No. 777,498. PATENTED DEC. 13, 1904.

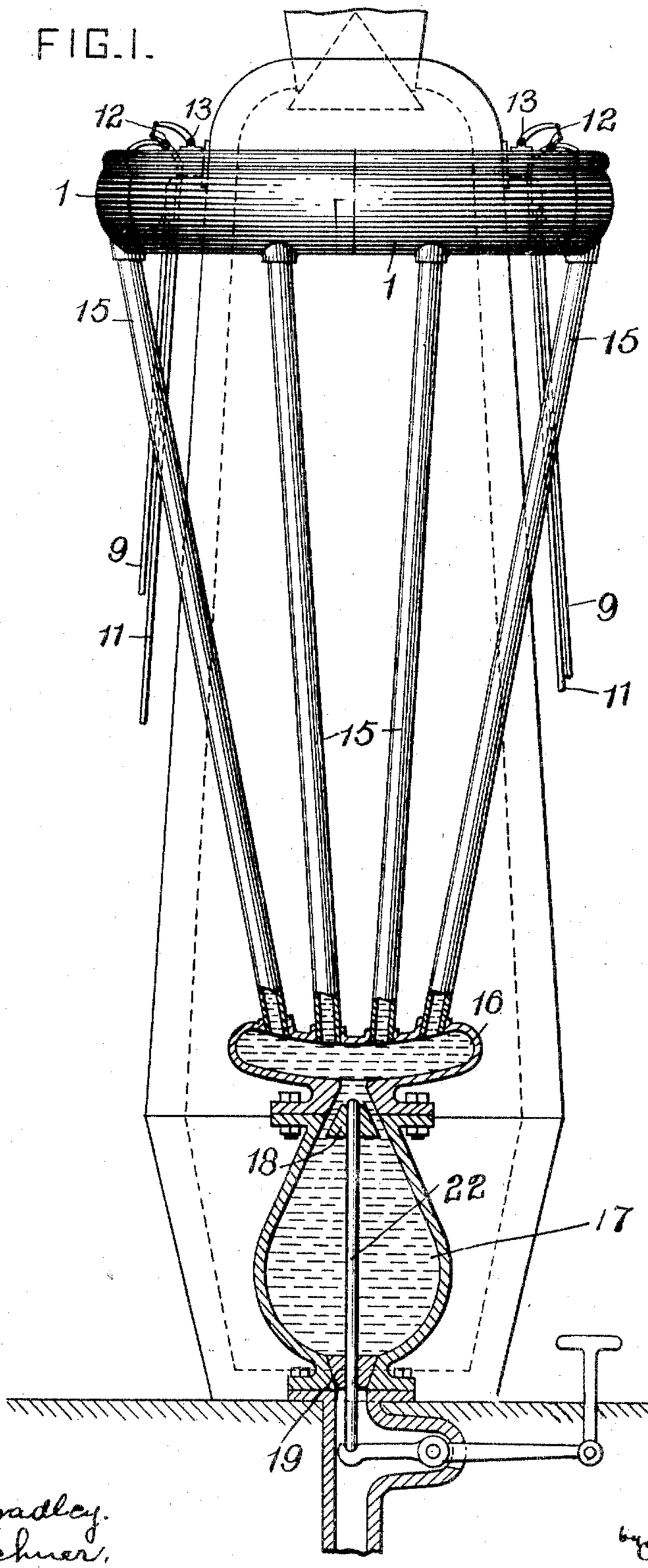
J. COYNE.

BLAST FURNACE.

APPLICATION FILED MAY 23, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:
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NO MODEL. 2 SHEETS—SHEET 2.

FIG. 2.

