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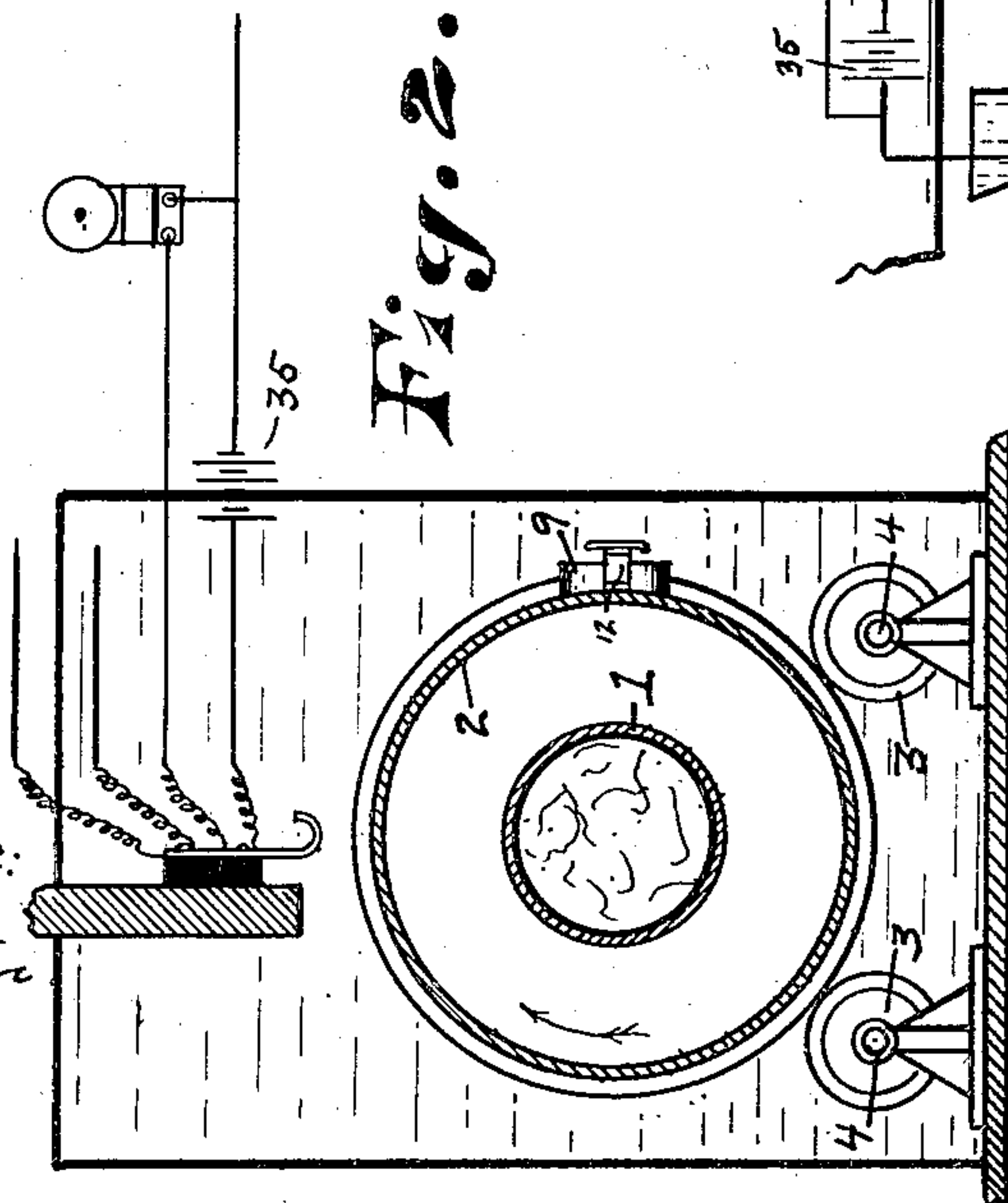
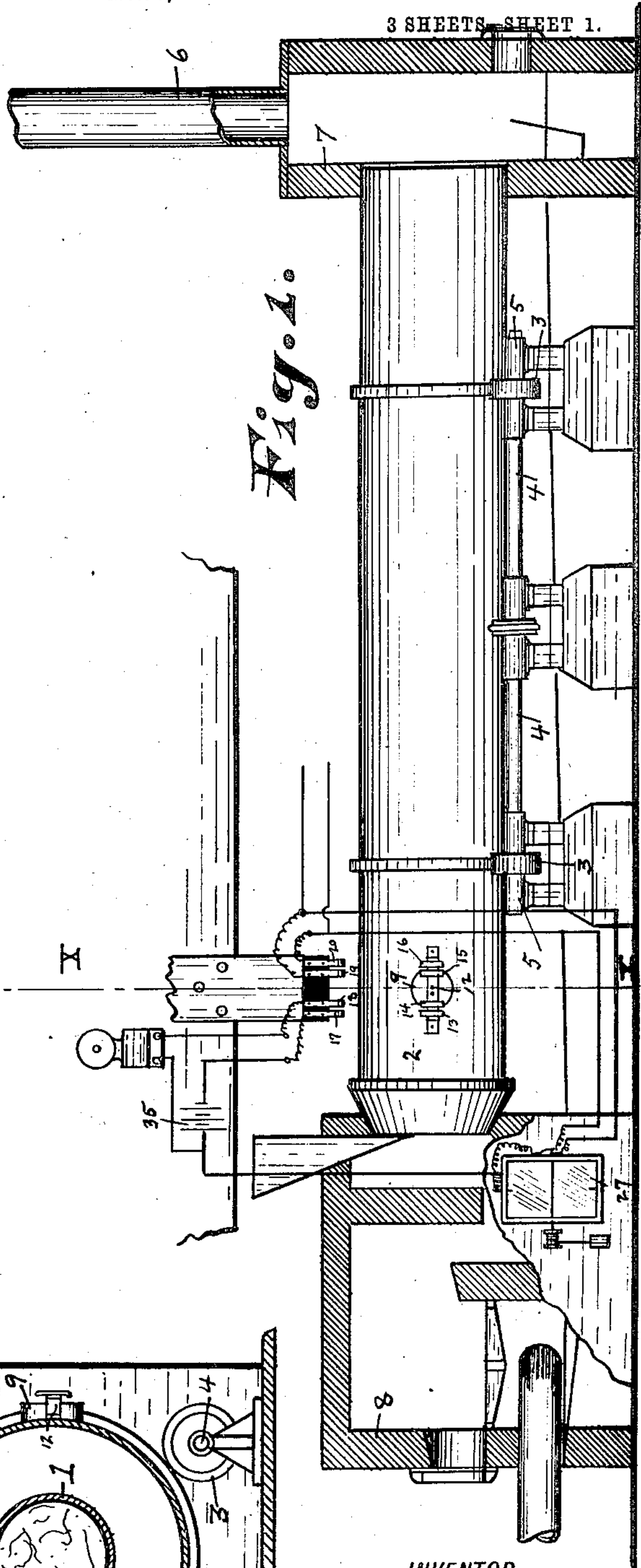
PATENTED AUG. 6, 1907.

