

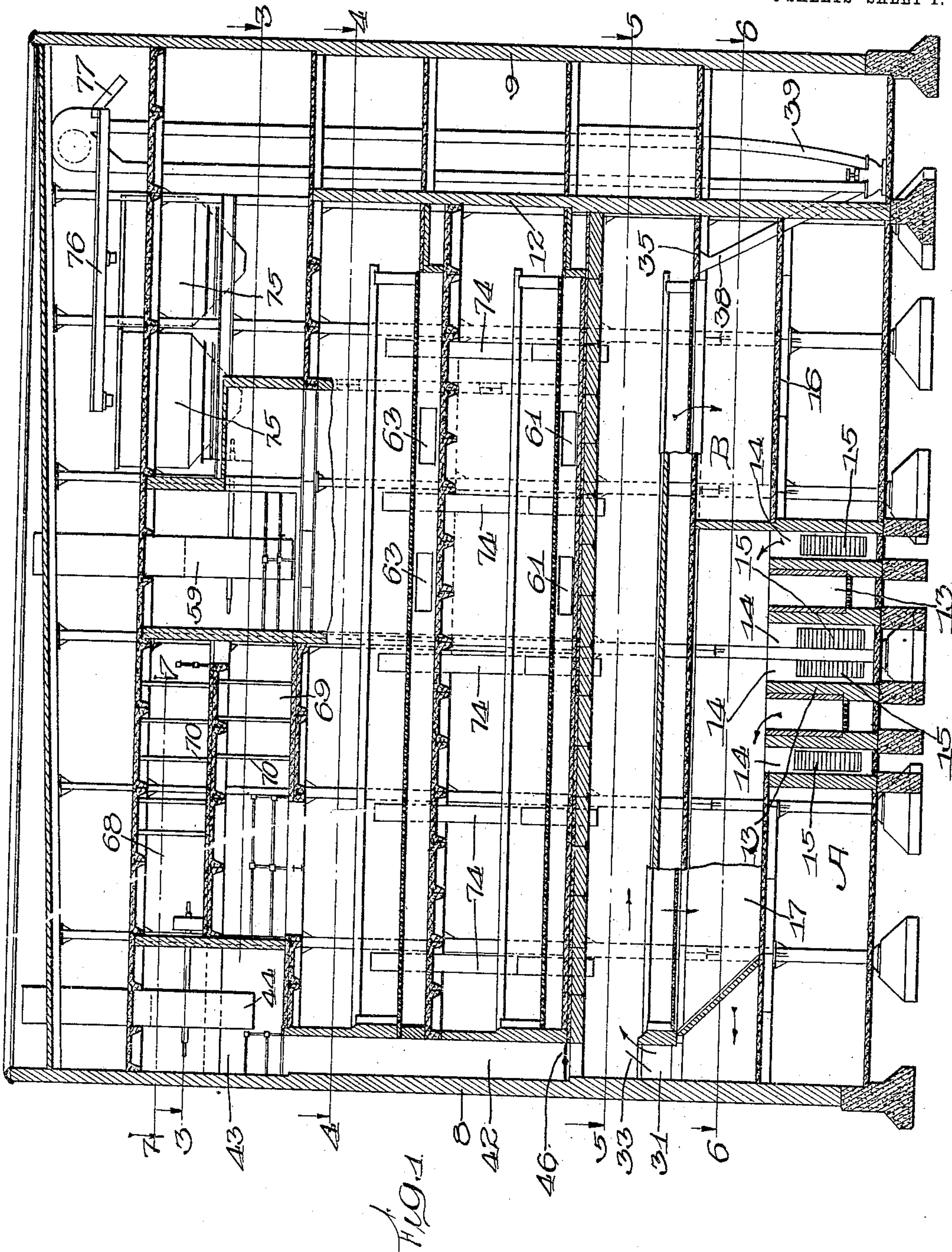
O. H. LUEBKERT.
MALT KILN.

APPLICATION FILED MAR. 6, 1908.

Patented Nov. 16, 1909.

6 SHEETS—SHEET 1.

940,172.



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940,172.

