F. C. ROBERTS.

FURNACE TOP.

APPLICATION FILED FEB. 21, 1912.

Patented July 16, 1912.

1,033,035.

FIG. 2.

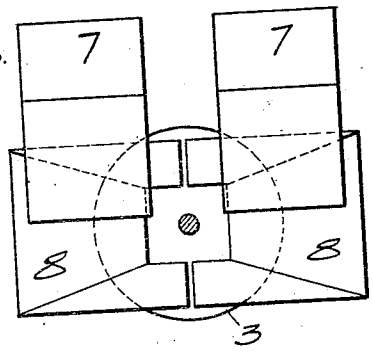

FIG. 1.

WITNESSES:

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FURNACE-TOP.

1,033,035. Specification of Letters Patent. Patented July 16, 1912.

Application filed February 21, 1912. Serial No. 679,009.

To all whom it may concern:

Be it known that I, FRANK C. ROBERTS, a citizen of the United States, and a resident of Wynnewood, in the county of Montgomery and State of Pennsylvania, have invented certain new and useful Improvements in Furnace-Tops, of which the following is a specification.

My invention relates to blast furnaces for the reduction of iron ore of the skip filled type which are provided with a centrally mounted bell-closed hopper or two such hoppers. The skip which introduces the material to the furnace top dumps always at the same side of the furnace from which there results an uneven and irregular distribution of material in the furnace producing irregular working and a lack of uniformity in the furnace product. Material when passing from the skip into the hopper separates roughly into two portions, the coarse and heavy particles settling on the side of the hopper opposite the dumping, while the finer particles and dust take a position in the side of the hopper nearer the dumping point. This irregularity persists in the furnace. It has been proposed to rotate successive hopperfuls of the charge thus separated through different degrees and thereby distribute about the furnace the irregularities of successive skip loads. It has also been proposed to place each skip load as a whole at a different point on one side of the furnace, thereby intermixing and placing on top of each other the coarse and fine of each skip load.

It is the object of my invention to intermix the coarse and fine of each skip load and distribute it in the furnace in a ring about its entire circumference, thus producing a uniform distribution as to quality and quantity of each skip load and consequently of the plurality of skip loads which may be in the furnace at any time. In order to accomplish this mixing, I rotate the hopper into which the material settles, either continuously or during such time as it is receiving material, or while it is receiving the material and while material is passing from it into the lower hopper or the furnace. The result of this is that both the coarser and finer portions of material lie about the entire circumference of the hopper instead of only on opposite sides. In dumping, the coarser and heavier portions pass out freely at first while the finer portion passes out more slowly, dribbling down and dropping mostly at one point. The effect, then, of the rotating receiving hopper is to distribute the coarser material about the hopper and then distribute the fine material about the circumference of the hopper making uniform filling in the hopper, which uniformity persists in the furnace. During this operation the bell of the hopper remains closed and retains the material in the hopper. The material, after thus being mixed, may be lowered in the lower hopper or into the furnace. During this discharge from the receiving hopper, the hopper may be rotated so that the rotary or centrifugal motion imparted to the material may increase and continue the mixing.

In the accompanying drawings, Figure 1 is a sectional view, showing one form my invention may take and Fig. 2 is a plan view of the skips and chutes.

I have shown a furnace, 1, surmounted by a bell-closed hopper, 2, above which is placed a rotary hopper, 3, closed by a bell, 4, and rotated by a motor, 5, through the gearing, 6. I may provide stationary or adjustable chutes, 8, shown as oppositely disposed, to lead the material into the hopper from the skip of which there may be one or, preferably, two side by side as shown in Fig. 2 which alternately bring a load of material to the furnace top. The material is brought to the top of the furnace in the skip cars, 7, alternately, from which it is dumped onto the chutes, 8, which direct the material into the hopper, 3, which is constantly rotated during the dumping operation, thereby producing a mixture in the hopper. The bell, 4, may then be lowered in the ordinary way and the mixed charge delivered to the lower hopper, 2, during which time the hopper, 3, may or may not be rotated. One or more skip loads of material may be assembled in the hopper, 2, and then charged into the furnace.

The receiving hopper, 3, may be rotated only while material is being delivered to it or also while material is passing from it or continuously during the operation of the furnace. The object of my invention might possibly be accomplished if the receiving hopper be rotated only while material is passing from it.

In the apparatus shown in the drawing

the material has a free and unimpeded passage from the skip to the hopper. It is not held in the chutes. Because of this freedom of movement, and the relative proportions and locations of the various parts of the apparatus, the material settles continuously on all sides of the center of the hopper. Even if the hopper were not rotated the material would take a position covering the bell in a ring or circle extending around the circumference of the hopper and across its whole area. I have used the phrase "in a ring" in some of the claims to indicate this disposition of the material on all sides of the center of the hopper. The rotation of the hopper produces a mixture of the material which makes up the ring.

The details of the apparatus illustrated are not essential and numerous changes may be made.

I claim as my invention:

1. In a furnace top, a centrally mounted bell closed hopper, means for delivering material spread out across substantially the whole area of the hopper, and means for rotating the hopper while the material is being fed thereto and therefrom.

2. In a furnace top, a centrally mounted bell closed hopper, means for delivering material spread out across substantially the whole area of the hopper, and means for rotating the hopper while material is being fed thereto.

3. In a furnace top, a hopper, means for delivering material thereto in a ring, and means for rotating the hopper to intermix the charge.

4. In a furnace charging device, a hopper, a skip arranged to introduce a charge of material spread out across substantially the whole area of the hopper, and means for rotating the hopper to intermix each skip load in the hopper.

5. In a furnace charging device, a hopper, a skip arranged to introduce a charge of material spread out across substantially the whole area of the hopper, means for closing the hopper while receiving the material, and means for rotating the hopper while receiving the material.

6. In a furnace charging device, an unobstructed hopper, means for introducing a charge of material spread out across substantially the whole area of the hopper, means for closing the hopper and holding it closed while receiving material, means for rotating the hopper to intermix each skip load in the hopper, and means for introducing the mixed charge from the hopper into the furnace in a ring.

7. In a furnace charging device, a bell closed hopper mounted centrally of the furnace, means for introducing a skip load of material into the hopper continuously and in a ring, and means for rotating the hopper while receiving the material.

8. In a furnace charging device, a bell closed hopper mounted centrally of the furnace, means for introducing part of a skip load of material into the hopper in a ring and for introducing the remainder of the skip load into the hopper, and means for rotating the hopper while receiving each part.

9. In a furnace charging device, a bell closed hopper mounted centrally of the furnace, means for introducing the coarse part of a skip load of material into the hopper in a ring and for introducing the fine part of the skip load into the hopper, and means for rotating the hopper while receiving each part.

Signed at Philadelphia, this 15th day of February, 1912.

FRANK C. ROBERTS.

Witnesses:
J. DONALDSON PAXTON,
CLARENCE S. BUTLER.