

No. 624,401.

Patented May 2, 1899.

W. & J. C. SWINDELL.
ANNEALING FURNACE.

(Application filed Nov. 10, 1898.)

(No Model.)

2 Sheets—Sheet 1.

FIG. 1

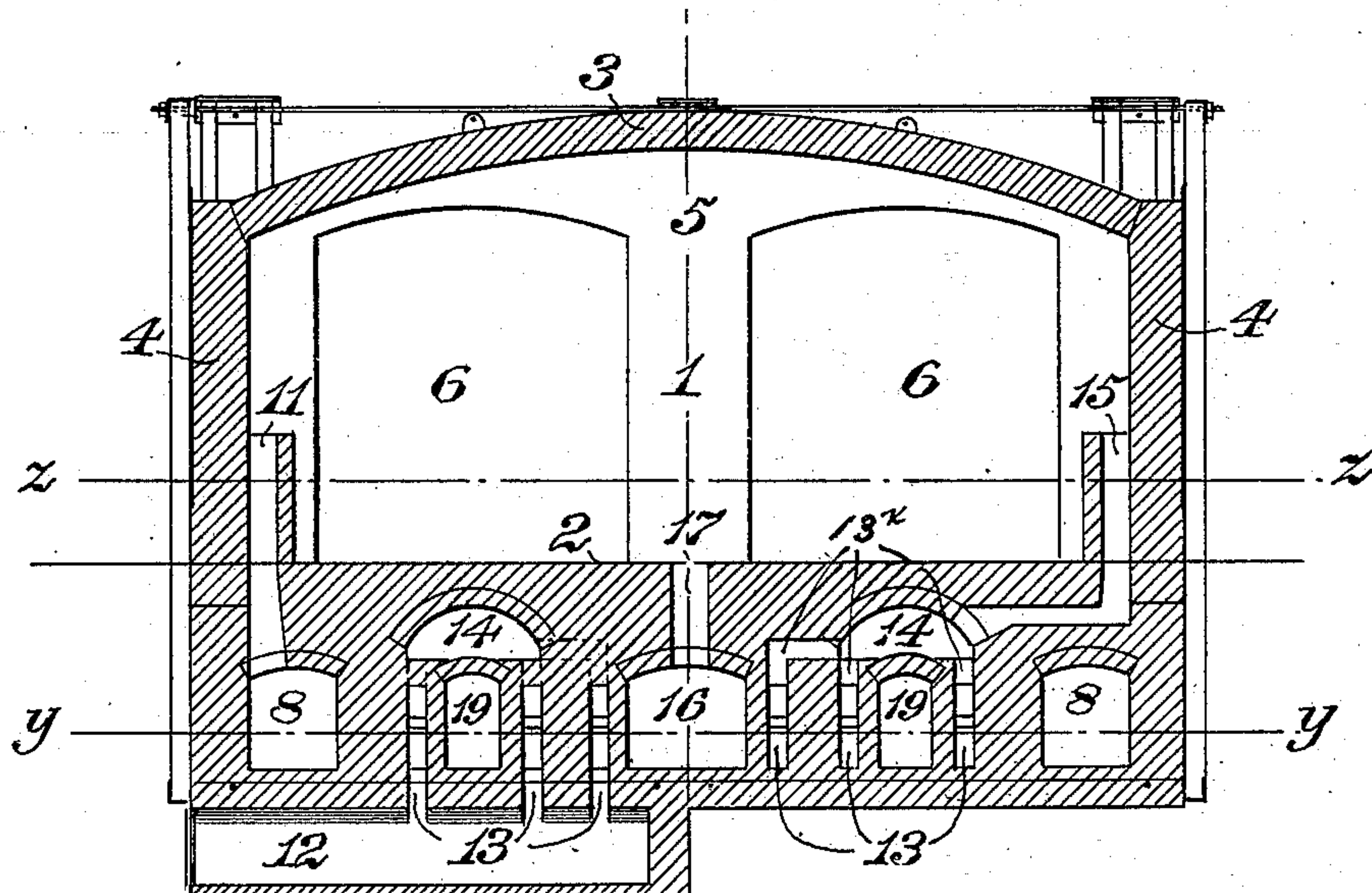
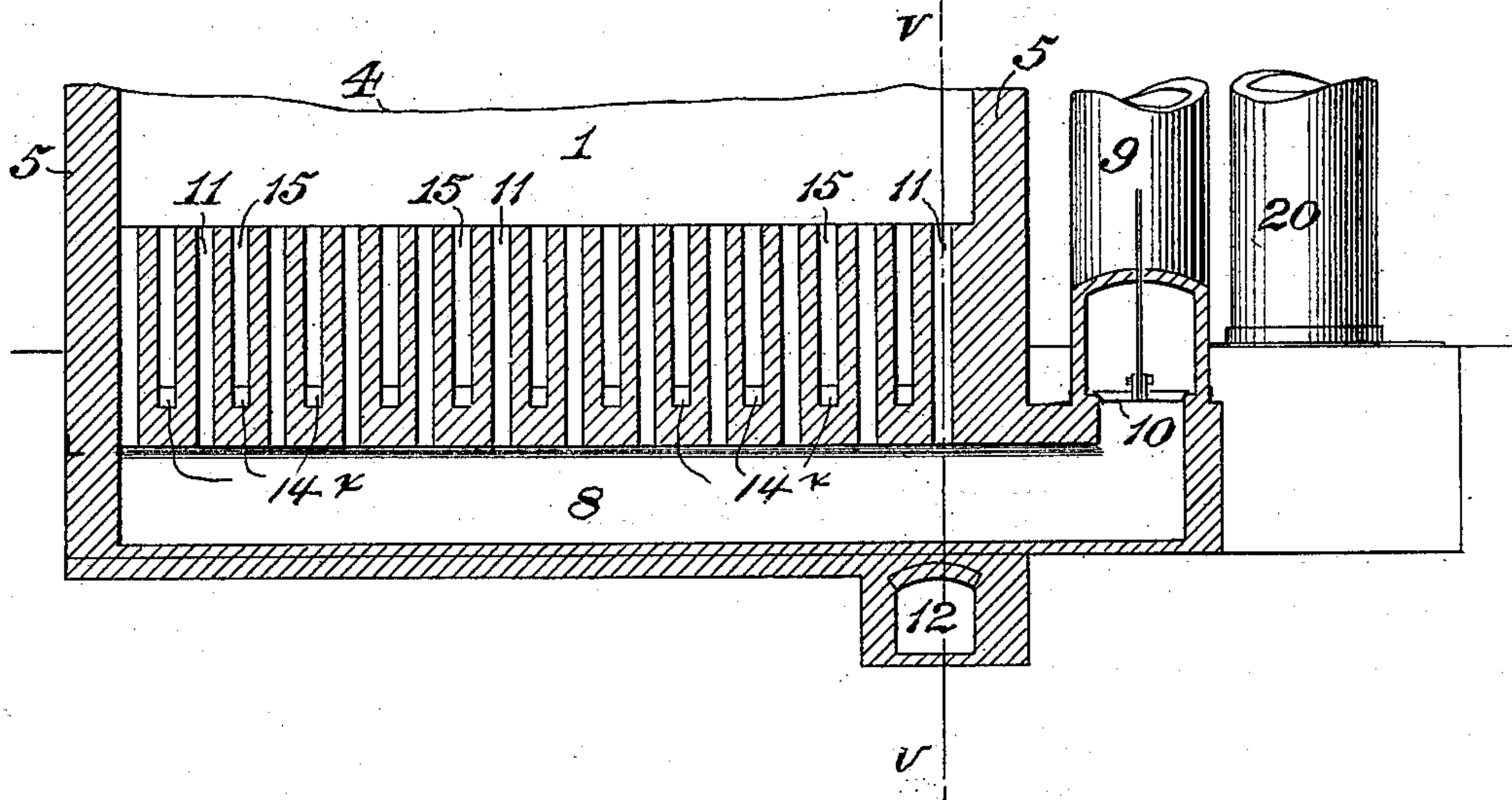