H. F. WESTPHAL.

AUTOMATIC TEMPERATURE REGULATOR FOR REVOLUBLE DRYING
APPARATUS.

APPLICATION FILED APR. 7, 1906.

3 SHEETS SHEET 1.



WITNESSES:

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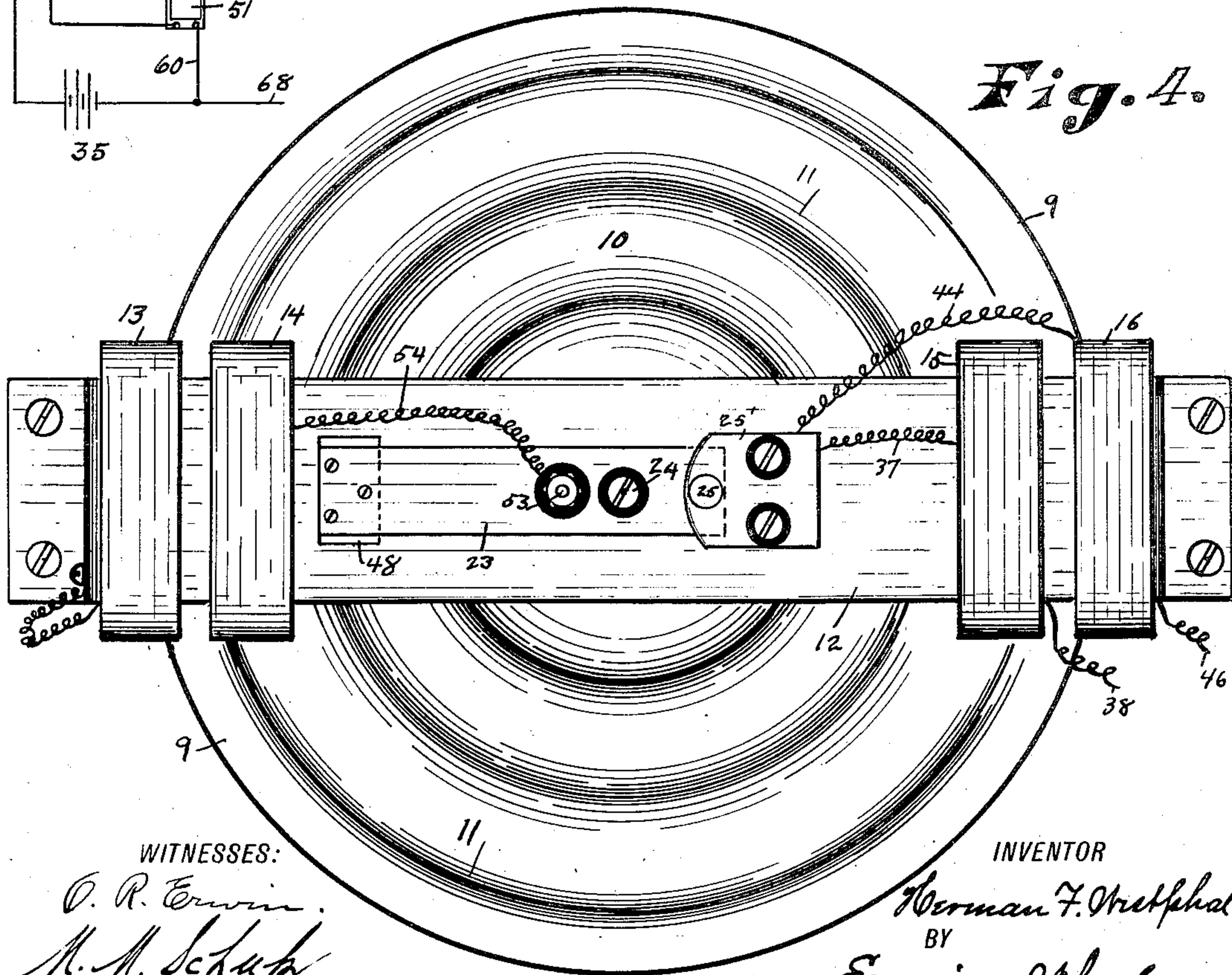
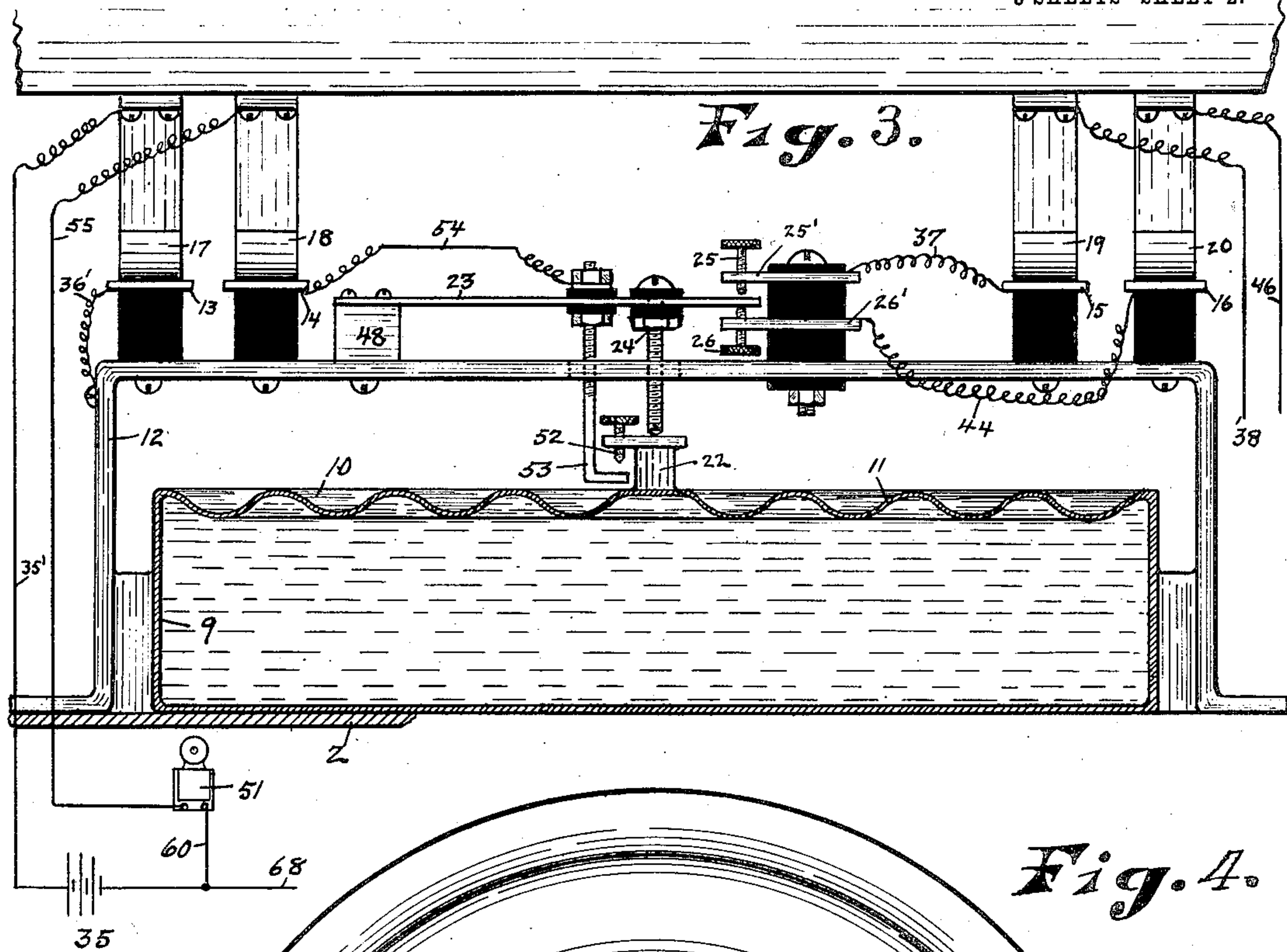
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3 SHEETS—SHEET 2.



