

No. 724,646.

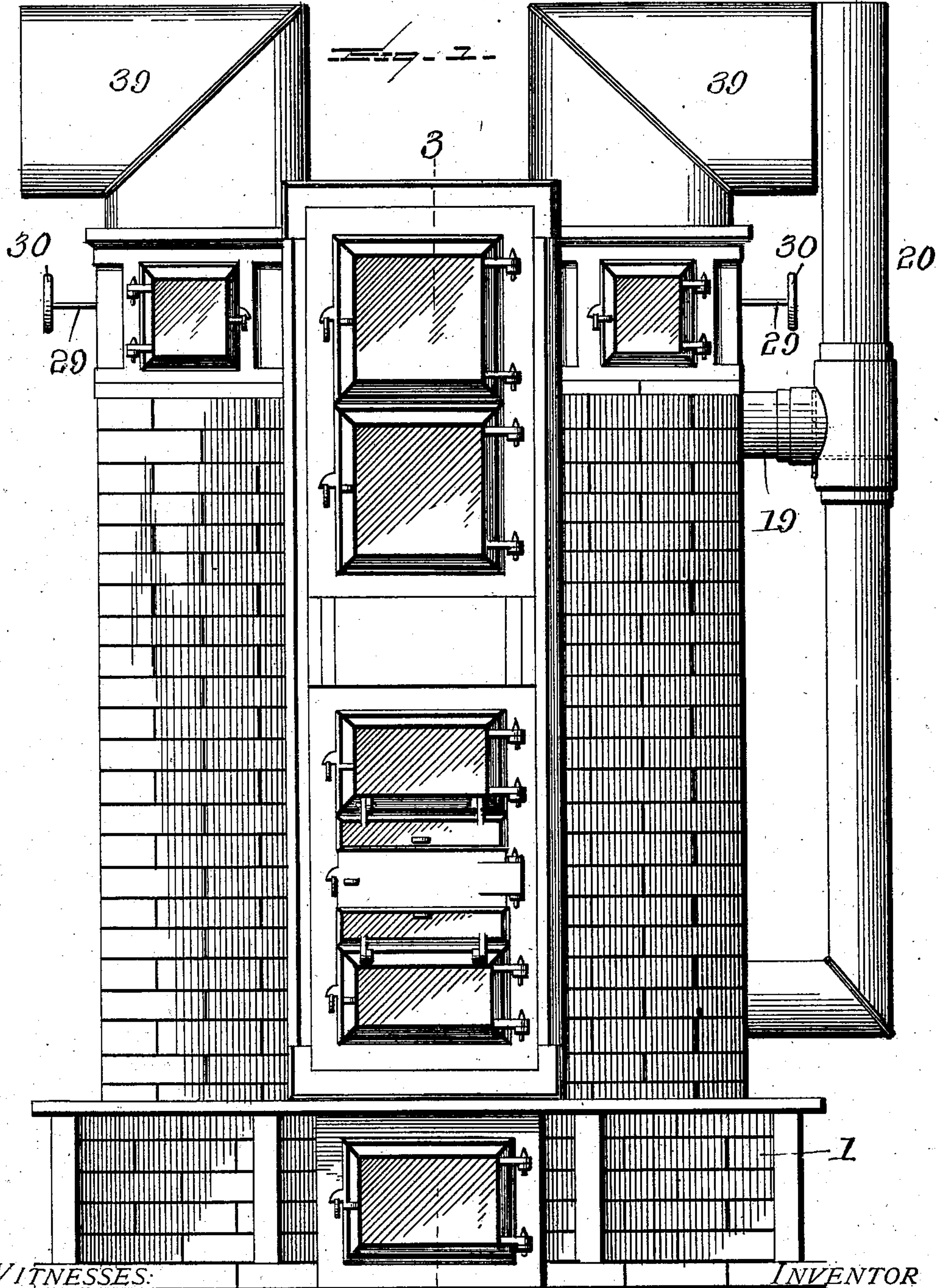
PATENTED APR. 7, 1903.

R. H. YEOMAN.
FURNACE.

APPLICATION FILED MAY 10, 1902.

NO MODEL.

7 SHEETS—SHEET 1.



WITNESSES:

