

No. 745,573.

PATENTED DEC. 1, 1903.

H. G. COX.
VERTICAL UNDERFEED FURNACE.

APPLICATION FILED MAR. 20, 1903.

NO MODEL.

3 SHEETS—SHEET 1.

Fig. 1

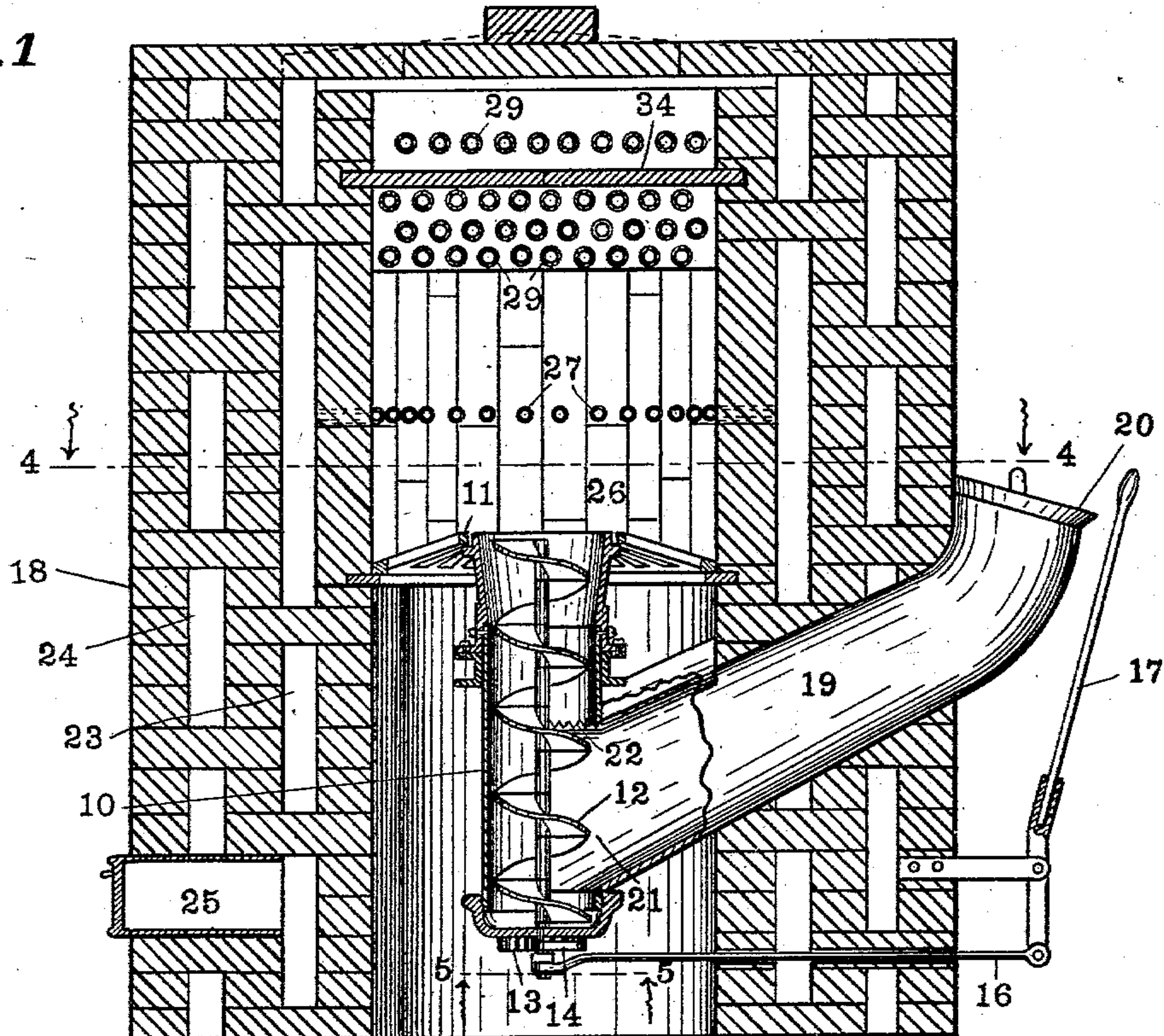


Fig. 4.

