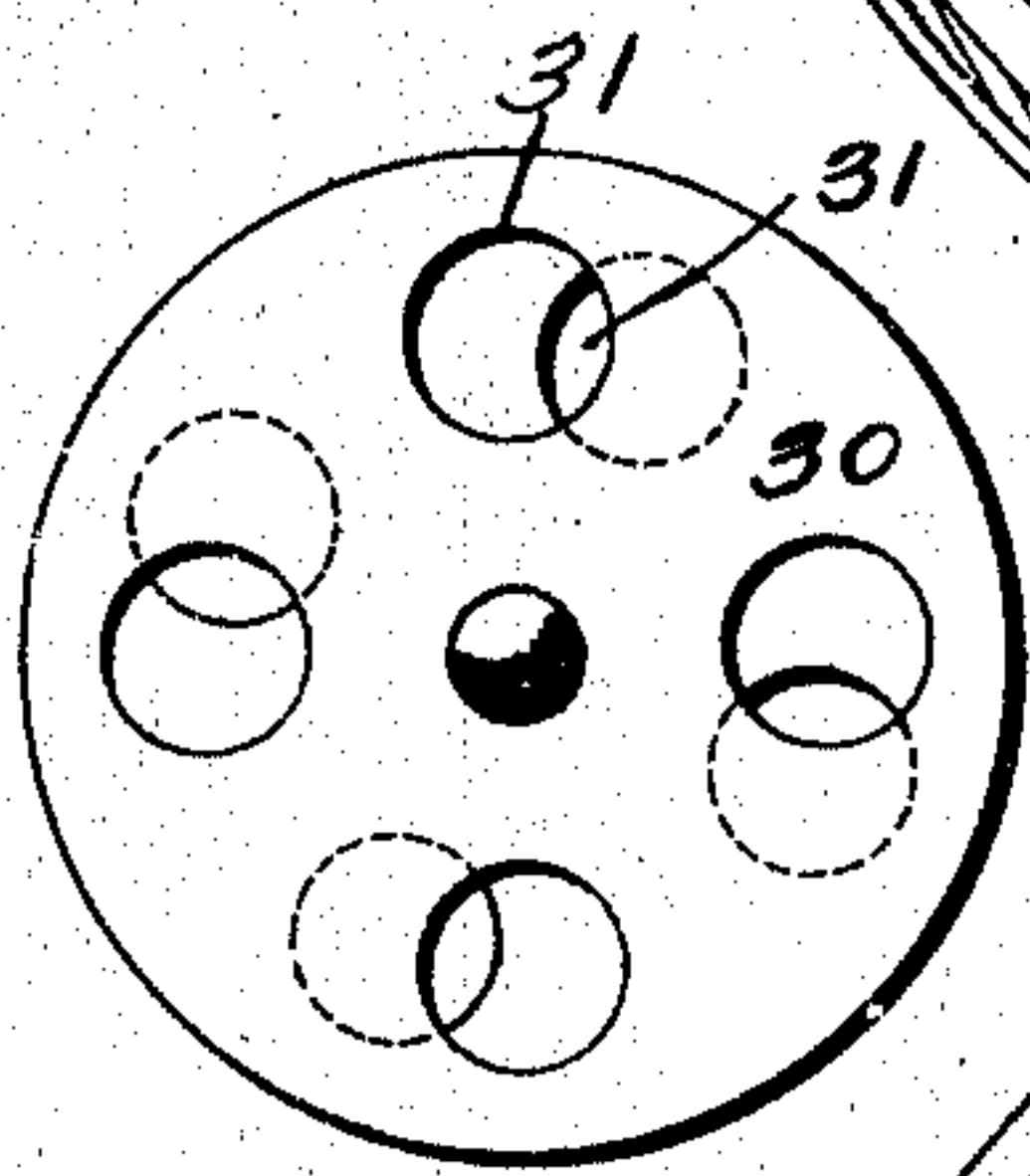