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3

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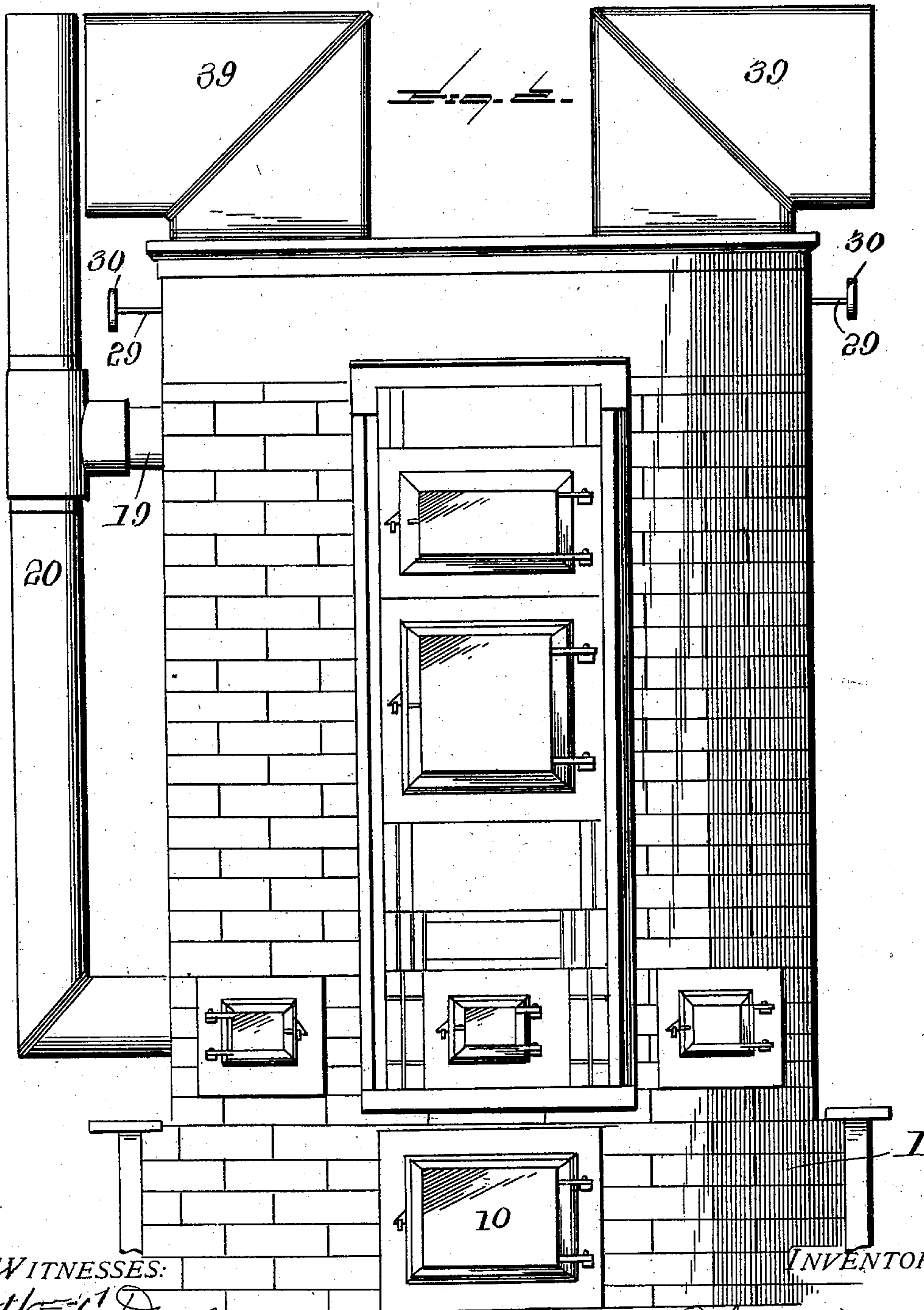
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7 SHEETS—SHEET 2.



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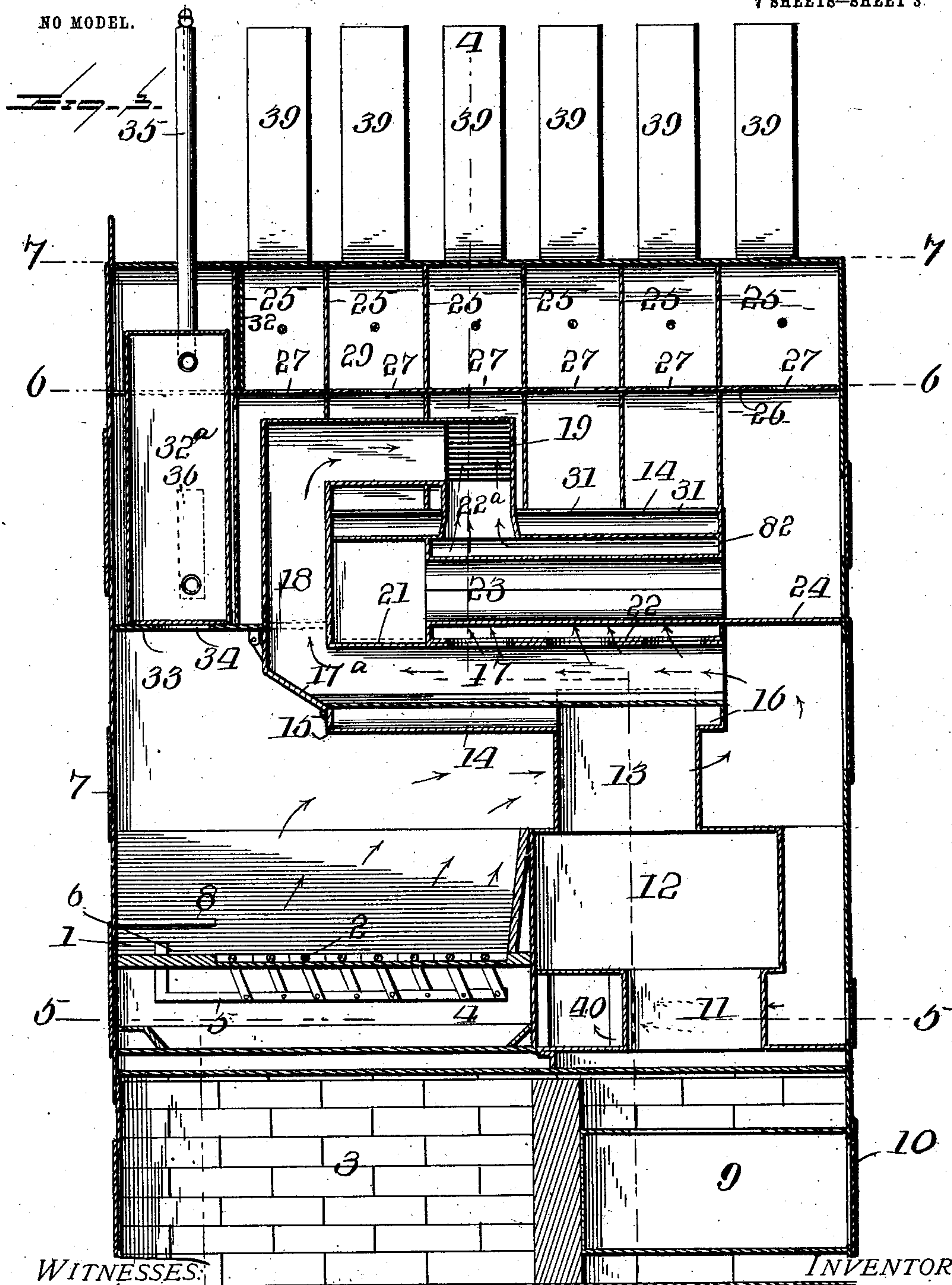
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7 SHEETS—SHEET 3.

