No. 853,016. PATENTED MAY 7, 1907.

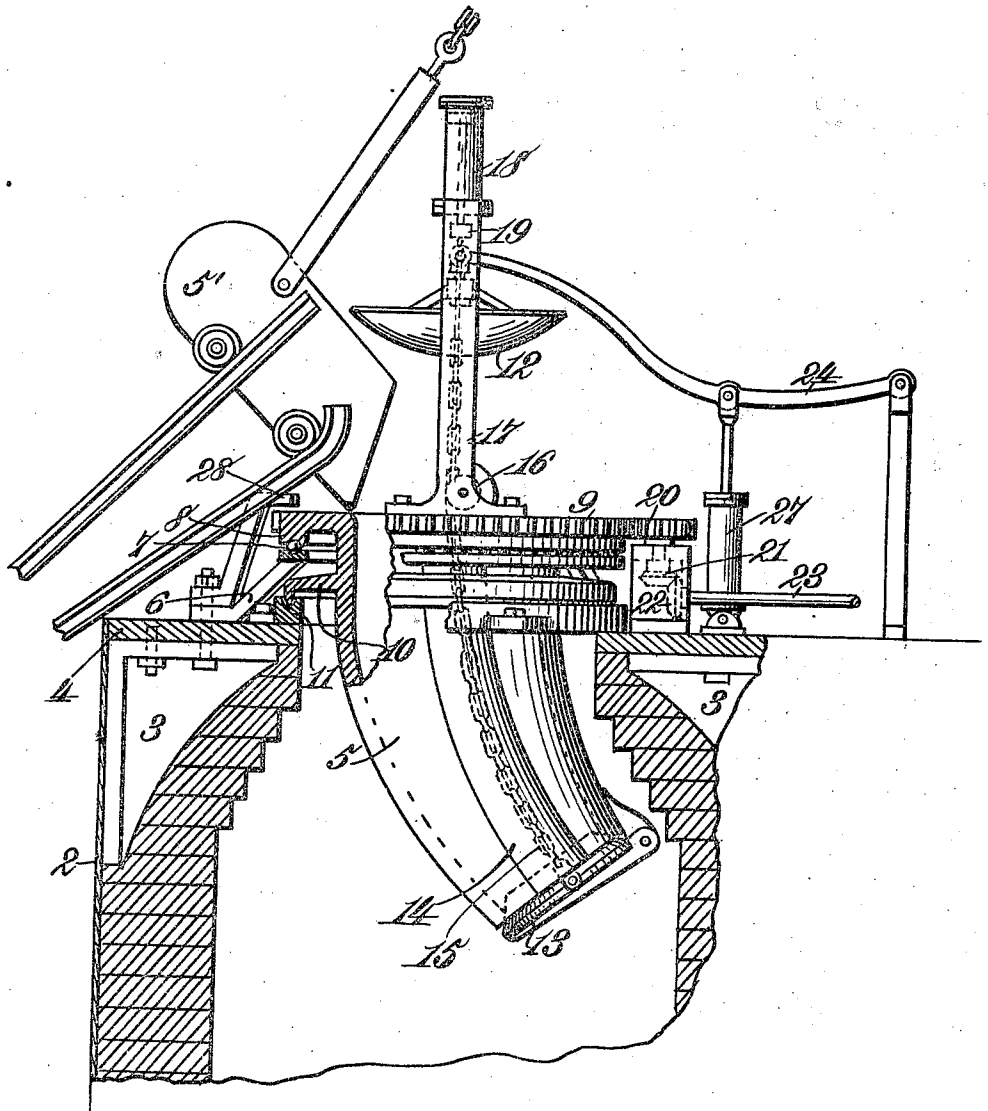
G. R. JOHNSON.

BLAST FURNACE CHARGING APPARATUS.

