

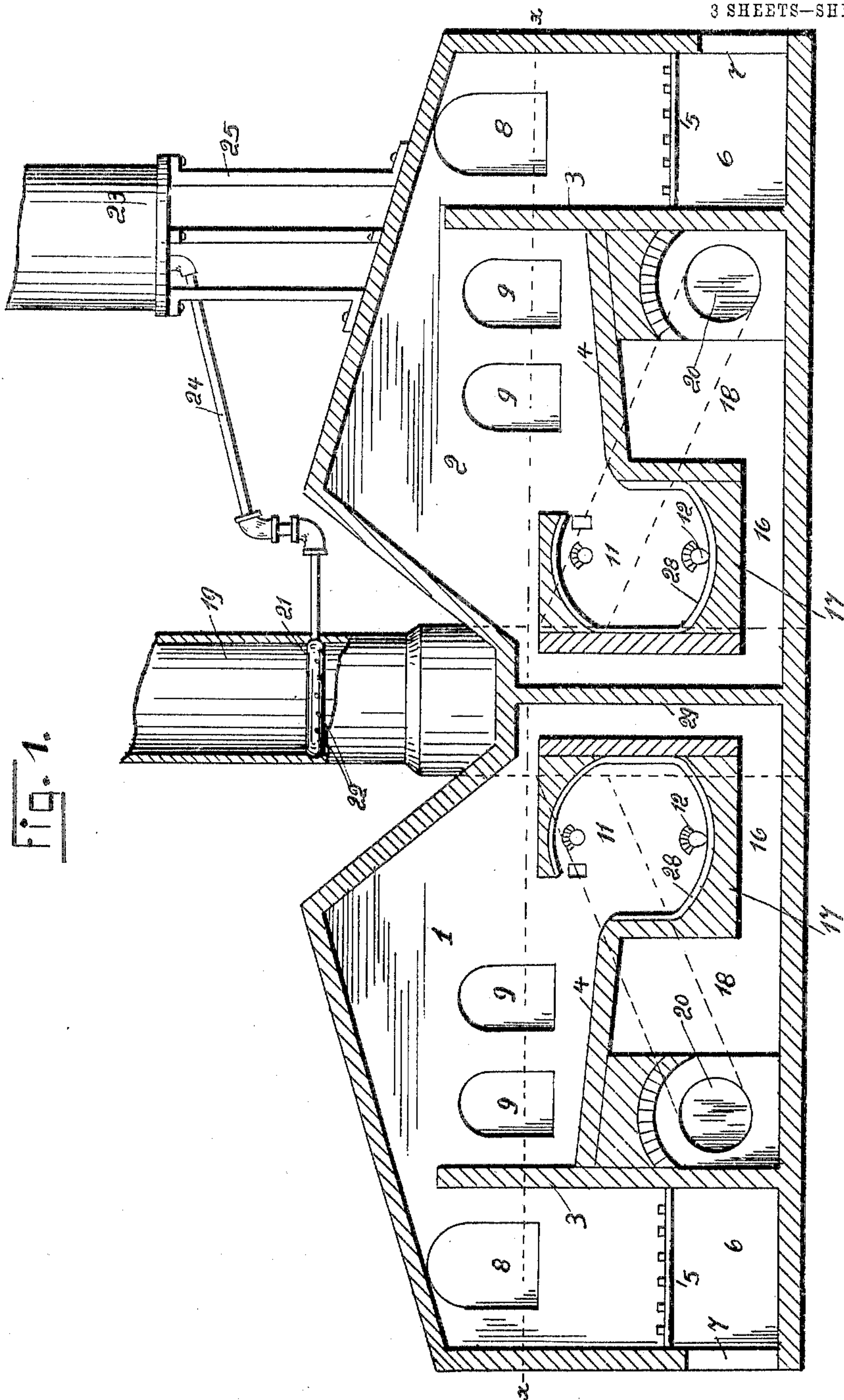
No. 793,938.

PATENTED JULY 4, 1905.

J. KIRBY.  
FURNACE.

APPLICATION FILED NOV. 5, 1904.