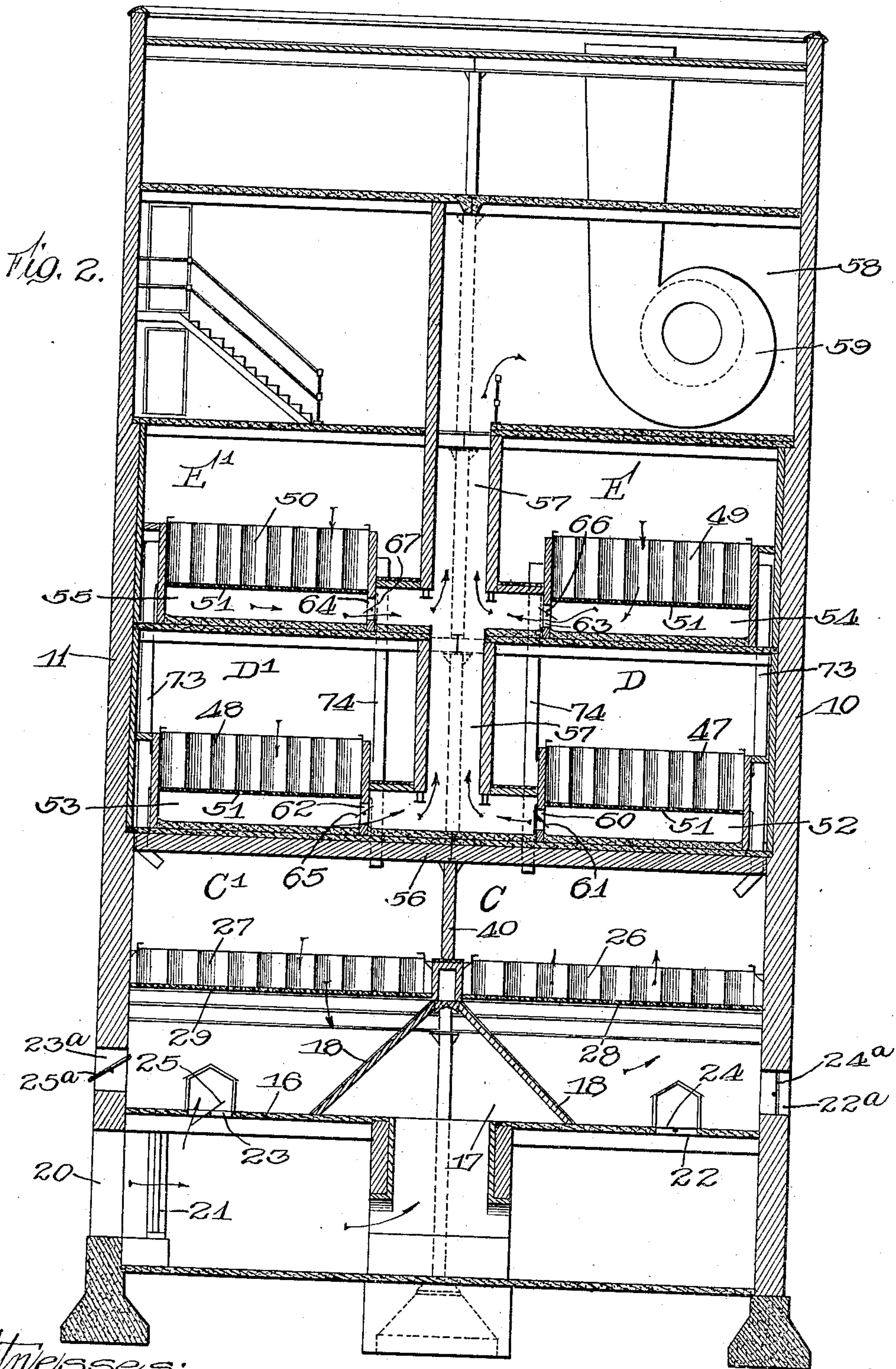
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6 SHEETS—SHEET 2.



