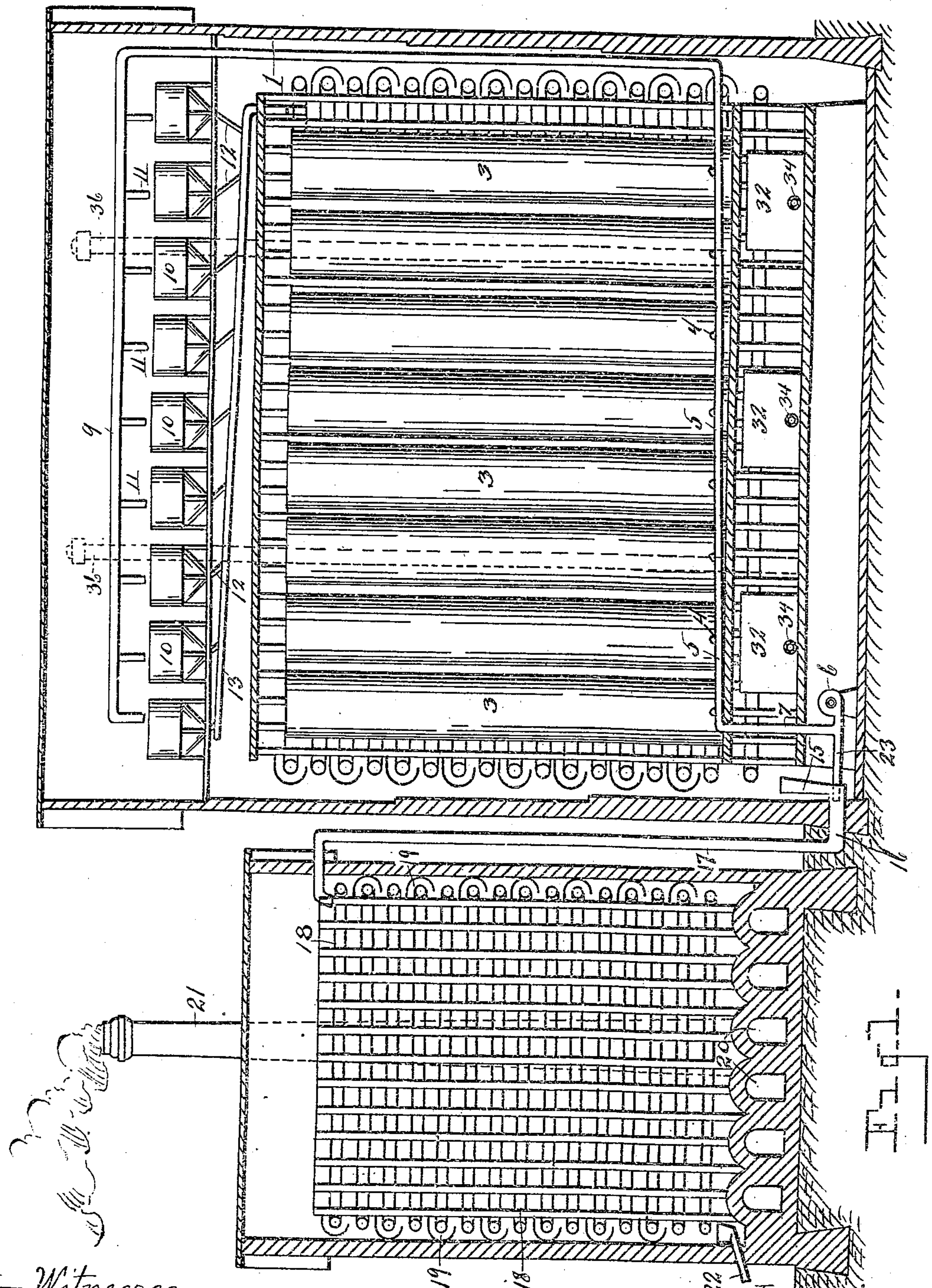


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APPARATUS FOR GERMINATING GRAIN.
APPLICATION FILED MAR. 22, 1906.

Patented Mar. 8, 1910.

4 SHEETS—SHEET 1.



Witnesses—
O. B. Baenziger.
J. G. Howlett.

