

No. 653,110.

Patented July 3, 1900.

T. MORRISON.

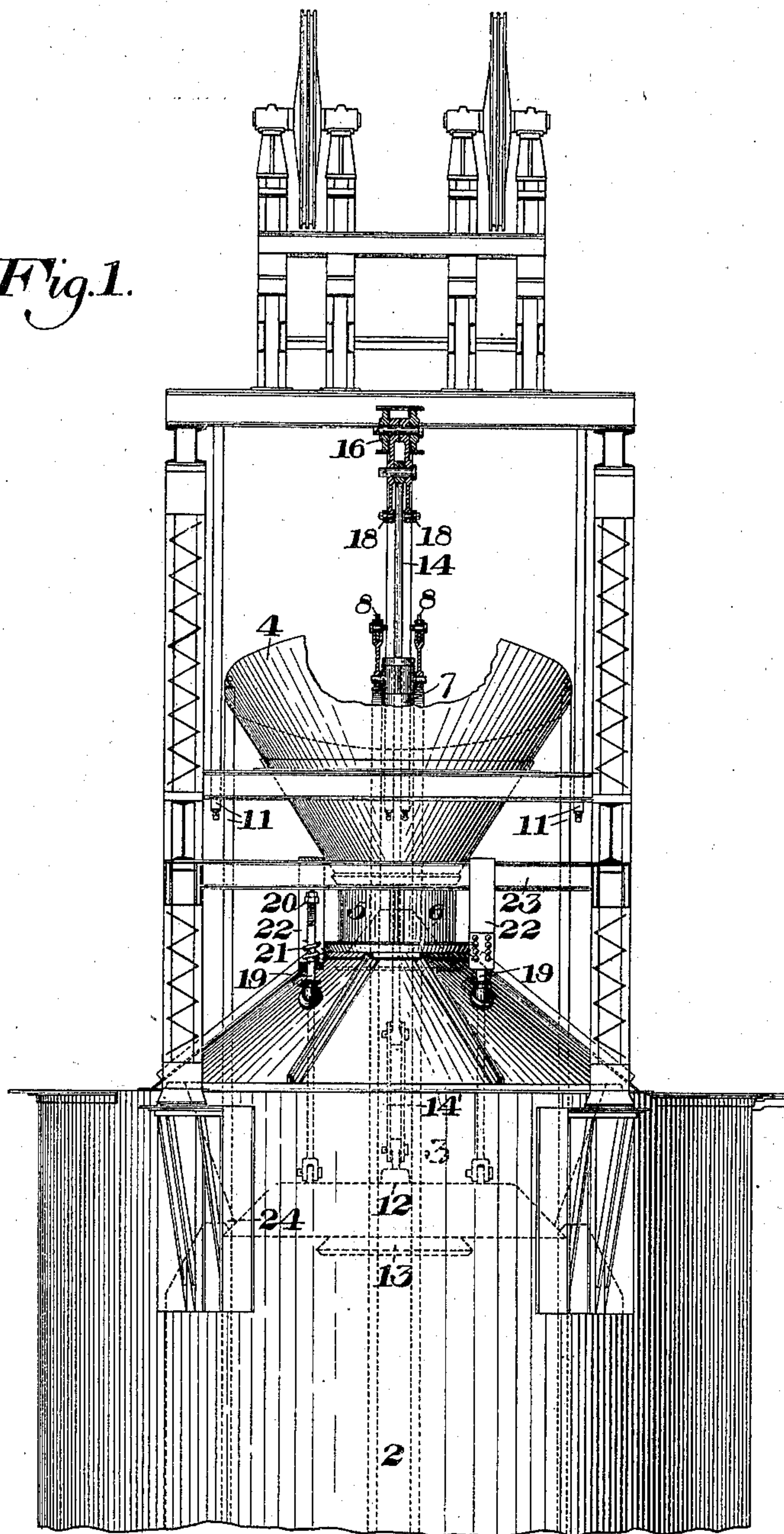
APPARATUS FOR FEEDING STOCK TO FURNACES.