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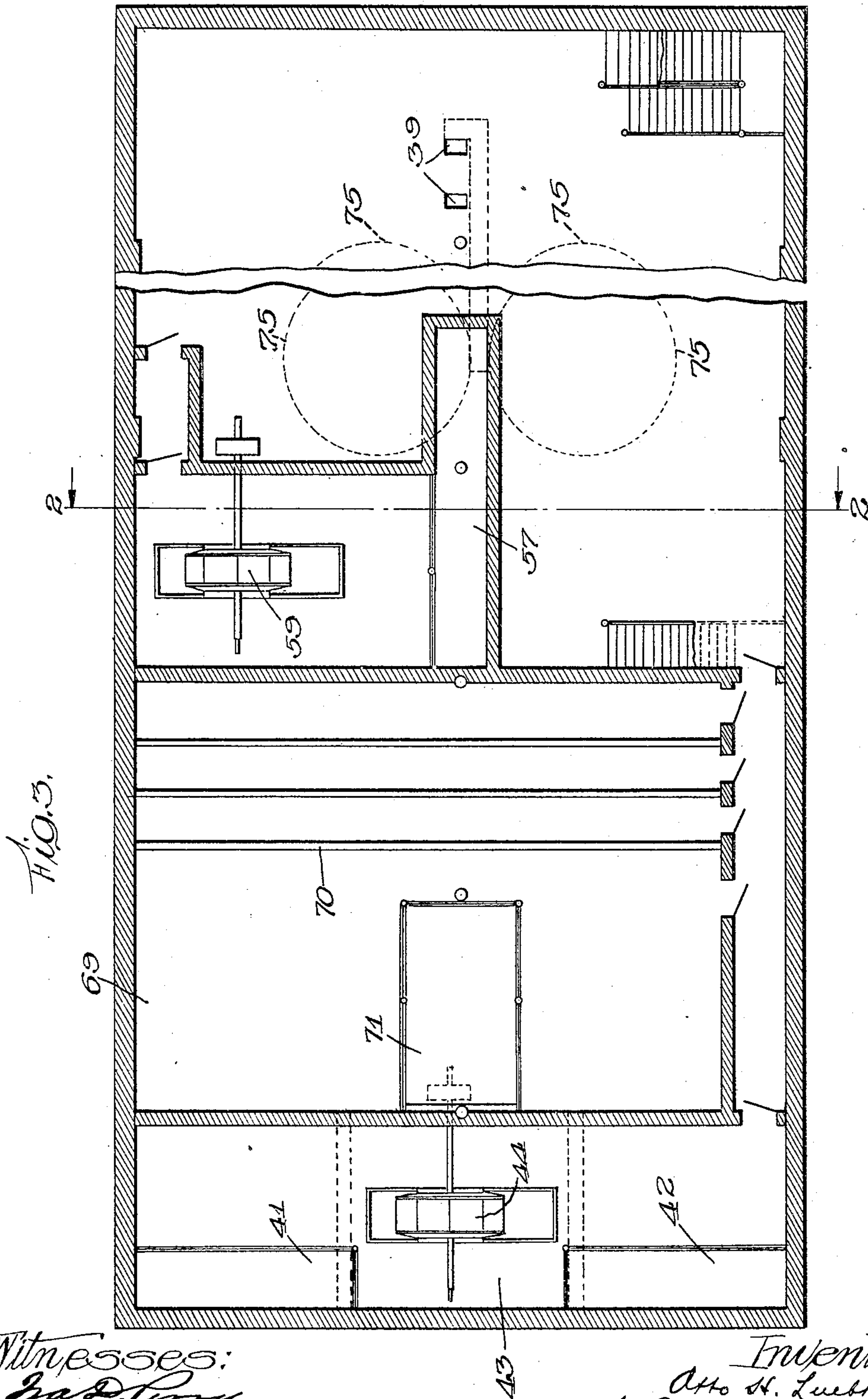
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6 SHEETS—SHEET 3.

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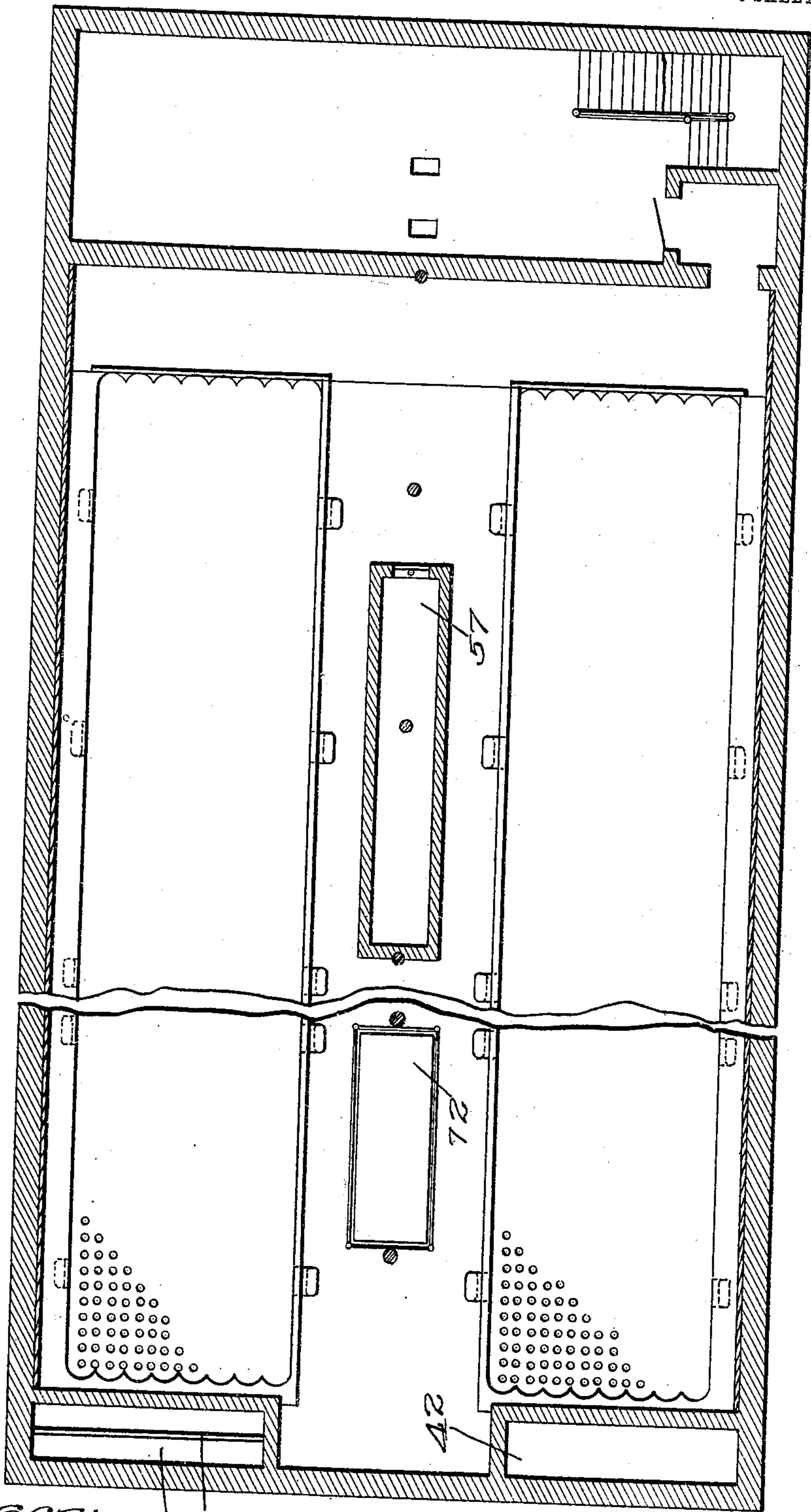
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6 SHEETS—SHEET 4.