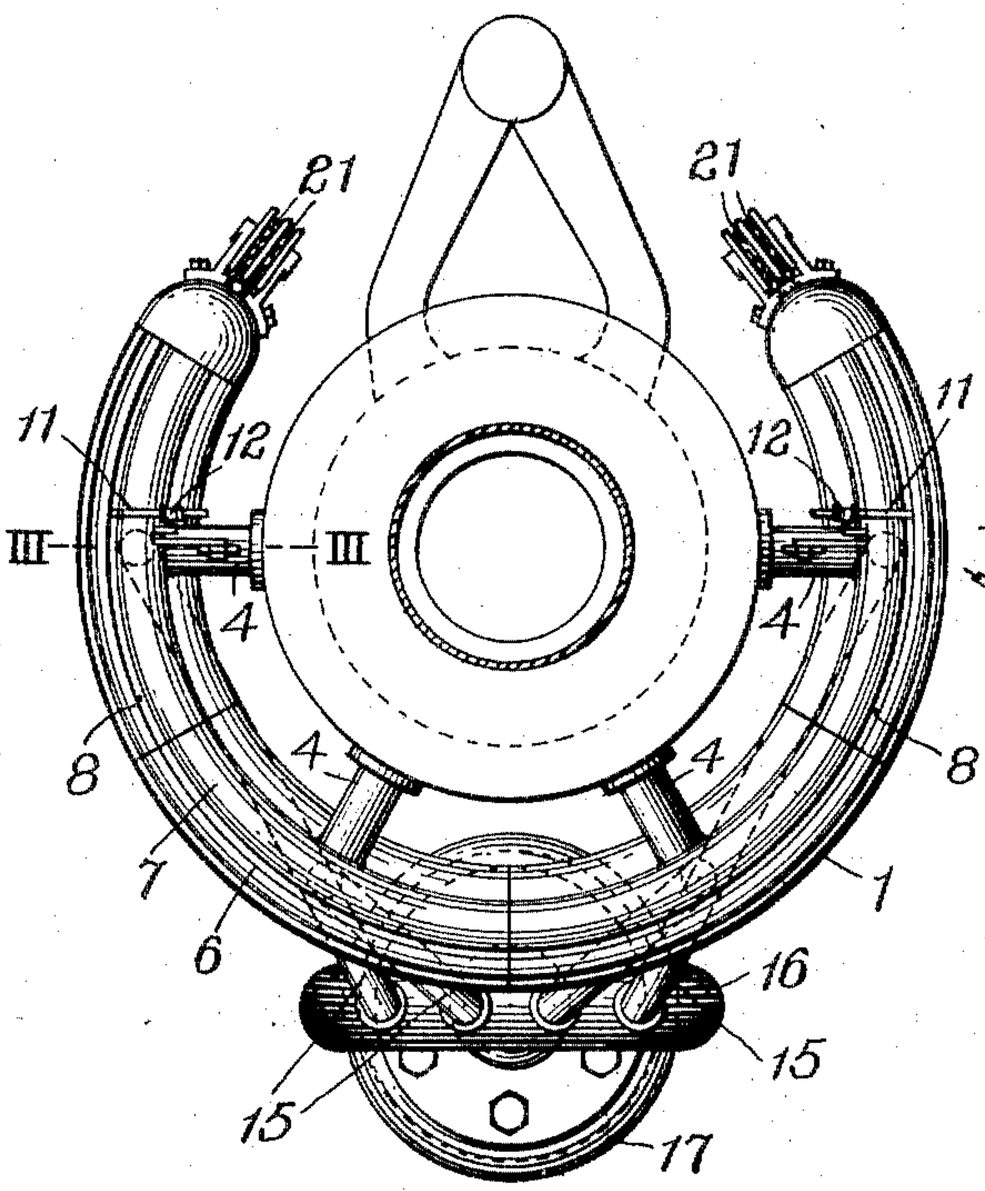


FIG. 5.