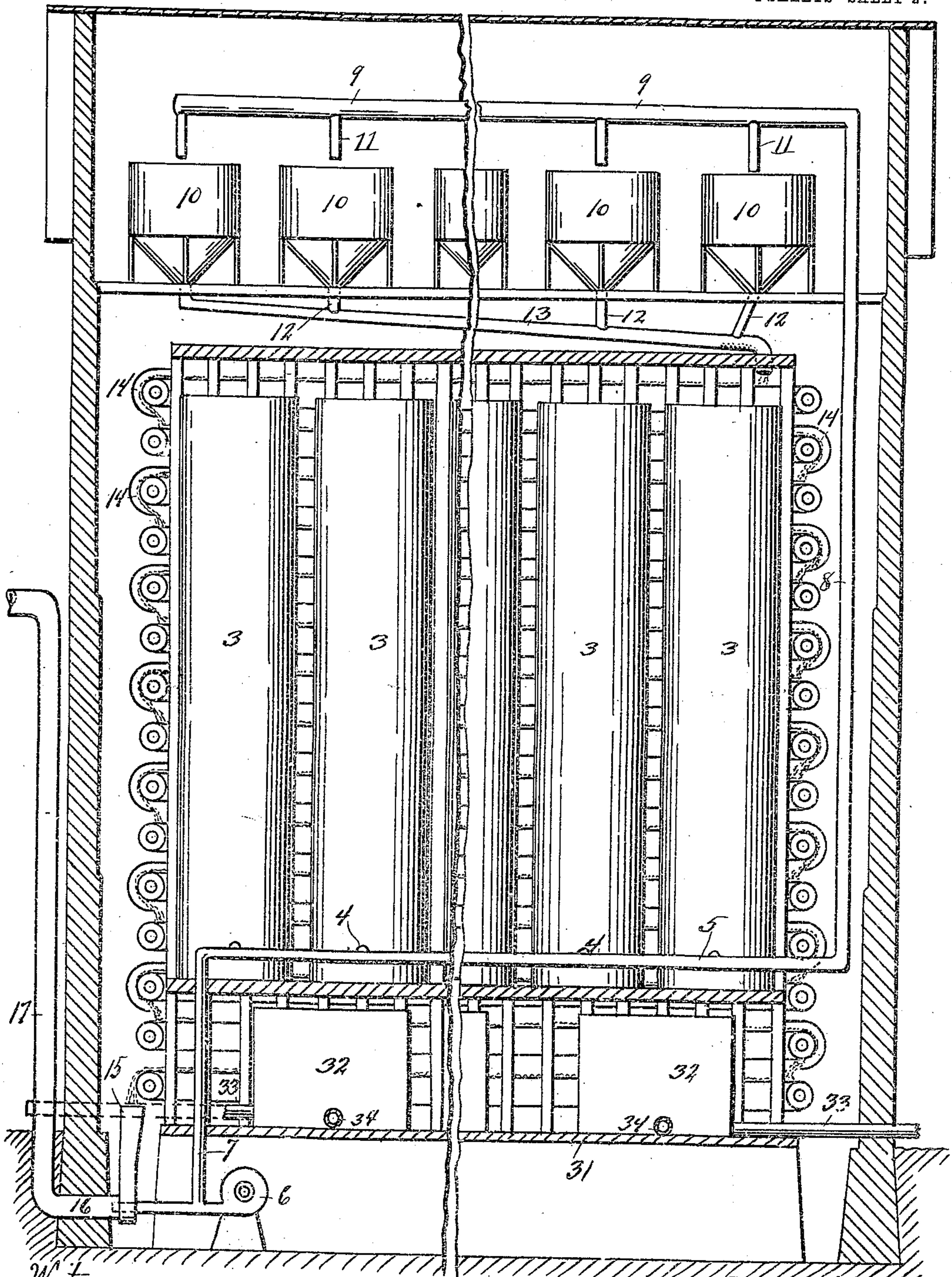
—Inventor—
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4 SHEETS—SHEET 2.



- Witnesses -
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 J. G. Howlett.

Fig. 2.

