F. C. ROBERTS.

FURNACE TOP.

APPLICATION FILED JAN. 25, 1912.

1,033,034.

Patented July 16, 1912.

2 SHEETS—SHEET 1.

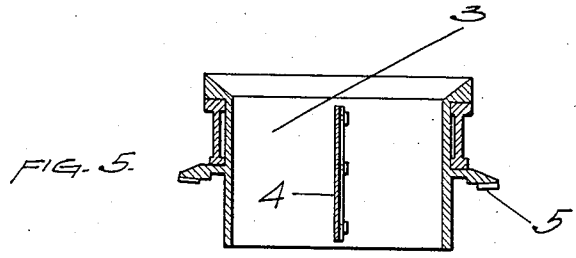

FIG. 5.

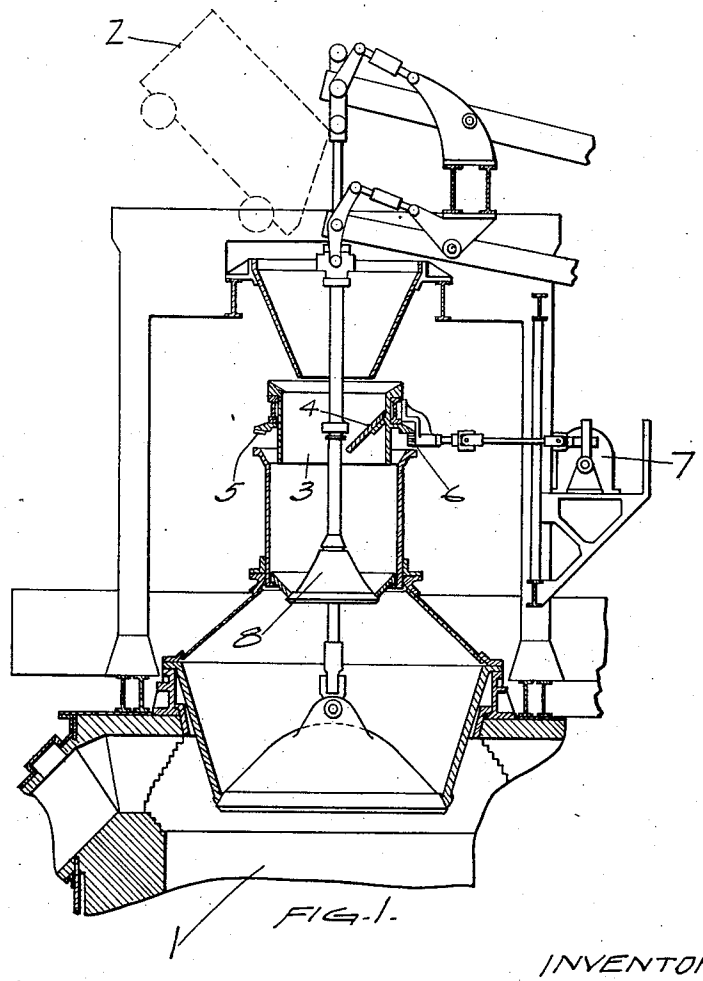

FIG. 1.

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2 SHEETS—SHEET 2.

