

No. 677,510.

Patented July 2, 1901.

B. HALL.

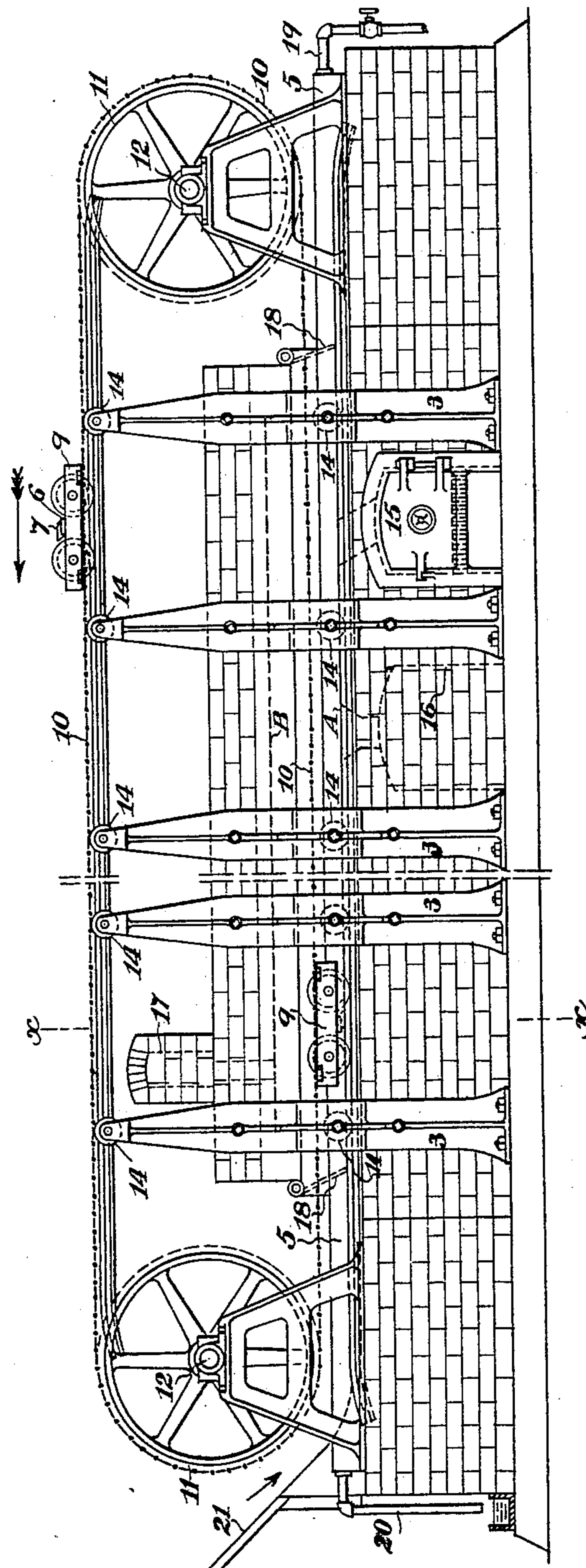
ROASTING FURNACE.

(Application filed Jan. 18, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



Witnesses,

E. A. Brandau,
J. H. Hourse

Inventor

Benjamin Hall
By Devoe Strong & Co.
attys

No. 677,510.

Patented July 2, 1901.

