

No. 764,552.

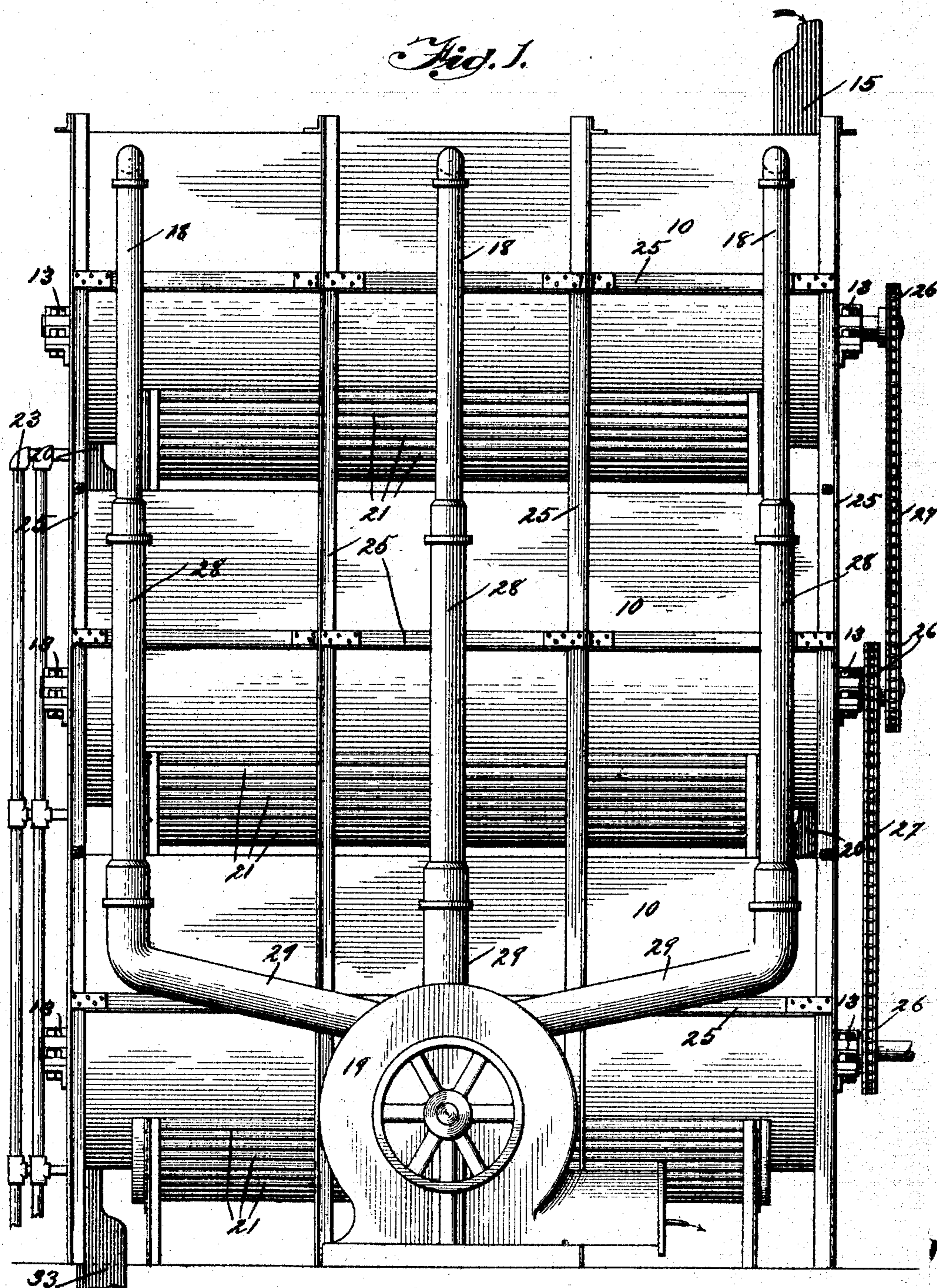
PATENTED JULY 12, 1904.