APPLICATION FILED OCT. 1, 1906.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

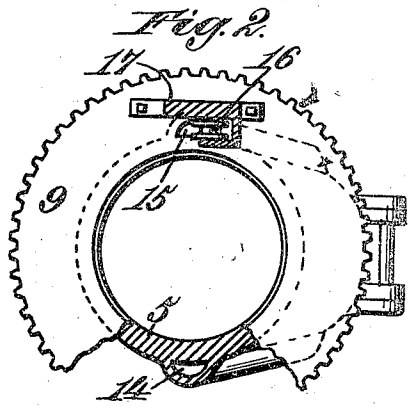


Fig. 3.

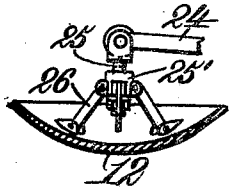
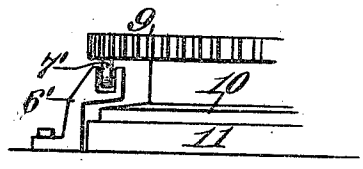


Fig. 4.



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UNITED STATES PATENT OFFICE.

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BLAST-FURNACE-CHARGING APPARATUS.

No. 853,016. Specification of Letters Patent. Patented May 7, 1907.

Application filed October 1, 1906. Serial No. 337,038.

To all whom it may concern:

Be it known that I, GUY R. JOHNSON, a citizen of the United States, residing at Clarksville, in the county of Montgomery and State of Tennessee, have invented new and useful Improvements in Blast-Furnace-Charging Apparatus, of which the following is a specification.

This invention relates to what I shall for convenience designate a blast furnace charging apparatus. The device, however, may be used in ways other than for supplying stock to blast furnaces.

The primary object of the invention is to provide an apparatus of the character set forth which can supply a charge to a desired part of a furnace, which is simple in construction, effective in operation and which can be inexpensively made.

The device includes other objects and advantages which with the foregoing will be set forth at length in the following description, while the novelty of said invention will be included in the claims succeeding said description.

In the drawings accompanying and forming a part of this specification I represent in detail one form of embodiment of the invention which to enable those skilled in the art to practice said invention will be described in detail in said description. Many variations, however, may be adopted within the scope of my said claims.

Referring to said drawings, Figure 1 is a sectional elevation of a device including my invention and showing the same in connection with a blast furnace. Fig. 2 is a sectional top plan view of a gear, standards and certain devices associated therewith. Fig. 3 is a sectional detail hereinafter more particularly described, and Fig. 4 is a modified form of support for said gear.

Like characters refer to like parts throughout the several figures.

In Fig. 1 of the drawings I have shown the upper end of a blast furnace of familiar form, the same being denoted in a general way by 2. I have represented as embedded in or surrounded by the masonry of the furnace brackets as 3 to which is bolted or otherwise suitably fastened a plate as 4. This plate 4 is illustrated as having a central opening, the center of which is intersected by the longitudinal or vertical axis of the furnace 2 and through this opening a charging spout as 5 passes, said charging spout being in the present instance revoluble and being preferably of tubular and longitudinally curved form. The plate 4 constitutes a suitable support for the charging spout or tube 5, although the latter is not directly carried by the former. Bolted or otherwise suitably fastened to the plate are several standards or bearings as 6 which sustain balls or other rollers as 7 which fit a raceway in the bead 8 pendent from the annular gear 9 which forms the top of the charging spout 5. The longitudinal or vertical axis of the furnace 2 passes through the center of this gear 9. I provide, therefore, an antifriction support for the charging spout.

Instead of using the type of support just described I may provide on the plate 4, uprights as 6′ carrying rollers as 7′ on which the said gear 9 may rest as shown in Fig. 4. I represent exteriorly of the spout 5 between the gear 9 and the plate 4 an annular flange 10 of angular form in cross section. The vertical portion of this flange 10 has a movement in a circular groove in the upper side of the ring 11 bolted or otherwise suitably fastened to the top of the plate 4 and surrounding the central opening of said plate. The flange 10 and ring 11 present a gas seal and I prefer to keep the groove or channel in the ring constantly lubricated by means of ordinary compression grease cups.