NO MODEL.



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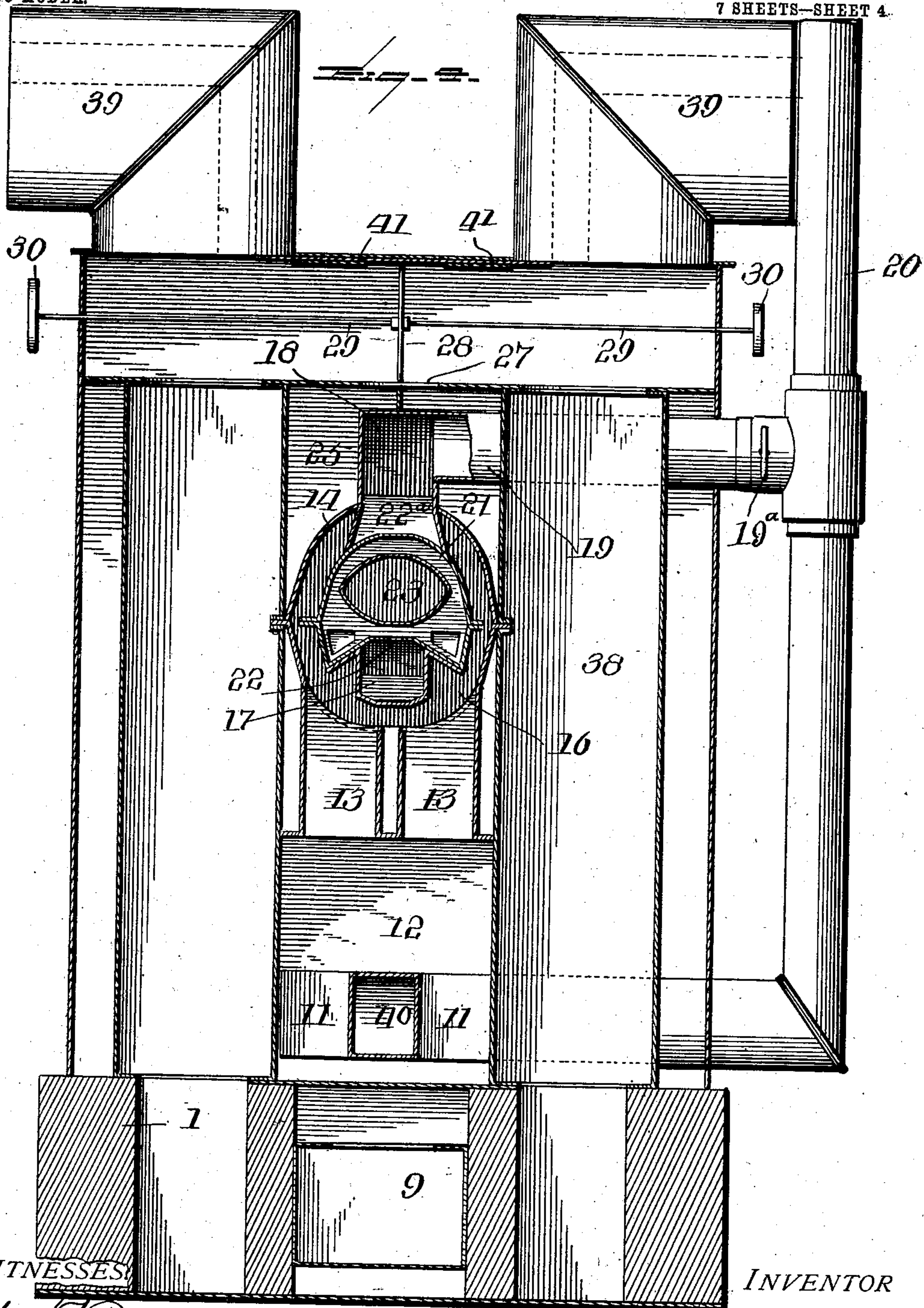
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7 SHEETS—SHEET 4.