FIG. 2



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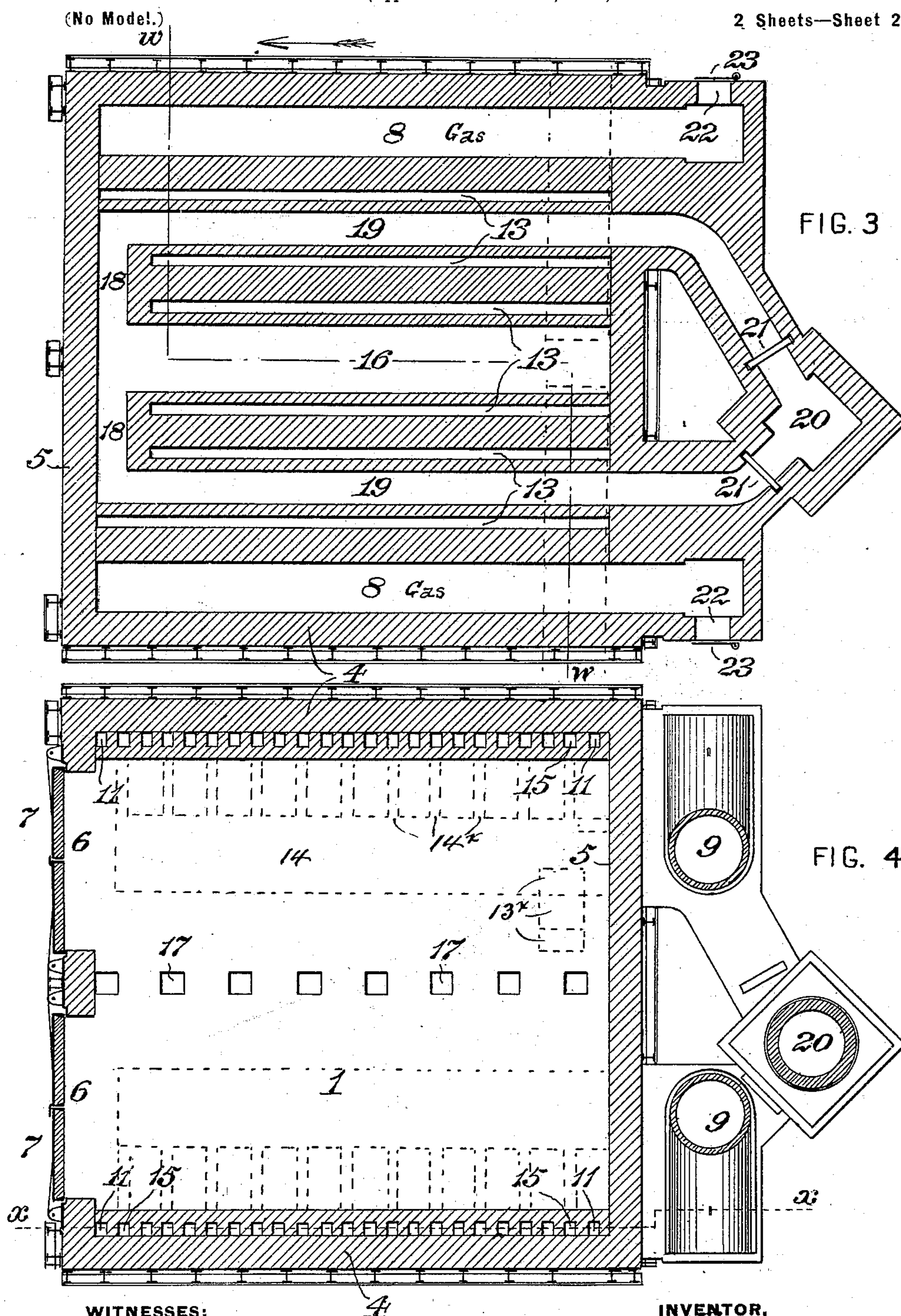
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UNITED STATES PATENT OFFICE.

WILLIAM SWINDELL AND JOHN C. SWINDELL, OF PITTSBURG,
PENNSYLVANIA.

ANNEALING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 624,401, dated May 2, 1899.