FIG. 4.



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6 SHEETS—SHEET 5.

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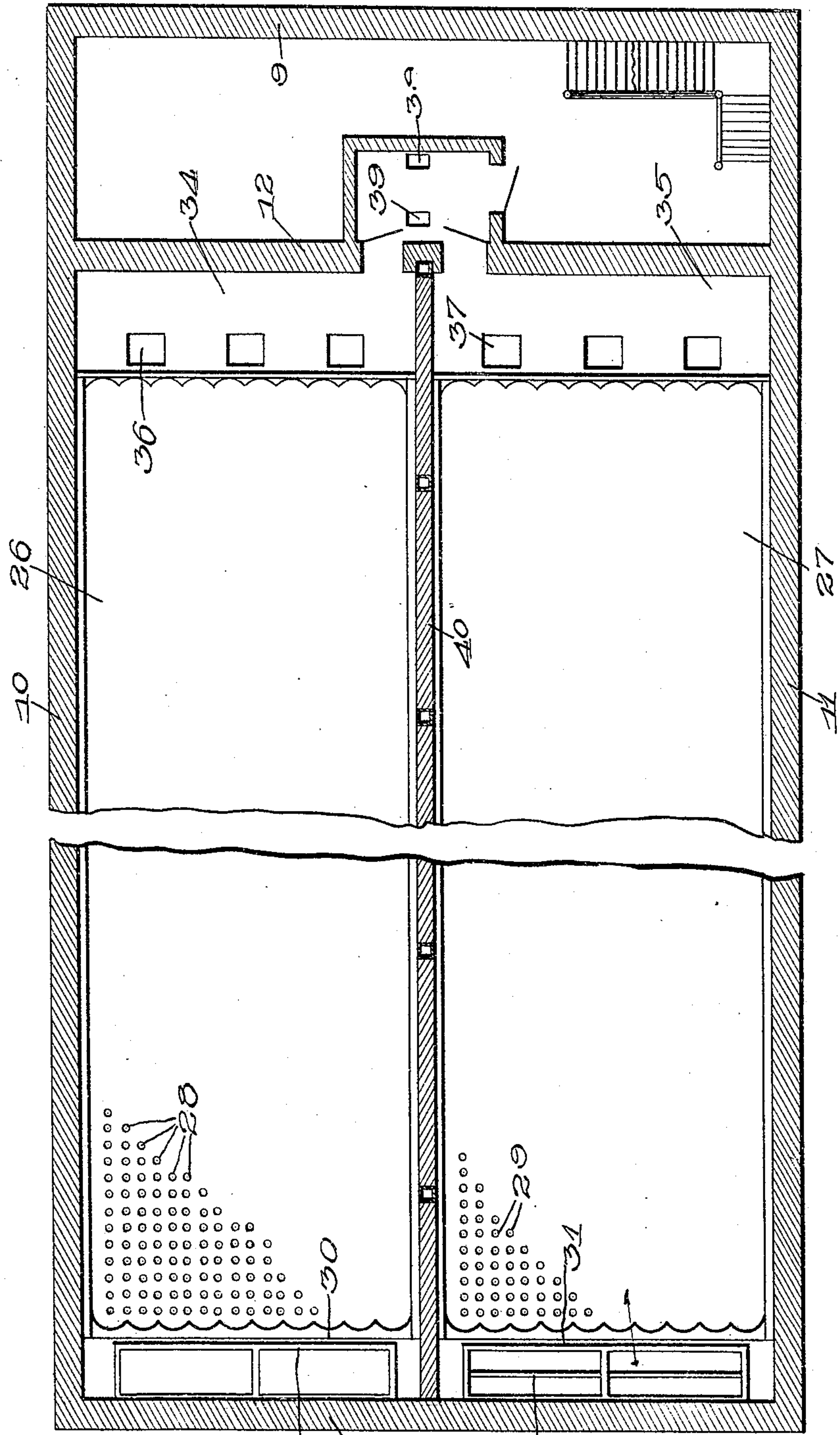


Fig. 5.