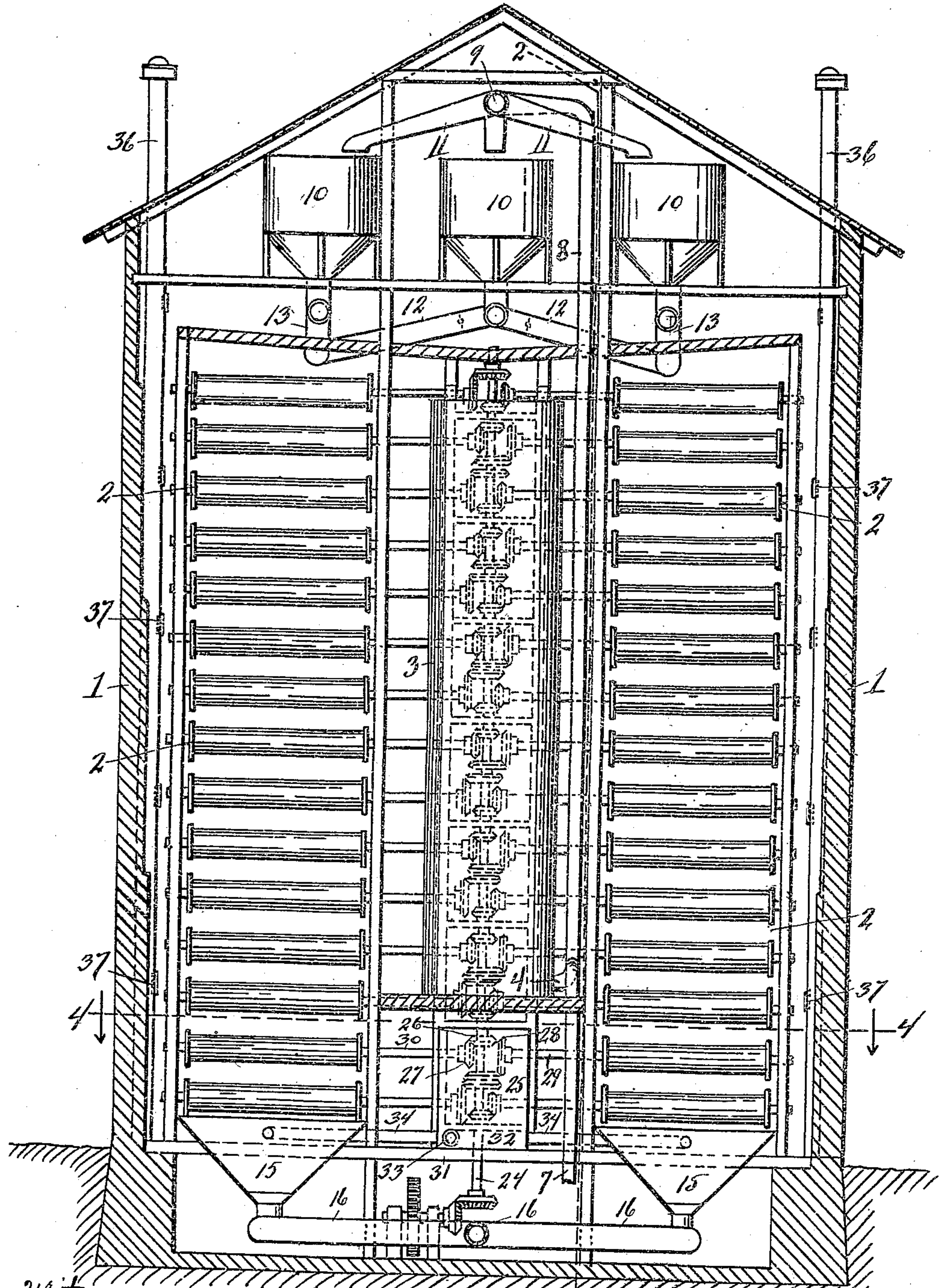
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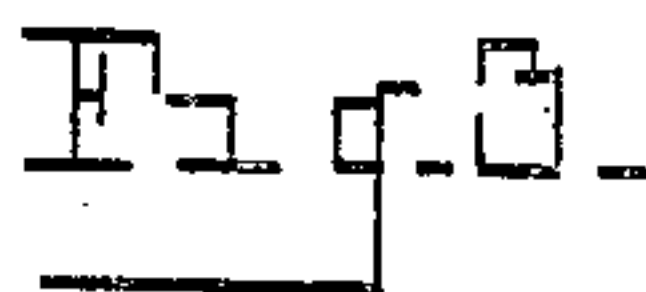
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 4 SHEETS—SHEET 3.



—Witnesses—
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4 SHEETS—SHEET 4.