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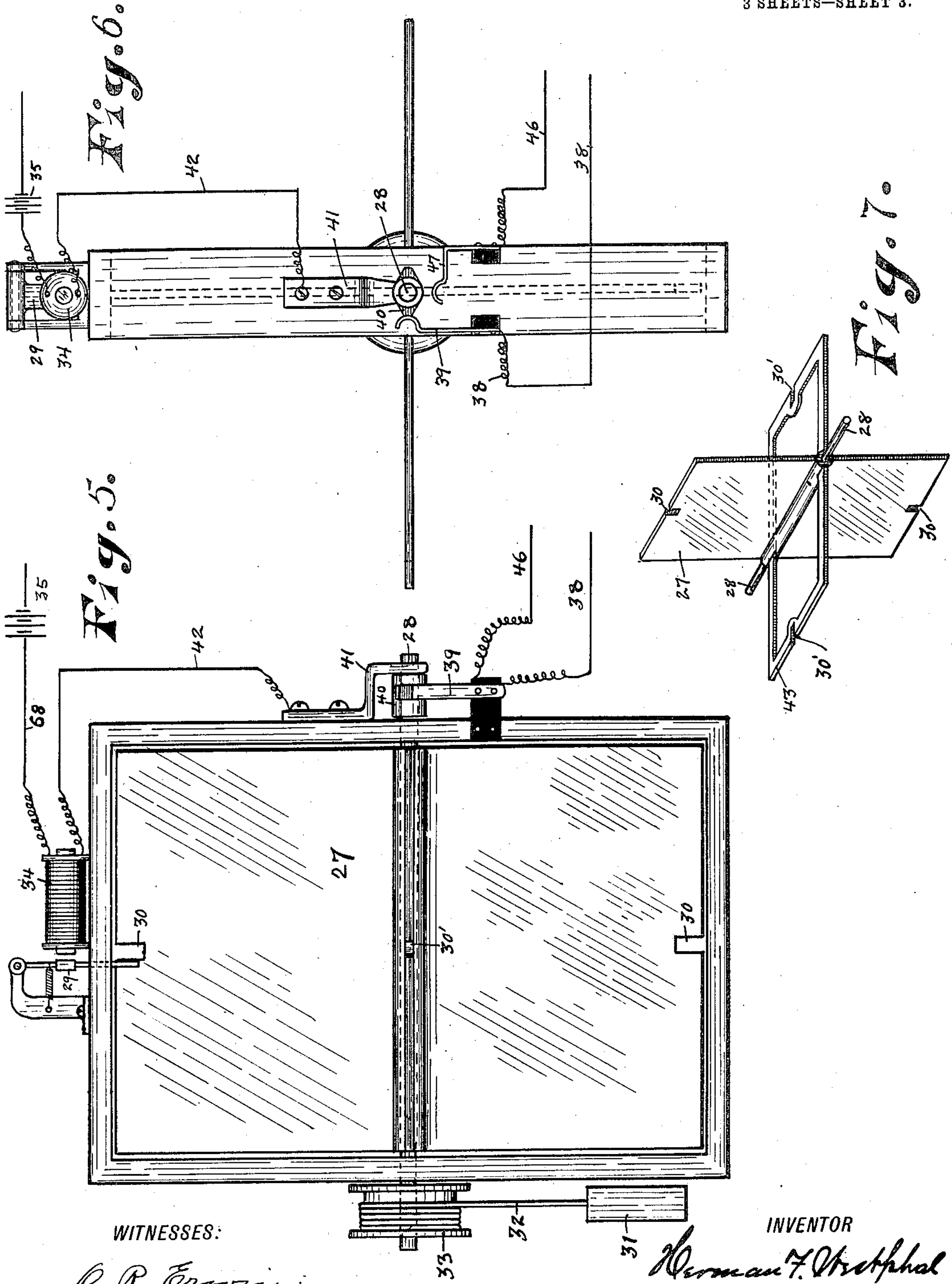
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3 SHEETS—SHEET 3.