J. D. BOURDEAU.  
DRIER.

APPLICATION FILED JAN. 20, 1902.

NO MODEL.

4 SHEETS—SHEET 1.



Witnesses:

*Chas. D. Perry*  
*J. B. Weir*

Inventor:

*Jesse D. Bourdeau*  
*by Coburn, McRobert & McChoy,*  
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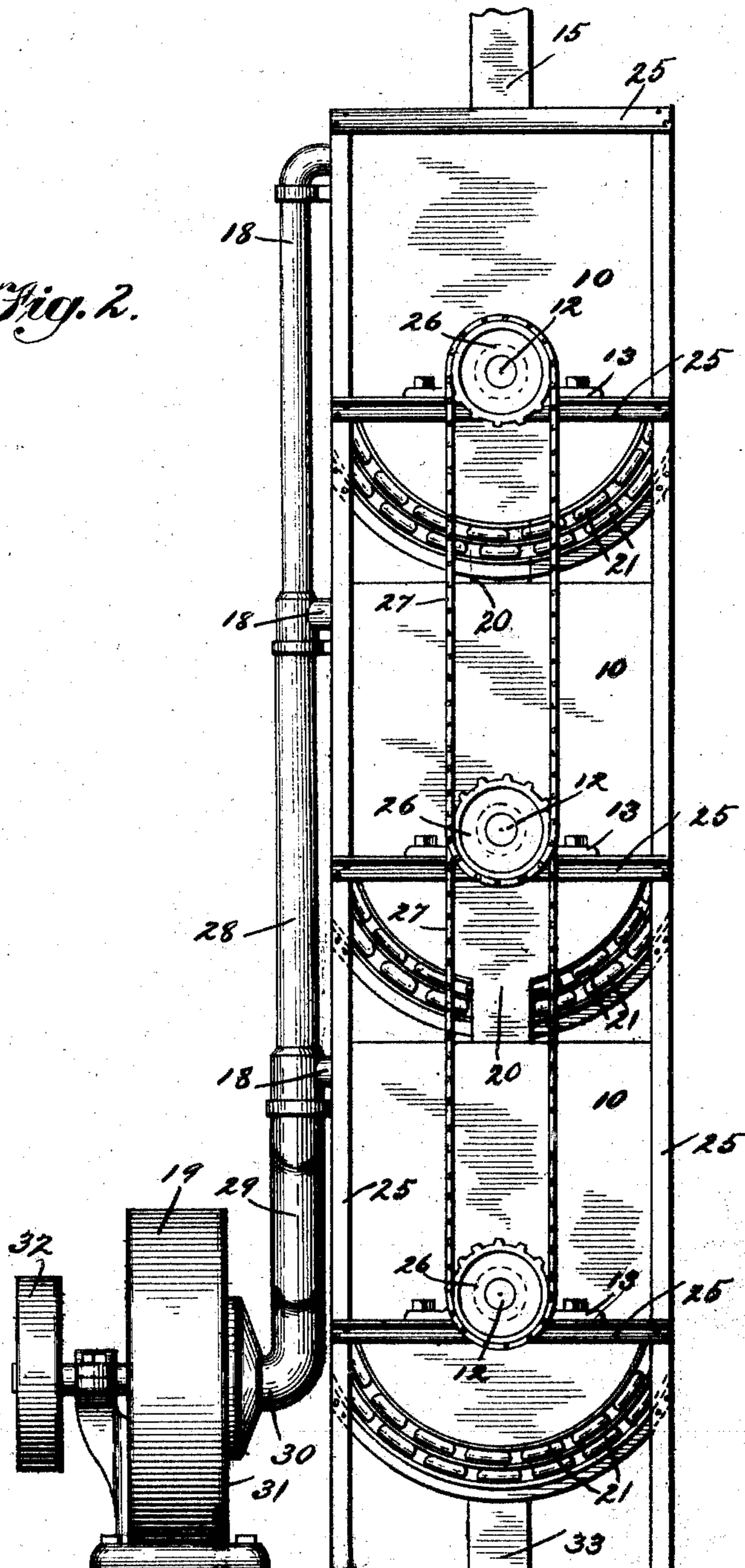
J. D. BOURDEAU.  
DRIER.