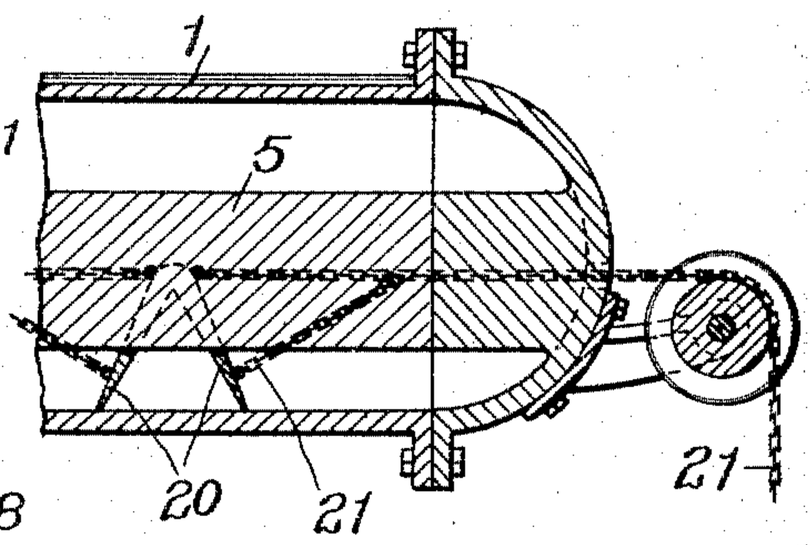


FIG. 4.