B. HALL.

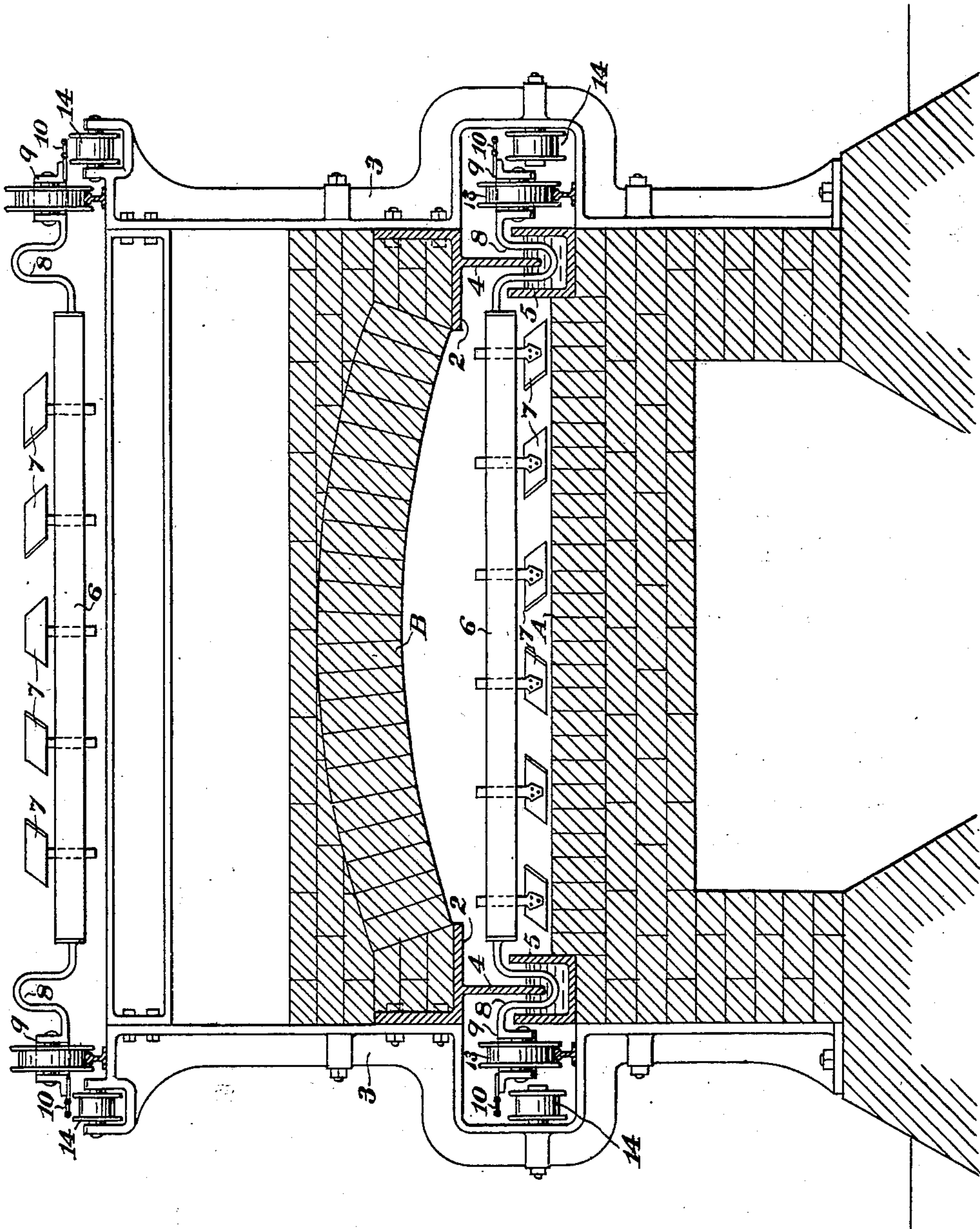
ROASTING FURNACE.

(Application filed Jan. 18, 1901.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 2.



Witnesses,
Ed. Brandau,
J. H. Stone

Inventor,
Benjamin Hall
By Dewey Strong & Co. atty

UNITED STATES PATENT OFFICE.

BENJAMIN HALL, OF NEVADA CITY, CALIFORNIA.

ROASTING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 677,510, dated July 2, 1901.

Application filed January 18, 1901. Serial No. 43,690. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN HALL, a citizen of the United States, residing at Nevada City, county of Nevada, State of California, have invented an Improvement in Roasting-Furnaces; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to that type of roasting-furnace known as an "automatic hearth roasting-furnace," in which the roasting-chamber consists of a floor or hearth upon which the ore is automatically charged and spread and wherein the ore is slowly stirred or turned over during the process of roasting or burning off the sulfur and at the same time carried forward toward the discharge-pit by means of rakes or rabbles which are attached to carriages moved by endless chain belts or wire ropes. As heretofore constructed, these carriages, with the chain belts or wire ropes, have been located and operated within a supplemental chamber or chambers contiguous to the main roasting-chamber or hearth in order to protect them from the burning ore, said supplemental chambers being connected with the roasting-chamber by means of an open slot or slots through which the rabble or rake is connected with the driving-carriage. The objection to a furnace of this construction is that the heat, dust, and acids produced from sulfurous gases pass from the main roasting-chamber or hearth through the slot connecting with and into the supplemental chamber, thus submitting the chain belts, wire ropes, or other connections and the carriages to a corrosive action, which in a short time destroys them.