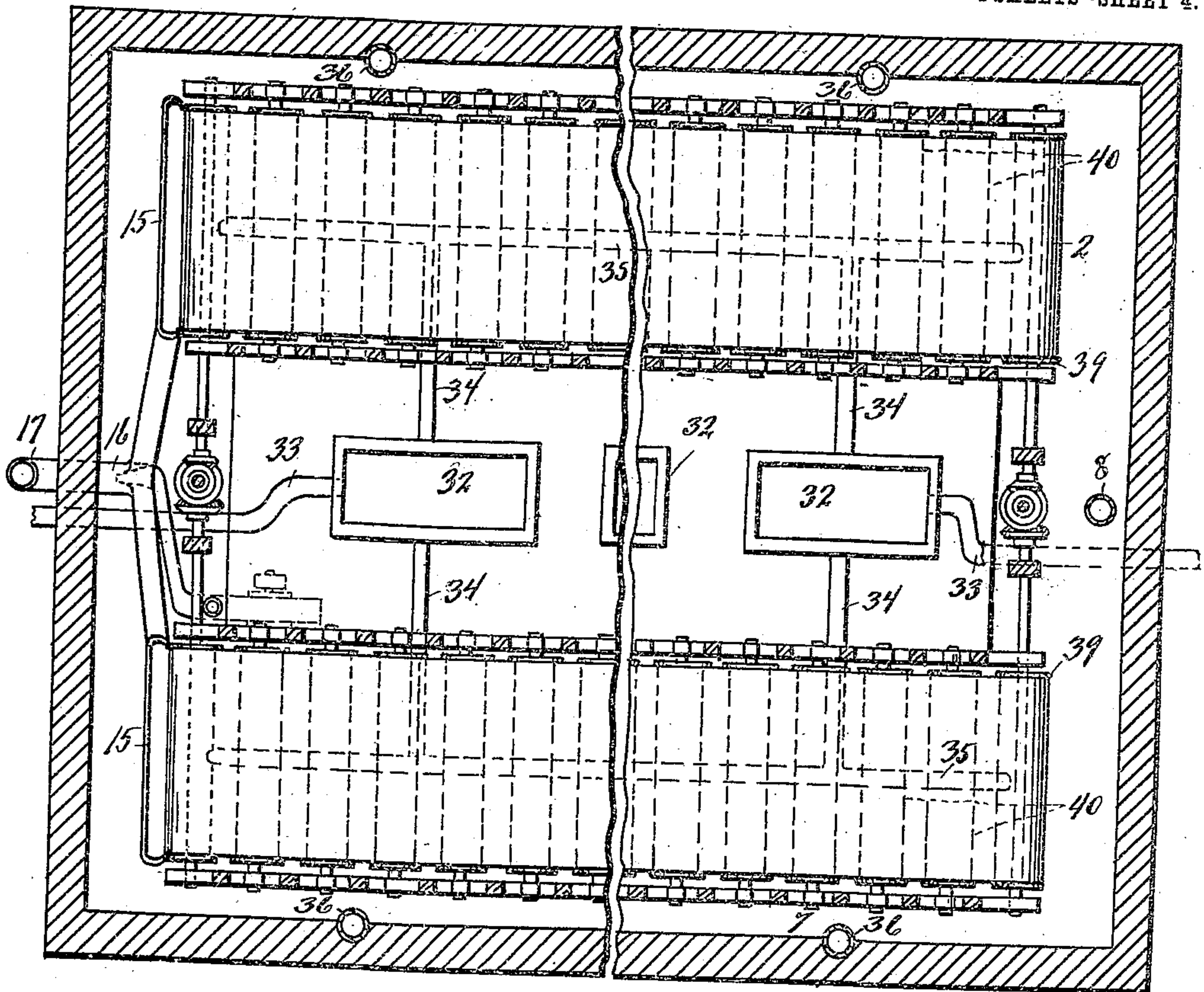


Fig. 4.

