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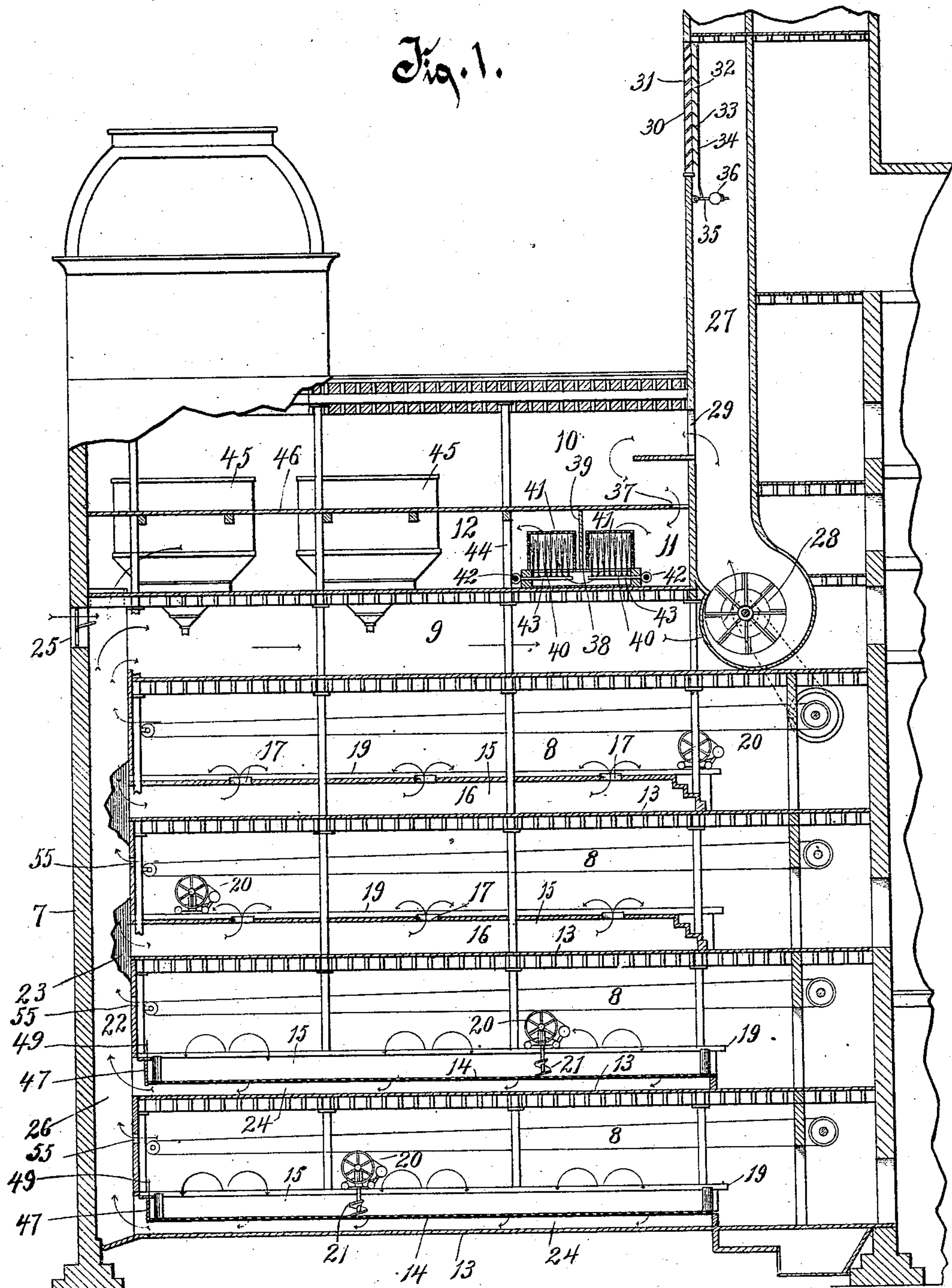
5 Sheets—Sheet 1

J. F. DORNFELD.  
MALT HOUSE.

No. 532,544.

Patented Jan. 15, 1895.

Fig. 1.



Witnesses.  
A. Keeney.  
Amos V. Faust

Inventor.  
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(No Model.)