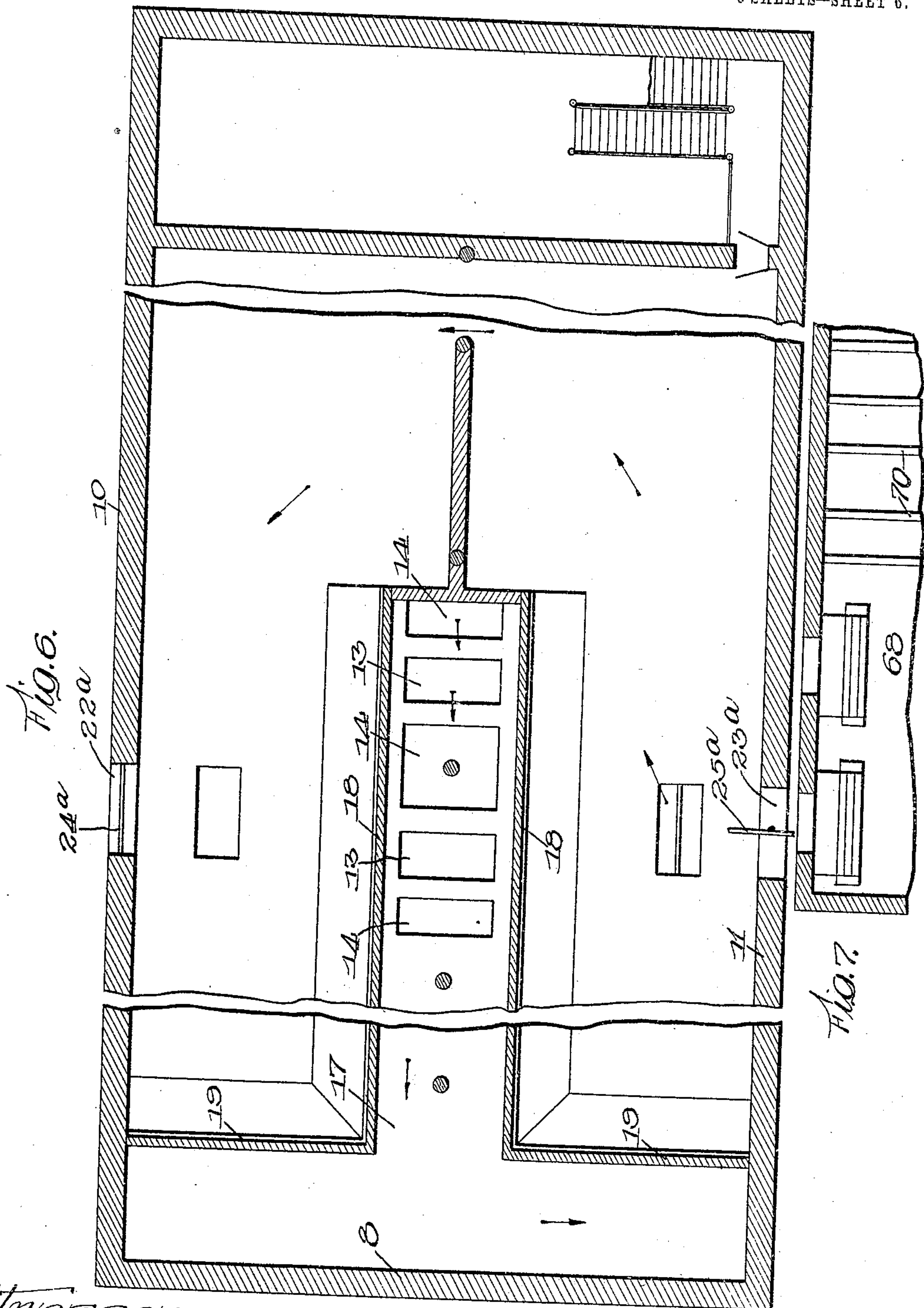
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UNITED STATES PATENT OFFICE.

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MALT-KILN.

940,172.

Specification of Letters Patent.

Patented Nov. 16, 1909.

Application filed March 6, 1908. Serial No. 419,438.