(Application filed Jan. 23, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



WITNESSES

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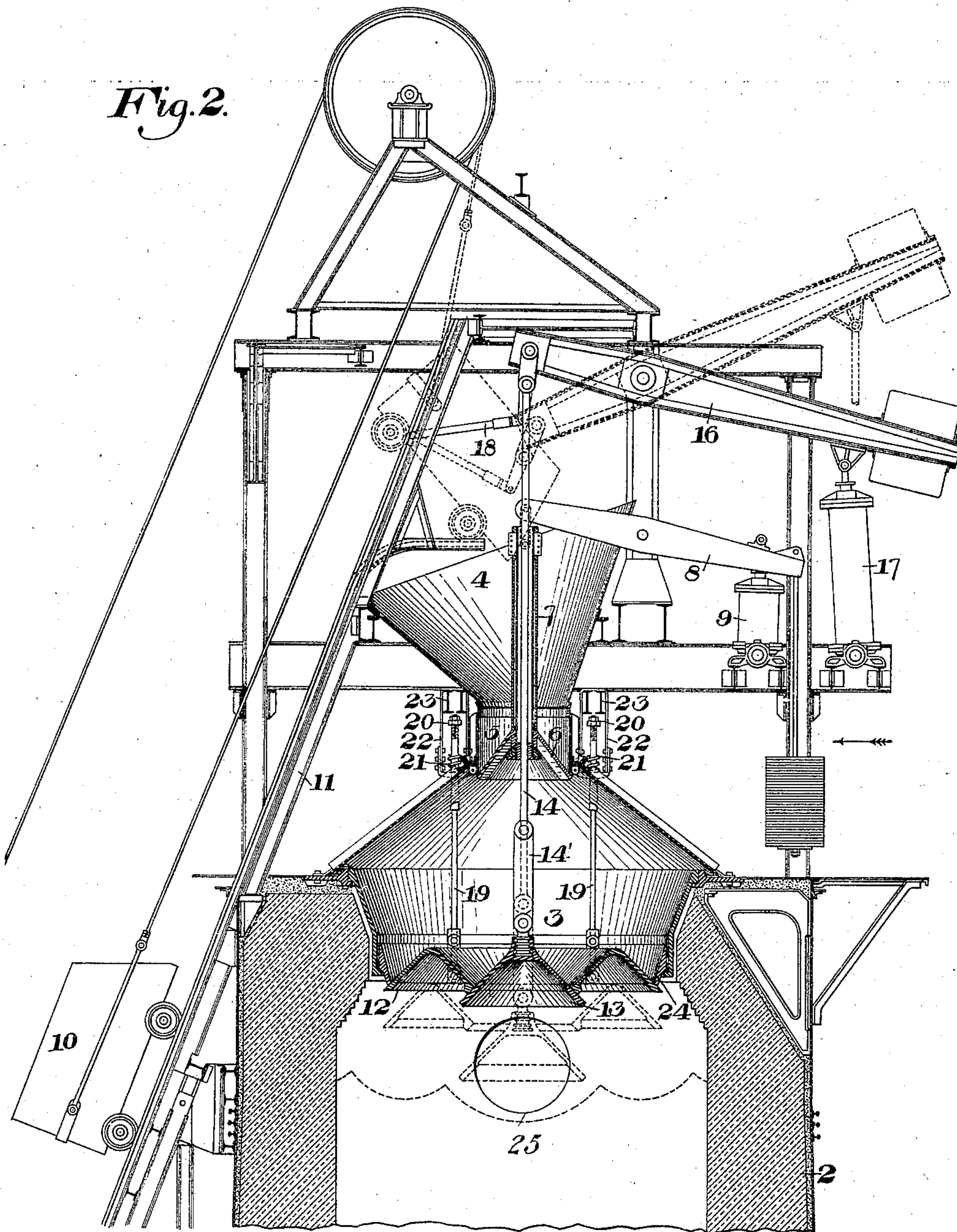
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2 Sheets—Sheet 2.



WITNESSES

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UNITED STATES PATENT OFFICE.

THOMAS MORRISON, OF BRADDOCK, PENNSYLVANIA.

APPARATUS FOR FEEDING STOCK TO FURNACES.

SPECIFICATION forming part of Letters Patent No. 653,110, dated July 3, 1900.

Application filed January 23, 1899. Serial No. 703,074. (No model.)

To all whom it may concern:

Be it known that I, THOMAS MORRISON, of Braddock, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for Feeding Stock to Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 shows in end elevation a blast-furnace-charging apparatus constructed in accordance with my invention. Fig. 2 is a vertical central section through the top of the blast-furnace and hoppers, showing the operating-levers and one of the cars in side elevation.