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AUTOMATIC TEMPERATURE-REGULATOR FOR REVOLUBLE DRYING APPARATUS.

No. 862,225.

Specification of Letters Patent.

Patented Aug. 6, 1907.

Application filed April 7, 1906. Serial No. 310,419.

To all whom it may concern:

Be it known that I, HERMAN F. WESTPHAL, a citizen of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Automatic Temperature-Regulators for Revolvable Drying Apparatus, of which the following is a specification.

The object of my invention is among other things to provide a device for automatically regulating the temperature of a revolvable drying apparatus and relates to that class of driers which are used for drying grain, brewers' grains, pulp and for any and all purposes where it is desirable to dry material as it is being agitated in a revolvable drying chamber.

It pertains more especially to the mechanism for communicating motion from the heat actuated contact bearings which are connected with a revolvable drying chamber to the temperature controlling valves or doors by which cool exterior air is admitted into or excluded from the revolvable drying chamber or by which the admission of heat through the agency of steam or hot air to the revolvable drying chamber is controlled and regulated.

My invention is further explained by reference to the accompanying drawings, in which,

Figure 1 is a side view of a revolvable drying apparatus comprising a revolvable cylinder and a furnace in connection with my heat regulating apparatus. Fig. 2 is a transverse section of my apparatus drawn on line X—X of Fig. 1. Fig. 3 is a transverse section of an expansion chamber which is connected with the exterior wall of the revolvable drying cylinder and adapted with each revolution of the drying chamber to be brought in contact with the terminals of electric circuits through which circuits the heat regulating doors or valves are automatically controlled. Fig. 4 is a top view of a diaphragm, a side view of which is shown in Fig. 4, with the expansion chamber. Fig. 5 is a front view of the door leading to the drying chamber. Fig. 6 is a side view of a weight actuated door in connection with a device for electrically controlling the same, and Fig. 7 is a perspective view of the doors and revolvable frame shown in Figs. 6 and 7 removed from their supporting stationary frame.

Like parts are identified by the same reference characters throughout the several views.

The drying apparatus comprising among other things the central cylindrical smoke flue 1, inclosing exterior cylinder 2, cylinder supporting rollers 3, roller supporting shafts 4, shaft supporting journal bearings 5, chimney 6, chimney supporting chamber 7 and furnace 8 all of which are substantially of the ordinary construction.

My invention pertains, as before suggested, more especially to the apparatus employed for regulating the temperature within the revolving cylinder 2 as

the material is being dried therein, which apparatus I will now proceed to more specifically describe.

9 represents the expansion chamber which is rigidly fixed to the exterior surfaces of the exterior cylinder 2 and revolves with it. This chamber 9 is provided with a flexible metallic diaphragm 10 which is preferably stamped to form a plurality of concentric corrugations 11, which corrugations serve to increase the flexibility of the same and thereby facilitate its movement. The chamber 9 when in use is provided with an expansive substance which expands and contracts corresponding with the temperature within the revolvable cylinder to which the chamber is attached.