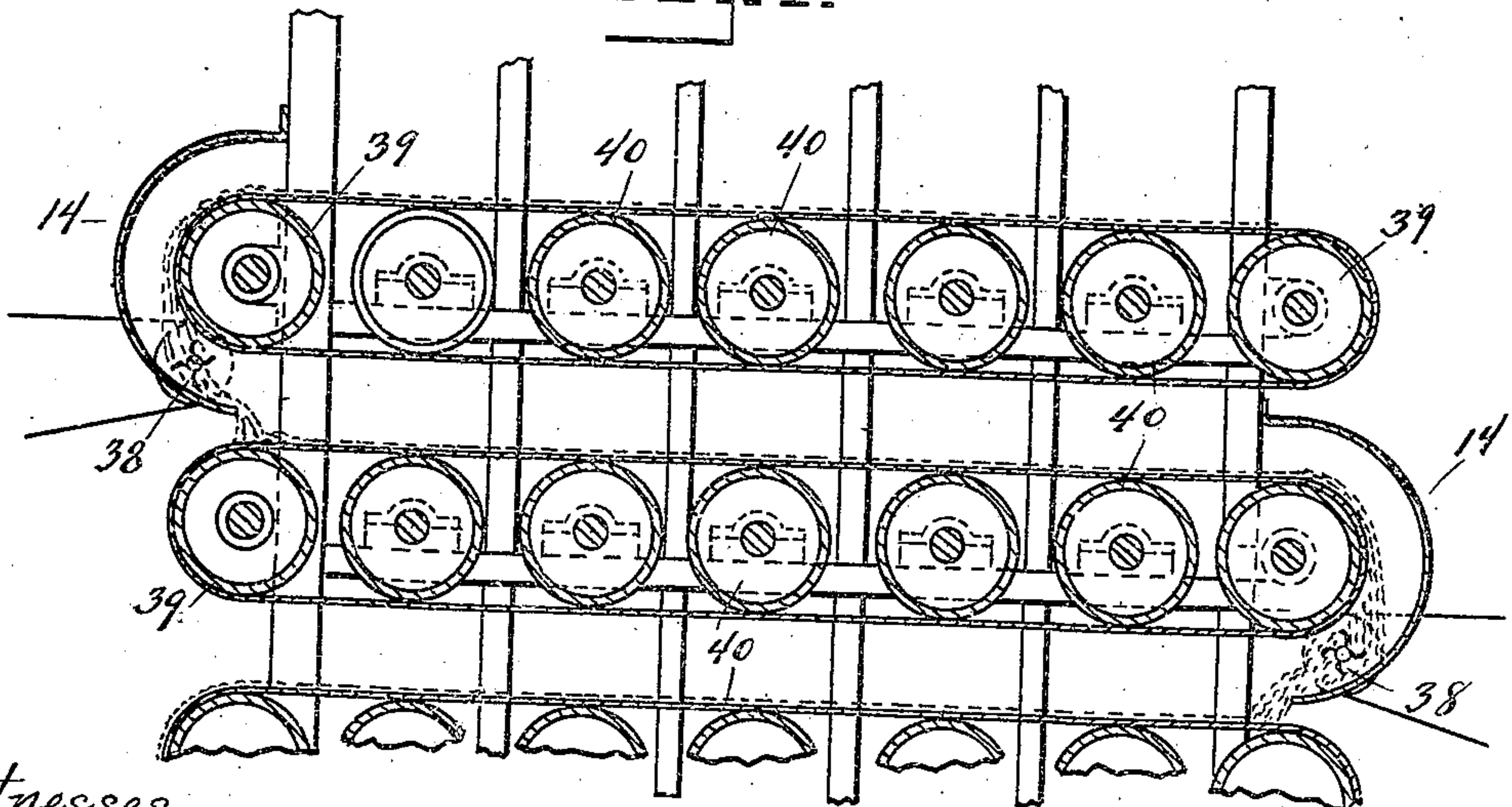


Fig. 5.

—Witnesses—

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UNITED STATES PATENT OFFICE.

LOUIS MUELLER, OF OWOSSO, MICHIGAN.

APPARATUS FOR GERMINATING GRAIN.

951,286.

Specification of Letters Patent.

Patented Mar. 8, 1910.

Application filed March 22, 1906. Serial No. 307,331.

To all whom it may concern:

Be it known that I, LOUIS MUELLER, a citizen of the United States, residing at Owosso, in the county of Shiawassee, State of Michigan, have invented certain new and useful Improvements in Apparatus for Germinating Grain; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to apparatus for germinating grain, adapted especially for use in the manufacture of malt.

The primary object of the invention is to provide simple and efficient means for carrying the grain from the grain bins to elevated steeples, discharging the wet grain from the steeples onto slowly moving, endless carriers or floors arranged vertically onto which the grain is successively deposited in its downward passage through the germinating house, supplying moistened and properly tempered air to the grain upon said traveling floors, conveying the germinated grain to a suitable drier, subjecting said germinated grain for the requisite length of time to a suitable temperature in the drier, cleaning the dried grain of its sprouts and other impurities and delivering it to the sacking bin preparatory to shipment, all of said operations being accomplished without manual labor.