My invention relates to improved means for introducing charges of ore, fuel, and flux as required into the top of a blast-furnace. Its object is to obtain a more uniform distribution of the stock than has heretofore been possible by any of the methods in common use. At present the usual apparatus for charging blast-furnaces comprises a hopper with a conical bell, which closes the opening at its bottom. This apparatus is placed at the top of the furnace and is made gas-tight at the joints. The stock is placed in the hopper while the opening is closed by the bell, and when the necessary amount of stock has been supplied the bell is lowered and the stock is allowed to slide down its inclined surface into the furnace, supplementary bells being sometimes provided to form gas-seals and the apparatus being provided with closing-doors and other accessory parts familiar to those skilled in the art. It is evident that by this arrangement the stock introduced into the furnace is thrown more or less against the side of the furnace structure, leaving a hollow or depression in the center, where the ascending currents of gas find less resistance and through which they pass more readily than through the portions nearer the walls. Such inequality of distribution and discharge tends to cause irregular working of the furnace, and it is such irregular distribution, with its attending disadvantages, that I overcome by my invention.

In the drawings, 2 represents a masonry or stack at the top of a blast-furnace.

3 is the main hopper.

4 is the supplemental hopper, situate above the main hopper and connected therewith by a throat 5. This supplemental hopper and the throat, with their bell and accessory parts, may be omitted or other parts substituted therefor without departure from my invention as defined in the broader claims of this specification.

6 is the bell of the supplemental hopper, which closes the opening at the base of the throat 5 and has a vertical tubular stem 7, connected with an operating-lever 8, which is operated by a motor 9, adapting the bell to be moved vertically in order to open or close the opening at the base of the throat.

10 is the skip or car mounted upon a track 11 of any suitable construction and adapted to discharge the stock into the mouth of the hopper 4.

The bell which closes the opening at the base of the main hopper 3 and which constitutes the leading feature of my invention is made in two or more sections, the outer sections or section being annular in form. In the drawings I show this bell constituted of two such sections—an outer annular section 12, which in cross-section is preferably of inverted-V shape, so as to deflect the stock falling thereupon both toward the center and toward its circumference, and a central section 13, preferably conical in form, which fits against the under side of the central opening of the annular section 12. The annular section thus normally rests upon and is supported by the central section 13 when the parts are in closed position. The section 13 has an upwardly-projecting stem 14 connected thereto by a link 14' and passing through the hollow stem 7 of the bell 6. The stem 14 is operated by suitable means, such as a lever 16 and cylinder 17, swinging links 18 (not of my invention) being preferably interposed to secure parallel motion. The outer section 12 of the bell has a suitable number of stems 19, which extend vertically through the cover of the main hopper and are provided at their ends with stops 20, con-

stituted, preferably, by adjustable nuts, which at the lowest position of the section 12 (indicated by dotted lines) rest upon stops constituted, preferably, by springs 21, supported
5 by straps 22, depending from beams 23.

When the bell of the hopper 3 is closed, the central section 13 is raised by the lever 16 and supports the outer section 12 in contact with the lower edge 24 of the main hopper,
10 the said annular section resting upon and its central opening being closed by the conical surface of the middle section 13. When it is desired to open the hopper 3 by lowering its bell, the lever 16 is operated so as to lower
15 the stem 14 and the bell-section 13, which in descending carries with it the outer bell-section 12 until the latter reaches the level shown by dotted lines in Fig. 2. Up to this point in their descent the central opening of the
20 annular section 12 is closed by the central section 13; but when the parts arrive at the level just indicated the stops 20 on the stems 19 of the annular section engage their spring-stops 21 and are stopped thereby, so as to
25 support the annular section 12 and to restrain it from any further down motion. Then as the central section 13 continues its descent it leaves the annular section 12 suspended by the links and opens the central opening thereof, as shown by dotted lines in Fig. 2. In
30 closing the hopper the central section 13 is raised by operation of the lever 16 until it reaches and closes the central opening of the annular section 12, and as it continues its ascent it raises the annular section into contact
35 with the hopper 3, as shown in full lines. It is evident that by adjustment of the stops 20 the annular section may be caused to move with the central section 13 throughout any
40 desired portion of the vertical travel of the latter, and the extent of motion of the central section is controllable by varying the motion of the operating-cylinder.