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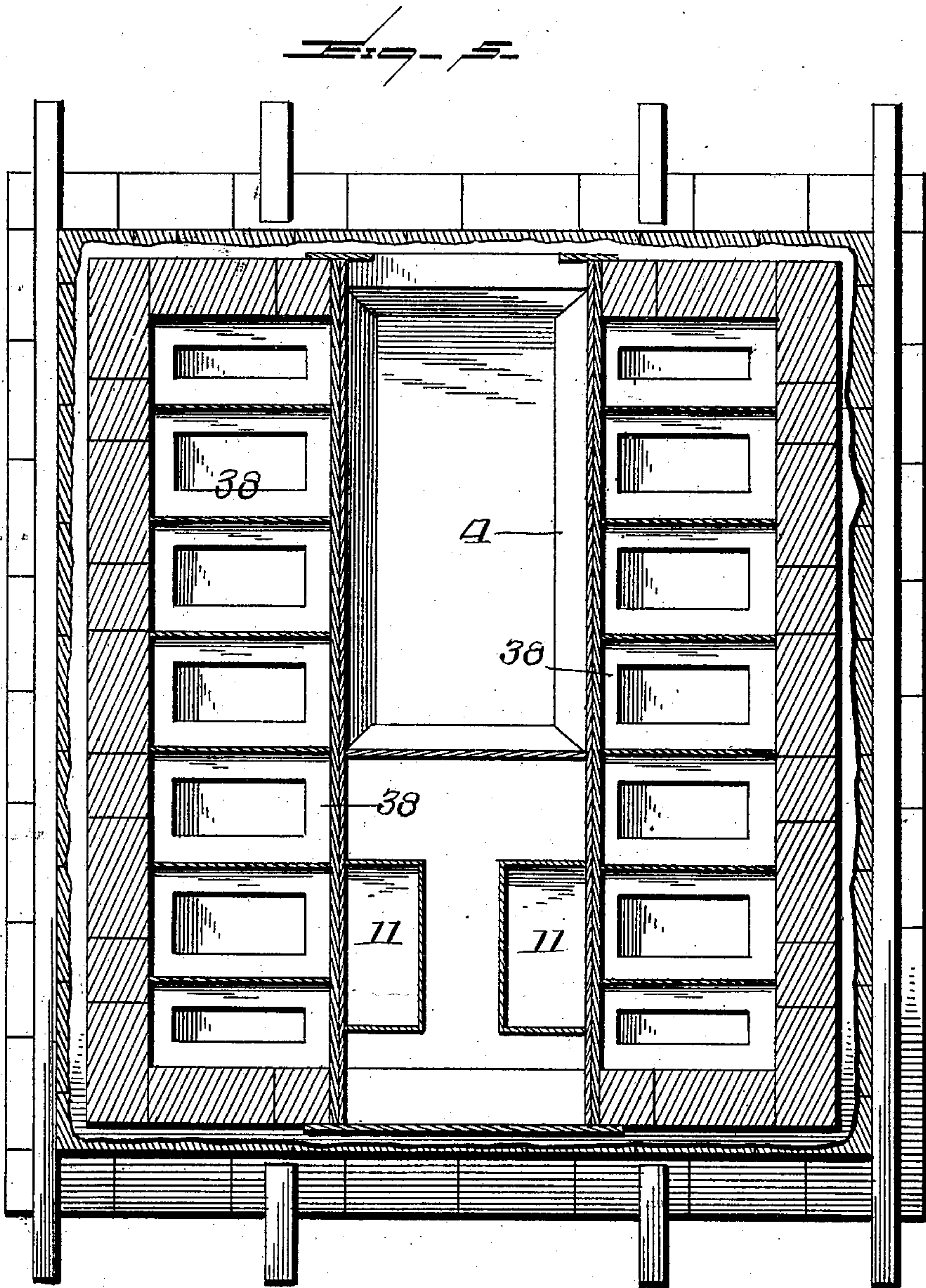
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7 SHEETS—SHEET 5.