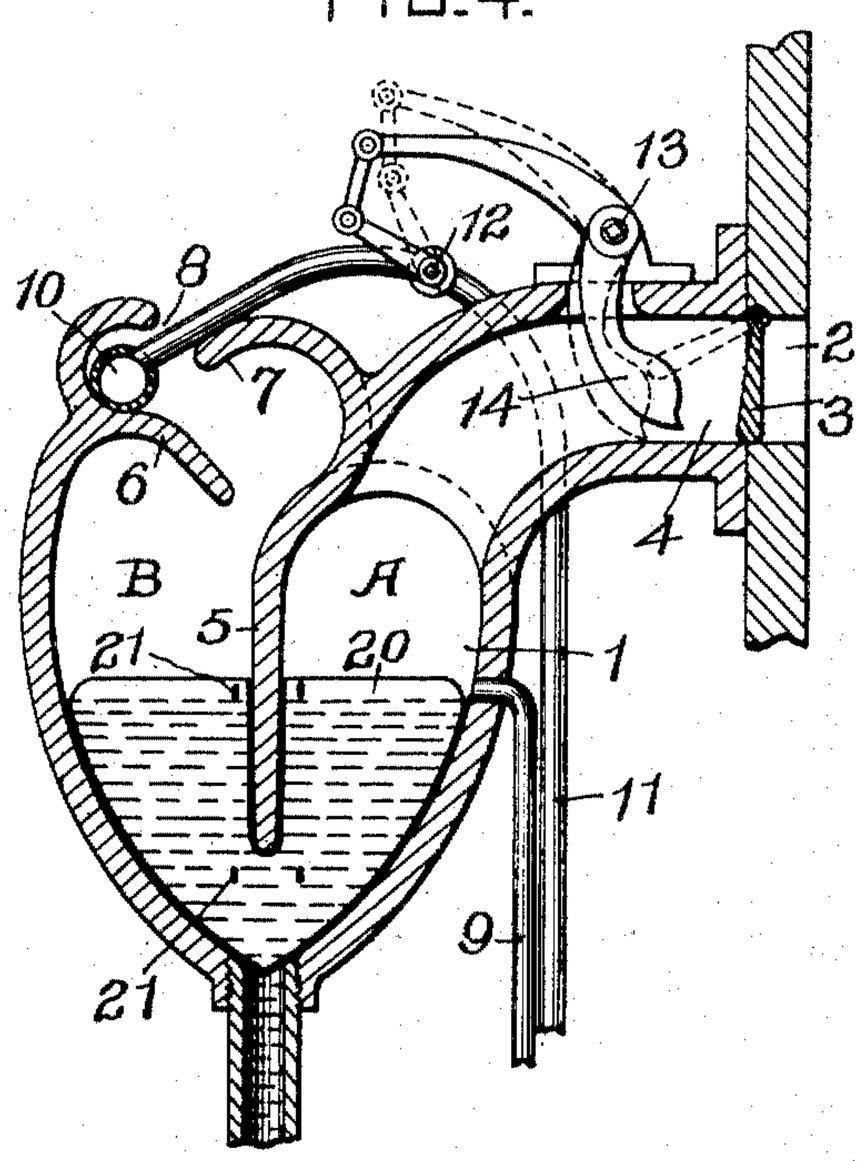
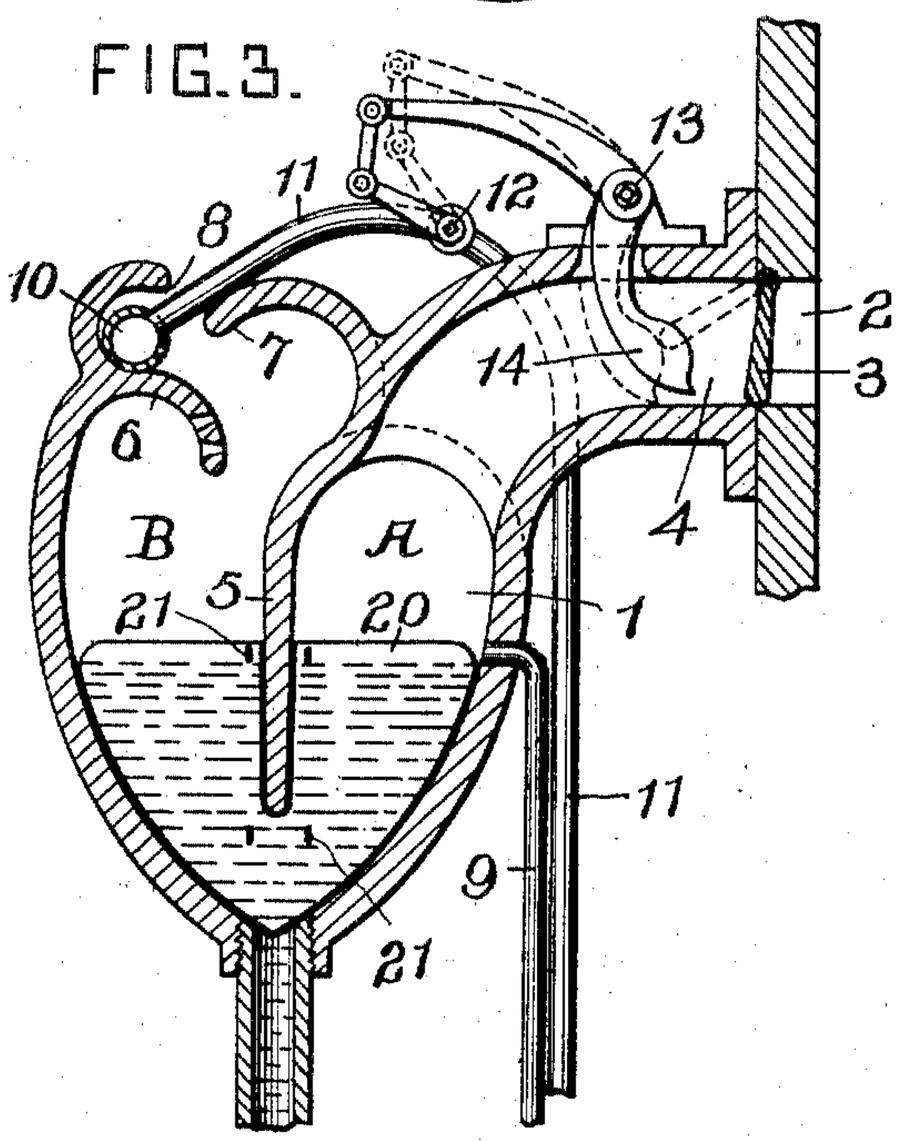


FIG. 3.



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No. 777,498. Patented December 13, 1904.

UNITED STATES PATENT OFFICE.

JOHN COYNE, OF ALLEGHENY, PENNSYLVANIA.

