No. 878,289. PATENTED FEB. 4, 1908.

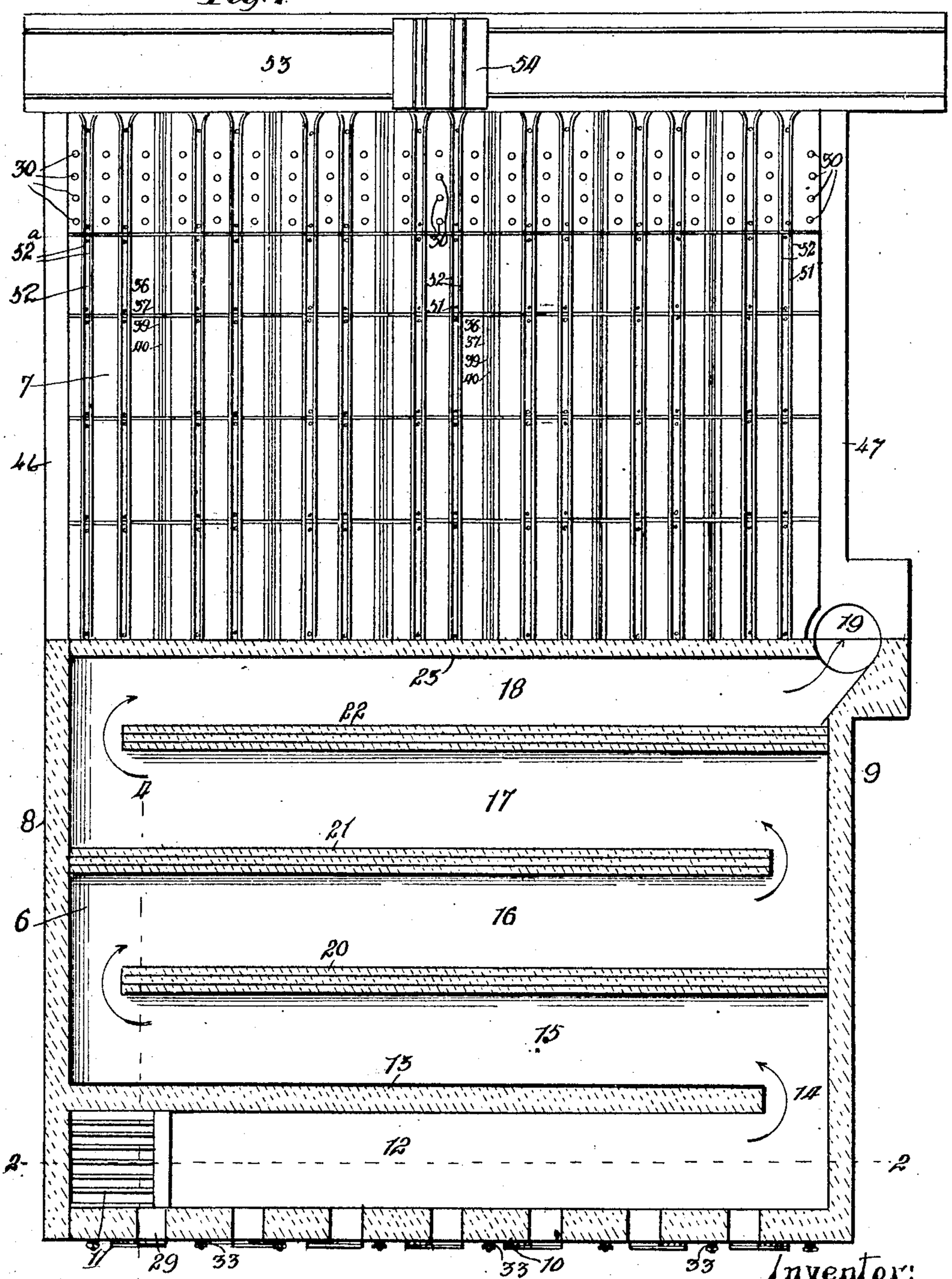
H. B. HUMPHREY.