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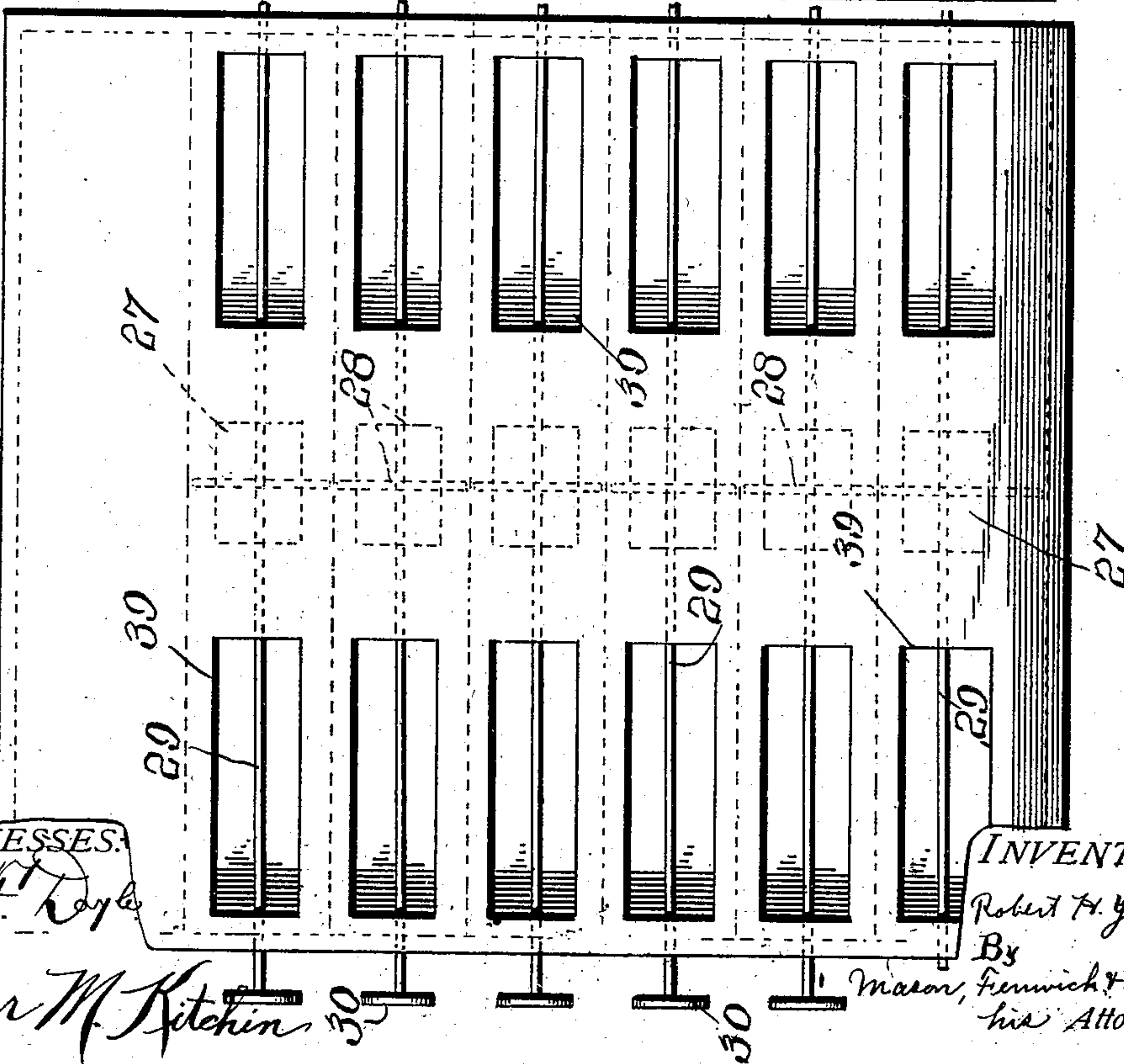
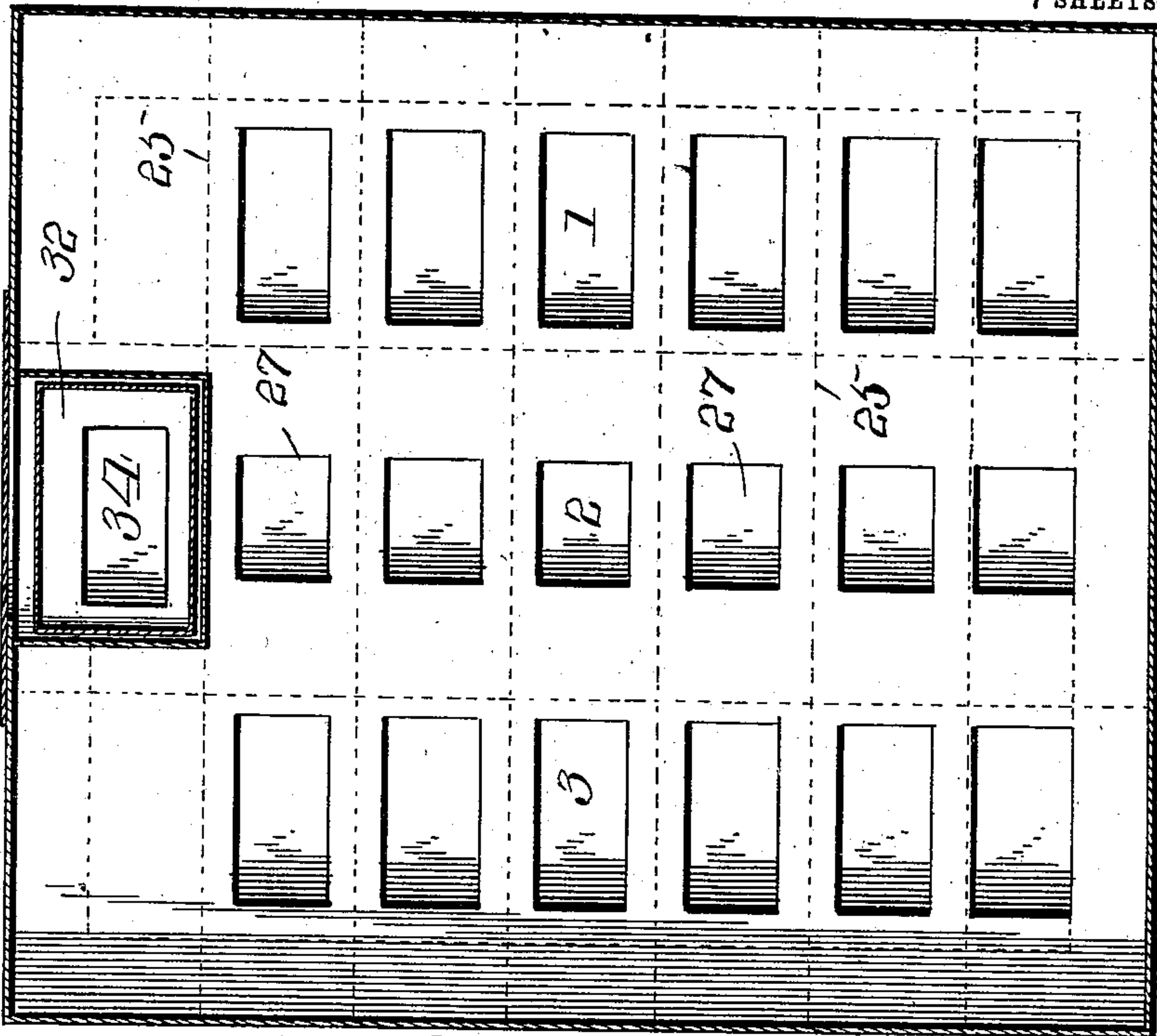
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7 SHEETS—SHEET 6.