To all whom it may concern:

Be it known that I, OTTO H. LUEBKERT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Malt-Kilns, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to malting, and has for its object to provide a new and improved malt house or kiln in which the grain under treatment may be transferred from the germinating compartments to the kiln compartment by gravity, and in which also the operation of drying may be conducted in such manner as to secure the best results without delaying the progress of the grain or malt through the house. Foreexample, after the germination of the grain has been carried to the proper stage it is desirable that during the first stage of the drying operation the grain be dried with air of low temperature and afterward subjected to a higher temperature to complete the operation, and by my invention I provide a construction by which the drying may be accomplished in the desired manner without in any way delaying the progress of the grain or interfering with the continuous operation of the malt house. This result is obtained by providing a plurality of kiln or drying chambers or compartments located side by side,—the green malt being placed in one of said compartments, while partially dried malt is in the other,—and so arranging the ventilating system that hot dry air is first supplied from the furnaces to the partially dried malt and after being mixed with cool air from the furnace room or outside is conducted through the green malt. By the time the partially dried malt is fully dried the green malt will have been partially dried, and by then removing the dried malt and introducing a fresh supply of green malt in its place the ventilation may be reversed and hot air directly from the furnace supplied to the partially dried malt and afterward mixed with cool air and conducted through the new charge of green malt; the ventilation being alternated in this way as each dried charge is removed and a fresh green charge introduced. The germinating compartment or compartments are arranged above the kiln compartment or compartments, means being pro-

vided by which the grain from the germinating compartments may be delivered by gravity to the kiln compartment in the general manner described in my application, Serial No. 415,566, filed February 12, 1908.

In the accompanying drawings,—Figure 1 is a longitudinal vertical section; Fig. 2 is a cross-section on line 2—2 of Fig. 3; Fig. 3 is a horizontal section on line 3—3 of Fig. 1; Fig. 4 is a horizontal section on line 4—4 of Fig. 1; Fig. 5 is a horizontal section on line 5—5 of Fig. 1; Fig. 6 is a horizontal section on line 6—6 of Fig. 1; and Fig. 7 is a partial horizontal section on lines 7—7 of Fig. 1.

Referring to the drawings,—8—9 indicate the end walls of the building, and 10—11 the side walls thereof. The building may be of any suitable size and shape.

12 indicates a partition wall parallel with and adjacent to the wall 9 and extending from the ground up through several stories, as shown in Fig. 1.

A indicates the basement, which contains furnaces 13,—said furnaces having adjacent thereto fresh air flues 14 having valved openings 15 for admitting fresh air to mix with the hot air from the furnace.

B indicates the sprout floor or story, which is immediately above the basement and has an imperforate floor 16, as shown in Fig. 1.

17 indicates an air-mixing chamber, which is on the sprout floor and extends longitudinally thereof immediately over the furnace 13 and flues 14, from which it receives hot and cold air (see Fig. 2). Said air-mixing chamber is preferably formed by inclined partitions 18 forming a V-shaped chamber which extends longitudinally of the sprout floor to a point near the end wall 8, where the partitions 18 join with transverse partitions 19 which extend to the side walls 10—11 of the building, so that the air-mixing chamber 17 is expanded to occupy the entire width of the building near the end wall 8, as shown in Fig. 6.

20 indicates an opening in the basement wall for admitting fresh air to the basement around the furnaces, as shown in Fig. 2.

21 indicates a steam heater arranged in front of the opening 20 for regulating the temperature of the incoming air.

22—23 indicate openings in the floor 16 of the sprout chamber, said openings having valves 24—25, respectively, by which they

may be opened or closed to admit or shut off direct communication between the basement and the sprout chamber (see Fig. 2).

22^a—23^a indicate openings in the side wall of the building, as best shown in Fig. 6, through which external air may be admitted to the sprout chamber to mix with the air coming from the basement or furnace room through valves 24 or 25 when the air from the latter source is too warm. By means of the openings 22^a—23^a external air is admitted without passing through the heaters 21 shown in Fig. 2. The openings 22^a—23^a are provided with valves 24^a—25^a, as shown in Fig. 2.

C—C' indicate kiln compartment rooms on the floor above the sprout floor, said compartment rooms having kiln compartments 26—27, respectively, each provided with perforated floors 28—29, respectively. The compartments 26—27 are provided with the usual stirring apparatus, such, for example, as that shown in my application above referred to.

30—31, respectively, indicate flues leading from the air-mixing chamber 17 to the kiln compartment rooms C—C', respectively, the flue 30 being provided with a valve 32 and the flue 31 with a valve 33, as shown in Fig. 5, in which the valve 32 is shown as being closed and the valve 33 as being open.

34 indicates gangways at the ends of the kiln compartments 26—27, as shown in Figs. 1 and 5.

36—37 indicate openings from the kiln compartment rooms C—C', respectively, to malt spouts 38 which conduct the finished malt from the several compartments by gravity to an elevator 39 by which the malt may be delivered. Said elevator also serves to supply the barley to the steep tanks, as described in my application above referred to.

40 indicates a partition wall which separates the two kiln compartment rooms C—C'.

41—42 indicate exhaust flues which lead, respectively, from the kiln compartment rooms C—C' to an exhaust chamber 43 at the top of the building, in which is placed a fan 44, as shown in Figs. 1 and 3. Said flues 41—42 are provided with suitable valves—as 45—46—shown in Figs. 1 and 4, by which the air may be drawn from either kiln compartment room, as desired.