APPLICATION FILED JAN. 20, 1902.

NO MODEL.

4 SHEETS—SHEET 2.

*Fig. 2.*



*Witnesses:*

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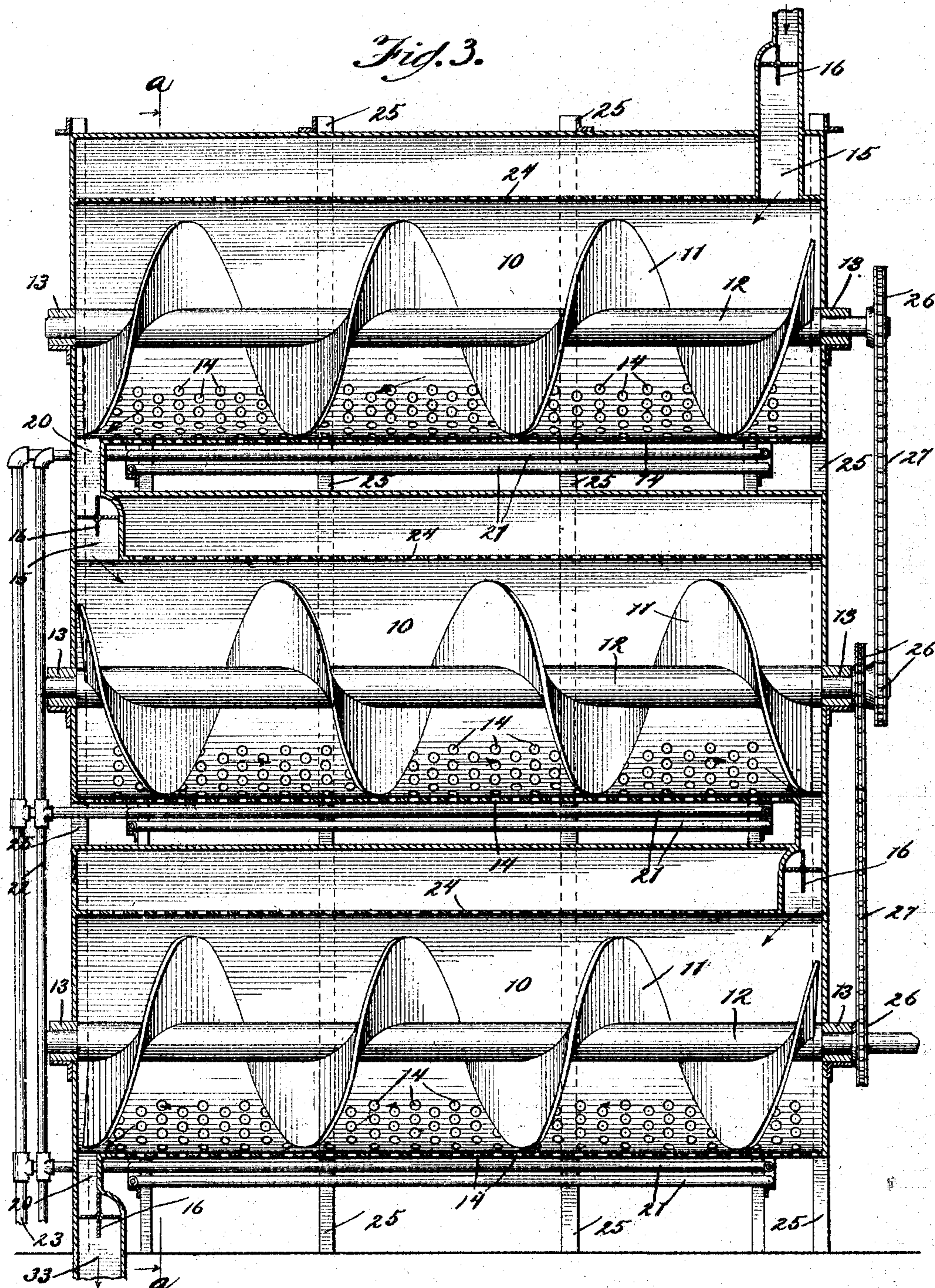
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4 SHEETS—SHEET 3.