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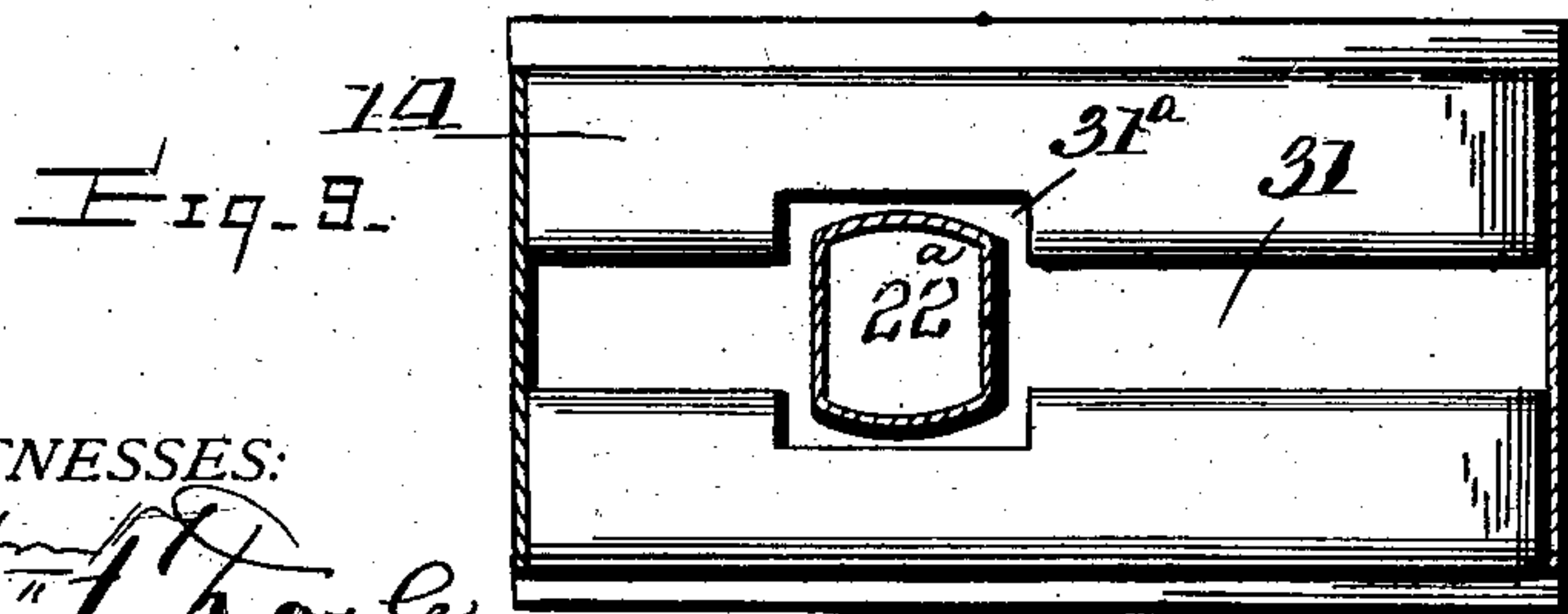
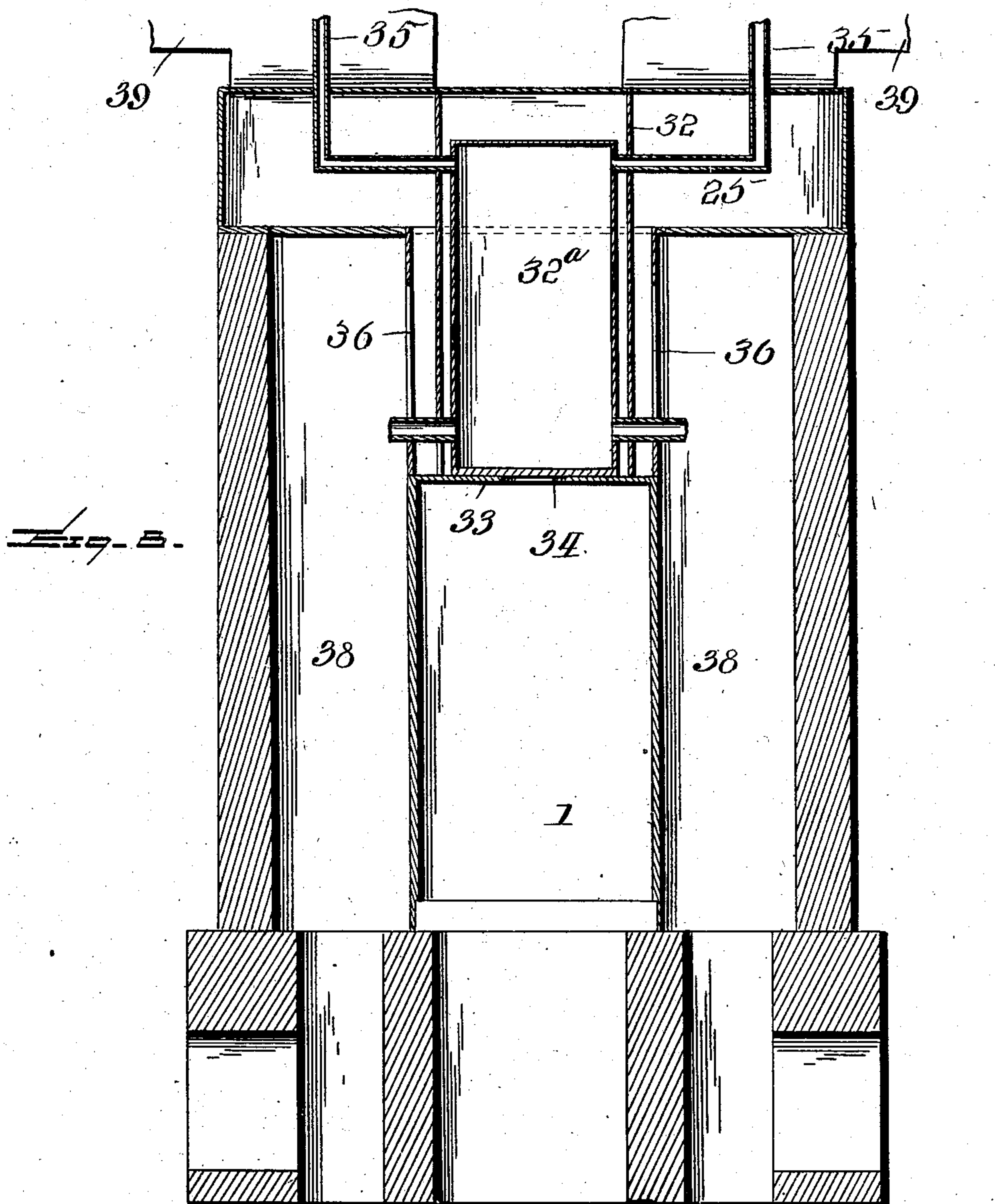
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R. H. YEOMAN.
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APPLICATION FILED MAY 10, 1902.

NO MODEL.

7 SHEETS—SHEET 7.



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UNITED STATES PATENT OFFICE.

ROBERT H. YEOMAN, OF OMAHA, NEBRASKA.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 724,646, dated April 7, 1903.

Application filed May 10, 1902. Serial No. 106,784. (No model.)