BLAST-FURNACE.

SPECIFICATION forming part of Letters Patent No. 777,498, dated December 13, 1904.

Application filed May 23, 1904. Serial No. 209,320. (No model.)

To all whom it may concern:

Be it known that I, JOHN COYNE, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Blast-Furnaces, of which improvements the following is a specification.

Frequently in the operation of blast-furnaces there occurs a violent expulsion of gases from the top of the furnaces, caused either by an explosion of gases or by what is known as a "slip" of the charge, or both at the same time. As a result of this violent expulsion of gases from the furnace the fine ore-dust which is now most generally in use is carried out in large quantities, thus occasioning not only a loss of material to the operator of the furnace, but also destruction of adjoining property by reason of the fine dust settling thereon.

The invention described herein has for its object the provision of means whereby the dust thus driven from the furnace may be separated from the gases collected, so as to be returned in a suitable form to the furnace.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a view in elevation of a blast-furnace having my improvement applied thereto, a portion of such improvement being shown in section. Fig. 2 is a top plan view of the construction shown in Fig. 1. Fig. 3 is a transverse section on a plane indicated by the line III III, Fig. 2. Fig. 4 is a view similar to Fig. 3, illustrating a modification of the improvement; and Fig. 5 is a sectional detail view of the collecting-chamber, showing the scraper arranged therein.

In the practice of my invention I provide a receiving-chamber 1 of a capacity many times greater than the united capacities of the openings 2, commonly provided in furnaces for the escape of gases and known as "explosion-ports," said ports being normally closed by doors or valves 3, constructed to move automatically to closed position after being forced open by an explosion of gases in the furnace. This circular chamber, which preferably extends almost around the furnace from one side of the down-comer pipe to the other, is connected by branches 4 to the ports 2, as shown in Fig. 3. This chamber or receptacle, which may be of any desired shape transversely, has its upper portion divided into two parts or compartments by a longitudinal depending wall or partition 5. One of these longitudinal compartments, as A, is connected to the explosion-ports of the furnace, as stated, while the other compartment, B, has its top wall slotted longitudinally for the escape of gases, as hereinafter described. Sufficient water is maintained in the receptacle 1 to insure a submergence of a considerable portion of the lower edge of the longitudinal partition 5, so that when there is a rush of gases from the furnace the water in the compartment A will be forced up into the compartment B. As the water is forced into the compartment B it will be pushed violently up against an inwardly-curved extension 6 of the outer wall of the chamber and also against the outwardly-curved extension 7 of the longitudinal diaphragm or partition. These top walls 6 and 7 are so curved as to direct the water back down into the compartment B. The escape of gases is permitted through a slot 8, extending along the top of the chamber and between the edge of the wall 7 and the top of the wall 6. By this construction the water is prevented from escaping from the chamber B, but a free escape is permitted for the gases, which will pass up through the water and escape by the port 8. By its passage through the water all the fine ore-dust will be separated from the gases and be retained in the water, settling onto the bottom of the chamber 1. In the construction shown in Fig. 3 the inner portion of the wall 6 is provided with perforations, so that when the water is forced up into the pocket formed by this wall 6 jets of water will be forced out across the opening between the inner portion of this wall 6 and the longitudinal partition and through the gases on their way to the outlet 8. In lieu of the construction shown in Fig. 3 the outer portion of the wall 6 may be constructed as shown in Fig. 4—*i. e.*, at such

an angle that the water will be thrown in a sheet against the partition 5 through the upwardly-escaping gases.