The object of my invention is to overcome this objectionable feature, and I accomplish it by entirely eliminating or doing away with the supplemental chamber and driving the rakes or rabbles by means of mechanism located outside of the furnace. At the same time I prevent cold air from entering the furnace and confining the heat, dust, and gases inside the furnace during the progress of the roasting. This is effected by mechanism which will be more fully explained by refer-

ence to the accompanying drawings, forming a part of this specification, and in which similar characters refer to similar parts in each drawing.

Figure 1 is a side elevation of the furnace. Fig. 2 is a transverse sectional view on the line *x x* of Fig. 1.

A is the floor or hearth of the furnace, upon which the ore is spread and slowly stirred during the roasting or burning off of the sulfur.

B is the arch or top of the furnace.

2 represents iron arch-plates attached to the binder-supports 3, and from these plates the shield 4 projects downward, dipping into a trough or water-jacket 5. The space inclosed between these two parallel troughs upon each side and between the floor A and arch B forms the roasting-chamber.

6 is a bar extending transversely across the interior of the chamber, to which are attached small shovel projections 7, and these constitute the rakes or rabbles for stirring the ore. The ends of the rake or rabble are bent into U shape, as shown at 8, and the lower curvatures of these bent arms pass under the shield 4 and outside of the furnace and are attached to carriages 9. These carriages are connected to the endless chain belts 10, which receive motion and are driven from the chain wheels or pulleys 11, suitably journaled with relation to the furnace. To these pulleys power is applied by any suitable means through the driving-shaft, as at 12. The backstays 3 exterior to the furnace not only serve to carry the arch and the superstructure, but they carry also the rollers 13, upon which the carriages 9 run.

The small rollers 14 are so located as to carry and hold up the endless chain belts 10, which are quite long and have a tendency to sag.

15 is the fire-box, through which heat is supplied to the furnace, and 16 is a pit or receptacle into which the roasted ore is automatically discharged by the rakes or rabbles.

17 is a flue connecting with the chimney, through which the fumes and gases pass from the roasting-chamber to the open air.

18 18 are two hinged doors that automatically open to allow the rakes or rabbles to enter and to leave the furnace.

19 is a pipe by means of which a continuous stream of cold water is introduced into the trough or water-jacket 5, and 20 is an overflow-pipe, allowing the heated water to escape from the trough or jacket, thus providing a continuous circulation.

21 is an incline upon which the ore to be roasted is automatically fed by means of any suitable feeder, and the ore is carried into the furnace and spread upon the hearth by the rakes or rabbles which engage it.

The operation of the furnace is as follows: The trough or water-jacket 5 is filled with water to the proper depth to form a perfect seal and closure of the channel between the water-jacket and the outside of the furnace.

The fuel in the fire-box 15 is ignited, the furnace heated up, and power is applied to the driving-shaft, thus setting in motion the chain-wheels 11, the endless chain belts 10, the carriages 9, and the rakes or rabbles 6 7.

Ore is fed upon the incline 21 and is carried into the roasting-chamber, spread upon the hearth, subjected to the action of the heat from the fire-box, and is gradually stirred and carried forward by the action of the rakes or

rabblers, which make successive passages through the furnace and over the hearth until the ore is finally roasted, the sulfur being driven off, after which the ore is discharged into the pit 16, from which it may be re-

moved as desired.

The special feature of this furnace is the method employed to drive the rakes or rabblers by means of endless chain belts and rabble-carriages located outside the furnace, while at the same time confining the heat, dust, and furnace-gases entirely within the roasting-chamber and preventing the entrance of air.

By referring to the drawing of cross-section of the furnace as shown in Fig. 2 it will be clearly seen that a perfect seal is main-

tained at all times during the passage of the rakes or rabblers through the furnace by means of the fluid within the trough or jacket

and the downwardly-projecting shield, which leaves a sufficient space beneath it through which the U-shaped arm 8 of the rabblers pass while being immersed in and surrounded by the fluid. By this method the endless

chain belts and carriages are entirely removed from the corrosive action of the heat, dust, and acids produced from sulfurous or other fumes, and I thus effect a great saving in these parts, which will if properly constructed last indefinitely without renewal.