To all whom it may concern:

Be it known that I, ROBERT H. YEOMAN, a citizen of the United States, residing at Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Furnaces; and I do hereby 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.

This invention relates to improvements in furnaces, and has in view the production of means for supplying heated air without bringing the same into contact with the products of combustion.

The object in view is the arrangement of the elements of a furnace in such a manner as to give a maximum of surface exposure to the air to be heated, whereby the heat units may be extracted to the greatest extent from the products of combustion before the same are discharged from the furnace.

With this object in view the invention consists in certain novel constructions, combinations, and arrangement of parts, as will be hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 represents a view in front elevation of the furnace combining the features of the present invention. Fig. 2 represents a similar view from the rear. Fig. 3 represents a vertical longitudinal section taken on the plane of line 3 3 of Fig. 1. Fig. 4 represents a vertical transverse section taken on the plane of line 4 4 of Fig. 3. Fig. 5 represents a horizontal section taken on the plane of line 5 5 of Fig. 3. Fig. 6 represents a similar view on the plane of line 6 6 of Fig. 3. Fig. 7 represents a top plan view of the furnace. Fig. 8 represents a vertical section taken on the plane of line 8 8 of Fig. 3. Fig. 9 represents a detail top plan view of the main heating-drum.

In the production of hot-air furnaces it has been found desirable to avoid the intermixing of the air to be heated with the products of combustion and at the same time to communicate as much heat from the products of combustion to the air being heated as is possible, and in order to attain this result to the best advantage I employ an arrangement of elements, as disclosed in the accompanying

drawings, in which 1 represents any suitable fire-pot provided with grate 2, arranged above the ash-pit 3, a suitable chute, as 4, being arranged beneath the grate and above the ash-pit for guiding the ashes into the said pit. The bars of grate 2 are designed to be rocked through the connection of a suitable rod 5, pivotally attached thereto, having its operating end extending above the plane of said grate, (shown at 6.) A fuel-feeding door 7 is arranged in front of the furnace, and a diaphragm 8 extends over the operating end of rod 5 for protecting the same when fuel is being fed to the furnace.

To the rear of the ash-pit 3 is arranged an air-supply chamber 9, designed to receive its supply through an opening in the rear wall of the furnace closed by a door 10, the chamber 9 communicating through air-ducts 11 with an air-chamber 12. The front wall of chamber 12 lies contiguous to the fire-pot 1, and the rear wall is spaced from the rear wall of the furnace, the ducts 11 being spaced apart and communicating with chamber 12 through the bottom thereof at either side. Suitable ducts 13 lead upwardly from chamber 12 and communicate with a longitudinally-arranged drum, as 14. The ends of drum 14 are closed by heads 15 and 16, the head 16 being spaced a suitable distance from the rear wall of the furnace. A pipe, as 17, extends longitudinally within drum 14 and opens at either end through the heads 15 and 16. A vertically-arranged pipe, as 18, contacts with the inner end of pipe 17, a door, as 17^a, opening in the lower bend of pipe 18 directly above fire-pot 1, and the said pipe 18 turns near its upper end to a horizontal plane and communicates with a discharge-duct, as 19, which in turn communicates with the stack of the furnace, as 20. Any suitable damper, as 19^a, may be provided for preventing communication of the products of combustion through duct 19 to stack 20. Within the drum 14, arranged longitudinally thereof above the pipe 17, is a shell, as 21, substantially crescent-shaped in cross-section and formed in its lower horizontal wall with suitable apertures 22, communicating with pipe 17. The upper wall of shell 21 is provided with a longitudinal slot, as at 31, the edges of said shell being broken

away, as at 31^a, for permitting the passage of a pipe 22^a, leading into duct 19. Within the shell 21, arranged longitudinally thereof, is an open-ended passage, as 23, which has its front end communicating with the interior of drum 14 and its rear end opening through head 16. A plate, as 24, is arranged horizontally and divides the space between the head 16 and the rear wall of the furnace into two sections, and it is with the upper section of the said space that the passage 23 communicates. A series of transversely-arranged plates, as 25 25, divides the furnace into hot-air compartments, a horizontally-arranged diaphragm, as 26, dividing the upper portion of the furnace into upper and lower hot-air sections. The diaphragm 26 is apertured, as at 27 27, for establishing communication between the lower section of each of the horizontal divisions with the upper section thereof, such upper section being provided with a vertically-arranged transverse damper, as 28, carried by operating-rods 29 29, extending to either side of the furnace and formed with the operating-handles 30 at the outer ends thereof. Each damper 28 is preferably normally adjusted to position centrally of its respective aperture 27, but may be adjusted to either side, as may be desired.

The slot 31 communicates with each of the lower sections of the horizontal divisions of the upper portion of the furnace for supplying heated air thereto.

I provide a drum 32 within the space between the foremost plate 25 and the front wall of the furnace. A plate, as 33, is arranged horizontally above the fire-pot 1 and forms the bottom of the said drum and is apertured, as at 34, for permitting the products of combustion to rise from the said fire-pot into direct contact with the bottom of a water-tank 32^a, arranged within said drum for heating the same. Suitable water-supply pipes, as 35^a 35^a, communicate with the tank 32^a, near the bottom thereof, and similar conduits, as 35 35, lead from the said tank, near the upper end thereof, for conducting heated water from said tank. Air-supply openings 36 36 are arranged for supplying atmosphere to the space surrounding drum 32, the wall of said drum being apertured for permitting communication therethrough of the heated air.

Each of the upper sections of the vertical divisions of the hot-air space of the furnace is provided with a vertical duct, as 38, communicating thereto from below and being designed to receive a supply of fresh air from outside the furnace and permitting the same to be heated as it passes along said duct near the drum 14, and it is in one set of these ducts that the apertures 36 are formed. A conducting-pipe 39 communicates with each of the upper sections of the vertical divisions, near each end thereof, and is designed to conduct therefrom heated air and carry the same to the rooms to be heated.

