J. W. SHOOK.

BLAST FURNACE CHARGING APPARATUS.

APPLICATION FILED MAY 14, 1912.

1,055,671.

Patented Mar. 11, 1913.

Fig. 1.

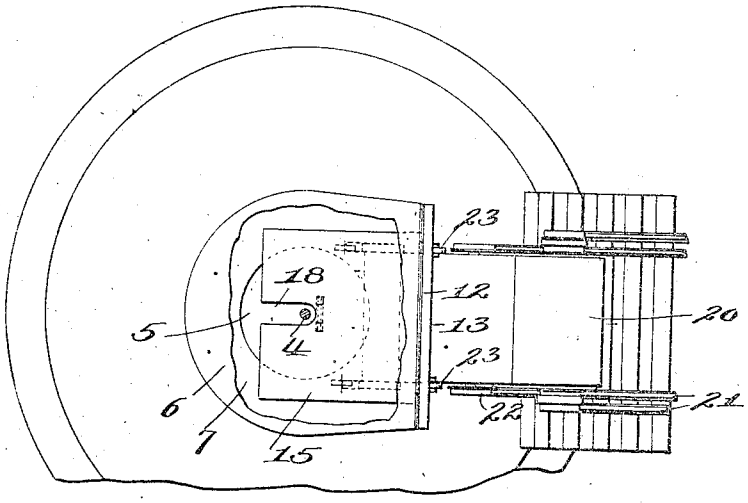
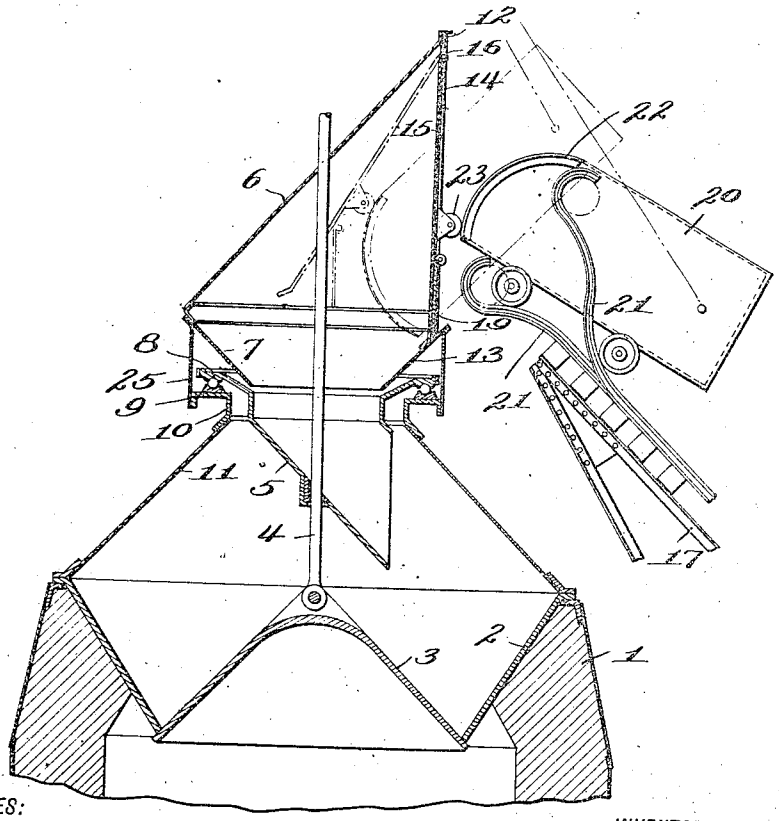


Fig. 2.



WITNESSES:

Guy M. Powell.

INVENTOR

James Warner Shook.

BY

Watts, Sheehan & Co

ATTORNEY

UNITED STATES PATENT OFFICE.

JAMES WARNER SHOOK, OF HOLT, ALABAMA.

BLAST-FURNACE-CHARGING APPARATUS.

1,055,671. Specification of Letters Patent. Patented Mar. 11, 1913.

Application filed May 14, 1912. Serial No. 697,196.

To all whom it may concern:

Be it known that I, JAMES WARNER SHOOK, a citizen of the United States of America, residing at Holt, in the county of Tuscaloosa and State of Alabama, have invented certain new and useful Improvements in Blast-Furnace-Charging Apparatus, of which the following is a specification.

My invention relates to improvements in charging apparatus for blast furnaces and more particularly to an improved gas seal, whereby I am able to dispense with the upper bell and its attendant complicated and expensive operating apparatus and to substitute therefor an exceedingly simple, light and inexpensive apparatus comprising only a receiving hopper which is closed overhead and provided with a hanging door which normally bears against the frame of the charging door for the hopper and seals it effectively against the escape of gas when the bell is dropped. To simplify the operation of parts, I adapt the skip car to automatically open the hopper door as the car tilts to discharge its contents into the hopper. When material is not being charged into the hopper the door remains closed and when the bell is dropped to charge material into the furnace, the furnace gas pressure will force the door against its seat or frame making it most effective as a seal when such is needed.

By my novel arrangement of charging hopper and gas seal door, I not only simplify the construction and operation of blast furnace tops and reduce operating expense, but, what is of great importance, I am enabled to reduce to a minimum the shock to material charged into the furnace, especially where skip cars are used. In other words, my invention permits of a low top which lessens the distance that the coke has to fall and therefore minimizes the amount of breakage and resultant coke breeze.