WIRE BAKING OVEN.

APPLICATION FILED JUNE 13, 1907.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

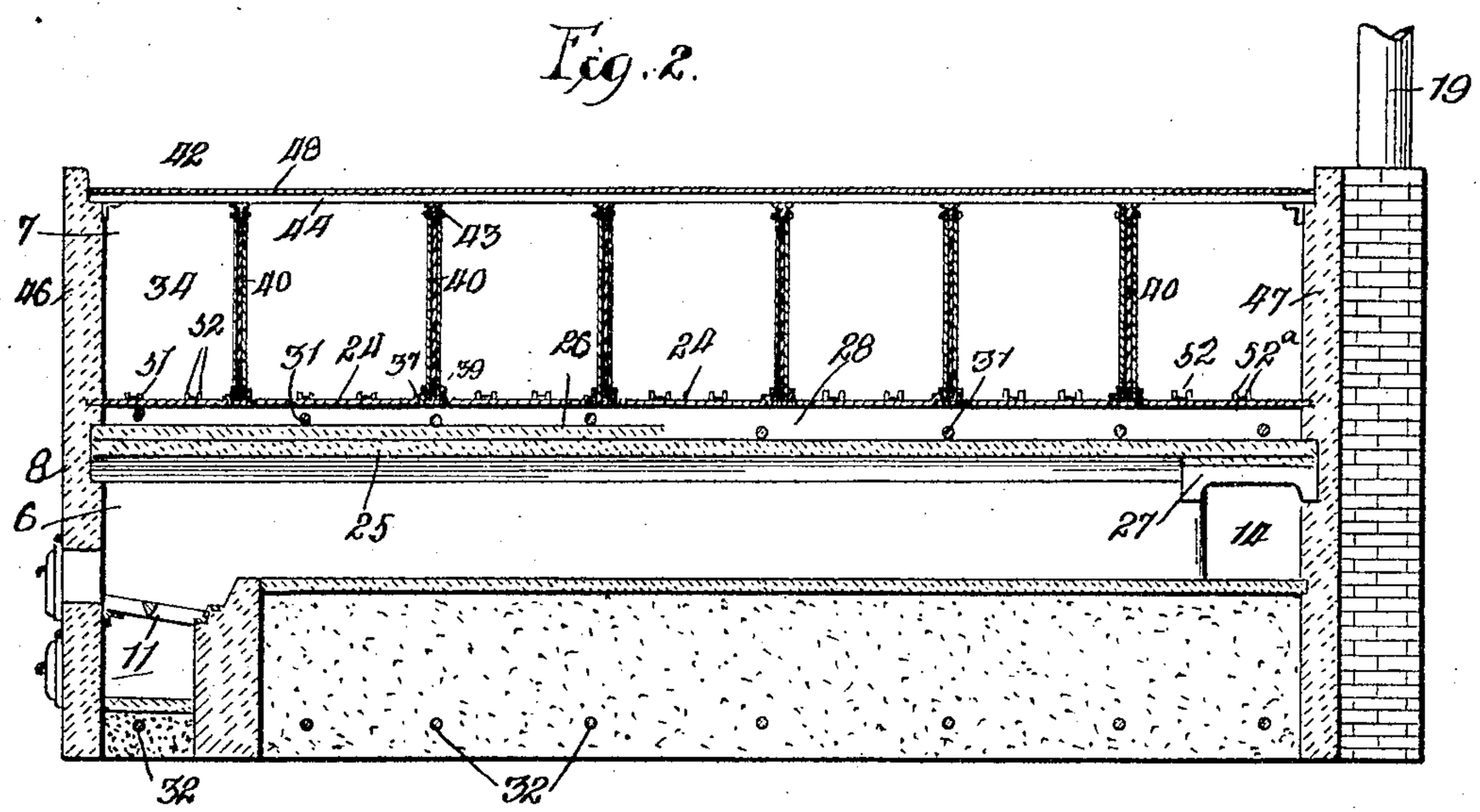
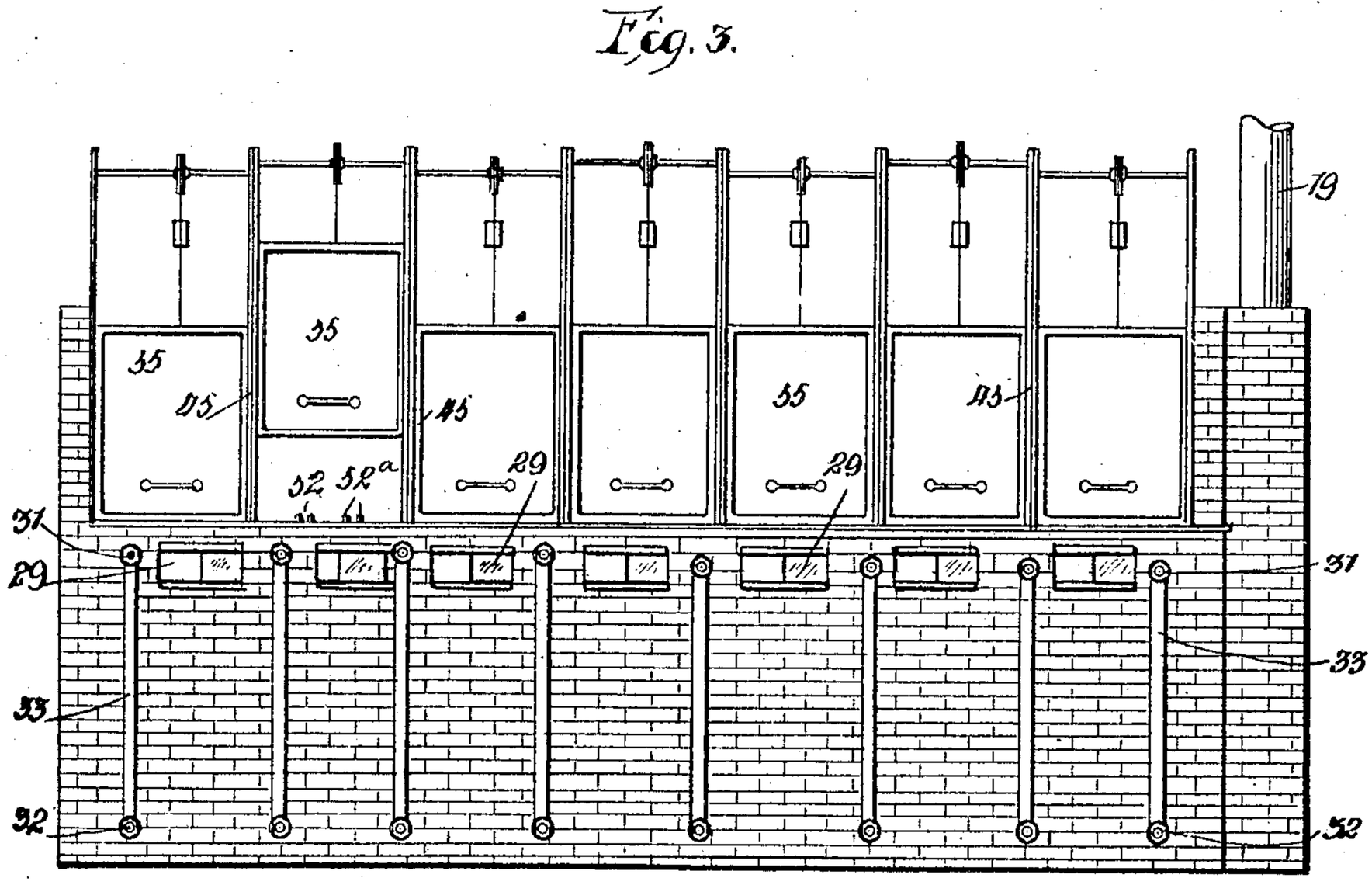