Water may be forced into the chamber 1 in any suitable manner and maintained at a suitable level, which is determined by the position of the outlet-pipe 9, or, if desired, water may be supplied in the form of jets at the time of each explosion. To this end a pipe 10, connected by a series of pipes 11 to a suitable supply, is arranged adjacent to the outlet 8 and is provided with perforations, which will direct jets of water across this outlet, so as to wash any gases passing therethrough. In the pipes 11 I arrange valves 12, having their operating-handles connected to rock-shafts 13, to which are secured triggers 14, extending down into the branches 4 in such proximity to the doors 3 as to be shifted by said doors to open the valves of the pipes 11 when the doors 3 are forced open by the gases. By this construction jets of water are caused to play across the escaping gases and a supply is maintained within the chamber 1. This chamber 1 is connected by a series of vertical pipes 15 to a receiving-chamber 16, located near the bottom of the furnace. This chamber 16 is connected to a locking-chamber 17, the port connecting receiving-chamber and lock being controlled by a valve 18. The outlet from the lock is controlled by a valve 19, the valves 18 and 19 being arranged on a common stem 22. These valves are so arranged that when one is closed the other will open, and vice versa. By this construction the dust or other material which passes in the form of mud down into the receiving-chamber may be discharged without any material loss of water in the explosion-chamber, the valves being so arranged and constructed that the upper valve 18 is normally open.

In order to remove the ore from the bottom of the chamber 1, a scraper 20, having its upper edge slotted for the reception of the lower edge of the partition 5, is arranged within the chamber and is adapted to be drawn from end to end by chains 21 connected thereto, as clearly shown in Figs. 3, 4, and 5.

By my improved construction a practically free escape is provided for the gases when a sudden increase of pressure occurs within the furnace, said gases during their passage to the air being thoroughly washed and cleansed from any dust carried by them out of the furnace, and further provision is made for the collection of this dust, so that it can be returned to the furnace without any material loss.

By maintaining a sufficient height of water above the lower edge of the partition 5 to balance any normal pressure in the furnace the explosion-doors may be omitted, the water seal in the receptacle 1 being substituted therefor.

By the term "explosion-chamber" as emplied herein is meant a chamber or receptacle connected to the blast-furnace by ports or passages and having outlets to the atmosphere and having a capacity sufficiently greater than the delivering capacity of ports connecting the chamber with the furnace to permit of a considerable expansion of gases and a consequent reduction in their rate of movement.

I claim herein as my invention—

1. The combination of a blast-furnace having an outlet for the normal escape of gas, an explosion-chamber connected to the furnace and means within said chamber for separating the gases from dust, substantially as set forth.

2. The combination of a blast-furnace having an outlet for the normal escape of gas, an explosion-chamber connected to the furnace, and means for washing gases on their passage through the chamber, substantially as set forth.

3. The combination of a blast-furnace having an outlet for the normal escape of gas, an explosion-chamber connected to the furnace, and a water seal to prevent the passage of gases under normal pressure, substantially as set forth.

4. The combination of a blast-furnace, an explosion-chamber connected thereto, a water seal arranged in said chamber and means for preventing the escape of water from the chamber when displaced by an increase of pressure in the furnace, substantially as set forth.

5. An explosion-chamber for blast-furnaces, &c., having two compartments, one of said compartments having an inlet and the other compartment having an outlet, a water seal controlling communication between said compartments, and deflecting-walls in the outlet-compartment for changing the direction of movement of water forming the seal when displaced on an increase of pressure in the inlet-chamber, substantially as set forth.

6. The combination of a blast-furnace having an outlet for the normal escape of gas, an explosion-chamber connected thereto, means for separating dust from gases during their passage through the chamber, and a dust-collecting chamber connected to the explosion-chamber, substantially as set forth.

7. The combination of a blast-furnace having an outlet for the normal escape of gas, an explosion-chamber connected thereto, means for washing the gases as they pass through the chamber, a normally closed chamber for receiving solid matter removed from the gases, and means for removing the solid matter from the receiving-chamber without a material escape of water from the explosion-chamber, substantially as set forth.

8. The combination of a blast-furnace, an

explosion-chamber connected thereto, a water seal arranged in said chamber, a normally closed receiving-chamber connected to the explosion-chamber, valves controlling the inlet and outlet from said chamber, and means for simultaneously opening one valve and closing the other, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JOHN COYNE.

Witnesses:
DARWIN S. WOLCOTT,
F. E. GAITHER.