My invention further comprises the details of construction and arrangement of parts which, in their preferred embodiment only, are hereinafter more particularly described and illustrated in the accompanying drawings, in which:—

Figure 1 is a top plan view of a furnace equipped with my charging apparatus, the top of the hopper being broken away to show the hopper door and the skip car in the positions assumed when the material is being charged into the hopper. Fig. 2 is a vertical sectional elevation through my improved charging apparatus.

Similar reference numerals refer to similar parts throughout the drawings.

The furnace stack 1 is fitted with a lip-ring 2 having a central opening adapted to be sealed by the bell 3. The bell has an operating rod 4 which passes upwardly and centrally through the rotary distributing chute 5 and the top 6 of the charging hopper 7. The chute 5 is provided with an annular raceway 8 which rests on a series of antifriction balls that run in a grooved way 9 supported on the annular bracket 10. This bracket is mounted on the conical top 11 which is bolted to the lip ring 2 and incloses the charging compartment immediately above the bell. The distributing chute 5 may be operated in any manner well known in this art, to distribute the material properly on the bell and the latter may be raised and lowered by any suitable mechanism. In fact the parts thus far described are all of standard construction except the charging hopper 7. This hopper in a horizontal cross-section is substantially U-shaped having a flat vertical side wall 12 which rises from the uncurved wall 13 forming a portion of the bottom of the hopper 7. The top plate 6 leads downwardly from the upper edge of wall 12 at a sharp angle to join the opposite marginal curved edge of the hopper bottom 7. Vertical curved walls inclose each side of the hopper which has a charging opening 14 in the wall 12. This opening is normally closed by a door 15, hinged at 16 to the wall 12 above the opening 14 which it normally hangs in a position to close effectively. Where, as illustrated, a single skip hoist 17 is used, the charging hopper will have only one door 15 which, since it stands opposite to the rod 4 and should swing inwardly beyond it in moving to admit a charge of material, must be provided with a slot 18 which is arranged to receive in it the said rod. This slot is closed by a small door 19 hinged to the outer face of the door 15 and having its lower end so disposed as to engage and be held closed by the wall 13 of the hopper bottom when the door 15 is closed. To give a better joint, the bottom edge of the door 15 is bent inwardly at a slight angle which corresponds to the inclination of wall 13 with which it makes a

close fit. When a double skip hoist is used, the rod 4 will be between the doors 12 and the slot 18 and door 19 are then unnecessary.

The skip hoist has a car 20 which may be of any standard construction and which rides on the tracks 21 of the hoist. These tracks are designed in the usual manner to gradually tilt the car 20 to dump its contents into the charging hopper of the furnace. In my invention I provide the car at each side of its front end with a curved flange or projection 22, which projections are adapted to engage each a roller 23 journaled in bearings 24 attached to each side of the door 12. Thus, as the car 20 tilts to discharge its contents into the hopper 7, it will engage and open the hopper door 12.

It will be noted that the skip car is brought quite close to the bell 3 by my construction, so that the coke has a minimum distance to fall. It will be further observed that the charging hopper is light, inexpensive and should be exceedingly durable. No complicated or duplex operating mechanism is required, as the bell 3 may be dropped by any simple means, and the door 12 is opened by the skip car, closes automatically, and is held closed by the gas pressure when the bell 3 is dropped. No parts are subjected to any special wear, and all may be readily and cheaply replaced.

In accordance with the requirements of law I have illustrated only that embodiment of my invention which I regard as preferable. I, however, claim as part of my invention all such modifications and changes as embody the gist of my invention which is set forth in the accompanying claims.

What I claim as new and desire to secure by Letters Patent, is:—

1. The combination with a blast furnace and its charging hopper and bell seal therefor, of a charging compartment over said hopper and having a bottom opening through which material falls into said hopper, a distributer which deflects the stock as it falls through said opening there being a side opening for the charging of material into said charging compartment, which opening extends downwardly to a point near the hood of the bottom hopper, and a self closing internal door for said side opening which automatically seals it and the furnace when the bell is lowered.

2. In a charging apparatus for blast furnaces, a charging hopper provided with a side opening, an inwardly swinging closure for said opening, rollers mounted at the sides of the outer face of sa[illegible] door, a charging car, and projections carried by the charging car which engage said rollers and move the door inwardly as the car tilts to discharge its contents into the hopper, substantially as described.

3. In a charging apparatus for blast furnaces, the lower hopper and bell, a charging hopper superposed above the lower hopper and bell, said charging hopper having a hood and a straight uncurved vertical side wall provided with an opening, and a flat door hinged within said hopper so as to swing over and close said opening.

4. A blast furnace top comprising a double hopper, a bell to seal the discharge opening of the lower hopper, the upper hopper having a vertical side opening which extends down to a point near the hood of the lower hopper, and an internal door in the upper hopper to seal said side opening through which material is introduced into the double hopper, substantially as described.

5. In a furnace top having a lip ring and bell, a normally closed cover over said lip ring, an inwardly opening side door for said cover, a rod for opening the bell, said door having a slot adapted to receive said rod as the door swings inwardly, a flap valve connected to the outer wall of the door and adapted to swing down over said slot, said flap valve being adapted to engage the cover and close the slot when the door is in closed position.

6. The combination with a furnace top which comprises a closed top hood having a side opening, a charging bell and hopper, and an inwardly opening door for said opening, of a charging car having at its forward end a curved member adapted to engage said door, and track supports for said car which cause said member to engage and gradually open said door as said car pivots to dump its contents through said opening.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES WARNER SHOOK.

Witnesses:
C. H. Blacklock,
W. M. Joyner.