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4.

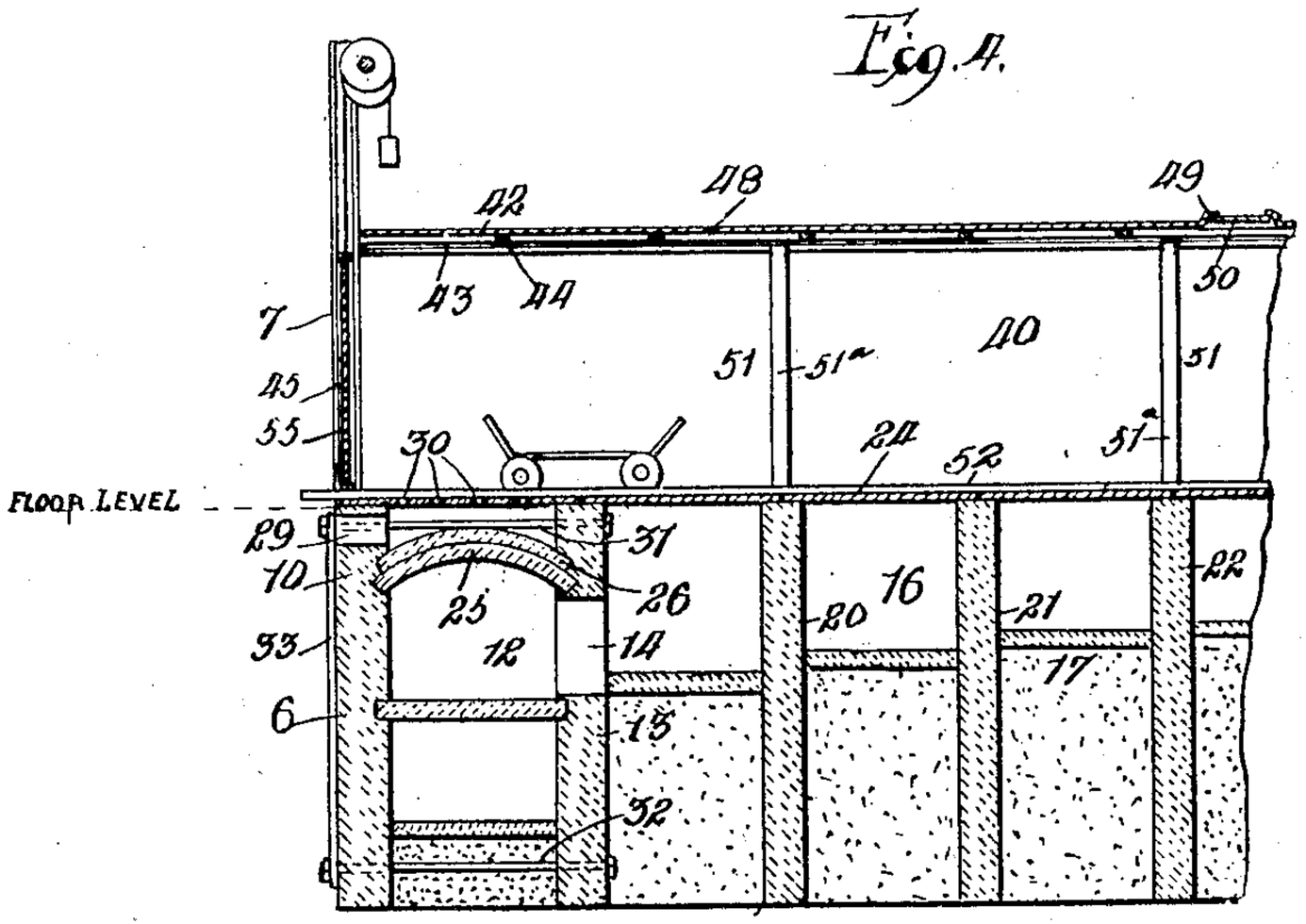


Fig. 5.