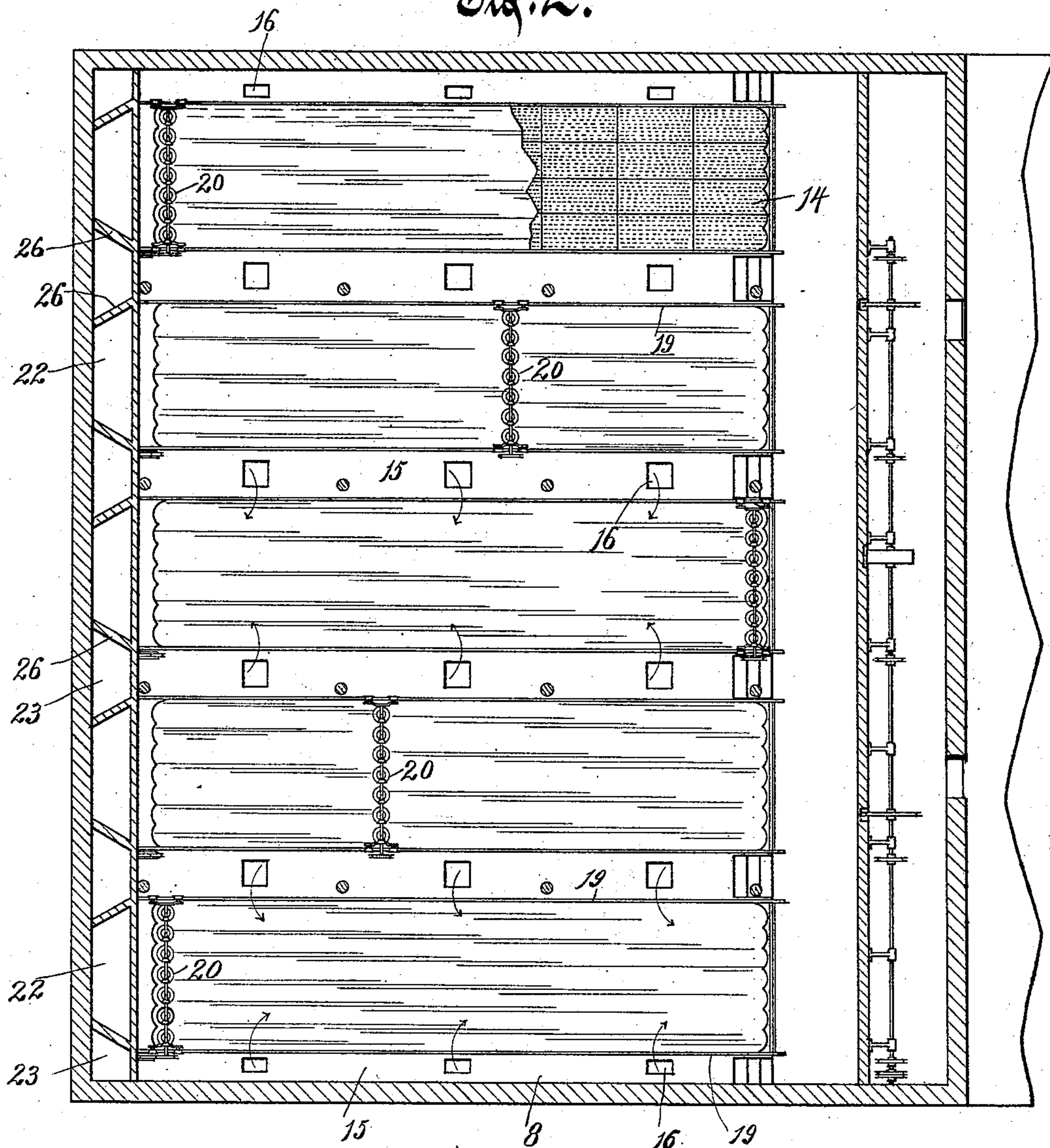
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Fig. 2.



Witnesses.

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(No Model.)

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Fig. 3.