The novelty in my invention which I desire to claim, broadly, is the method of driving the rakes or rabblers from the outside of the furnace, where the parts will be entirely

free from the corrosive action of the burning sulfur, and preventing the cold air from gain-

ing admission to the roasting-chamber and confining the heat, dust, and gases within the furnace by means of a seal, while the stirring of the ore is effected by the passage of the rabblers over the floor or hearth during the operation of roasting.

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

1. A hearth roasting-furnace, rakes or rabblers operating therein, driving mechanism located outside the furnace-walls, and connected with the rakes or rabblers, and means inclosing the connections and forming a mobile seal in the side walls of the furnace whereby the heat and gases are confined within, and cold air prevented from entering the furnace, during the passage of the rakes or rabblers through the ore and over the hearth of said furnace.

2. In combination with an ore-roasting furnace having openings in its side walls, rakes or rabblers within said furnace, a driving mechanism exterior to the furnace-walls and connecting through the openings with the rakes or rabblers, and means forming a liquid seal for said openings whereby the heat, dust and gases, are confined within the roasting-chamber, while permitting the rakes or rabblers to be operated through said openings.

3. In an ore-roasting furnace, a chamber having stirrers or scrapers adapted to move over the floor of the furnace, tracks parallel with and exterior to the furnace, trucks or carriages mounted and movable upon said tracks, arms connecting the exterior trucks with the interior stirrers, troughs or channels between the trucks and furnace-chamber containing a substance which will form a seal, and plates centrally disposed with reference to the troughs and dipping into the contained substance, the arms connecting the carriage with the stirrers being bent so as to dip into the substance in the troughs, whereby a seal is effected.

4. In an ore-furnace, an ore-chamber having stirrers or scrapers by which the ore is stirred and advanced, troughs or channels formed exterior to the furnace, with depending plates extending centrally into said channels, a substance placed within said channels to cover the depending plate and form a seal therewith, tracks exterior to the furnace, carriages adapted to travel upon said tracks, and arms having one end connected with the carriage and the other with the stirrers or scrapers, said arms being bent so as to dip into the sealing-channels and pass beneath the depending plates.

5. A horizontal ore-furnace having traveling stirrers or scrapers movable through said furnace, carriages exterior to the furnace, means for operating the carriages, connections between said carriages and the stirrers whereby they are moved in unison, and troughs in the side walls of the furnace and

containing a sealing substance to prevent the ingress or egress of hot or cold air or vapor, the connections between the carriages and the stirrers being bent to pass through the sealing material in the channels.

5 6. A roasting or desulfurizing furnace, having a trough in its side walls provided with sealing material, a scraper or stirrer adapted to move over the furnace-hearth, an arm extending from said scraper and passing through the sealing material, and driving means exterior to the furnace connected to the arm for moving the scraper over the hearth, substantially as set forth.

15 7. A roasting-furnace having rakes or rab-
bles movable over the furnace-floor, carrying
devices exterior to the furnace, connections
between said devices and the rakes, and
troughs in the side walls of the furnace and
20 containing a mobile substance forming a con-
tinuous seal through which the connecting-
arms move, and depending plates, the lower
edges of which dip into the sealing substance
above the line of travel of the arms.

25 8. In combination with an ore-roasting fur-
nace having openings in its side walls, rakes

or rabbles within said furnace, a driving
mechanism exterior to the furnace-walls and
connecting through the openings with the
rakes or rabbles, means forming a liquid seal 30
for said openings, whereby the heat, dust and
gases, are confined within the roasting-cham-
ber, while permitting the rakes or rabbles to
be operated through said openings, and means
by which the sealing liquid is removed and 35
circulated.

9. A horizontal furnace having upper and
lower portions of the side walls made rigid,
an intermediate portion extending from end
to end and including means forming a mobile 40
seal, whereby the sides of the furnace are
continuously closed, rakes or rabbles within
the furnace-chamber, and driving means ex-
terior of the furnace and connecting with the
rakes or rabbles through said intermediate 45
portion.

In witness whereof I have hereunto set my
hand.

BENJAMIN HALL.

Witnesses:

S. H. NOURSE,
CHAS. E. TOWNSEND.