12 is a rectangular frame or bracket which is secured to the cylinder 2 centrally above the diaphragm chamber 9 and serves to support a plurality of electric terminals 13, 14, 15 and 16 which are adapted to register and contact with the stationary contact bearings or brushes 17, 18, 19 and 20 with each revolution of the cylinder 2, whereby electric circuits are closed, as hereinafter described, between the battery 35 and the operative mechanism of the draft doors and steam controlling valves.

The center of the diaphragm 10 is provided with a contact bearing 22 which, when the contents of the chamber 9 expands, is forced outwardly and whereby the switch bar 23 is forced in contact with the terminal 25, motion being communicated from the contact bearing 22 to the switch bar 23 through the adjustable screw 24, and whereby an electric circuit is closed through the medium of which the temperature regulating doors or valves are operated so as to reduce the temperature in the drying chamber when, as a consequence, the temperature in the expansion chamber 9 will be lowered and the movement of the contact bearing 22 will be reversed whereby the switch bar 23 is brought by its own resiliency in contact with the terminal 26 and an electric circuit is closed through the medium of which the heat regulating doors and valves are reversed and the temperature raised, whereby the heat in the chamber may be retained at any desired predetermined temperature which is best adapted to dry the contents in the drying chamber. When the temperature is normal the switch bar 23 which is actuated by the diaphragm will be out of contact with the terminals 25 and 26. 27 represents a door by which air is admitted to or excluded from the drying chamber. This door is centrally pivotally supported upon a shaft 28 and is retained in its closed position indicated in Fig. 6 by the latch 29 which engages the respective ends of the door on one side of the recess 30 as said door revolves. The door is when released from its retaining latch 29 automatically revolved on its supporting shaft and opened by the gravity of the weight 31 acting through its suspension

cord 32 and cord supporting pulley 33 which pulley is rigidly fixed to the shaft 28. The latch 29 is thrown out of contact with the door 27 by the action of the electro-magnet 34. It will be understood that the door 27 and door inclosing frame 43 are rigidly connected together and mounted upon a shaft 28 at right angles to each other as shown in Fig. 7 of the drawings.

It will be understood that when the temperature in the drying chamber is normal the bearings 13, 14, 15 and 16 will be brought in contact with the brushes 17, 18, 19 and 20 with each revolution of the drying chamber without closing an electric circuit or without performing any useful function whatever. When, however, the temperature is above or below the normal, the diaphragm 10 and the connecting switch mechanism will be actuated as hereinbefore described whereby the necessary electric circuits will be formed for actuating the draft controlling doors or the steam controlling valves, as hereinbefore described.

It will be understood that the electric circuit is formed between the battery 35 to the switch bar 23 through the conductor 35' brush 17, contact bearing 13, conductor 36', bracket 12, and switch supporting block 48 and that the electric current is communicated to the door opening mechanism when the temperature is excessive from the switch bar 23 which will thereby be brought in contact with the terminal 25 through the terminal 25, bar 25', conductor 37, contact bearing 15, brush 19, conductor 38, contact bearing 39, revoluble terminal 40, shaft 28, bracket 41, conductor 42, electro-magnet 34, whereby the electro-magnet is energized and the latch 29 which serves as an armature is brought out of contact with the door and the door released, when said door is free to be actuated by the weight 31, as hereinbefore described, when said door is caused to revolve a fourth of a revolution on its supporting shaft, whereby the door frame 43 is brought to the vertical when it is engaged by the latch 29 when the door is thereby locked in its open position at right angles to the frame 43. When the door is thus opened the temperature in the drying chamber will of course be lowered when a reverse movement will be communicated through the diaphragm 10 and contact bearing 22, whereby the position of the electric switch 23 will be reversed and the same brought in contact with the terminals 26 whereby the electric circuit will be closed between said battery 35 and the door actuating latch through said switch bar 23, terminal 26, bar 26', conductor 44, bearing 16, brush 22, conductor 46, contact bearing 47, revolving contact bearing or terminal 40, shaft 28, bracket 41, conductor 42 and thence to the electro-magnet 34, whereby the electro-magnet is again energized and said latch 29 is drawn out of engagement with the recess 30' of the revoluble frame 43, whereby said frame is released when the door and frame are again revolved on their supporting shaft and the door brought to a closed position where it is retained by said latch.