In the application of my invention, the grain is conveyed from the grain bins through pneumatic tubes to the elevated steeples, wherein it is properly steeped; from said steeples the grain is next fed continuously onto the uppermost floor of a series of endless floors or traveling platforms arranged vertically in the germinating house, and of which there may be as many as desired. These traveling floors are preferably covered with a wire netting upon which the grain is deposited, whereby freer action of the air upon the grain is permitted. The speed at which these movable floors or platforms travel is varied *i. e.* the upper six of said floors are caused to travel at a speed of one hundred and twenty (120) feet in twelve (12) hours, while the remaining or lower floors are caused to travel at

the rate of one hundred and twenty (120) feet in eight (8) hours, making the total time required for the grain to pass from the top to the bottom of said floors, one hundred and sixty-eight (168) hours or seven (7) days of twenty-four (24) hours each. While the grain is passing from one floor to another in its travel downwardly in the germinating house, it is subjected to the action of moistened and tempered air which has passed through a moistening and filtering room, and then is directed under the traveling floors to act upon the grain thereon, provision being made for the escape of all gas and foul air created by the germinated grain through the medium of vent shafts and damper controlled ventilating openings which lead from the germinating house into said shafts, said dampers enabling the draft to be regulated. After being discharged from the bottommost of the traveling floors upon which the grain is germinated, said grain is directed into a suitable hopper, and by means of pneumatic tubes it is conveyed to the top of a suitable dry kiln, wherein are arranged in vertical order movable or traveling floors similar to those in the germinating house, upon the uppermost of which the germinated grain is deposited; the grain in the dry kiln passes downwardly successively from floor to floor and is subjected while on said traveling floors to the action of air at a high temperature generated by a furnace located on the lower floor of said kiln, or at any other suitable point, whereby the germinated grain is thoroughly dried. After passing through the dry kiln, the germinated grain is then conveyed to a suitable cleaning and sprout-removing machine, after which it is ready for shipment and may be discharged into a car or into the sacking bin, as desired. The arrangement in carrying out these various steps provides for a continuous passage of the grain from the bins through the germinating house and the dry kiln, without the necessity of handling the grain manually during the process of germinating and drying, at the same time the arrangement is such, and the several parts in their operation are so timed, as to produce uniformity of action upon the grain, resulting in a more perfect germination without the liability of cracking the grain or otherwise injuring it as is incident to manual handling.

The apparatus which is preferably employed in carrying out my method is illustrated in the accompanying drawings, in which:—

Figure 1 is a vertical section through the germinating house and dry kiln. Fig. 2 is a longitudinal vertical section through the germinating house, as on dotted line 2—2 of Fig. 3, showing in elevation the grain bins therein. Fig. 3 is a transverse section through the germinating house. Fig. 4 is a horizontal section as on line 4—4 of Fig. 3. Fig. 5 is a fragmentary view in section, showing a number of the traveling floors, and illustrating the manner in which the grain passes from one of the traveling floors to another.

Referring to the characters of reference, 1 designates the house which is of suitable height, and in which are located the endless traveling floors 2, of which there are two series, said series being located on opposite sides of said house. Between the series of movable floors are the vertical grain bins 3 from the bottoms of which lead the spouts 4 into a horizontal pneumatic tube 5, one end of said horizontal tube 5 being connected with a blower 6 by means of the vertical tube 7, and the other end of said horizontal tube 5 being connected by the vertical tube 8 with the horizontal tube 9, which extends above the steeps 10 located in the top of the germinating house above the series of conveyers, and into which the grain is discharged from the horizontal tube 9 through the spouts 11. From the bottoms of the steeps lead suitable spouts 12 which connect with the main inclined spouts 13 that discharge the steeped grain which passes from the steeps onto the uppermost of the traveling floors. Each of said traveling floors at its discharge end is provided with an inclosing hood 14 which receives the grain and directs it onto the succeeding floor below. It will be understood that said floors travel alternately in opposite directions, and that by this arrangement the grain is carried the length of each of said floors in succession as it passes downwardly through the germinating house.