Witnesses:

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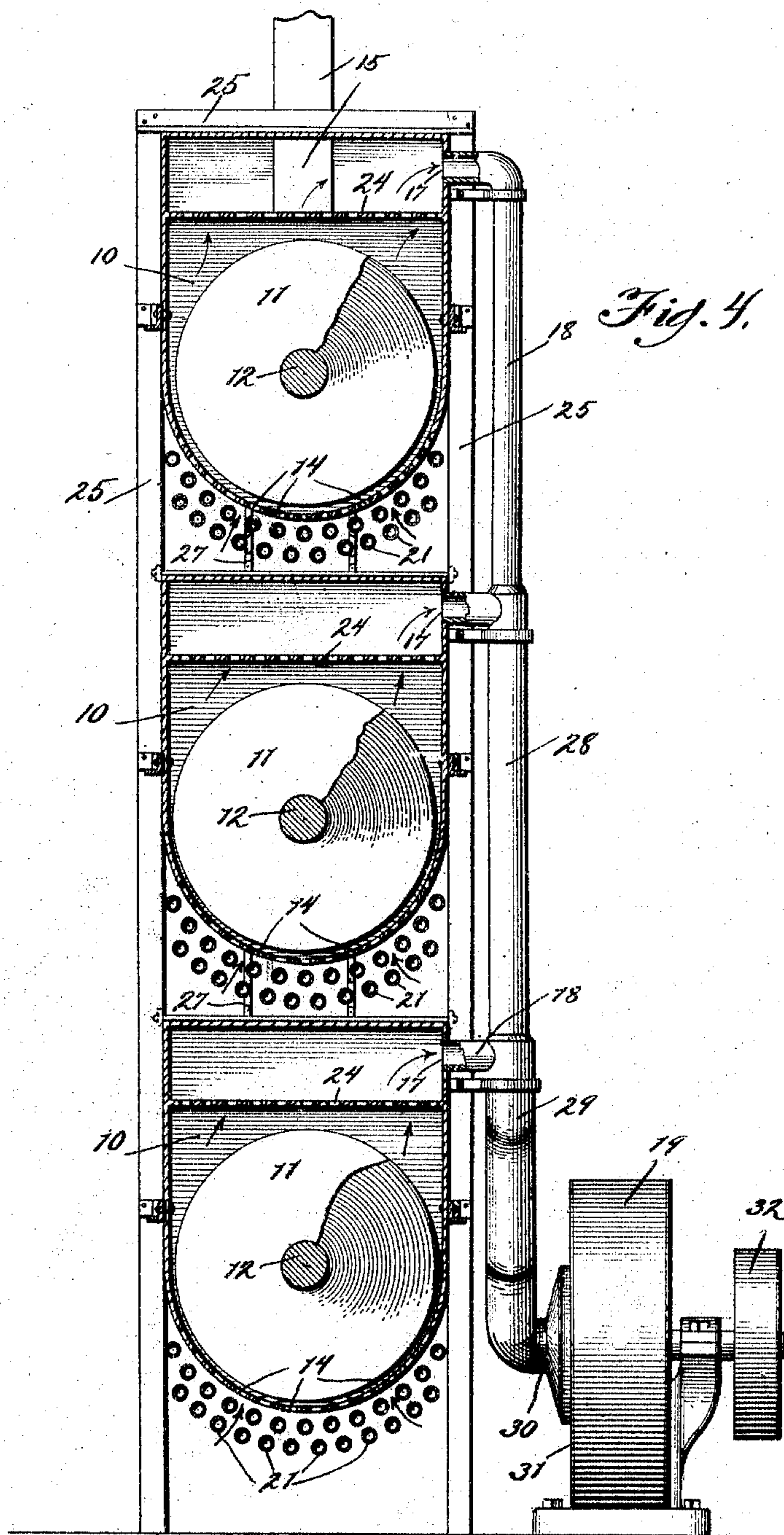
J. D. BOURDEAU.