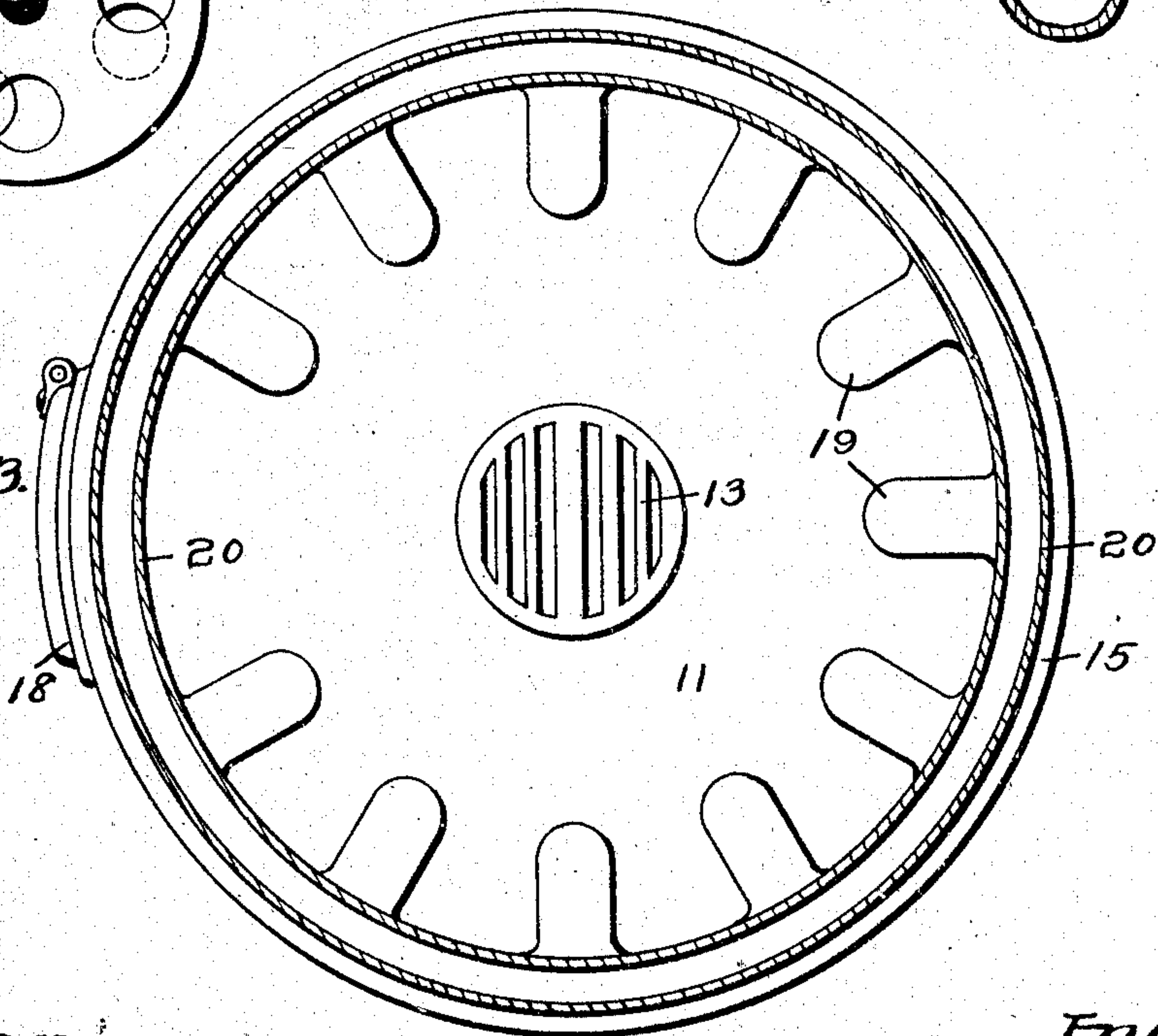