It will be understood that if the electric circuit between the battery with the electro-magnet were to remain closed after the door has been released then the latch would not be in position to engage the revoluble door inclosing frame. Consequently it becomes necessary to break the electric circuit when the door is released so that the latch 29 will be released from the

electro-magnet and brought back to its normal position, preparatory to engaging the frame, and as a consequence the electric circuit would be closed between the battery and electro-magnet with each revolution of the drying drum. It therefore becomes necessary to provide means for automatically cutting out the electric circuit as soon as either the door or door supporting frame escapes from the latch. This end is accomplished by the movement of the revolving terminal 40 which is supported upon the end of the door supporting shaft 28.

It will now be understood that when the door is in the closed position, indicated in Figs. 5 and 6, the terminal 40 will be brought in contact with the resilient contact arm 39, whereby the electro-magnet 34 will be energized and the latch 29 drawn out of contact with the door when the door will be free to revolve as previously described, whereby the revolving terminal 40 will be brought out of contact with the arm 39 and the electric circuit will be cut out when said terminal 40 will be brought in contact with the circuit closing arm 47 when contact will be made at this point preparatory to closing the electric circuit as soon as the temperature in the heater has been so reduced as to close the electric circuit between the switch bar 23 and the opposite terminal 26, it being understood that the door 27 will remain in its open position and no current of electricity will pass from the battery to the electro-magnet until the circuit is closed by the lowering of the temperature and consequently the closing of the circuit, as described.

We have thus far described the mechanism for automatically opening and closing the door through which cool air is admitted to or excluded from the drying chamber, which mechanism is equally adapted for opening and closing an electric circuit with a steam controlling valve or other similar mechanism used for controlling the admission of steam or hot air to the drying chamber, as hereinbefore described. I will now proceed to describe the mechanism by which the electric circuit is closed between the battery and the bell 51. When the temperature in the drying chamber has lowered sufficiently the adjustable terminal 52 will be brought in contact with the terminal 53 and an electric circuit will be closed between the battery and the bell as follows: Beginning with the battery 35 it is closed through the conductor 35', brush 17, contact bearing 13, conductor 36', frame 12, frame supporting cylinder 2, expansion chamber 9, diaphragm 10, contact bearing 22, adjustable terminal 52, terminal 53 which last named terminal is insulated from and supported by switch bar 23, conductor 54, terminal 14, brush 18, conductor 55 and from thence back to the battery through the conductor 60 and bell 51, whereby a signal will be sounded and the operator will be notified that the apparatus requires his attention.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is,

1. In a device of the described class, the combination with a revoluble drying chamber of an expansion chamber, a contact bearing adapted to be moved by the expansion and contraction of the contents of said expansion chamber, a plurality of contact bearings forming electric terminals supported from said revoluble chamber, a plurality of stationary brushes forming electric terminals adapted to contact with said contact bearings with each revolution of the drying chamber, a switch bar yieldingly supported from said drying chamber and adapted to revolve with it, a stationary battery located at a

distance from said switch bar, means for forming an electric circuit between said battery and said switch bar with each revolution of said drying chamber, electric terminals located upon the respective sides of said switch bar against which said bar is adapted to contact as the same is raised or lowered, means for communicating forward and backward movement from the contact bearing of said expansion chamber to said switch bar as the contents of said chamber is expanded and contracted, a door or valve, mechanism for operating such door or valve, means for closing an electric circuit between either of said terminals and the door or valve actuating mechanism with each revolution of said drying chamber, whereby the position of said door or valve will be automatically changed, opened if closed and closed if opened.

2. In a device of the described class the combination with a revoluble drying chamber of an expansion chamber provided with a flexible diaphragm, a contact bearing connected with and adapted to be moved by said diaphragm, a metallic frame supported above said diaphragm, a plurality of contact bearings forming electric terminals supported from said frame, a plurality of stationary brushes forming electric terminals adapted to contact with said contact bearings with each revolution of the drying chamber, a switch bar yieldingly supported from said frame, a stationary battery located at a distance from said switch bar, means for forming an electric circuit between said battery and said switch bar with each revolution of said drying chamber, electric terminals located upon the respective sides of said switch bar against which said bar is adapted to contact as the same is raised and lowered, means for communicating a forward and backward movement from the contact bearings of said expansion chamber to said switch bar as the contents of said chamber is expanded and contracted, a door or valve, mechanism for operating such door or valve, means for closing an electric circuit between either of said terminals and the door or valve actuating mechanism with each revolution of said drying chamber whereby the position of said door or valve will be automatically changed, and opened if closed and closed if open.