3 SHEETS—SHEET 1.



Witnesses:

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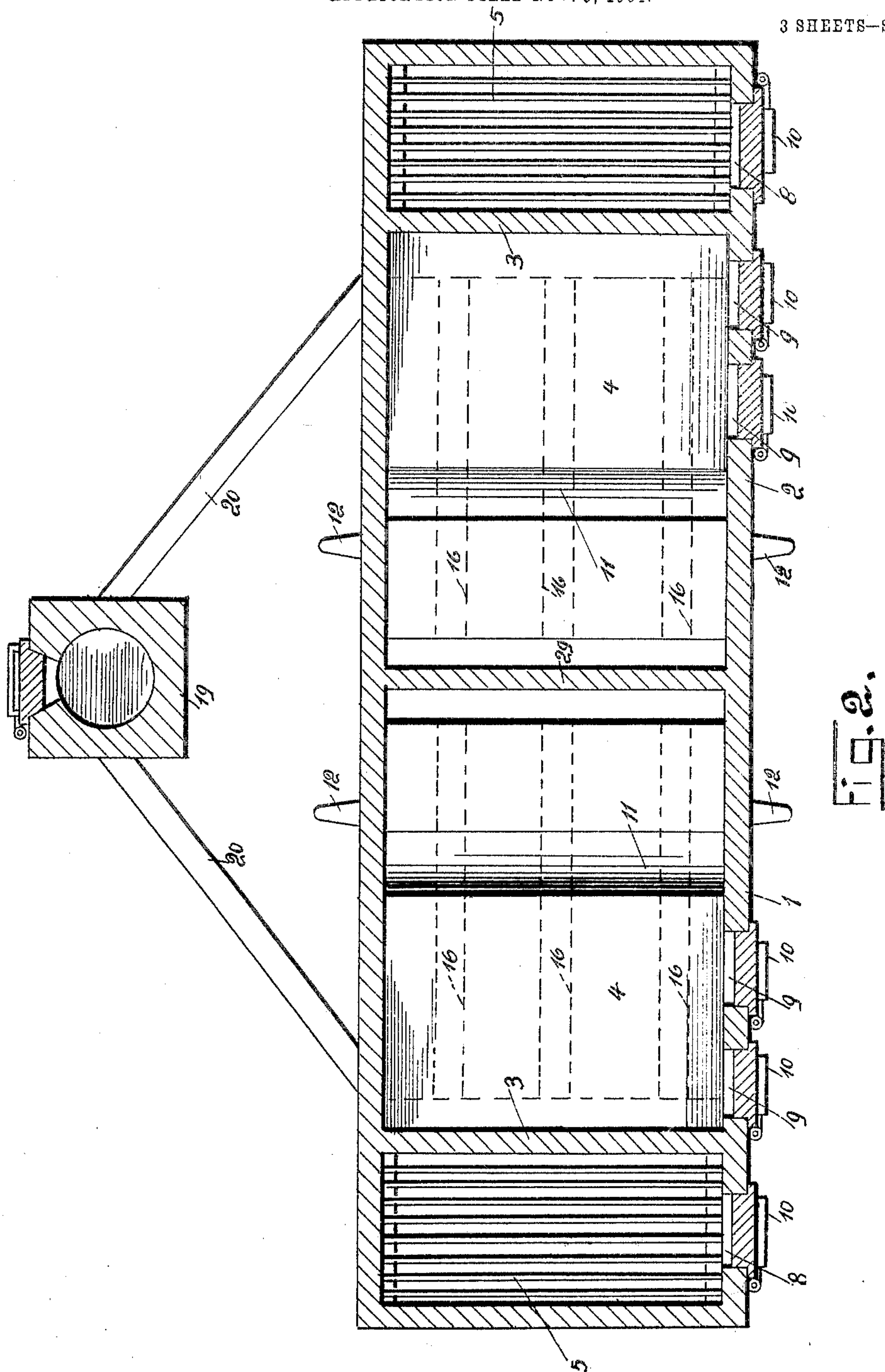
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3 SHEETS—SHEET 2.