Fig. 5.



Fig. 3.



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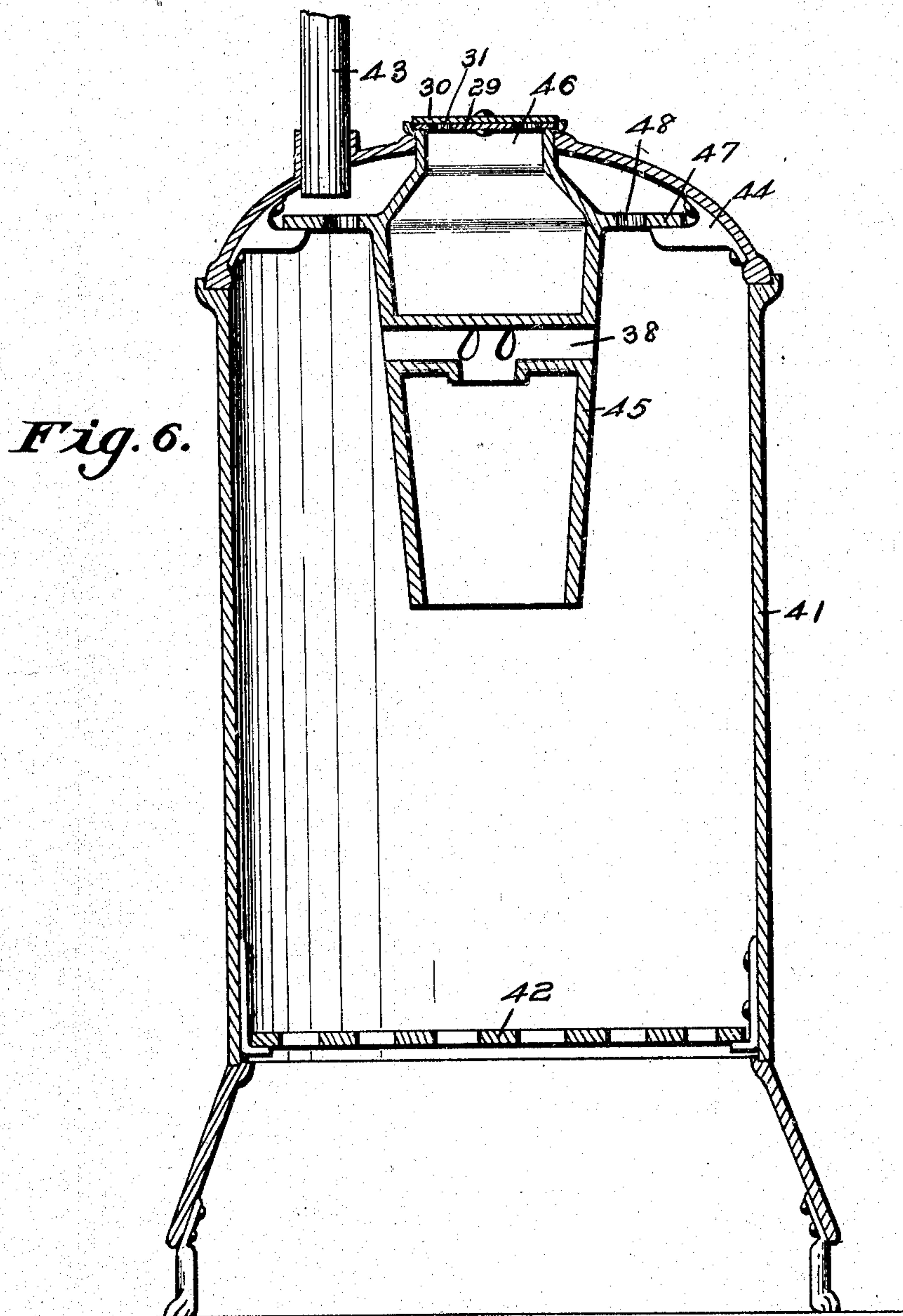
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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FURNACE.

952,047.

Specification of Letters Patent.

Patented Mar. 15, 1910.

Application filed April 12, 1909. Serial No. 489,328.

To all whom it may concern:

Be it known that I, WILLIAM A. NORTON, a citizen of the United States, residing at Marshalltown, in the county of Marshall and State of Iowa, have invented a certain new and useful Furnace, of which the following is a specification.

The object of my invention is to provide a furnace provided with a funnel-shaped air feeding device above the center of the fire-box and also provided with means whereby the draft of the furnace will cause a current of fresh air to be discharged downwardly through said funnel-shaped air feeding device to supply fresh air into the combustion chamber and also to provide means for giving to the fresh air passing downwardly through said air feeding device, centrifugal action which will tend to create a vacuum in the lower end of said funnel-shaped air feeding device, and the vacuum thus created will also tend to cause the smoke and soot arising from the combustion chamber to commingle with the fresh air in said funnel-shaped air feeding device and be carried with the fresh air over the burning fire to thereby wholly consume all of the smoke and gases thus fed to the fire.