Application filed November 10, 1898. Serial No. 696,022. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM SWINDELL and JOHN C. SWINDELL, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Annealing-Furnaces, of which improvement the following is a specification.

Our invention relates more particularly to furnaces of the class designed to receive and impart heat to annealing-boxes containing sheets, plates, or other articles which are to be annealed; and its object is to provide a furnace of such class in which a uniform degree of heat may be imparted to the annealing-boxes and an economical consumption of gaseous fuel be attained.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical transverse section through an annealing-furnace embodying our invention, taken at the line *ww* of Fig. 3; Fig. 2, a longitudinal section through the lower portion of the same at the line *xx* of Fig. 4; and Figs. 3 and 4, horizontal sections through the same at the lines *yy* and *zz*, respectively, of Fig. 1.

In the practice of our invention we construct a furnace having an annealing-chamber 1, which is preferably square or rectangular in horizontal section, above its floor 2 and a series of gas and air flues below the floor. The annealing-chamber is inclosed by and between the floor 2, an arched top or roof 3, side walls 4, and end walls 5, openings 6, closed by doors 7, being formed in one of the end walls for the insertion and removal of the annealing-boxes and their contents. The required degree of heat is imparted to the annealing-boxes in the chamber 1 by the combustion of a mixture of gas and heated air, which is supplied to the chamber through a series of flues located below the floor and supply-passages formed in the side walls and connecting therewith, the essential features of which flues and passages are as follows:

Longitudinal gas-supply flues 8 8 are formed in the masonry of the lower portion of the furnace, each of said flues extending throughout the length of the furnace below the floor of the annealing-chamber and adjacent to one

of the side walls. Pipes 9 9 lead from a suitable gas-producer to the gas-supply flues 8 8, the flue on each side of the furnace communicating at one end with one of said pipes and the supply of gas therefrom being controlled by a suitable valve 10. The gas-flues 8 communicate with the annealing-chamber 1 by a plurality of vertical gas-supply passages 11, which are formed on the inner sides of the side walls 4 and open into the annealing-chamber a short distance above the floor.

Two transverse air-admission flues 12 12, (see dotted lines, Fig. 3,) the outer open ends of which may be provided with proper valves or doors, extend from the sides of the furnace toward its center below the gas-supply flues 8 and adjacent to the end of the furnace at which the pipes 9, leading from the producers, are located. Longitudinal air-supply and heating flues 13 communicate at one end with the air-admission flues 12, as shown in Fig. 1, and lead therefrom to or nearly to the opposite end of the furnace, where they communicate through ports 13^x, Figs. 1 and 4, with superposed longitudinal air-supply and heating flues 14. The flues 14 communicate, through ducts 14^m, Figs. 1, 2, and 4, with a plurality of vertical air-supply passages 15, which are formed on the inner sides of the side walls 4, each being located adjacent to one of the gas-supply passages 11 and opening into the annealing-chamber on or nearly on a level therewith.

A central waste or discharge flue 16 extends longitudinally through the furnace below the floor and communicates with the annealing-chamber by a plurality of discharge-passages 17. The flue 16 is connected at one end by transverse passages or connecting-flues 18 with two lateral waste or discharge flues 19, which extend through the furnace and, passing out of the opposite end thereof, are led into a common stack 20. Each of the flues 19 is provided with a damper 21, governing communication with the stack 20.

The air-supply and waste flues are so located relatively one to the other that the heat of the products of combustion passing from the annealing-chamber to the stack 20 shall be imparted as fully as possible to the currents of air passing to the annealing-chamber

through the flues 13 and 14. To this end a flue 13 is located on each side of the central waste-flue 16 and on each side of each of the lateral waste-flues 19. The air-flues 14 are
 5 each located immediately above one of the lateral waste-flues 19 and immediately under and in contact with the floor of the combustion-chamber, so that they are effectively heated. The walls separating the waste and
 10 air flues are made as thin as is consistent with stability of construction, and it will be seen that the lateral waste-flues 19 are each surrounded on three sides by air-flues and that there are air-flues on two opposite sides of
 15 the central waste-flue 16, while the air-flue 14, through which the air passes just prior to its entrance to the combustion-chamber, is between the highly-heated floor of the latter and the waste-flue 19.