By this construction it will be apparent that by opening valve 33 in flue 31 and closing valve 32 in flue 30 the mixed hot and cold air may be caused to pass directly into the upper part of kiln compartment room C'. If at the same time valve 45 in exhaust flue 41 is open and valve 46 in exhaust flue 42 is closed the air admitted to kiln compartment C' will be caused to flow downward through the malt in compartment 27 to the sprout floor, where cool air from the furnace room or the outside is added, thence

across and up through the perforated floor of compartment 26, passing upward through the malt in such compartment and out exhaust flue 41 to the fan 44. In like manner by reversing the positions of the several valves, the circulation of the air may be reversed. Thus the malt in one kiln compartment may be treated by downward ventilation of hot air derived directly from the air-mixing chamber, while the malt in the other kiln compartment is treated by upward ventilation of the same air mixed with cool air. The sprout chamber serves as a mixer by which the air passing downward through the perforated floors of the kiln compartments is thoroughly mixed with air entering the sprout chamber through valves 24—25 or valves 24^a—25^a before it passes up through the perforated floor of the adjoining kiln compartment, since the air entering the sprout chamber in the several ways indicated is compelled to flow around to the other side thereof before it passes up through the perforated floor of the kiln compartment, as illustrated by the arrows in Fig. 6. By providing the several inlets for air, as above described, the temperature of the air passing upward through the kiln compartment floors may be very accurately regulated. The flow of air may be alternated at pleasure by simply adjusting the several valves. When finished, the malt may be discharged through the spouts 38.

D—D' and E—E' indicate lower and upper germinating compartments arranged on floors successively above the kiln compartment floor, as best shown in Fig. 2. Said floors contain, respectively, germinating compartments 47, 48, 49 and 50, each of which is provided with a perforated floor 51, 52, 53, 54 and 55 indicate, respectively, the spaces or chambers under the compartments 47—48—49—50.

56 indicates an imperforate floor separating the kiln compartments from the lower tier of germinating compartments, as shown in Fig. 2.

57 indicates an exhaust air flue preferably arranged centrally of the building, as shown in Fig. 4, and extending upward from the floor 56 to an exhaust air room 58 having a fan 59 for causing air to circulate through the germinating compartments, as herein-after described.

60 indicates an opening affording communication between the space 52 below compartment 47 and the exhaust air flue 57. Said opening is provided with a valve 61. 62—63—64 indicate similar openings connecting the exhaust air flue with the spaces 53—54—55 under the other germinating compartments, said openings having valves 65—66—67, respectively, as shown in Fig. 2.

68—69 indicate upper and lower attemperator rooms having attemperators 70 for

supplying fresh attemperated air to the germinating compartments.

71 indicates an opening in the floor of the attemperator room 69 which admits air from said attemperator room to the upper germinating compartment rooms E—E', as shown in Fig. 3. In like manner 72 indicates a similar opening between the upper germinating compartment rooms E—E' and the lower compartment rooms D—D', as shown in Fig. 4. Thus attemperated air is admitted to both tiers of germinating compartment rooms, and may be caused to circulate through the grain in the several germinating compartments by operating the fan 59, thereby causing the air to flow down through the grain in the several compartments to the spaces below such compartments and thence out through the exhaust-air flue 57.

By means of the valves 61, 65, 66 and 67 the circulation of air through any particular compartment may be controlled as desired.

73—74 indicate spouts or ducts through which malt may be delivered from the several germinating compartments to the kiln compartments, as described in my application above referred to.

By the construction described the circulation of air through the germinating compartments is entirely independent of the circulation through the malt in the kiln compartments, so that the drying of the grain, as well as its germination, may be controlled as circumstances may require. Furthermore, when germination has advanced to the desired stage the malt may be delivered to the kiln by gravity and the operation of drying conducted in the manner hereinafter described.

75 indicates the usual steep tanks which may be provided with any suitable means for delivering steeped grain to the germinating compartments, as, for example, the apparatus described in my application hereinbefore referred to.

The elevator 39 is provided with a conduit 76 for delivering the grain to the steep tanks and also with a connection 77 by which it may deliver finished malt to any suitable means that may be provided for carrying it away.

That which I claim as my invention, and desire to secure by Letters Patent, is,—

1. A malt kiln having a plurality of compartment chambers arranged side by side, means for heating air, means for causing the heated air to pass successively through the malt in said chambers and intermediate means for mixing cool air therewith.

2. A malt kiln having a plurality of compartment chambers, means for heating air, means for causing heated air to pass successively and in opposite directions through

the malt in said chambers and intermediate means for mixing cool air therewith.

3. A malt kiln having a plurality of chambers arranged side by side and having compartments provided with perforated floors, means for heating air, means for causing heated air to flow successively through the malt in said compartments and intermediate means for mixing cool air therewith.

4. A malt kiln having a plurality of chambers having compartments provided with perforated floors, means for heating air, means for causing heated air to flow successively and in opposite directions through the malt in said compartments and intermediate means for mixing cool air therewith.