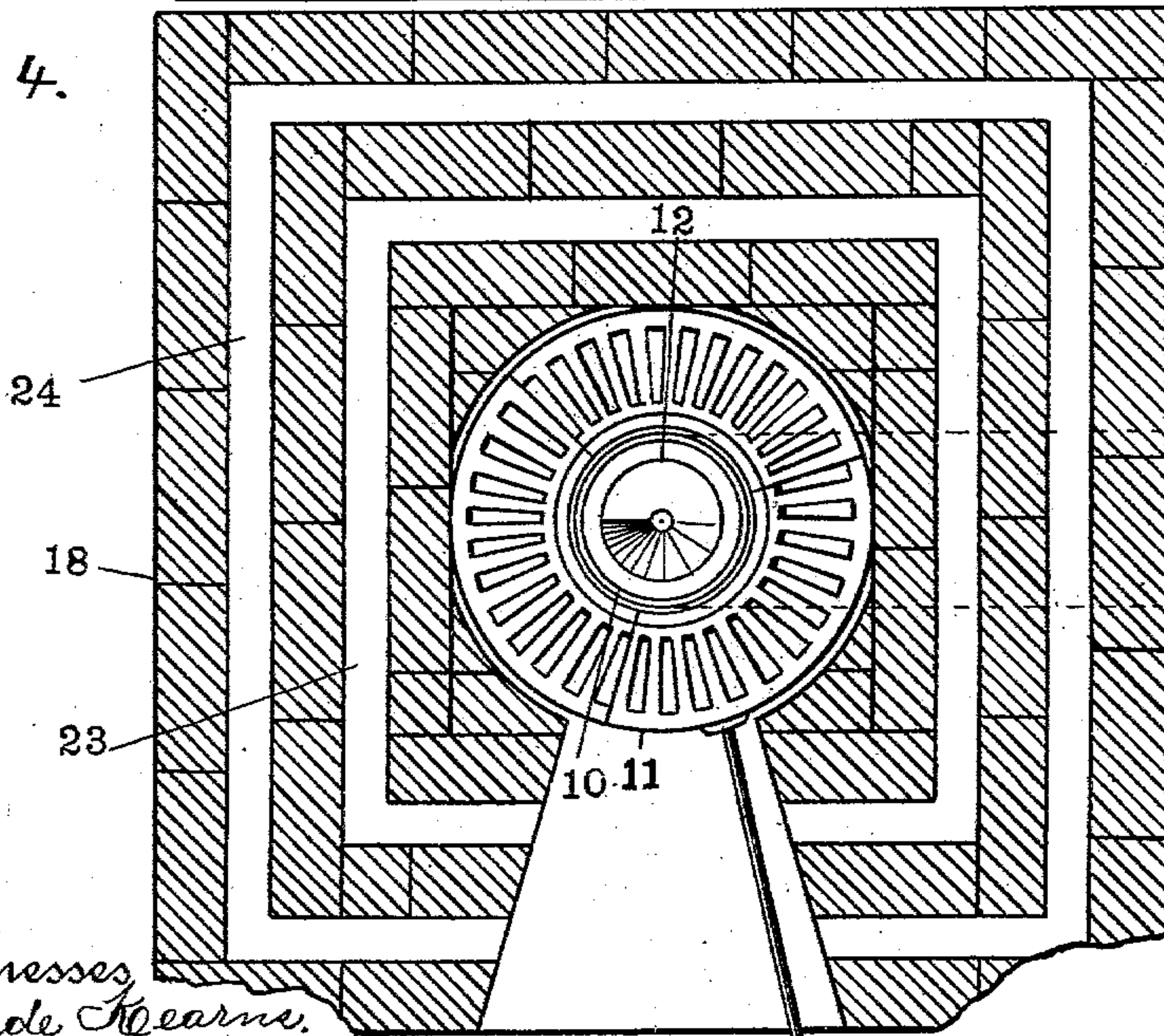