DRIER.

APPLICATION FILED JAN. 20, 1902.

NO MODEL.

4 SHEETS—SHEET 4.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

JESSE D. BOURDEAU, OF BATTLECREEK, MICHIGAN, ASSIGNOR TO BOURDEAU FOOD COMPANY, LIMITED, OF BATTLECREEK, MICHIGAN.

## DRIER.

SPECIFICATION forming part of Letters Patent No. 764,552, dated July 12, 1904.

Application filed January 20, 1902. Serial No. 90,538. (No model.)

*To all whom it may concern:*

Be it known that I, JESSE D. BOURDEAU, a citizen of the United States, residing at Battlecreek, in the county of Calhoun and State of Michigan, have invented certain new and useful Improvements in Driers, of which the following is a specification.

My invention relates to certain new and useful improvements in driers which may be employed for drying any materials, but which are designed especially to be used in drying cooked cereal foods; and it is the object of the invention to secure a device of this class in which the material will be uniformly dried from the center to the surface of each kernel and in which the drying may be carried on continuously.

Another object of my invention is to produce an apparatus of this class in which the temperature and moisture of the air used in drying may be regulated as may be necessary to produce the best results in all the varying conditions of temperature and moisture in the atmosphere.

To illustrate my invention, I annex hereto four sheets of drawings, in which the same reference characters are used to designate identical parts in all the figures, of which—

Figure 1 is a front elevation of the drier. Fig. 2 is an end elevation thereof. Fig. 3 is a central longitudinal section, and Fig. 4 is a vertical section on the line *a a* of Fig. 3.

In carrying out my invention I employ one or more troughs 10, preferably constructed of sheet-iron and U-shaped in cross-section, the bottom being curved on the arc of a circle to cooperate with the screw conveyer 11, secured to the shaft 12, mounted to rotate in the bearings 13 in the end of the trough. The trough has formed in the bottom thereof the perforations 14, which extend over only so much of the bottom as is adapted to be covered by the grain and are small enough so that the grain cannot escape through them. The trough has at one end the inlet-trunk 15, through which the grain enters. This trunk has located therein the valve or gate 16, which is rotated by the action of the falling grain and serves to prevent the entrance of air with

the grain, it being desired that all the air which enters the trough enter through the perforations 14. Distributed along one side of the trough near its upper end are one or more apertures 17, which are connected by the pipes 18 with a suction-fan 19, by the operation of which the air is drawn up through the apertures 14 through the grain which is being dried and thence through the apertures 17, the troughs being air-tight except for the apertures mentioned and the discharge-aperture 20, formed in the bottom thereof, at the end opposite to the entrance-aperture.

In connection with each trough I preferably employ one or more rows of steam-pipes 21, which are supplied with the necessary quantity and pressure of steam from the pipe 22 and from which the steam or water of condensation is discharged through the return-pipe 23. As seen in Figs. 2 and 4, these steam-pipes extend beneath the bottom of the trough in proximity to the apertures 14, so that in case any artificial heat is necessary in connection with the drying it may be obtained by drawing the air over the steam-pipes before drawing it through the grain. I may employ in connection with each trough a screen-plate 24, suitably perforated above the conveyer and beneath the apertures 17, which prevents the grain or other material from being drawn out of the trough in case the current of air should become too strong.

In the description heretofore given I have described one single section of my drier, and it will be apparent that this section might be extended to any length required to complete the drying of the material; but in order to secure an economy of floor-space I preferably divide the trough into several sections and place them one above another, as illustrated. In doing this I employ a framework 25, which is built up of strips of angle-iron, which are secured together in any design or manner that may be necessary to accommodate the arrangement of the troughs. These sections of troughs are placed one above the other, and the shafts 12 of the various conveyers are supplied with sprocket-wheels 26 of uniform size on one end thereof, and these sprocket-wheels

are connected by the sprocket-chain 27, this illustrating a convenient form of gearing by which all the shafts may be driven simultaneously from a single source of power and at a uniform rate of speed. The pipes 18 of the upper trough are conveniently turned downward and are joined with the pipes 18 of the trough immediately beneath them, the vertical portions 28 of the pipes 18 of the lower troughs being enlarged to increase the air capacity of the pipes. Similarly the pipes 18 from the lowermost troughs open into the enlarged pipes 29, which receive the pipes 28, and these large pipes 29 converge to form the pipe 30, which enters into the casing 31 of the suction-fan 19, which is driven by the belt-wheel 32 by any convenient source of power.