Beneath chamber 12 and forward of ducts 11 is arranged a duct 40, communicating with the lower end of stack 20.

In operation the products of combustion rise from fire-pot 1 and pass directly up flue 18 through the opening at its lower end, and this direct draft is maintained until the fire is sufficiently started, when the door 17^a is closed and the said products are compelled to pass between the ducts 13 13 and on either side thereof into the rear end of pipe 17 and thence up pipe 18 and out duct 19, part of the products passing through apertures 22 about passage 23 and out pipe 22^a. The smoke and gases may be permitted to pass out duct 19 for any given time; but when the fire is sufficiently started within pot 1 the damper 19^a is preferably closed and the products of combustion are compelled to take a course downwardly about chamber 12 between ducts 11 and out duct 40. By the arrangement shown and described a maximum surface exposure is produced, and the air being supplied to chamber 9 rises through ducts 11 into chamber 12, and at the same time air being supplied to pipes 38 will move upwardly and enter the outer sections of the vertical divisions of the hot-air portions of the furnace. The air from the chamber 12 moves through ducts 13 into drum 14 and thence through slot 31 into the vertical divisions formed by plates 25, some of the air passing from the interior of the drum 14 through passage 23 into the rearmost division formed by said plates 25. When it is desired to direct all the heated air rising in one of the vertical sections formed by plates 25 into one of the conducting-pipes 39 and prevent entry of the same into the other of said pipes, it is only necessary to move damper 28 from the center of aperture 27 to the edge thereof, the degree of supply of heated air to either of the said pipes 39 being relative to the position of the damper 28 above aperture 27.

Any suitable stops 41 41 may be provided for limiting the movement of damper 28.

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

1. In a hot-air furnace, the combination with a suitable fire-pot having inclosing walls, plates dividing the upper section of said furnace into air-spaces, means for supplying air into the one of said spaces above the fire-pot, a tank in said space, a drum surrounding said tank and provided with an apertured bottom for permitting contact of the products of combustion from the said tank, a series of conducting-pipes leading from said furnace, means for supplying hot air from the space around said drum to some of said conducting-pipes, and means for supplying heated air to the other of said pipes, substantially as described.

2. In a hot-air furnace, the combination with a suitable fire-pot having inclosing walls, plates dividing the upper section of said furnace into air-spaces, means for supplying air

to one of said spaces above the fire-pot, a tank in said space, a series of conducting-pipes leading from said furnace, means for supplying hot air from the space around said tank to some of said conducting-pipes, and means for supplying hot air to the other of said pipes, substantially as described.

3. In a hot-air furnace, the combination with a fire-pot having inclosing walls, of hot-air sections arranged transversely of the upper portion of said furnace, means for supplying heated air to each of said sections, a vertically-arranged damper slidable in each of said sections and dividing the same into a plurality of parts and controlling the supply of heated air thereto, and means for shifting said damper for shutting off the supply of air to one part of the respective section and permitting the other part thereof to be supplied, substantially as described.

4. In a hot-air furnace, the combination with a suitable fire-pot having inclosing walls, of plates arranged above the same dividing said furnace into an upper and lower air-chamber, plates dividing said chamber into vertical sections, means for supplying heated air to some of said sections, and auxiliary means for supplying heated air to the other thereof, substantially as described.

5. In a hot-air furnace the combination with a suitable fire-pot having inclosing walls, of plates forming an upper heated-air chamber, vertically-arranged plates dividing said chamber into vertical sections, a horizontal diaphragm again dividing said sections, means for supplying heated air to all said sections, and auxiliary means for supplying air to the said foremost sections, substantially as described.

6. In a hot-air furnace, the combination with a suitable fire-pot having inclosing walls, of means for dividing the upper portion of said furnace into vertical heated-air sections, means for supplying heated air to said sections, and tubes arranged vertically in the furnace and having a portion of their walls designed to be contacted with the products of combustion from said fire-pot, the upper ends of said tubes being connected with said heated-air sections, substantially as described.

7. In a hot-air furnace, the combination with a suitable fire-pot having inclosing walls, of means for directing the products of combustion from said fire-pot, means for supply-

ing air in contact with the outer surface of the walls of the conducting-pipes for said products, vertical sections arranged in the upper portion of said furnace, an aperture formed in the lower wall of each of said sections for permitting entrance of said atmosphere into the sections, and a vertically-arranged damper extending across each of said sections and dividing the same transversely, whereby the supply of heated air to either portion of each of said sections may be controlled, substantially as described.

8. In a hot-air furnace, the combination with a fire-pot having inclosing walls, of heated-air sections arranged transversely of the upper portion of said furnace, means for supplying heated air through an aperture in the end wall of each of said sections, a vertically-arranged damper slidable in each of said sections and dividing the same into two parts, said damper normally resting above the hot-air communicating aperture, means for sliding said damper to either side of said aperture, and means for limiting said damper in its movement, substantially as described.

9. In a hot-air furnace, the combination with a suitable fire-pot having inclosing walls, of a drum, a vertically-arranged pipe above said fire-pot, a horizontally-arranged pipe communicating therewith and having its rear end opened and designed to receive products of combustion rising from said fire-pot, air-ducts communicating air to said drum, a duct leading from beneath said fire-pot, passages being arranged for permitting products of combustion to pass into said duct, and means for directing the products of combustion into said duct, substantially as described.

10. In a hot-air furnace, the combination with a suitable fire-pot having inclosing walls, of a drum arranged above the same having an aperture in its bottom, a water-tank arranged in said drum, means for supplying water to and conducting it from said tank, said drum being surrounded by said inclosing walls, means for supplying air to the space about said drum, and means for directing the heated air within said space away from said furnace, substantially as described.

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

ROBERT H. YEOMAN.

Witnesses:

C. J. YEOMAN,

U. F. THOMPSON.