A further object is to provide a furnace of this kind especially adapted for use as a hot water or steam heater and in which the water to be heated is contained within the walls of the furnace and within the parts of said air feeding device so that it will be heated quickly and the heat arising from the fire will be utilized to its maximum.

My invention consists in the construction, arrangement, and combination of the various parts of the device whereby the objects contemplated are attained as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which—

Figure 1 shows a vertical, central sectional view through a furnace embodying my invention. Fig. 2 shows a sectional view taken on the line 2—2 of Fig. 1, with the cone shaped deflector removed. Fig. 3 shows a sectional view on the line 3—3 of Fig. 1. Fig. 4 shows a detail view of the draft regulating device. Fig. 5 shows an enlarged, sectional view on the line 5—5 of Fig. 1, and—Fig. 6 shows a vertical, central sectional view of a modified form of furnace embodying my invention.

Referring to the accompanying drawings,

the preferred form of my invention is built up of sections, as clearly shown in Fig. 1, the lower section being indicated by the numeral 10. This lower section forms the ash-pit. Above the lower section is the grate section 11 having a central opening 12 therein with a grate 13 covering said opening, the bottom of said section being inclined downwardly from the sides toward the central opening. This section is made hollow to receive water and a water supply pipe 14 is arranged to communicate therewith. Above the grate section is the combustion chamber section 15 which is also formed hollow and which communicates with the grate section through the pipe 16. It is provided at one side with a door opening 17 and a door 18 for feeding fuel to the grate. This section of the furnace is provided, on its inner wall, with a series of radiating ribs 19, said ribs being spaced apart throughout the diameter of the furnace section and being tapered from a maximum thickness at their upper ends to a minimum at their lower ends so that the upper ends of the radiating ribs project inwardly a considerable distance toward the interior of the combustion chamber.

Above the combustion chamber is the radiating chamber 20 which is also provided with double walls and which has an inwardly extended annular rib 21 near its top. The water chamber of this section communicates with the interior of the combustion chamber section through the pipe 22, this radiating section is also provided with a series of radiating ribs 23 which project inwardly at their tops and are tapered outwardly toward their lower ends.

Resting on top of the radiating section is the air mixing and feeding device. This comprises a double-walled, disk-shaped top portion 24 and a funnel-shaped air mixing chamber 25 also formed with double walls. This air mixing and feeding chamber 25 extends downwardly into the interior of the furnace to a point near the upper end of the combustion chamber. The space between the walls of the parts 24 and 25 is connected with the pipe 22 by means of the pipe 26. In the disk-shaped top portion 25, is a series of draft openings 27. The top of the funnel-shaped air mixing chamber 25 communicates with an air supply pipe 28 which extends upwardly through the top of the furnace and which is provided at its top with

a draft-regulating device comprising two plates 29 and 30 having openings 31 therein capable of being brought into registering positions to thereby regulate the flow of air through them. The water chamber between the walls of the part 24 is also placed in communication with the water chamber at the top of the radiating section by means of the pipe 32.

The top of the furnace comprises a double-walled section 33 communicating with the pipe 32 by means of the pipe 34 and provided with an opening to receive the pipe 28, and also provided with a flue passageway 35 connected with the flue pipe 36. A water discharge pipe 37 is also placed in communication with the double walls of the furnace top.

For the purpose of causing the products of combustion arising from the combustion chamber to enter the air mixing chamber, I have provided, in said air mixing chamber, a device comprising a series of transverse tubes 38 extended through the mixing chamber 25 in a horizontal plane a short distance beneath the rib 21 of the radiating chamber. These tubes are spaced apart equal distances at their outer ends and meet at their central portions and communicate with each other. They are of such shape in cross section that each will cause the air that strikes upon its top surface to be deflected downwardly and laterally against the walls of the interior of the mixing chamber. In Fig. 5 of the drawings, I have shown a transverse, sectional view of one of these tubes to show the flattened, inclined upper portion thereof that will cause the air current to be deflected. In other words, the entire set of tubes 38 is so arranged that it will have the same effect on a current of air passing downwardly around it as would a stationary propeller blade fixed in said mixing chamber. All of said tubes 38 unite with each other at their central portions and at the central portion is a downwardly extended flange 39 open at its lower end. Above the central portion of the tubes 38 is a cone-shaped deflector 40 to draw the current of air outwardly so that it will pass downwardly through the spaces between the said tubes 38.