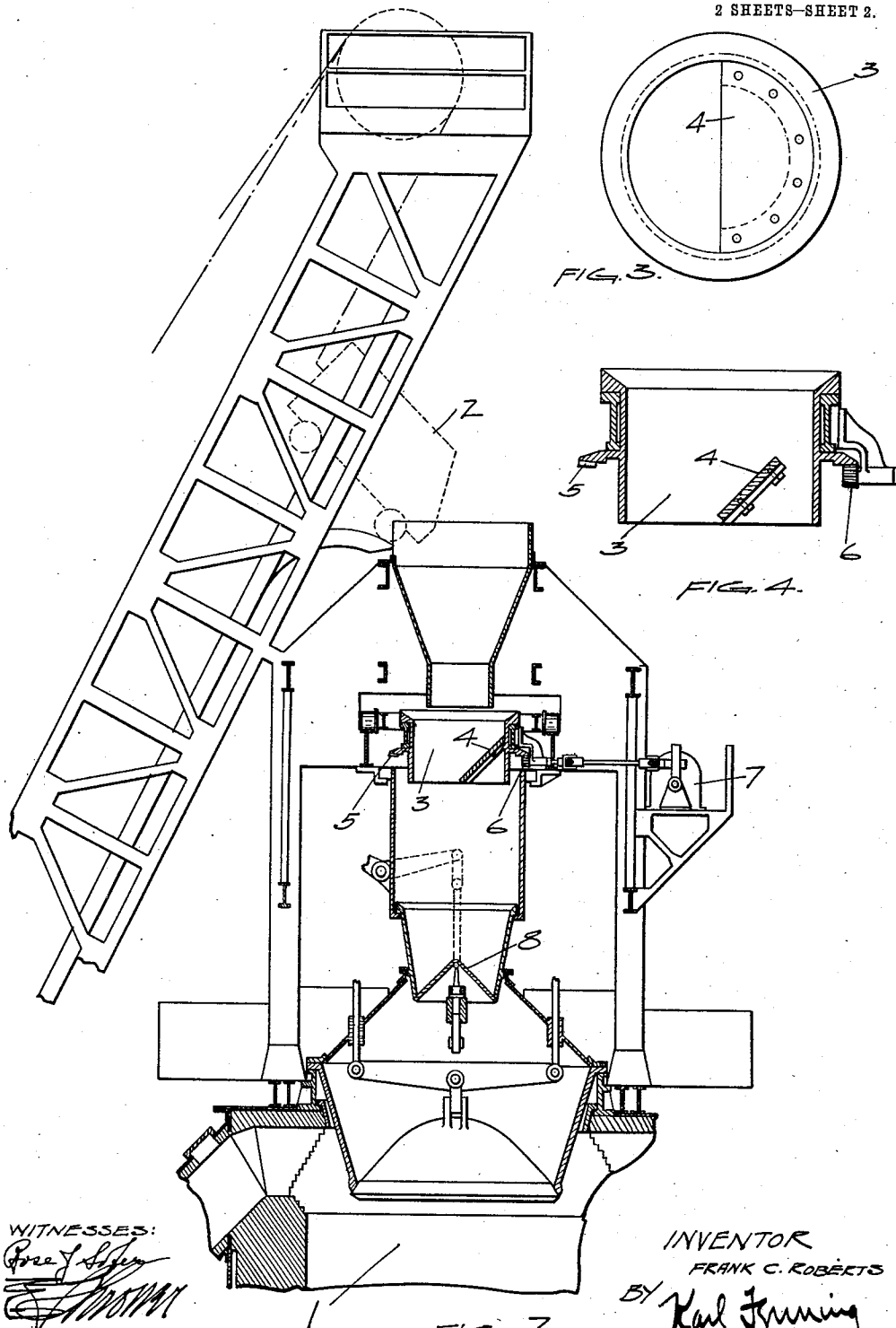

FIG. 2.

FIG. 3.

FIG. 4.

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UNITED STATES PATENT OFFICE.

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FURNACE-TOP.

1,033,034. Specification of Letters Patent. Patented July 16, 1912.

Application filed January 25, 1912. Serial No. 673,309.

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 is particularly intended for use in charging materials into a blast furnace for the reduction of iron ore.

It is usual to carry the various materials introduced into the furnace in skip cars to the top of the furnace and dump the skip cars into a receiving hopper from which they are introduced either directly into the furnace or into another hopper from which they pass into the furnace. It is well known that when materials are dumped from the skip car there is a tendency for each skip load to separate into two roughly defined portions, one of which contains more large pieces than the other. One way of correcting this separation is to direct each skip load as a whole toward one side of the furnace and deposit it in a more or less mixed condition in a body in the hopper, each skip load lying on one side of the radius of the furnace. In order, however, to obtain uniform distribution as to quantity of each skip load about the furnace, it is desirable that each skip load be distributed in a ring about the radius of the furnace.

It is an object of my invention to provide means for correcting the segregation of coarse and fine by intermixing them and to distribute each skip load in a ring around the furnace. This may be done either with a furnace top consisting of a single hopper or a double hopper of the centrally filled type. In order to accomplish my purpose, I place between the skip and furnace a mixing device which acts upon the material passing from the skip into the hopper or furnace.