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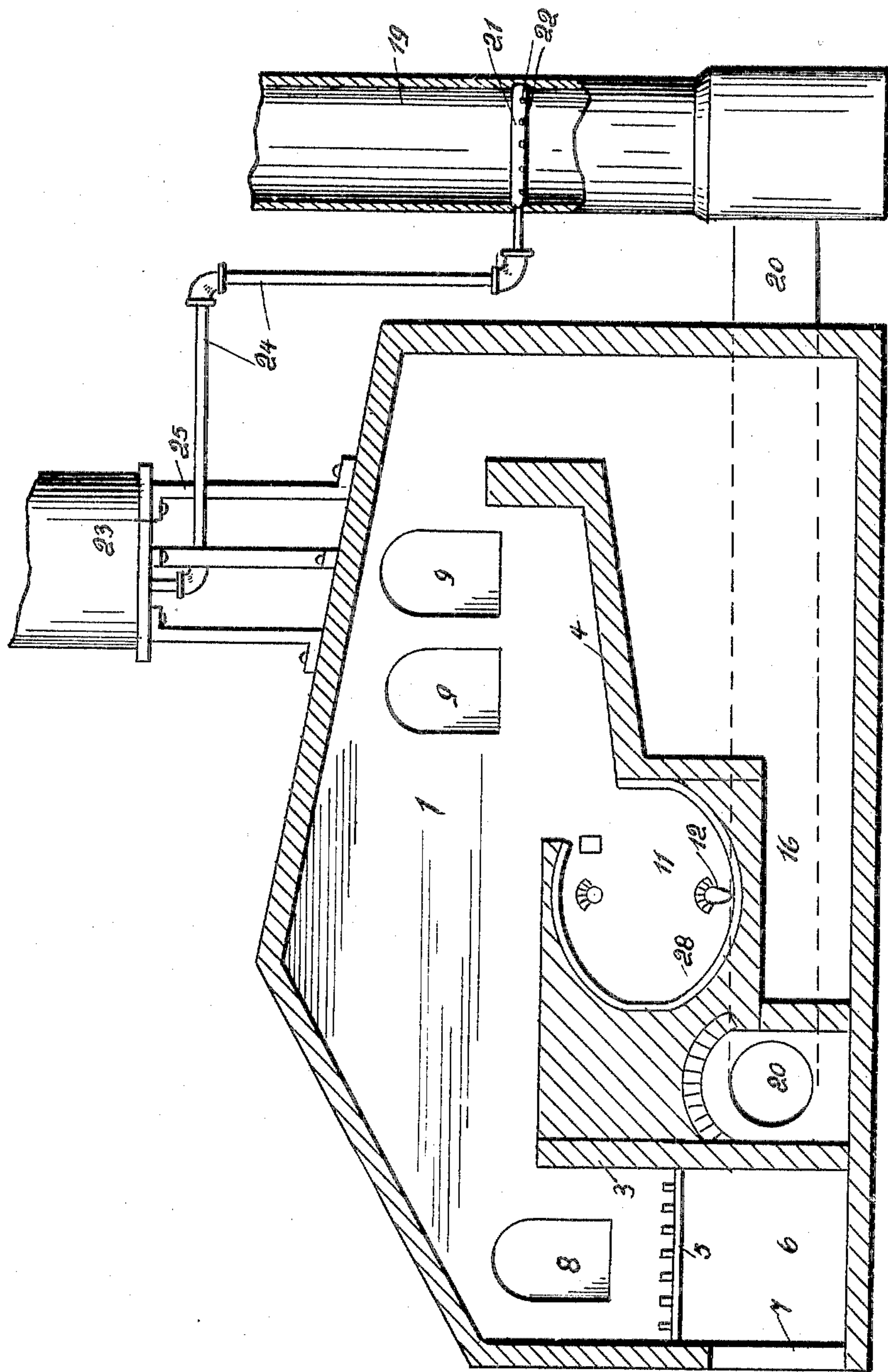
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3 SHEETS—SHEET 3.



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# UNITED STATES PATENT OFFICE

JOHN KIRBY, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE KIRBY FURNACE SMELTING AND REFINING COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF SOUTH DAKOTA.

## FURNACE.

SPECIFICATION forming part of Letters Patent No. 793,938, dated July 4, 1905.

Application filed November 5, 1904. Serial No. 231,532.

*To all whom it may concern:*

Be it known that I, JOHN KIRBY, a citizen of the United States of America, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in furnaces, and more particularly to that type which is employed for extracting and refining metals from copper ores and all other kinds of ores.

The invention has for its object the provision of a novel form of furnace in which the raw material or ore is smelted and refined by one and the same fire. I have provided novel means by which the heat of said fire, taking a downdraft course, is divided and, furthermore, encircles the two principal parts of my improved furnace. I have further provided means and so constructed my furnace that it is a continuous smelter and refiner.

Another object of my invention is to provide novel means in connection with my furnace for preventing the dust and lighter particles which arise from the smelting and refining of ores from escaping to the atmosphere.

In constructing my new and improved furnace I have employed such features of construction that the furnace may be built as a single, a double, or a double-double furnace.

The many advantages of this furnace will be apparent by the following description, taken in connection with the claims.

In the accompanying drawings like numerals of reference designate corresponding parts throughout the several views, in which—

Figure 1 is a longitudinal sectional view of my improved furnace in which the refining-crucible is in the rear part of the furnace. Fig. 2 is a transverse sectional view taken on the line *xx* of Fig. 1. Fig. 3 is a longitudinal sectional view of my improved furnace where constructed as a single furnace and where the refining-crucible is adjacent to the fire-box.