In practical operation, the action of the drafts and air currents of the furnace is as follows: Assuming that a fire is burning upon the grate, a draft will be created upwardly around the mixing chamber 25 and through the flue 35. This draft will create a suction downwardly through the air pipe 28 into the interior of the mixing chamber, and the air thus fed will commingle with the products of combustion above the fire. As the current of air passes downwardly through the pipe 28, it will strike upon the deflecting tubes 38 and a rotary motion will be imparted to it. This will create a centrifugal action in the air currents that are

passing downwardly below the tubes 28, and said centrifugal action will tend to create a vacuum in the central portion of the mixing chamber 25 below the tubes 38; hence, a suction will be created below the tubes 38 and this suction will draw a portion of the products of combustion and smoke arising from the fire to enter the ends of the tubes and pass downwardly into the mixing chamber 25 where they will be commingled with the fresh air and discharged downwardly and outwardly with the heated air directly above the fire where they will be consumed. Some of the heated air and burned gases arising from the combustion chamber will pass through the openings 27 to the flue, but by the arrangement just described, it is obvious that a sufficient quantity of the smoke and gases arising from the fire will be drawn into the mixing chamber and commingled with the fresh air in such a manner that when discharged on top of the fire, all of the smoke and gases arising from the fire will be consumed before any of them pass to the flue. It is further obvious that the hollow-walled construction will serve the purpose of heating water in an efficient manner. Furthermore the rib 21 co-acts with the exterior of the mixing chamber in such a manner as to tend to draw the products of combustion arising from the fire toward the end of the tubes 38.

In the modified form of the invention, shown in Fig. 6, I have shown a very simple structure of hot air furnace comprising a cylindrical body portion 41 with a grate 42 at its bottom and a flue 43 at its top. Within the top is a series of lugs 44 on which I support the air mixing device. This device may be formed complete of cast metal and comprises a body portion 45 tapered toward its lower end, and having an air feeding pipe 46 formed at its upper end. A draft plate similar to the draft plates 29 and 30 is placed in the upper end of the air pipe 46. On the exterior of the body portion 45 is a disk-shaped flange 47 designed to rest upon the lugs 44 and provided with draft openings 48, and formed near the central portion of the body portion 45 are the mixing tubes 38 similar to the mixing tubes 38 before described. The operation of this modified form is substantially the same as that described in connection with the preferred form of my invention in so far as the mixing of the air with the products of combustion is concerned.

I claim as my invention.

1. The combination of a combustion chamber, an open-ended mixing device projected downwardly into the combustion chamber, means for supplying fresh air to the top of the mixing device and a number of tubes in the mixing device communicating at one end with the space between the

mixing device and the combustion chamber and arranged to discharge downwardly through the central portion of the mixing device.

5 2. The combination of a combustion chamber, an open-ended mixing device projected downwardly into the combustion chamber, means for supplying fresh air to the top of the mixing device and a number
10 of tubes in the mixing device communicating at one end with the space between the mixing device and the combustion chamber and arranged to discharge downwardly through the central portion of the mixing
15 device, said tubes being so shaped as to impart a rotary motion to the current of air passing downwardly through the mixing chamber.

20 3. The combination of a combustion chamber, a mixing device extended downwardly and discharging into the combustion chamber, said mixing device being tapered toward its lower end, a fresh air pipe communicating with the upper end of the mixing device, and a series of transverse tubes in
25 the mixing device communicating at their outer ends with the combustion chamber, and being united at their inner ends and having a downwardly extended discharge
30 opening at their inner ends, said tubes hav-

ing their upper surfaces inclined as set forth to impart a rotary motion to the air passing downwardly through the mixing device.

4. The combination of a combustion 35 chamber, a mixing device extended downwardly and discharging into the combustion chamber, said mixing device being tapered toward its lower end, a fresh air pipe communicating with the upper end of the mixing device, and a series of transverse tubes
40 in the mixing device communicating at their outer ends with the combustion chamber, and being united at their inner ends and having a downwardly extended discharge
45 opening at their inner ends, said tubes having their upper surfaces inclined as set forth to impart a rotary motion to the air passing downwardly through the mixing device, and
50 an annular rib extended around the interior of the combustion chamber above the ends of the said tubes to deflect the products of combustion inwardly toward the mixing device near the tubes.

Des Moines, Iowa, March 24, 1909.

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Witnesses:

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