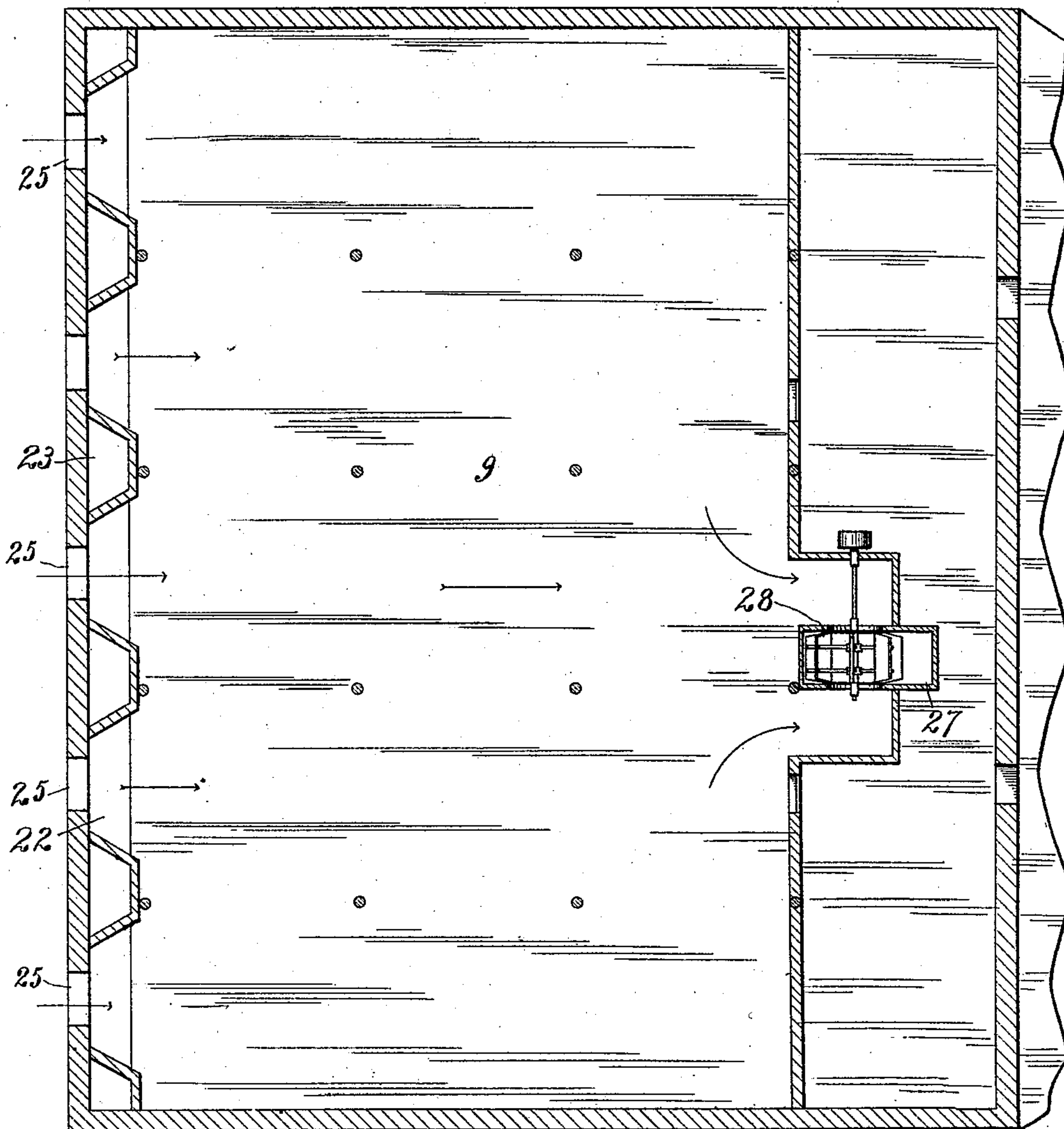
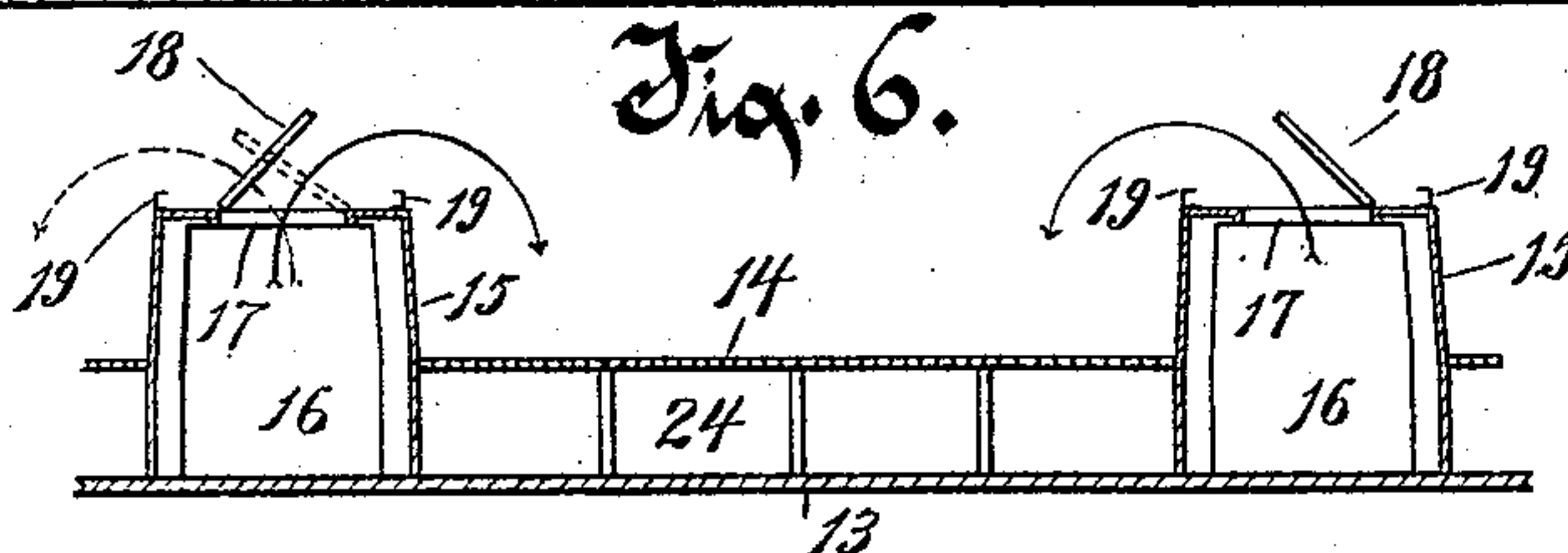


Fig. 6.



Witnesses.

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(No Model.)