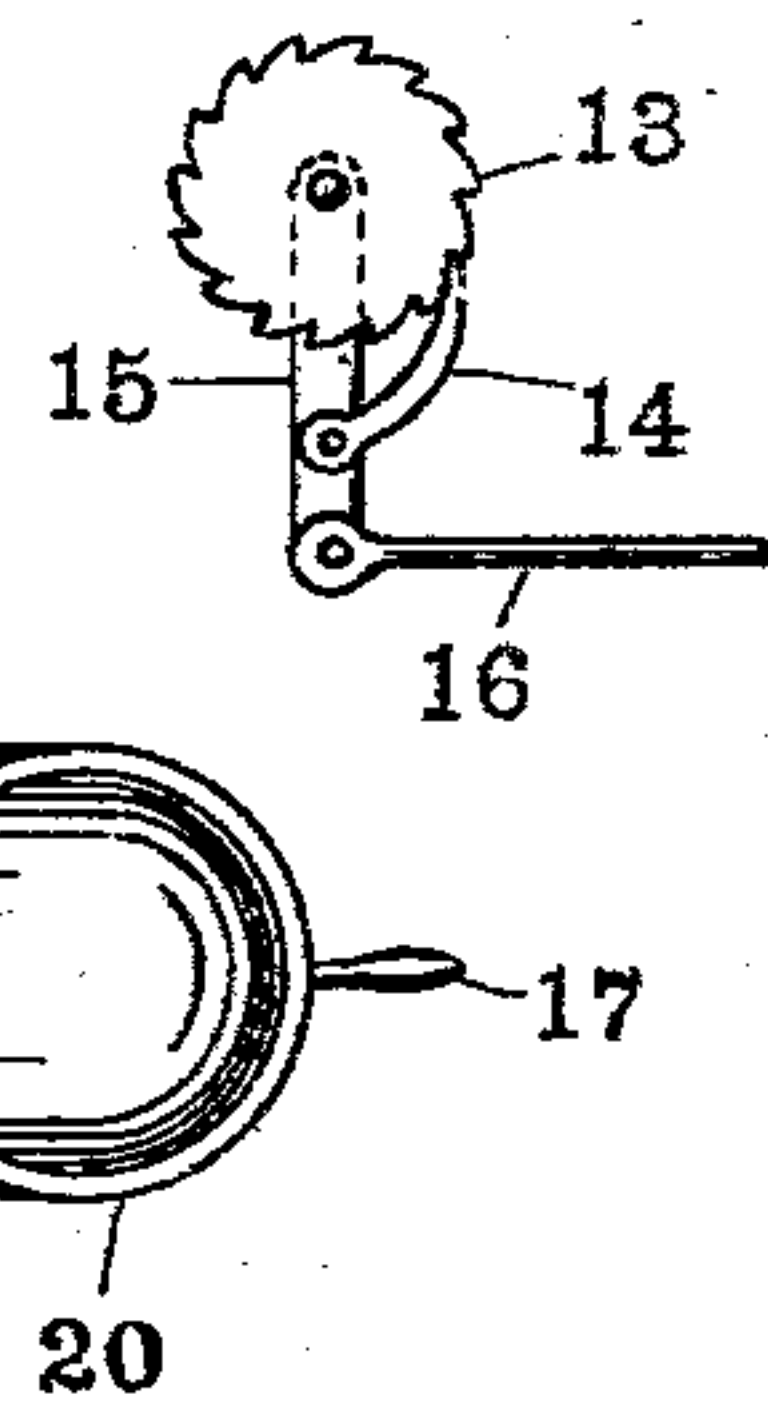