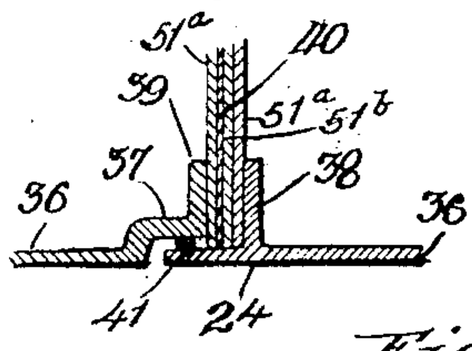


Fig. 6.

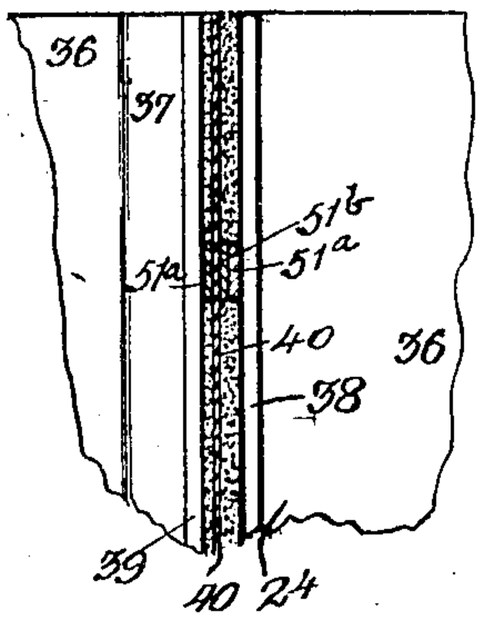
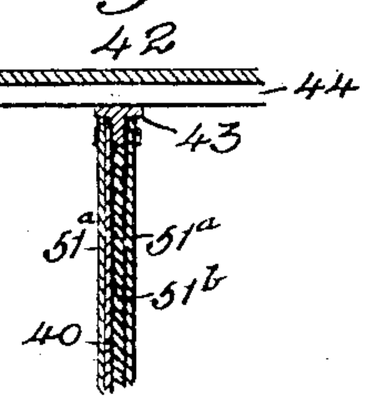


Fig. 7.



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UNITED STATES PATENT OFFICE.

HARRY B. HUMPHREY, OF JOLIET, ILLINOIS, ASSIGNOR TO HUMPHREY & SONS, OF JOLIET, ILLINOIS, A COPARTNERSHIP CONSISTING OF HORACE FRED HUMPHREY AND HARRY B. HUMPHREY.

WIRE-BAKING OVEN.

No. 878,289. Specification of Letters Patent. Patented Feb. 4, 1908.

Application filed June 13, 1907. Serial No. 378,825.

To all whom it may concern:

Be it known that I, HARRY B. HUMPHREY, a citizen of the United States, residing at Joliet, in the county of Will and State of Illinois, have invented certain new and useful Improvements in Wire-Baking Ovens, of which the following is a specification.

In the operation of wire drawing, it is customary to receive the raw material from the rolling mill in the form of rods which are usually coated with rust and scale; and, in order to prepare the rods for the wire drawing operation, it is necessary to immerse the reels, around which the rods are wound, in an acid and thereafter to neutralize the effect of the acid by the use of an alkali such as lime or similar substance. If the wire were immediately delivered to the drawing blocks it would be coated or covered with a neutralized acid which would quickly tend to impair the quality and strength of the completed wire, for which reason it is necessary to subject the raw rods to a baking operation in order to thoroughly dry out the acid and deliver the rods in clean condition to the wire drawing blocks. In some cases it has been customary to bake the rods in a steam heated oven, but this method is objectionable in view of the moisture which will always be present in steam heated ovens, for which reason dry heat provides the only satisfactory means of baking the rods preparatory to their being drawn into wire.

The object of the present invention is to provide an oven in which the rods can be subjected to a high degree of dry heat, and the invention particularly relates to the construction of the oven whereby the metal portions of the oven are prevented from direct contact with the fire and the deterioration or burning out which would occur were the metallic parts not protected.

The invention further relates to the means provided for securing a circulation of fresh heated dry air which tends to quickly carry off the acid fumes and at the same time prevents the oven plates from burning out when subjected to the high temperature necessary in baking the wire rods.