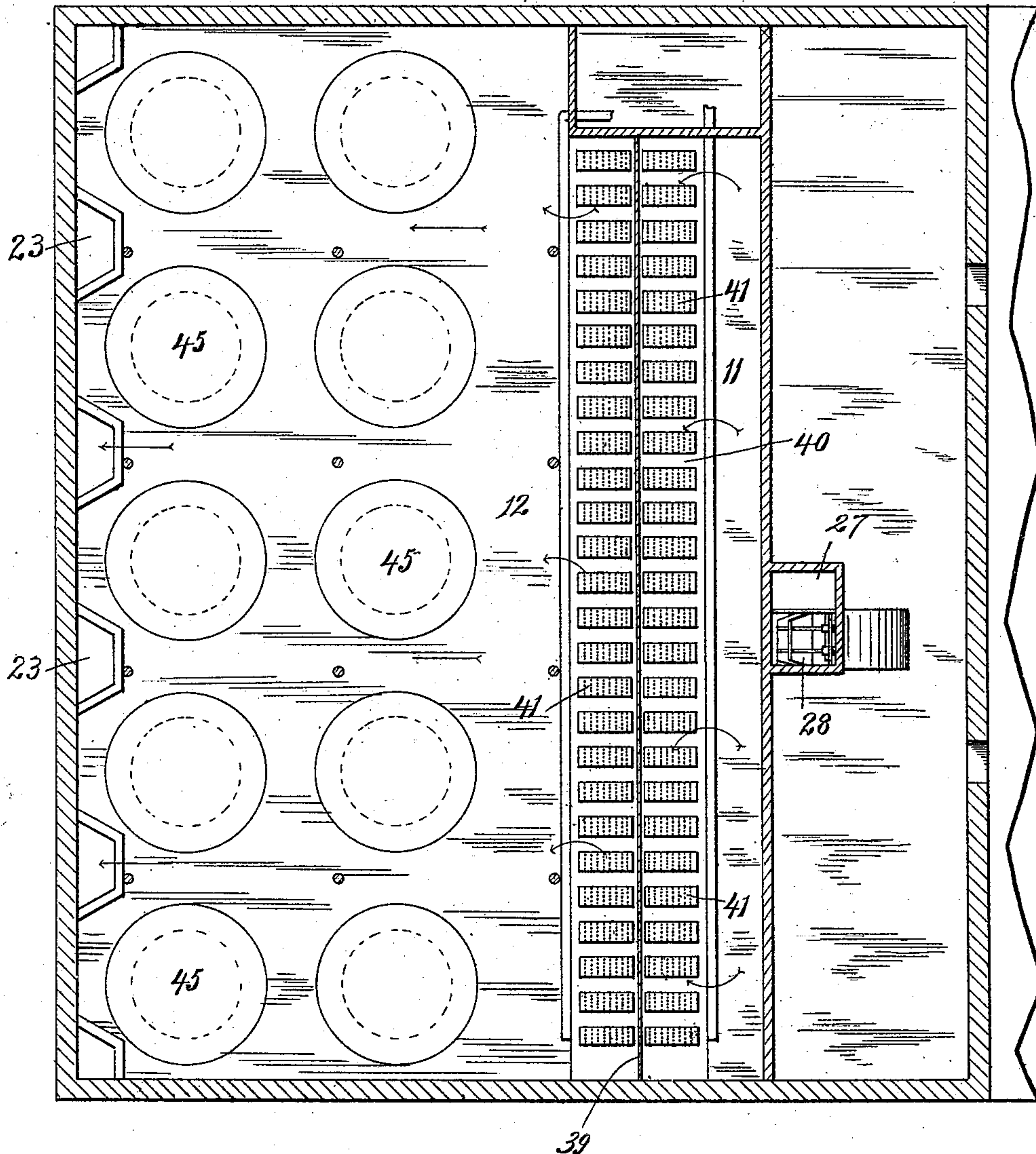
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J. F. DORNFELD.  
MALT HOUSE.

No. 532,544.

Patented Jan. 15, 1895.

Fig. 4.



Witnesses.