20 Access to the gas-flues 8 is afforded by openings 22, controlled by doors 23, and the air-flues may also be provided with suitable openings and doors.

While the most effective results are attain-
 25 able by a duplicate system of air, gas, and waste flues on opposite sides of the longitudinal central plane of the furnace, as above described, it will be obvious that such duplication is not an essential of our invention and
 30 that the same structural and operative principle would be embodied in a furnace of a construction substantially similar to that of one-half of the furnace shown.

In the operation of the furnace gas from
 35 the producer passes from the pipes 9 into the flues 8 and thence into the annealing-chamber 1 by the passages 11, which distribute it throughout the length of the chamber. Air enters at the open ends of the admission-flues
 40 12 and thence passes in divided currents through the flues 13, from which it passes through the flues 14 and is thence distributed throughout the length of the chamber by the passages 15, each of which is in close prox-
 45 imity to a gas-passage 11. The gas and air meet and are mingled at the outlets of the passages 15 and 11, and the mixture is ignited and burns thereat, the heat evolved being ex-
 50 erted with substantial uniformity throughout the annealing-chamber. The hot products of combustion pass from the annealing-chamber by the discharge-passages 17 into the waste-flue 16, and thence pass through the connecting-flues 18 and lateral flues 19 to the
 55 stack 20. In their passage through the flues 16 and 19 their heat is imparted to the walls thereof and thence to the currents of air passing through the flues 13 and 14 to the annealing-chamber. The heat of the waste
 60 gases is thus effectually utilized before their escape into the stack.

We claim as our invention and desire to secure by Letters Patent—

1. In a furnace, the combination of a com-
 65 bustion-chamber, a gas-supply flue extending

longitudinally below the floor thereof, a plurality of gas-supply passages leading from the gas-supply flue into the combustion-chamber, an air-supply flue extending longitudinally
 70 below and in contact with the floor of the combustion-chamber so as to be heated thereby, a plurality of air-supply passages leading from the air-supply flue into the combustion-chamber, and a waste-flue leading out of and
 75 extending below the floor of the combustion-chamber and adjoining the air-supply flue.

2. In a furnace, the combination of a combustion-chamber, a gas-supply flue extending longitudinally below the floor thereof whereby it is heated, a plurality of gas-supply pas-
 80 sages leading from the gas-supply flue into the combustion-chamber, a waste-flue leading out of and extending below the floor of the combustion-chamber, air-supply flues extending longitudinally below and in contact with
 85 the floor of the combustion-chamber whereby they are heated, and adjoining opposite sides of the waste-flue whereby they are further heated, and a plurality of air-supply passages leading from the air-supply flues into
 90 the combustion-chamber.

3. In a furnace, the combination of a combustion-chamber, a gas-supply flue, a plurality of gas-supply passages leading from the gas-supply flue into the combustion-chamber,
 95 a waste-flue leading out of and extending below the floor of the combustion-chamber, air-supply flues extending longitudinally below the floor of the combustion-chamber, and adjoining opposite sides of the waste-flue, an air-
 100 supply flue in contact with the floor of the combustion-chamber whereby it is heated and communicating at one end with said air-supply flues and adjoining a third side of the waste-flue, and a plurality of air-supply pas-
 105 sages leading therefrom into the combustion-chamber, each adjacent to the outlet of one of the gas-supply passages.

4. In a furnace, the combination of a combustion-chamber, gas-supply flues extending
 110 below the floor and adjacent to opposite sides thereof, a plurality of gas-supply passages leading from the gas-supply flues into the combustion-chamber, a central waste-flue leading out of and extending below the floor of the com-
 115 bustion-chamber, lateral waste-flues, each leading independently from the central waste-flue, air-supply flues extending longitudinally below the floor of the combustion-chamber and adjoining opposite sides of the central and lat-
 120 eral waste-flues, and a plurality of air-supply passages leading from the air-supply flues into the combustion-chamber, each adjacent to the outlet of one of the gas-supply passages.

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