5. A malt kiln having a plurality of chambers arranged side by side and having compartments provided with perforated floors, means for heating air, flues for conducting heated air to said chambers, exhaust flues communicating with said chambers, means for causing heated air to pass successively through the malt in said chambers and intermediate means for mixing cool air therewith.

6. A malt kiln having a plurality of chambers having compartments provided with perforated floors, means for heating air, flues for conducting heated air to said chambers, exhaust flues communicating with said chambers, means for causing heated air to pass successively and in opposite directions through the malt in said chambers and intermediate means for mixing cool air therewith.

7. A malt kiln having a plurality of chambers arranged side by side and having compartments provided with perforated floors, a furnace, an air-mixing chamber, means for supplying air from said mixing chamber to the malt in said compartments successively and intermediate means for mixing cool air therewith.

8. A malt house having a plurality of kiln compartment rooms arranged side by side, means for supplying heated air successively to the malt in said rooms, a plurality of germinating compartments above said kiln compartments, and means for delivering malt from said germinating compartments to said kiln compartments.

9. A malt house having a plurality of kiln compartment rooms arranged side by side, means for supplying heated air successively to the malt in said rooms, a plurality of germinating compartments above said kiln compartments, and means for delivering malt from said germinating compartments to said kiln compartments by gravity.

10. A malt house having a plurality of kiln compartment rooms arranged side by side, means for supplying heated air successively to the malt in said rooms, a plurality of germinating compartments above said kiln compartments, means for delivering

- malt from said germinating compartments to said kiln compartments, and independent means for causing a circulation of air through the grain in the germinating compartments.
- 5 11. A malt house having a plurality of separate kiln compartment rooms on the same floor, means for supplying heated air successively to the malt in said kiln compartment rooms, a plurality of germinating compartments above said kiln compartment rooms, and means for delivering malt from said germinating compartments to said kiln compartment rooms.
- 10 12. A malt house having a plurality of separate kiln compartment rooms on the same floor, means for supplying heated air successively to the malt in said kiln compartment rooms, a plurality of germinating compartments above said kiln compartment rooms, means for delivering malt from said germinating compartments to said kiln compartment rooms, and independent means for causing fresh air to circulate through the malt in the germinating compartments.
- 15 13. A malt house having a plurality of separate kiln compartment rooms on the same floor, means for supplying heated air successively to the malt in said kiln compartment rooms, a plurality of germinating compartments above said kiln compartment rooms, and means for delivering malt from said germinating compartments to said kiln compartment rooms by gravity.
- 20 14. A malt kiln having a plurality of compartment chambers arranged side by side, means for heating air, means for causing heated air to pass successively through the malt in said chambers, and means for admitting external air to the heated air and mixing it therewith.
- 25 15. A malt kiln having a plurality of compartment chambers arranged side by side, means for heating air, means for causing the heated air to pass successively through the malt in said chambers, and means for admitting fresh air to said heated air after it passes through one of said chambers and before it enters the other.
- 30 16. A malt kiln having a plurality of chambers having compartments provided with perforated floors, means for heating air, means for causing heated air to flow successively and in opposite directions through the malt in said compartments, and means for admitting air to and causing it to mix with the heated air after it passes through one of said compartments and before it enters the other.
- 35 17. A malt kiln having a plurality of com-

partment chambers arranged side by side and having perforated floors, a chamber below said perforated floors, means for admitting heated air to the chamber below said perforated floors, and means for admitting external air to the latter chamber.

18. A malt kiln having a plurality of compartment chambers arranged side by side and having perforated floors, a chamber below said perforated floors, means for admitting heated air to the chamber below said perforated floors, means for admitting external air to the latter chamber, and means for introducing heated air to said compartment chambers from above the perforated floors therein.

19. A malt kiln having a plurality of compartment chambers arranged side by side and having perforated floors, a chamber below said perforated floors, means for heating air, means for delivering heated air to either of said compartment chambers from above the perforated floors therein, and means for admitting air to the chamber below said perforated floors.

20. A malt kiln having a plurality of compartment chambers arranged side by side and having perforated floors, a chamber below said perforated floors, means for heating air, means for delivering heated air to either of said compartment chambers from above the perforated floors therein, and means for admitting heated air to the chamber below said perforated floors.

21. A malt kiln having a plurality of compartment chambers having perforated floors, a chamber below said perforated floors, means for heating air, means for delivering heated air to either of said compartment chambers from above the perforated floors therein, means for admitting heated air to the chamber below said perforated floors, and means for admitting external air to the latter chamber.

22. A malt kiln having a plurality of compartment chambers provided with perforated floors, a chamber below said perforated floors, means for heating air, means for delivering heated air to either of said compartment chambers from above the perforated floors therein, exhaust passages communicating with said compartment chambers above the perforated floors therein, and an air inlet communicating with the chamber beneath said perforated floors.

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