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*Anna V. Faust*

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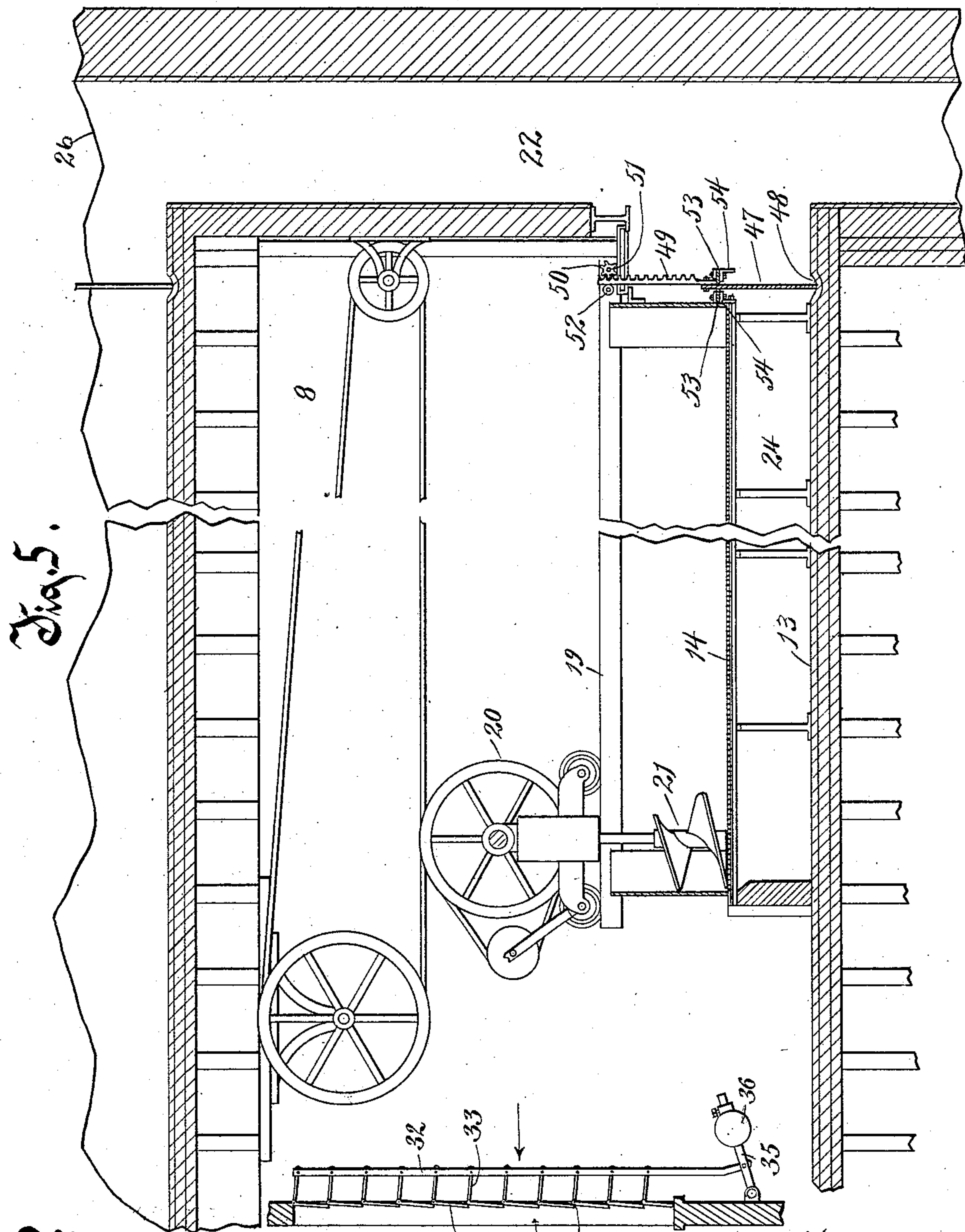
(No Model.)

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J. F. DORNFELD.  
MALT HOUSE.

No. 532,544.

Patented Jan. 15, 1895.



Witnesses.

*A. H. Keeney.*

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Fig. 7.

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# UNITED STATES PATENT OFFICE.

JOHN F. DORNFELD, OF CHICAGO, ILLINOIS.

## MALT-HOUSE.

SPECIFICATION forming part of Letters Patent No. 532,544, dated January 15, 1895.

Application filed May 8, 1894. Serial No. 510,454. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN F. DORNFELD, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Malt-Houses, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention has relation to a pneumatic malting system.

The object is to provide an improved malt house involving the least possible expense in its operation and construction, and one wherein simplicity and effective and practically perfect results are obtained.

The invention consists of the device and parts, or their equivalents, as hereinafter more fully described and claimed.

In the accompanying drawings, Figure 1, is a longitudinal section of the entire malting house, with parts broken away, the first and second stories being sectioned through the centers of the malting floors, and the third and fourth stories through the boxes 16. Fig. 2, is a floor plan of one of the four germinating floors shown in Fig. 1. Fig. 3, is a floor plan of the fifth story, or exhaust air room. Fig. 4, is a floor plan of the sixth story, comprising the air distributing room, the attenuating room, and the moist air room. Fig. 5, is a longitudinal section of one of the germinating compartments, to show clearly the exhaust air cut off valve or gate at the back end. Fig. 6, is a transverse section of compartment, showing clearly the feed of the air to the malting floor, and Fig. 7 is a detail view of the valves 31, and mechanism in connection therewith.

Like numerals of reference denote like parts throughout the several views.

Referring to the drawings, the numeral 7 indicates the malt house which is shown in the drawings as composed of six stories, the first four stories, designated by the numeral 8 being germinating compartments, the fifth story, 9, an exhaust air room, and the sixth story divided into an air distributing room 10, an air attenuating room 11, and a moist air and steep tank room 12.

Upon each floor 13 of a malting room or compartment is built a perforated malting floor 14, which is located about one-third of

the distance from the floor of the malting room to the top compartment thereof. This malting floor is composed of sections, and each section is arranged between side boxes 15, 15, which form channels 16, 16, said boxes provided with openings 17, 17 in their tops, which openings are controlled by means of lids or covers 18, 18. See Fig. 6. Upon the tops of the boxes 15, 15 are arranged tracks 19, upon which tracks the malt stirring machines 20 travel; said machines carrying rotating plows 21, which extend down and operate upon the malt on the floors 14. These machines may be of any desired construction, but I prefer to employ the style shown, described, and claimed in my pending application for patent, for improvements in malt turning or stirring machines, filed April 9, 1894, Serial No. 506,848.

A malt stirring machine may be employed for each compartment, but the system admits of one being employed for each floor, comprising three or four compartments.