The furnaces as contemplated by me are to be built of material as follows: The ore-smelting hearths 4 4 are to be constructed of magnesite brick and magnesia mortar. The bottoms of crucibles 28 28 are to be lined by the same material. The remaining parts of the furnaces are to be constructed of a suitable material such as is commonly employed in the constructing of furnaces of this type.

Reference will be first had to Figs. 1 and 2 of the drawings, wherein a double furnace is shown. In these views the reference-numerals 1 and 2 designate two compartments of a double furnace divided by a wall 29. The wall of fire-box is designated by 3 3. At a suitable height on 3 3 the ore-smelting hearths 4 4 are constructed, each hearth being inclined toward the basins 11 11. Between partitions 3 3 and the end of each compartment I construct the grates 5 5, upon which the fire is built adapted to smelt and refine the ores. The reference-numerals 6 designate the ash-pits of the furnace, which have a suitable opening 7 7 communicating therewith. In the side walls of the furnace I provide the opening 8 8, whereby fuel may be added to the fire from time to time. The side walls are also provided with openings 9 9, through which the raw material may be placed upon the smelting-hearth 4 4. The openings 8 8 and 9 9 are provided with suitable doors 10 10. Adjacent to hearths 4 4 are constructed basins 11 11, which are adapted to receive linings 28 28, which are adapted to collect the molten mass as it flows from the hearths 4 4, and the molten mass reaches its state of refinement in said basins. The side walls and the basins are provided with openings 12 12, whereby the metal and slag may be withdrawn from time to time and said walls and the tops of basins also to have openings whereby fluxes may be added. The furnace is also provided with a flue in rear of each of the basins which extends downwardly to the base of the furnace and communicates with a plurality of longitudinal flues 16 16. The basins are supported by brickwork 17, which forms the side walls of the partitions of the flues 16. These



longitudinal flues terminate in transverse flues 18 18. At the side of the furnace is constructed a suitable stack or chimney 19, and each of the transverse flues is connected to said chimney or stack by a pipe 20. Within the chimney or stack I provide a sprinkler which consists of an annular pipe 21, having perforations formed upon its inner lower face, as indicated at 22, and this annular pipe communicates with the reservoir 23 by a pipe 24. The reservoir is supported by standards 25, and this reservoir is located at a sufficient height to feed the sprinkler with water or other substance by gravity.

We will assume that the ore is to be treated within the furnace and the metal within said ore to be extracted and refined. The raw material or ore is placed upon the smelting-hearth, and the heat generated by the fire in the fire-box will smelt the ores. The molten mass will then pass into the basin, where it is refined. The slag forming at the top of the refined metal is skimmed off from time to time and the metal drawn from time to time. The dust and other lighter particles arising from the treating of the ore will be collected at the base of the chimney or stack by the sprinkler mounted within the chimney or stack.

In Fig. 3 of the drawings I have illustrated my improved furnace as a single furnace. The same principles of operation hold good in the single as in the double furnace. The features of construction in Fig. 3 are somewhat changed. The basin in this drawing is adjacent to the fire-box, while the smelting-hearth is in the rear of the furnace.

I do not wish to be confined in my claims to a furnace constructed as above described, but also wish my claims to cover a furnace constructed as above described, but placing the basin or basins adjoining the fire-box or fire-boxes and the inclined hearth upon which the ore or other materials are smelted at the farthest end of the furnace from the fire-box or fire-boxes—in other words, the furnace as above described reversed in construction in

so far as location of the inclined hearth and basin are concerned.

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

1. In furnaces of the type described, the combination of a fire-box, an ore-smelting hearth, a collecting-basin, a flue extending in the rear of and beneath said basin and in such juxtaposition thereto, that the products of combustion passing through said flue will communicate their heat to said basin.

2. A furnace comprising a fire-box, an ore-smelting hearth located adjacent to said fire-box, a collecting-basin constructed below said hearth and having a top, means for removing the products from said basin, and means for conveying the waste products of combustion from said furnace over the top down the rear end and under the bottom of the basin and in direct contact with the top, the rear wall and the bottom of the basin, substantially as described.

3. In a furnace the combination of a furnace structure comprising side and end walls and a central partition, of a central flue located adjacent the furnace and in alinement with the center thereof, a fire-box arranged at each end of the furnace, an inclined smelting-hearth arranged adjacent each fire-box, a basin arranged adjacent each said hearth and a flue extending in the rear of and below each basin, said flues extending below the basins and immediately adjacent thereto and communicating with pipes leading to said central flue and the said central flue being provided with a water-sprinkler mounted therein wherein the products of combustion from both fire-boxes will be subjected to the action of water from said sprinkler, substantially as described.

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

JOHN KIRBY.

Witnesses:

E. E. POTTER,  
K. H. BUTLER.