Fig. 5.



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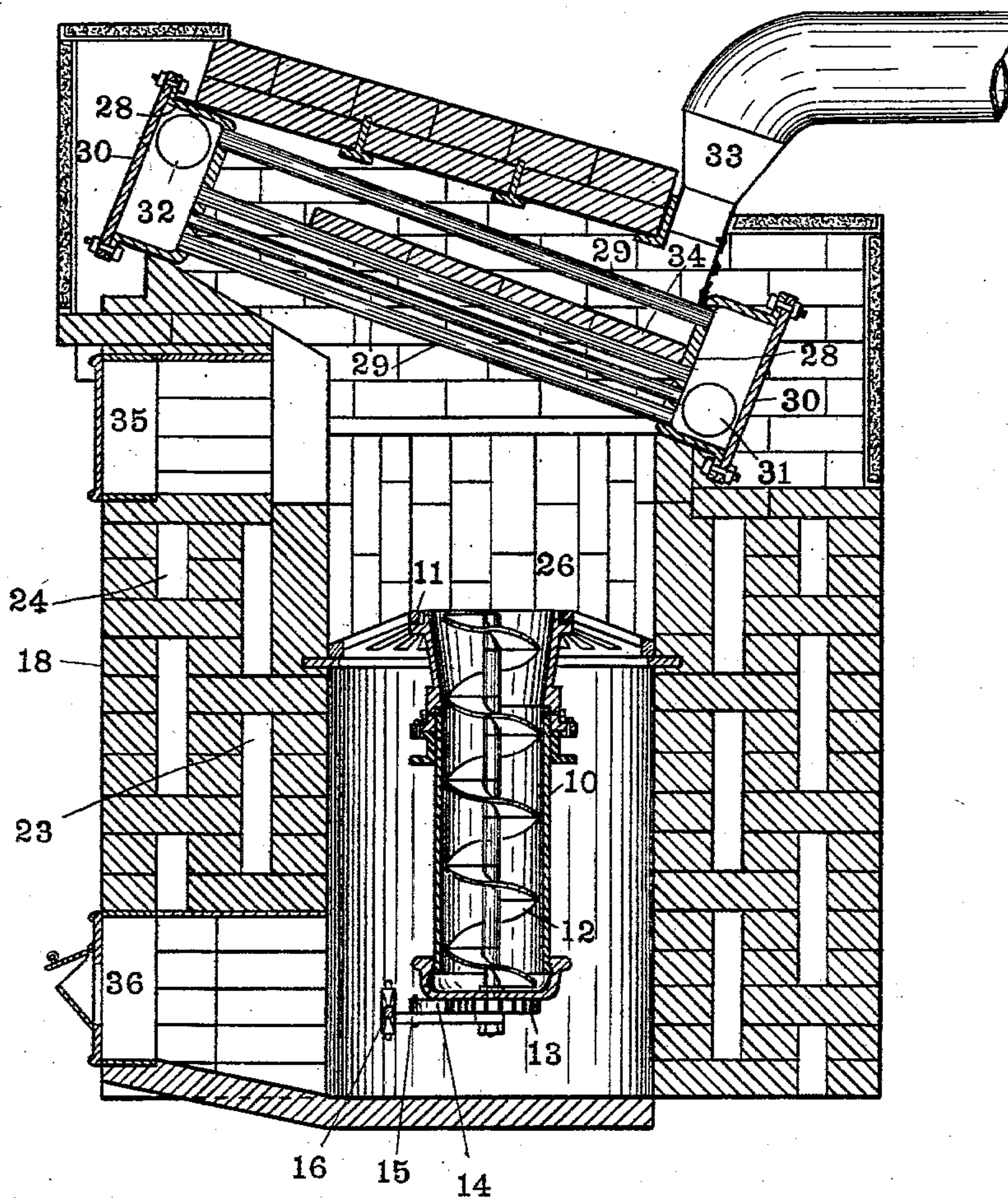
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3 SHEETS—SHEET 2.

Fig. 2.