In the specific form of apparatus which I prefer to use I insert between the skip and the hopper a chute in axial alinement with the furnace and provide the chute with an interior diaphragm in the path of the charge so arranged that when the chute is rotated the diaphragm acts upon the material passing through the chute so as to deflect its course and intermix it. I provide means for rotating the chute either continuously or during such time as material is passing through it from the skip to the hopper. The result of this arrangement is that instead of the material reaching the hopper in a condition of segregation as to coarse and fine, each skip load is delivered to the hopper in an approximately uniform condition as to coarse and fine and distributed around the entire circumference of the furnace and preferably approximately uniformly as to quantity which arrangement is maintained in the furnace.

In the accompanying drawings, Figure 1 is a view partly in section, of my invention applied to a double bell closed blast furnace in which the bells are operated through central rods; Fig. 2 is a view, partly in section, of my invention applied to a double bell closed blast furnace in which the bells are operated by external levers; Fig. 3 is a plan view of one form of my rotary distruting chute and Figs. 4 and 5 are sectional views of optional forms it may take.

As usual, material is delivered to the furnace 1, in skip cars 2, which dump the material into the charging top of the furnace. As is well known when the material leaves the skip it separates roughly, the coarser and heavier particles going toward the side of the furnace opposite the skip while the finer and lighter particles go toward the near side. In my device, however, the material passing from the skip goes through a chute or distributer 3, which is provided with a diaphragm 4, extending, in the preferred form, across half the area of the chute and inclined downwardly. The chute is provided with a rack 5, which is engaged by a gear 6, rotated by a motor 7. The motor may be operated, and consequently the chute rotated, continuously during the operation of the furnace or it may be normally at rest in which event the motor will be operated to rotate the chute whenever a skip is dumping material into the furnace top and through the chute. It will be seen that as the material passes through the revolving chute it is deflected and intermixed under the influence of the diaphragm 4, so that each skip load comes to rest on the bell 8, of the receiving hopper in a condition practically uniform as to coarse and fine since

the incipient segregation has been corrected by the action of the rotary mixer. Moreover, by the rotation, the opening through the chute is made to take a continuingly different position so that each skip load reaches the bell 8, practically evenly distributed around its axis and not in a body at one side. As is well known, the material maintains practically the same position in the lower bell and in the furnace as is given it on the bell 8. It will be seen, therefore, that by my device, I place in the furnace each skip load of material in a layer of practically uniform thickness around the circumference and in a practically uniform condition as to coarse and fine. The result is that the furnace will work uniformly and be free from slips, blow-outs and other troubles which irregular charging produces. In the claims I have used the terms uniform manner and uniform condition to describe this arrangement of the material in the furnace.

In Figs. 1, 2, and 3 I have shown the diaphragm 4, approximately semi-circular and covering half of the passage way through the chute 3. It is obvious, however, that this is not necessary and other shapes and arrangements may be given the diaphragm. For instance, in Fig. 4, I have shown the diaphragm as consisting of an eccentrically arranged inclined plate extending across the chute but leaving openings on both sides of it. In Fig. 5, I have shown a vertical diaphragm arranged in the chute which will give to the material passing it a whirling motion which will produce the desirable uniformity in the charge. Other immaterial changes will readily suggest themselves.

I claim as my invention:

1. In a furnace top, a cylindrical chute, an inclined diaphragm extending part way across the chute and having a passage way between the diaphragm and the wall of the chute, and means for rotating the chute and the diaphragm while the material is passing through the chute.

2. In a furnace top, a chute, a diaphragm in the chute having passage ways on both sides thereof between it and the wall of the chute, and means for rotating the chute and diaphragm while material is passing through the chute.

3. In a furnace top, a chute, a diaphragm in the chute leaving a passage way between the diaphragm and the wall of the chute, and means for rotating the diaphragm in a plane substantially perpendicular to the average path of the material while material is passing through the chute.

4. In a furnace charging device, a skip for introducing a charge of material into a hopper, a chute through which the material passes between the skip and hopper, a diaphragm in the chute, means for rotating the chute while material is passing through it so as to mix the charge, a hopper for receiving each mixed skip load in a ring in a uniform condition, and means for introducing the charge into the furnace.

Signed at Philadelphia, this 23rd day of January, 1912.

FRANK C. ROBERTS.

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