The invention further relates to the general arrangement of the oven as a whole and to the structural features hereinafter described and claimed.

In the drawings, Figure 1 is a half sectional plan view of the entire oven, the upper portion of the figure showing the oven floor with the roof removed, the lower portion the flue construction; Fig. 2 a cross sectional view taken on line 2—2 of Fig. 1; Fig. 3 an end elevation showing the doors controlling the several compartments; Fig. 4 a sectional view taken on line 4—4 of Fig. 1; Fig. 5 an enlarged detail showing the method of supporting the floor structure; Fig. 6 a detail plan view of the floor structure and Fig. 7 a sectional detail showing the method of securing the oven partitions to the roof.

The oven as a whole is of rectangular shape and comprises a lower or flue structure 6, which is preferably positioned below the floor level of the wire mill, and an upper or baking structure 7, which is preferably positioned above the floor. The flue structure comprises a front side wall 8, a rear side wall 9, and end walls 10. At the front corners of the flue structure are located grates 11, one of which is shown in Fig. 1, and the grates are in direct communication with initial flue passages 12, which are formed between the end walls 10 and the first inner flue walls 13. It will be understood that the flue structure is the same at both ends of the furnace so that the half sectional view shown in Fig. 1 is symmetrical from end to end, and it is not deemed necessary to show in detail both ends of the flue structure. The first inner flue walls terminate inside of the rear wall 9, leaving a communicating flue passage 14 which connects the initial flue passage 12 with a second flue 15, which in turn communicates with a third flue 16. The third flue communicates with a fourth flue 17, which latter communicates with a final flue 18 terminating in a stack 19. The second, third, fourth and final flue passages are separated from one another by flue partitions 20, 21 and 22, which are arranged in staggered relation with respect to their open ends so as to provide a sinuous or devious path of travel for the heated products of combustion prior to their discharge through the stack.

The two companion ends of the flue structure are separated from one another by a center partition wall 23, which is located in line with the stack, so that the same stack serves as an outlet for both grates. The flue passages, with the exception of the initial passages, are covered directly by the iron flooring 24 of the oven chambers, but the initial flues, which are directly exposed to

the action of the fire, are protected by a fire arch 25, which extends from end to end of the initial flue. The fire arch is composed of fire brick or similar nonfusible substance, and, immediately above the grate, comprises a supplemental thickness or layer 26, shown in Figs. 2 and 4, which affords complete protection for the iron floor of the baking ovens at the point where the floor is most exposed to the heat. The arch extends between the end wall and the first flue partition and is supported at its rear end on a bridge casting or plate 27 which arches over the rear end of the initial flue at the point of exit through the passageway 14. The arch is so located as to provide a space 28 between the arch and the iron floor, which space extends from end to end immediately above the initial flue and affords, in effect, a heating chamber for the supply of heated fresh air to the baking ovens for the purpose of creating a circulation which will tend to quickly dry out the wire rods and carry off the fumes of the acid.

The heating space or chamber 28 has opening thereinto, through the end wall, a series of damper regulated ports 29, and the iron floor of the baking ovens or pockets, immediately above the arch, is provided with a plurality of holes or perforations 30, which permit the air, which enters through the ports 29 and passes over the heated arch, to rise up into the several ovens or pockets of the baking portion of the structure. In order to reinforce the arched flue structure, upper and lower tie rods 31 and 32 are run through the outer end wall and the first inner partition wall, which rods, at their outer ends, are secured to exterior vertical tie bars 33, which fully reinforces the structure and prevents the walls from spreading by the weight of the arch.