The operation of the complete apparatus will be readily apparent. The grain enters through the uppermost gate 16 and passes along the length of the uppermost trough, being moved therethrough gradually by the action of the conveyer and having a supply of air of any desired temperature drawn through it constantly as it is passing through the trough. At the end of the uppermost trough it escapes through the discharge-aperture 20, which opens into the trunk 15 of the second trough, and passing through the gate 16 of the second trough it enters into said trough and is carried the length of it in the same manner, the conveyer of this trough being shaped so as to carry the grain in the opposite direction, during which passage it is operated on by the air as in the first trough. At the end of this trough it escapes to the third trough, and so on until the drying is finally completed, and it is discharged into the trunk 33, which carries it to the place or mechanism where it is next operated on.

By the construction herein shown and described it will be apparent that I am able to very rapidly dry any grain at any desired speed and temperature, as by regulating the draft of the suction-fan the speed of the drying may be controlled in that way. The speed of the drying may also be controlled by the use of the steam-pipes to increase the amount of heat applied to the air used in drying. By the employment of my apparatus I am enabled to control all the conditions of drying any grain so as to secure any desired result, the time, temperature, and drying being entirely under my control. Inasmuch as the heat applied to the air prior to passing through the drier expands the air and proportionately diminishes the amount of moisture in a given volume of air, the amount of moisture in the air used in the drier is to this extent under my control.

While I have shown steam-pipes placed beneath the troughs as the preferred method of applying heat to the air used in drying, it will be apparent that the air may be heated by other methods and that I do not desire to

be limited to the employment of steam-pipes when heat is required. It will also be apparent that in case it is desired to more than dry the grain it may be roasted by simply increasing the temperature of the air which is drawn through it.

While I have shown my apparatus as embodied in the form which I at present consider best adapted to carry out its purpose, it will be understood that it is capable of some modifications and that I do not desire to be limited in the interpretations of the following claims except as may be necessitated by the state of the prior art.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A drier comprising a vertical series of parallel perforated conduits connected to each other alternately at opposite ends, conveyers in said conduits for feeding the material in opposite directions in alternate conduits, and means for exhausting the air from all of said conduits.

2. A drier comprising a vertical series of horizontally - arranged perforated conduits, vertical conduits connecting said horizontal conduits alternately at opposite ends, worm conveyers in said conduits alternately right and left in succeeding conduits, a common drive connection for all of said conveyers, and means for exhausting air from all of said conduits.

3. A drier comprising a series of parallel perforated conduits alternately connected to each other at opposite ends, means for feeding the material successively through said conduits, a longitudinally - extending exhaust-conduit and connections between said exhaust-conduit and all of said perforated conduits at different points in the length of the latter adapted to uniformly exhaust the air from all portions thereof.

4. In a device of the class described, the combination with a conduit having the perforated bottom, of the conveyer therein for carrying the material longitudinally over said bottom, supply and discharge openings at opposite ends of the conduit, rotating gates in said openings, and a suction device connected by suitable pipes with said conduit above the conveyer so the air can be drawn through the material as it is carried through the conduit by the conveyer.

5. In a device of the class described, the combination with a plurality of superimposed conduits each having a perforated bottom, of the conveyers in said conduits, supply and discharge openings at the opposite ends of said conduits, the discharge-opening of one conduit serving as a supply-opening for the conduit beneath it, rotating gates in said supply and discharge openings, a plurality of pipes opening into said conduits above the conveyers and connected to form a trunk, a suction-fan connected with said trunk, and means for op-