In the first and second stories of the building illustrated in Fig. 1, the malting floors are shown as sectioned longitudinally, while in the third and fourth stories the boxes 15 are so sectioned.

Along one side of the building runs a series of vertical exhaust and fresh air flues 22 and 23, respectively, the former communicating directly with the germinating compartment through passages 24 beneath the malting floors, and also communicating at their tops with the exhaust air room 9. The flues 23 communicate with the channel 16, and at their upper ends lead to the moist air room 12. The exhaust air room 9 may also be supplied with fresh air by means of valve-controlled openings similar to 25 Fig. 1. It will be noticed that the partitions 26 forming the flues 22 and 23 run diagonally between said flues. This arrangement adds to the capacity of the fresh air flues without decreasing the widths of the exhaust flues where said flues also join with the exhaust compartments.

To one side of the exhaust air room and the attenuating and air distributing compartments above, is an air shaft 27, which shaft extends vertically above the roof of the building. The lower end of the shaft is enlarged to form a fan casing, which casing communi-



cates with the exhaust air room 9. A rotatable fan 28 is arranged within the fan casing. The shaft 27 also communicates with the air distributing room 10 through an opening 29.

5 Another opening 30 is provided at the upper end of shaft 27. This latter opening is controlled by means of pressure regulating slats or valves 31. These pressure regulating slats or valves are pivoted at the points 32, and

10 have extending at angles therefrom rigid arms 33, said arms pivotally connected with a vertical rod 34, which rod in turn is connected at its lower end to a pivoted arm 35, said arm carrying thereon a weight 36. In

15 Fig. 1 the slats are shown as partly open, while in the detail view Fig. 7, said slats are shown as closed. The air acting against the slats in the direction indicated by the arrow Fig. 7, and at a certain pressure, will have

20 the effect of opening the slats to the position shown in Fig. 1, and allowing the weighted arm 35 to drop. The weight of course is a counterbalance for the slats. When said weight is moved inwardly on the arm 35, or

25 toward the pivot of said arm, the slats will then open only under greater pressure, and when said weight is moved outwardly on the arm, the slats are open under a decreased pressure.

30 I do not wish to be understood as confining myself to the specific construction of slats shown, inasmuch as any other desirable form of valve acting to open automatically under excess pressure will answer.

35 The air distributing room 10 communicates with the attemperating room 11, by means of an opening 37 in the floor of the former. Within the attemperating room is a raised flooring 38, which is divided into two sections

40 by means of a partition 39. Each section of the raised flooring is provided with a series of longitudinally arranged openings 40, over which are placed perforated attemperating hoods 41. Running parallel with each row

45 of hoods are pipes 42, 42, which lead to a suitable source or sources of supply. These pipes are provided with a series of branches 43, one being employed for each hood, and extending beneath said hoods. These branch pipes have

50 projecting therefrom a series of nozzles which spray the water issuing from the same up into the hoods.

The air attemperating device just described is the same as that covered in my

55 Letters Patent No. 513,487, dated January 30, 1894, for improvements in apparatuses for attemperating air, excepting that the partitions between the two sets of hoods run straight instead of zigzag. This straight partition

60 permits of greater capacity than the zigzag form shown in the Letters Patent referred to. The attemperating room is in open communication with the moist air and steep tank room 12 as shown at 44. In this room 12 are located

65 the steeping tanks 45. It will, therefore, be seen that the space necessary for the steep tanks is utilized as a reservoir or passage for

the attemperated fresh air which is forced therefrom through the flues to the malt rooms below. This air in the moist air room 12 also

70 furnishes the desired temperature to that space both in the winter and summer. The moist air room is divided horizontally by a partition 46, which forms a platform, enabling ready access to be obtained to the steeping

75 tanks.

Each malt compartment has a valve or cut off slide at the back end for shutting off communication with the space 24 beneath the malting floors. This valve or gate is shown

80 clearly in Fig. 5, and is indicated by the numeral 47. Its lower edge fits, preferably, in a recess 48 in the floor 13 of the malting compartment. To its upper edge is attached

85 a rack bar 49, which engages with a small pinion 50 carried on a shaft 51, said shaft provided at its end with a suitable operating handle or lever (not shown). A small roller

52 holds the rack in engagement with the pinion. The valve or gate 47 passes between

90 two rubber, or other flexible, plates 53, 53 secured to angle bars 54, 54. These plates bear tightly against opposite sides of the valve or gate, whereby, when said valve or gate is closed, the air is prevented from escaping

95 from the space 24.

Small openings 55 are provided in the wall of each room, said openings leading to the exhaust air flues 22. These openings permit

100 any impure air in the rooms to be constantly drawn out through the same into the exhaust air flues.