The baking portion of the structure comprises a plurality of pockets or ovens 34, running in transverse relation to the flue partition walls, and of any number to suit the required capacity of the oven. In the present case seven ovens or pockets are shown, which extend from end to end of the structure, although it is obvious that a greater or less number of pockets or ovens might be employed. As before stated, the floor 24 of the ovens is formed of iron and is supported directly on the flue partition walls. The floor is composed of a plurality of iron plates 36, each of the connecting plates being provided at one of its edges with an offset flange 37, and the plate having, at some distance from its other edge, a vertically extending flange 38. The offset flanges 37 terminate in vertical flanges 39, which lie in parallel relation with and at a slight distance from the flanges 38 on the adjacent section of the flooring. This arrangement provides a recess or channel for the lower edge of a sheet iron partition wall 40, and the space or channel around the edge of the partition wall, is preferably filled with sand, which serves as a packing to prevent the fumes traveling through the flues from passing into the baking chamber above. The offset flange 37 overlies the edge of the adjacent floor section, which latter is provided, near its edge, with a V-shaped channel 41, in parallel relation with the vertical flange 38, which channel is adapted to receive a packing, preferably in the form of an asbestos rope, which is compressed between the overlapping edges of the floor sections and serves to prevent the escape of the sand filling, the weight of the plate being sufficient to hold the packing rope tightly compressed.

The ovens are inclosed by a roof 42, which is supported upon longitudinally extending beams 43, upon which are laid transversely extending roof bars 44. The ends of the longitudinally extending beams are entered into slide-door casings 45, at the ends of the oven, and the sides of the oven structure, as a whole, are formed by elevating the front and rear side walls 8 and 9 of the flue structure to form front and rear oven walls 46 and 47, respectively. The roof itself is formed of sheet iron sections 48, or in any other suitable manner. The roof of each of the ovens or pockets has, near its center, a vent opening 49, which is preferably controlled by means of a slide damper 50 of the usual formation. The longitudinally extending beams, intermediate their ends, are supported upon a plurality of columns 51, each of which is preferably formed of two clamping sections 51^a and an interposed filler section 51^b, between which and one of the clamping sections the sheet iron partition is clamped, which obviates the necessity of drilling or puncturing the partition.

Each of the ovens or pockets has, extending from end to end thereof, car tracks 52, which, as shown, are formed by securing two pairs of bars 52^a to the floor of the oven, in suitable manner to provide grooves for the reception of the car wheels, which rest directly upon the iron floor of the oven. At the receiving end of the oven, which in Fig. 1 is indicated at the upper portion of the sheet, is a transversely extending switch track 53, upon which runs a car 54 of the usual character, and the switch track is, of course, located below the level of the oven tracks so that the surface of the switch car will be flush with the level of the oven tracks, so that a car containing bundles of wire rods can be carried upon the switch car and run into any one of the ovens. The ovens are closed at their ends by means of the usual counter-weighted doors 55.

In use, fires are started in the two front corner furnaces, and the sinuous or devious character of the flue structure causes the products of combustion to pass back and

forth under the iron floor of the baking structure, which soon becomes hot, in preparation for the reception of the cars containing the wire rod bundles. The arched structures, which are doubly arched immediately above the grate, prevent the flames from coming in direct contact with the floor at the point of highest temperature, but serve to heat the arch to a very high degree so that the air entering the ports 29, which are equally distributed from front to rear of the end walls, will pass into the heating space above the arch, and be dry and heated to a high degree prior to its entrance into the outer ends of the ovens or pockets, whence it circulates to the center, where it rises and is discharged, together with the acid fumes, through the ports or openings in the center of the roof of the baking structure. In this manner a high degree of dry heat can be obtained without danger to the metal floor, and at the same time much better results can be obtained, by reason of the circulation of the air, than if the baking were performed in an air tight chamber or oven from which the escape of the vaporized acid gases was impossible. After the wire rod bundles have been thoroughly baked, the cars on which the bundles are carried can be run out of the discharge end of the baker, and cars containing fresh bundles run thereinto, as required. It will be noted that the flue structure, as illustrated, comprises two symmetrical end sections, and it is obvious that, in building a small baker, the structure of Fig. 1 could be cut in half, as it were, and the flue structure of but one end employed, without departing from the spirit of the invention.