At the discharge end of the lowermost of the traveling floors is a hopper 15 into which the germinated grain falls and from which it is conveyed in a tube 16 to a vertically extending tube 17 that leads to the top of the dry kiln and discharges the grain onto the uppermost of the traveling floors 18 therein, said floors being arranged in vertical order and driven alternately in opposite directions, whereby the grain is caused to pass from one floor to another in its downward travel through the kiln. The traveling floors in the dry kiln, like those in the germinating house, are made of wire netting, or analogous material, so as to permit of the action

of hot air upon the grain. The ends of the alternate floors are provided with the housings 19 which receive and direct the grain onto the succeeding floor below. Connecting with the dry kiln at the bottom thereof are suitable furnaces 20 which supply sufficient hot air to effect the drying of the grain, said air passing upwardly through the grain upon the traveling floors. Connected with said furnaces is a suitable stack 21. At the discharge end of the lowermost of the traveling floors in the dry kiln is a receiving spout 22 in which the dried grain may be conveyed to a cleaner and spout-remover, not shown. The air blast necessary to carry the germinated grain from the lowermost floor in the germinating house to the top of the dry kiln is supplied by the blower 6 through the connecting pipe 23.

The traveling floors in the germinating house are driven through the medium of a vertical shaft 24, shown more clearly in Fig. 3, which is turned at the proper speed from any suitable source of power and whereon are the gear wheels 25 and 26 which mesh with like gear wheels 27 and 28 on the shafts 29 and 30 respectively of the opposed series of traveling floors, whereby the required movement to said floors is imparted.

Located upon the main floor 31 of the germinating house are the filtering and tempering rooms 32 into which air is forced by any suitable means through the pipes 33, and in which said air is moistened and purified in a manner well understood in the art. Leading from said filtering and tempering rooms are the air pipes 34 which discharge into the pipes 35 extending longitudinally of the germinating house below the traveling floors. Extending vertically of the walls of the germinating house are the ventilating flues 36 provided with regulating dampers 37 through the medium of which the draft may be controlled and provision is made for the escape of gases and foul air from the germinating grain.

To prevent the germinated grain forming in cakes, rotary agitators are provided, which are located at the lower portions of the housings 14, as shown in Fig. 5, and which stir and break up the mass of grain, as it passes from one floor to another.

Interposed between the end rollers 39 over which the traveling floors pass, are a plurality of supporting rollers 40 which prevent the sagging of said floors.

Having thus fully set forth my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A grain germinating apparatus, comprising a plurality of movable floors or platforms arranged in vertical alinement in superimposed relation, said floors traveling successively in opposite directions and extending from end to end of the germinating

chamber, a housing at the discharge end of each of said floors to direct the grain onto the succeeding floor below, means for continually depositing wet grain onto the uppermost floor, means in each housing for agitating the grain as it passes downwardly from one floor to another, a vertical rotary shaft, a plurality of horizontally extending rotary shafts adapted to impart movement to said floors respectively, a gear wheel on the end of each of said horizontal shafts, a plurality of gear wheels on the vertical shaft meshing with the gear wheels on the horizontal shafts, said gear wheels being arranged to impart a differential speed to the upper and lower series of floors, and means for rotating said vertical shaft.

2. A grain germinating apparatus, comprising a plurality of endless vertically aligned traveling floors in superimposed relation extending from end to end of the germinating chamber, rotatable rollers around which said traveling floors pass, means for driving said rollers in unison and for rotating one series thereof faster than the other, an elevated steep above the uppermost of said floors, means for discharging wet grain from said steep continuously onto the uppermost floor, means for directing the grain from one floor to another, an agitator for

agitating the grain during its passage from floor to floor, an air moistening and tempering chamber, means for directing the moistened and tempered air under the traveling floors, a ventilating flue adjacent the traveling floors, and regulating dampers for said flues.

3. A grain germinating and drying apparatus, comprising a plurality of traveling floors in superimposed relation movable at variable speeds and extending from end to end of the germinating chamber, an elevated steep above the upper floor, means for conveying grain from said steep onto the uppermost floor, means at the discharge end of each floor for agitating and directing the grain onto the succeeding floor below, an air moistening and tempering chamber, means for directing the air therefrom under the lowermost of said traveling floors, a vertical ventilating flue adjacent the traveling floors, regulating dampers therein, and means for drying the grain after passing from the lowermost floor.

In testimony whereof, I sign this specification in the presence of two witnesses.

LOUIS MUELLER.

Witnesses:

E. S. WHEELER,
I. G. HOWLETT.