In the operation of my improved system, by rotating the exhaust fan on the fifth floor a partial vacuum is produced on this floor,

105 which will extend down each air shaft 22. By opening any one of the valves or gates 47 this vacuum is extended to the space 24 beneath the malting floor, and will cause a movement of moisture saturated air down and

110 through the malt, removing the heat and carbonic acid gas contained in the malt. The exhaust fan discharges the exhaust air into the air shaft 27, and from said shaft into the air distributing room through the opening

115 29, the air in the shaft 27 being forced by pressure into the air distributing room 10 as described. From the air distributing room it passes down through the opening 27 into the attemperating room 11, and after circu-

120 lating through the attemperating hoods, it passes by way of the open side 44 into the moist air chamber 12, and thence down the air flues 23, and along the fresh air channel 16. The air pressure in shaft 27 is so regu-

125 lated that its force is sufficient to deliver the air into the channel 16 to the opening 17, at which point the pressure is worn out. The air now passes through the opening 17 into the rooms 8. This fresh and humid air being

130 the least unobstructed volume of air, and the nearest to the perforated malting floor, will follow the slightest suction, and hence rush in and through the malt, thence into the pas-



sage 24 to the flue 22, and by said flue to the chamber 9, and from said chamber to the exhaust fan, thus completing the circuit of ventilation. Since some of the oxygen of the circulated air is consumed, fresh air must be admitted, while the carbonic acid gas is condensed by water, and partly discharged by exhaust. It is for the purpose of supplying this fresh air that I provide the valve regulating openings 25. If no outlet were provided for this overplus air, the pressure of the air would, of course, exceed the pressure required for forcing a column of air down the flues 23 into channels 16 to the openings 17. It is to provide for the escape of this overplus air that I employ the relief and pressure regulating valve 31. The amount of fresh air admitted through the openings 25 is controlled by valves in said openings. The amount discharged through the opening 30 of the air shaft 27 is equal to the amount admitted through said openings 25, this equalization being secured by a proper adjustment of the weight 36 on the rod 35. By moving this weight to the right or left, the air pressure in the shaft 27 can, of course, be increased or decreased.

By reference to Fig. 6, it will be seen that the lids or covers 18 for the openings 17 are so arranged that they can be braced open toward the compartment to be ventilated, thus guiding the humid air toward its proper direction.

It will be seen by the construction employed for carrying out my improved malting system that the attemperator is located over the malting room, with a space intervening between the same and the ceiling of the malting room. In most malting systems now in use heating pipes are located beneath the ceilings of the malting rooms to prevent the moist air in said rooms from being condensed. In my construction it will be observed that a space is provided in each malting room above the ceiling of the room below. The air passing through the malt, is, of course warmed somewhat, and entering the space referred to warms the ceiling beneath, thus entirely dispensing with the necessity of pipes for the purpose. All this warm air is drawn into the exhaust air flues into the space 9 between the attemperating room and the upper malting room, so that a means for warming the ceiling of said upper malting room is also provided.

Among other advantages of my system may be mentioned the fact that one fan works as an exhaust and pressure, and no matter how much fresh air is added at 25, the pressure in 27 is the same. Again, by so regulating the pressure that its force becomes exhausted at the opening 17, neither vacuum nor pressure need exist in the malting room, notwithstanding the fact that large quantities of air are circulated through the same. This is of great importance, inasmuch as in case of vacuum, impure, hot or cold air would be drawn through

cracks and other openings of the walls of the building; and in case of pressure would overload the room with this humid air, making it unpleasant, and too moist for some of the heaps.

It is a further advantage in the system that the arrangement is such that the cool and humid air has to descend the air shafts, while the warm and drier air ascends, thus conforming to nature's laws.

It is a further advantage that the space necessary for the steep tanks is almost entirely utilized in attemperating and circulating air for the pneumatic malt rooms below, using the space 9 below the tanks for returning the warm exhaust air, and the space 12 above this, between or under the tanks, for admitting the fresh air to the flues leading down to the malt rooms.

It is also an important feature of my system that the several air flues all along one end of the house are alternately fresh and exhaust air flues, and reach from the bottom of the lower floor of the house to above and over the upper malting room, the fresh air flues communicating at the top with a fresh and moist air supply room, and the exhaust flues with an exhaust air room, and each communicating with flues extending the entire length of the germinating compartments, forming the conduits for the circuit of ventilation.

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

1. A malting system comprising one or more malting rooms, longitudinal boxes or air flues provided with openings, a perforated malting floor between said boxes, forming the germinating compartment, and having an air space beneath, an exhaust air chamber over the upper malting room and attemperator chamber over the exhaust air chamber, fresh and exhaust air shafts, the former communicating at one end with the attemperator chamber, and at its opposite end with the longitudinal boxes or air flues, and the latter communicating at one end with the exhaust chamber, and at its opposite end with the air spaces beneath the malting floors, and means for circulating the air to and from the top down through the germinating malt or grain, substantially as set forth.

2. A malting system comprising one or more malting rooms, a longitudinal box or air flue provided with an opening, a perforated malting floor adjacent to and against the longitudinal box, said floor having a space between the same and the floor proper of the malting room, an exhaust air chamber over the upper malting room, an attemperator chamber, fresh and exhaust air shafts, the former communicating at one end with the attemperator chamber and at its opposite end with the longitudinal box, and the latter communicating at one end with the exhaust chamber, and at its opposite end with the air space beneath the malting floor, and means for cir-



culating the air to and from the top down through the germinating malt, substantially as set forth.