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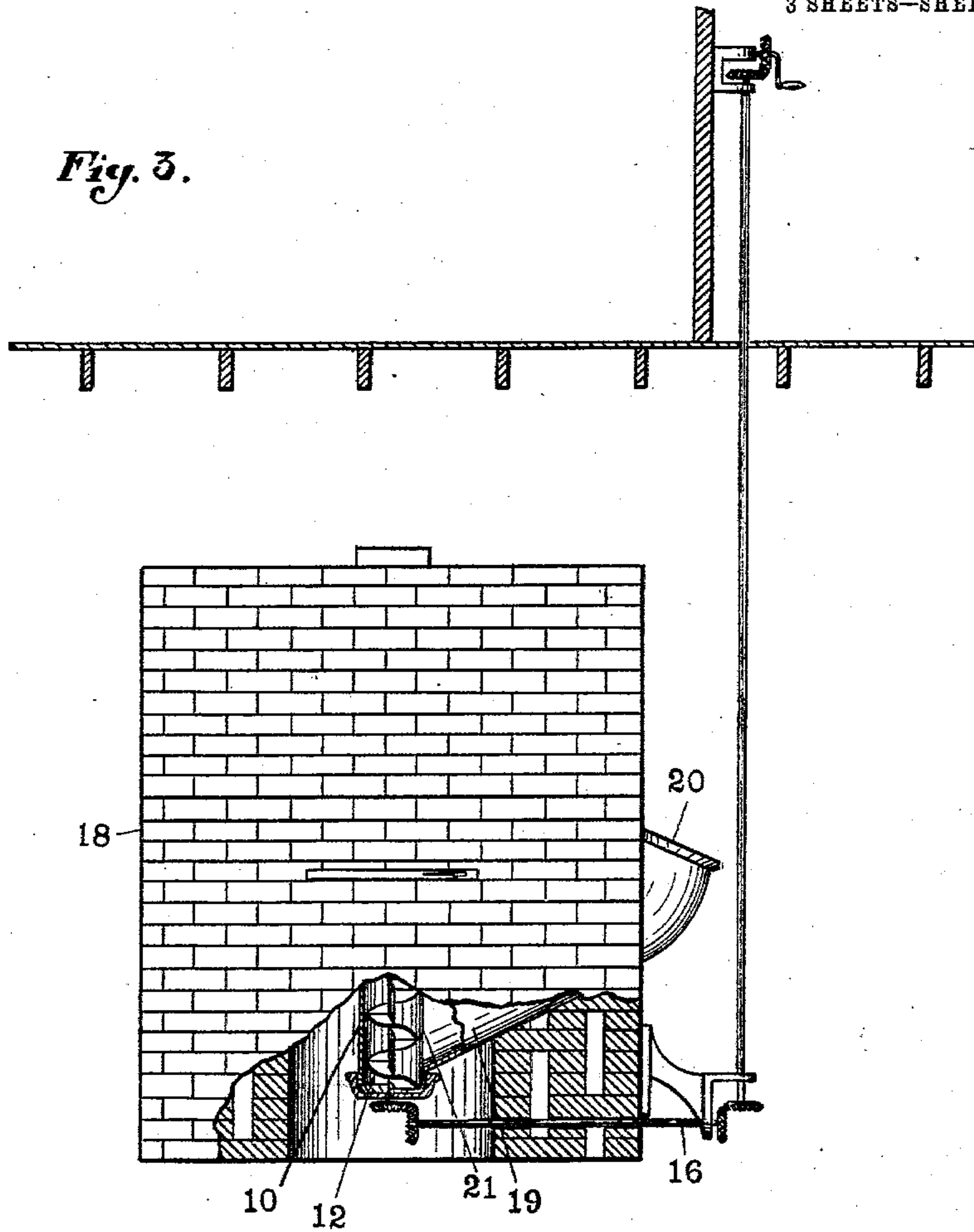
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3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

HENRY GRANDISON COX, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO
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VERTICAL UNDERFEED-FURNACE.

SPECIFICATION forming part of Letters Patent No. 745,573, dated December 1, 1903.

Application filed March 20, 1903. Serial No. 148,695. (No model.)

To all whom it may concern:

Be it known that I, HENRY GRANDISON COX, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Vertical Underfeed-Furnaces, of which the following is a specification.

The object of my present invention is to provide a water-heater or steam-generator especially designed for small sizes, particularly of the class to be used in houses for heating purposes, and in which a low grade of fuel may be used to advantage.

The accompanying drawings illustrate my invention.

Figure 1 is a central vertical section parallel with the face-plate or front of the furnace. Fig. 2 is a similar view at right angles to Fig. 1. Fig. 3 is a view showing a means for operating the feeding mechanism from a distant point. Figs. 4 and 5 are details on lines 4 4 and 5 5 of Fig. 1.

The essential feature of my invention resides in the provision of a vertical fuel-spout 10, located at the center of an annular grate 11, the bars of which are inclined downward and outward, said grate being preferably circular in plan, and in the provision of means for forcing the fuel upward through the feed-spout 10. In the form shown, which is probably the preferred form, I mount within the feed-spout 10 a vertical feed-worm 12, the shaft of which is projected through the bottom of spout 10 and provided at its lower end with suitable means by which it may be rotated. In the drawings said means consists of a ratchet-wheel 13, secured to the lower end of the worm-shaft and adapted to be engaged by a pawl 14, carried by a lever 15. Secured to lever 15 is an operating-rod 16, connected at its outer end to a hand-lever 17, mounted outside of the setting 18. Leading inward and downward to the bottom of feed-spout 10 is a reservoir 19, the outer end of which is projected beyond the setting 18 to form a receiving-hopper 20, into which the fuel may be introduced. The reservoir 19 leads to an opening 21 in the side of the feed-spout