The method of forming the oven flooring is one which provides a thoroughly tight joint, which at the same time possesses sufficient flexibility to provide for the necessary expansion and contraction incident to the operation of the baker; but the joint will remain tight under all conditions of usage. By the provisions of vent openings near the center of each of the baking ovens or chambers, the circulation will be carried from the ends of the ovens to the center, thereby providing a complete circulation throughout the entire length of the oven structure. The construction is one which provides a substantially uniform heat throughout the entire length of the oven, so that after the rods emerge from the oven they will be thoroughly dried and in condition for further manipulation.

What I regard as new and desire to secure by Letters Patent is:

1. In a baker of the class described, the combination of a flue structure, a baking chamber above the flue structure and having a metallic floor provided with openings, a partition of impervious material interposed between the fire space of the flue structure and the metallic floor, in position to leave a heating space immediately below the openings in the floor, and ports leading to the heating space for protecting the metallic floor and providing a circulation of air, substantially as described.

2. In a baker of the class described, the combination of a flue structure, a baking chamber above the flue structure and having a metallic floor provided with openings, an arch of impervious material interposed between the fire space of the flue structure and the metallic floor, in position to leave a heating space immediately below the openings in the floor, and ports leading to the heating space for protecting the metallic floor and providing a circulation of air, substantially as described.

3. In a baker of the class described, the combination of a flue structure, a baking chamber above the flue structure and having a floor provided with openings, a partition of impervious material interposed between the fire space of the flue structure and the floor, in position to leave a heating space immediately below the openings in the floor, and ports leading to the heating space for protecting the floor and providing a circulation of air, substantially as described.

4. In a baker of the class described, the combination of a flue structure, a baking chamber above the flue structure and having a floor provided with openings, an arch of impervious material interposed between the fire space of the flue structure and the floor, in position to leave a heating space immediately below the openings in the floor, and ports leading to the heating space for protecting the floor and providing a circulation of air, substantially as described.

5. In a baker of the class described, the combination of a flue structure having sinuous passages, a stack in communication therewith, a baking structure divided into ovens running in right angle relation with respect to the flue passages, a flooring for the ovens, provided, above the first flue passage, with openings, a partition of impervious material bridging the first flue passage and leaving a heating space below the perforated floor, and ports for supplying air to said heating space, whereby the floor of the baking structure is protected and a circulation of air created, substantially as described.

6. In a baker of the class described, the combination of a flue structure having sinuous passages, a stack in communication therewith, a baking structure divided into ovens running in right angle relation with respect to the flue passages, a metallic flooring for the ovens, provided, above the first flue passage, with openings, a partition of impervious material bringing the first flue passage and leaving a heating space below

the perforated floor, and ports for supplying air to said heating space, whereby the metallic floor of the baking structure is protected and a circulation of air created, substantially as described.

7. In a baker of the class described, the combination of a flue structure provided at each end with sinuous passages terminating in the center of the structure, a stack in communication with both sets of flue passages, two grates, one for each end of the flue structure and in direct communication with the first flue passage of each end, an arch of impervious material above each of the first flue passages, a plurality of baking ovens running in right angle relation to the flue passages and provided with metallic floors perforated above the impervious arch and positioned to provide a heating space in communication with said perforations, a port at each end of the structure communicating with the heating space, and a roof provided with a vent hole for each of the baking ovens, substantially as described.

8. In a baker of the class described, the combination of a flue structure provided at each end with sinuous passages terminating in the center of the structure, a stack in communication with both sets of flue passages, two grates, one for each end of the flue structure and in direct communication with the first flue passage of each end, an arch of impervious material above each of the first flue passages, a plurality of baking ovens running in right angle relation to the flue passages and provided with metallic floors perforated above the impervious arch and positioned to provide a heating space in communication with said perforations, a port at each end of the structure communicating with the heating space, a roof provided with a vent hole for each of the baking ovens, ovens for completing the circulation, the metallic floor being formed of sections, each of which is provided at one edge with an offset flange adapted to overlie the adjacent edge of the companion section, each of the adjacent edges being further provided with a vertically extending flange forming in combination a channel adapted to be filled with a packing, and partition walls having their edges entered within the channel and packed therein, substantially as described.

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