The main hopper 3 receives its charge of
45 stock from the throat of the supplemental hopper 4, from which it is discharged uniformly by lowering the bell 6, and when a sufficient amount of stock has been accumulated in the main hopper 3 and it is desired
50 to discharge the same into the blast-furnace the operator lowers the stem 14. The first effect of this is to cause the entire bell, comprising the sections 12 13, to descend and to open an annular space between the outer edge
55 of the section 12 and the edge 24 of the hopper, through which a portion of the stock at the outer part of the hopper 3 will drop and will be deflected toward the wall of the furnace. When the parts of the bell reach the
60 lowest position desired for the section 12, this section is suspended and held from further descent by the engagement of the stops 20 and 21, and as the central section 13 continues to descend it opens the central opening of the section 12, and the portion of the
65 stock which is at the middle of the hopper

will drop through said opening and will be distributed in the furnace at a more central position than that portion of the stock which is discharged through the annular opening
70 around the section 12. After the stock has thus been discharged into the furnace the sections of the bell are again raised into the closed position. (Shown by full lines in the drawings.) In case it is desired to use the
75 bell 12 13 as a single bell this can be done by removing the stop 20, so as to permit the section 12 to travel with the section 13 to the full extent of its movement. The gases pass
80 off through the side off-take, (shown at 25 in Fig. 2.)

The advantages of my invention have been indicated generally and will be appreciated by those skilled in the art. The apparatus is simple and effective and secures a very
85 good distribution of the stock in the furnace.

Within the scope of my invention as herein defined changes may be made in the construction and arrangement of the parts, since

What I claim is—

1. A blast-furnace having a closed top and a side gas-offtake, and provided with a feeding apparatus comprising a vertical movable annular section having an intermediate ridge arranged to split the stock and distribute it
90 in the form of a central core and an annular surrounding core, and a closed central bell of larger diameter than the opening in the annular section, and seated upwardly against it, and mechanism for moving the bell downwardly beyond the limit of motion of the section, substantially as described. 95
2. A blast-furnace having a closed top and a side gas-offtake, a charging-bell comprising an annular section having an intermediate ridge arranged to split the stock and distribute it in the form of a central core and an annular outer core and a central closed section arranged to close the opening of the
100 annular section and support the same, means for moving the central section vertically, and a stop adapted to limit the motion of the annular section; substantially as described. 105
3. A blast-furnace having a closed top and a side gas-offtake, a charging-bell comprising an annular section having an intermediate ridge arranged to split the stock and distribute it in the form of a central core and an annular surrounding core and a closed central section arranged to close the opening of the
110 annular section and support the same, means for moving the central section vertically, and a spring-stop adapted to limit the motion of the annular section; substantially as described. 115
4. A blast-furnace having a closed top and a side gas-offtake, a charging-bell comprising an annular section having an intermediate ridge arranged to split the stock and distribute it in the form of a central core and an annular surrounding core and a closed central section arranged to close the opening of the
120 section 12, and the portion of the stock which is at the middle of the hopper 3 will drop through said opening and will be distributed in the furnace at a more central position than that portion of the stock which is discharged through the annular opening around the section 12. After the stock has thus been discharged into the furnace the sections of the bell are again raised into the closed position. (Shown by full lines in the drawings.) In case it is desired to use the bell 12 13 as a single bell this can be done by removing the stop 20, so as to permit the section 12 to travel with the section 13 to the full extent of its movement. The gases pass off through the side off-take, (shown at 25 in Fig. 2.)

annular section and support the same, means for moving the central section vertically, and an adjustable stop adapted to limit the motion of the annular section; substantially as described.

5 5. A blast-furnace having a closed top and a side gas-offtake, a charging-bell comprising a movable annular section having an intermediate ridge arranged to split the stock and distribute it in the form of a central core and an annular surrounding core and a movable closed middle section adapted to close the opening of the annular section and to support the stock; one of said sections being movable
10 downwardly beyond the limit of motion of the other, and means for varying independently the extent of the motions of said sections; substantially as described.

20 6. A blast-furnace having a closed top and a side gas-offtake, a main charging-hopper, a bell for said hopper comprising a movable annular section having an intermediate ridge arranged to split the stock and distribute it in the form of a central core and an annular
25 surrounding core and a movable closed middle section adapted to close the opening of the annular section and to support the stock; a

second hopper having a vertical throat above the main hopper, and a bell for said throat adapted to effect the discharge of stock from
30 said throat into the main hopper upon the sections of the bell thereof; substantially as described.

7. A blast-furnace having a closed top and a side gas-offtake, a charging-bell having an
35 annular section with an intermediate ridge arranged to split the stock and distribute it in the form of a central core and an annular surrounding core, and a closed central section having a central support and arranged to
40 close the opening in the annular section and support the same, and rods secured to the annular section and extending through the closed cover or top and provided with stops, the central section being movable down-
45 wardly beyond the limit of motion of the annular section; substantially as described.

In testimony whereof I have hereunto set my hand.

THOMAS MORRISON.

Witnesses:

J. E. MITCHELL,
G. E. F. GRAY.