10, and the upper edge of this opening is serrated, as at 22, in order to form a crushing edge, against which large fuel may be brought and crushed by the action of the feed-worm 12. The setting 18 is preferably formed with two annular air-chambers 23 and 24, the inner chamber 23 being connected with the outside air near its bottom by a ventilating-passage 25. Leading into the combustion-chamber 26 at a point somewhat above the grate and from the air-chamber 23 is a plurality of air-tubes 27. Arranged above the combustion-chamber 26 and projecting across the same is a water-tube boiler, which is composed of a pair of similar cast headers 28, which are cup-shaped and between which extend the straight water-tubes 29, said tubes being secured in the headers by any suitable means. The outer ends of the cups are closed by detachable plates 30. The boiler described is set upon an angle, and leading into the lower side of the lower header is a supply or return pipe 31, and leading from the upper header is a discharge-pipe 32. I prefer to have the smoke-pipe lead from near the lower end of the boiler, as at 33, and in order to produce the proper circulation of the heated gases around the tubes I arrange the upper row of tubes 29 at a somewhat greater distance from the next lower row than are the other rows of pipes, and below this upper row of pipes I arrange a baffle-plate 34, which extends forward and upward to a point near the forward or upper header. The combustion-chamber is provided with the usual firing-door 35, and an ash-pit passage 36 leads into the ash-pit.

The upper end or section of the feed-spout 10 is provided with a flange 37, which serves as a support for the inner ends of the grate-bar sections and upon which said grate-bar may be rotated. The outer ends of the grate-bars are supported in a flange 38, and a shaker-bar 39 extends out to a convenient point. The upper section of the feed-spout 10 is supported upon suitable beams or channel-irons 40.

In Fig. 3 I have shown a gear 41 substituted for ratchet 13, and geared with this is a train of gearing and shafting 42, which is

led to any distant point—as, for instance, an upper room—where the feed-worm may be operated by a suitable crank 43.

In operation a very low grade of fuel—such, 5 for instance, as slack, mine-run, or dust—may be introduced into reservoir 19 and flows by gravity therefrom into feed-spout 10. The rotation of the feed-worm 12 in the proper direction will then result in a lifting of the 10 fuel upward through spout 10, so as to form a cone-shaped deposit of fuel above the grate. As a consequence a fire on grate 11 results in a cone-shaped mass of coals, the interior of which is fresh fuel, which becomes 15 gradually coked and thereafter is forced upward, so as to flow outward and downward, the ashes dropping through the grate. This results in a substantially smokeless fire, for the reason that the gases from the fresh fuel 20 must pass upward and outward through the hot external coating of live coals. There is therefore practically no tendency to soot up the water-tubes and bridge between them, as would be the result where the ordinary form 25 of grate was used. By opening door 25 any desired quantity of air may be allowed to pass upward through chamber 23 and inward through tubes 27 to the top of the fire.

I claim as my invention—

30 1. The combination, in a furnace, of a fuel-reservoir inclined downwardly and leading from the outside of the furnace to a central point where it joins a vertical duct, said vertical duct, a serrated crushing edge arranged 35 in the vertical duct, a feed-worm mounted in said vertical duct, power mechanism for propelling said feed-worm and conveying the fuel from the point where it enters said duct

from the reservoir up into the combustion-chamber, and a grate surrounding the upper 40 end of said duct and forming the bottom of said chamber, substantially as shown and described.

2. The combination, in a furnace, of an inclined fuel-reservoir down which the fuel will 45 descend by gravity to a central duct, said central duct, a serrated crushing edge formed at the junction of the gravity-feed chute and the central duct, mechanism in said duct for elevating the fuel to the combustion-cham- 50 ber, and a power-train connected to said mechanism and leading from a point distant to the furnace, and means at said distant point for operating said power-train.

3. The combination, in a furnace, of a series of hot-water tubes disposed above the 55 combustion-chamber, a series of air-tubes below said water-tubes leading into said combustion-chamber, a central vertical duct below said combustion-chamber for conveying 60 the fuel to said chamber, a grate surrounding the upper end of said duct, mechanism within said duct for forcing the fuel upward, an inclined reservoir for supplying the fuel 65 to said duct, a serrated crushing edge formed at the junction of the reservoir and duct, and means for operating the fuel-feeding mechanism in the duct, all substantially as shown and described.

In witness whereof I have hereunto set my 70 hand and seal, at Indianapolis, Indiana, this 16th day of February, A. D. 1903.

HENRY GRANDISON COX. [L. S.]

Witnesses:

ARTHUR M. HOOD,
JAMES A. WALSH.