3. In a device of the described class, the combination with a revoluble drying chamber of an expansion chamber, a contact bearing adapted to be moved by the expansion and contraction of the contents of said chamber, a plurality of contact bearings forming electric terminals supported from said revoluble chamber, a plurality of stationary brushes forming electric terminals adapted to contact with said first named contact bearings with each revolution of the drying chamber, a switch bar yieldingly supported from said drying chamber and adapted to revolve with it, a stationary battery located at a distance from said switch bar, means for forming an electric circuit between said battery and said switch bar with each revolution of said drying chamber, electric terminals located upon the respective sides of said switch bar against which said bar is adapted to contact as the same is raised or lowered, means for communicating a forward and backward movement from the contact bearing of said expansion chamber to said switch bar as the contents of said chamber is expanded and contracted, a draft door communicating with the revoluble drying chamber centrally supported upon a revoluble shaft, means for locking said door in its closed and open position, means for automatically revolving said door when released from its locking mechanism, means for closing an electric circuit between either of said terminals and the locking mechanism of said door with each revolution of said drying chamber when the switch bar is in contact with said terminals.

4. In a device of the described class, the combination with a revoluble drying chamber of an expansion chamber, a contact bearing adapted to be moved by the expansion and contraction of the contents of said chamber, a plurality of contact bearings forming electric terminals supported from said revoluble chamber, a plurality of stationary brushes forming electric terminals adapted to con-

tact with said first named contact bearings with each revolution of the drying chamber, a switch bar yieldingly supported from said drying chamber and adapted to revolve with it, a stationary battery located at a distance from said switch bar, means for forming an electric circuit between said battery and said switch bar with each revolution of said drying chamber, electric terminals located upon the respective sides of said switch bar against which said bar is adapted to contact as the same is raised or lowered, means for communicating a forward and backward movement from the contact bearing of said expansion chamber to said switch bar as the contents of said chamber is expanded and contracted, a revoluble door and door inclosing frame arranged at right angles to said door and supported upon the same shaft, said door and frame being provided at their respective ends with recesses for the reception of a retaining latch, a retaining latch pivotally supported upon said stationary frame above said door and revoluble frame, said latch being adapted to serve the two fold purpose of a latch and an armature to an electro-magnet, an electro-magnet located in close proximity to said latch, means for closing an electric circuit between either of said terminals and said electro-magnet with each revolution of said drying chamber when said terminals are in contact with said switch bar, whereby said latch is drawn out of engagement with said revoluble door and said door inclosing frame and said door is opened and closed and the temperature of said drying cylinder thereby regulated.

5. In a device of the described class, the combination with a revoluble drying chamber of an expansion chamber, a contact bearing adapted to be moved by the expansion and contraction of the contents of said chamber, a plurality of stationary brushes forming electric terminals adapted to contact with said first named contact bearings with each revolution of the drying chamber, a switch bar yieldingly supported from said drying chamber and adapted to revolve with it, a stationary battery located at a distance from said switch bar, means for forming an electric circuit between said battery and said switch bar with each revolution of said drying chamber, electric terminals located upon the respective sides of said switch bar against which said bar is adapted to contact as the same is raised or lowered, means for communicating forward and backward movement from the contact bearing of said expansion chamber to said switch bar as the contents of said chamber is expanded and contracted, a revoluble door a door inclosing frame arranged at right angles to said door a door and frame supporting shaft, said door and frame being provided at their respective ends with recesses for the reception of a retaining latch, a retaining latch pivotally supported upon said stationary frame above said door and revoluble frame, an armature affixed to said latch, an electro-magnet located in close proximity to said armature, means for closing an electric circuit between either of said terminals and said electro-magnet with each revolution of said drying chamber, when said terminals are in contact with said switch bar, means controlled by the revolving movement of said draft door and revoluble door inclosing frame for opening the electric circuit between either of said terminals and said electro-magnet the instant said latch is brought out of engagement with the retaining recess of said door or door inclosing frame, whereby said latch will remain in its normal position out of contact with the electro-magnet and the electric circuit cut out after having disengaged the latch from the door or frame during the interval of time that the switch bar is being moved from one of said terminals to the other by the change of temperature in the drying chamber.

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

HERMAN F. WESTPHAL.

Witnesses:

JAS. B. ERWIN,
O. R. ERWIN.