3. In a malting system, the combination, of  
5 a flooring provided with longitudinal lines of openings leading to a channel beneath, a straight partition arranged between the openings and separating said flooring into two longitudinal sections, perforated hoods placed  
10 over the openings of the flooring, pipes for spraying water up into the hoods, and means for forcing air into the perforated hoods, said air adapted to pass down through one line of hoods, and thence descending to the channel  
15 beneath, and finally passing up into and out of the next line of hoods, substantially as set forth.

4. In a malting system, an air shaft provided at its upper end with an opening, a fan  
20 within said shaft for forcing the air to be attemperated, an exhaust air passage leading to the air shaft and provided with openings for fresh air, and a pressure regulating and relief valve for governing the upper opening of the  
25 air shaft, said valve adapted to automatically admit of the discharge of the overplus air drawn through the fresh air openings into the exhaust flues or air passages, substantially as set forth.

30 5. In a malting system, the combination, of a series of malting rooms, perforated malting floors arranged above the same to form air spaces beneath, boxes on opposite sides of the malting floor, said boxes provided with  
35 upper openings, and flues leading from a moist air room over an exhaust room to the channels of the side boxes to conduct the air through the openings of said boxes to the malting floors, and flues leading from the  
40 spaces beneath the malting floors to the exhaust room, substantially as set forth.

6. In a malting system, the combination, of a series of malting rooms, perforated malting floors arranged above the same to form air  
45 spaces beneath, boxes on opposite sides of the malting floors, said boxes provided with upper openings, flues leading to the channels of the side boxes, covers for regulating the openings of the side boxes, said covers  
50 adapted to be arranged at opposite inclines to regulate the flow of air to the proper section of flooring, and flues leading from the spaces beneath the malting floors, substantially as set forth.

55 7. A malting system, comprising a series of malting rooms, perforated malting floors therein arranged above the floors proper of the malting rooms to form spaces above the ceilings of the rooms next below, an exhaust  
60 air chamber above the upper malting room, a moist air chamber above the exhaust air chamber, said moist air chamber divided into an air distributing room, an attemperating room, and a steep tank room, an air shaft  
65 having its lower end in communication with the exhaust air room, and also provided with an opening communicating with the air dis-

tributing room, a rotatable fan in the lower end of the air shaft, adapted to force the air into the distributing room, from said room to  
70 the attemperating room, and from the latter to the moist air room, boxes on opposite sides of the malting floors, said boxes provided with openings at their tops, and flues leading, respectively, from the spaces beneath the  
75 perforated malting floors up to the exhaust air chamber, and from the moist air chamber to the side boxes, and through the openings thereof to the tops of the malting floor, substantially as set forth. 80

8. In a malting system, an air shaft provided with an opening leading to an attemperating room, a fan located within one end of said shaft for forcing the air to be attemperated, a pressure regulating and relief valve  
85 located in the end opposite the fan for governing the pressure and quantity of air to be maintained in the circulation, an exhaust passage provided with openings, said passage leading to the fan, the openings adapted for  
90 admitting fresh air into the exhaust part of the system of circulation, substantially as set forth.

9. A malting system comprising a series of malting rooms, each arranged in compart-  
95 ments with a box or air flue longitudinally on both sides, with top openings, a perforated malting floor within said compartments arranged a distance from the floor proper, forming a space or air flue, vertical air shafts communicating and leading respectively from  
100 said air flues to and from separate air chambers, a circulating fan between said air chambers, an automatic pressure and relief valve communicating with the outside and the pressure chamber or chambers, said fan acting as a  
105 combined exhaust and pressure drawing the air from the top openings of the boxes or air flues through the malt and passages described to the fan, and pressing the air from the fan  
110 through the passages described to the said top openings of the boxes or air flues automatically controlled, as fresh air is admitted, or not, substantially as set forth.

10. A malting system comprising a series of  
115 malting rooms, each arranged in compartments, with a box or air flue longitudinally on both sides with top openings, a perforated malting floor within said compartments arranged a distance from the floor proper, forming  
120 a space or air flue, air shafts communicating and leading respectively from said air flues to and from separate air chambers, said air shafts adapted to conduct alternately attemperated air to, and exhaust air from, the  
125 germinating malt, substantially as set forth.

11. A malting system comprising a series of malting rooms, each arranged in compartments, with a box or air flue longitudinally on  
130 both sides, a perforated malting floor in each of said compartments arranged a distance from the floor proper forming a space or air flue, vertical air shafts communicating and leading respectively from said air flues to ex-



haust and fresh air chambers, said vertical air shafts having the separating partitions built diagonally, substantially as set forth.

12. In a malting system the combination, of  
5 a series of malting rooms, perforated malting floors arranged above the floors proper of the malting rooms to form air spaces, boxes on opposite sides of the malting floor, said boxes provided with upper openings, and flues lead-  
10 ing to the channels of the side boxes to con-

duct the air through the openings of said boxes to the malting floors, and flues leading from the spaces beneath the malting floors, substantially as set forth.

In testimony whereof I affix my signature 15  
in presence of two witnesses.

JOHN F. DORNFELD.

Witnesses:

JOHN D. ROWEN,

JOHN J. CRESAP.