The revoluble charging spout 5 is provided with an upper valve 12 and a lower valve 13. The lower valve is represented as consisting of a drop-down gate hinged or otherwise suitably jointed to the lower end of the spout exterior thereof. The body of this valve or gate 13 is of inwardly tapered or conical form in order that it may be tightly fitted within the mouth or delivery end of the spout. This lower gate or valve acts to effectively close the lower end of the spout. Upon the exterior of this spout and disposed in parallelism with each other I mount two pipes 14. These pipes are of substantially similar length and their length agrees approximately with that of the spout. In longitudinal shape the pipes conform to the spout. These pipes receive for longitudinal movement chains as 15. I use the term "chains" in a generic sense to include not only structures so known, but equivalent devices such as cables. In fact the various terms employed by me are used in their broad senses. The lower ends of these

chains are connected suitably to the valve, gate or door 13, while they pass between their ends around guide pulleys as 16 sustained by standards as 17 rising from and suitably fastened to the gear or other driven member 9. These standards 17 constitute a convenient support for the cylinder 18, the piston of which is connected with a cross bar as 19 connected with the upper ends of the two chains 15. The cylinder 18 may be of steam or any other type; in fact, any other form of motor could be used for operating the two chains 15 in a direction to close the gate or door 13. It will be assumed that steam is admitted to the steam cylinder 18 in a direction to elevate the piston thereof. When this occurs the bar 19 and necessarily the chains 15 are drawn upward to close the gate or door 13. When the gate or door is closed the spout or tube 5 can be charged with stock. The spout or tube may be of any desirable capacity. When the spout 5 is charged with the necessary stock, which may be coke, or limestone, etc., said spout may, as will hereinafter appear, be revolved in order that the delivery end of the latter may be brought to the desired place at which said stock is to be supplied, following which the gate or door 13 will be opened to release the mass of material in the spout, so that such material can gravitate into the furnace exactly at the required place.

The gear 9 may be rotated in any desirable way. I have shown means for this purpose including the pinion 20, the teeth of which are in mesh with said gear 9 and the shaft of which is suitably supported by a bearing on the plate 4 and may be equipped at its lower end with a bevel gear as 21, the teeth of which mesh with the teeth of the coöperating bevel gear 22 on the suitably driven shaft 23. When, therefore, the shaft 23 is operated the spout 5 may, through the intermediate connections, be revolved.

The upper or outer open end of the spout 5 as previously indicated is closed by a valve as 12, which in the present instance consists of a cap of dished disk form and which may be suspended from a lever or other suitable carrier as 24. From the inner end of this lever 24 is suspended a stem as 25 having a sleeve 25′ swiveled to its lower end to which are jointed several links as 26 similarly connected at their lower ends with the valve or cap 12. This cap is practically used solely as a gas seal for the upper end of the spout 5 when the gate or door 13 is opened.

In addition to the cylinder 18 I show a second cylinder as 27, the piston rod of which is illustrated as connected at its upper end to the lever 24 between the ends of the latter. The purpose of the cylinder 27 is to cause the operation of the lever 24 in a direction to move the seal or cap 12 into position to close the upper opening of the tube or spout 5, and it may be also utilized for the purpose of uncovering said opening or for returning said seal to its elevated position.

In order to prevent possibility of the device being dislodged when slips occur I may provide clips as 28 which may be held in position to the plate 4 by the bolts or equivalent fastenings which hold the standards 6 in place. The upper ends of these clips overlie but do not normally engage the head or gear 9. If there were an engagement between these two parts there would be unnecessary friction so I prefer to slightly separate the same. Should, however, a slip occur and the spout 5 and gear 9 be elevated the gear will strike against the clips 28 which will prevent the two parts and the other parts associated therewith from being blown from place.

In operation the stock is brought to the top of the furnace in any desirable way and dumped directly into the spout 5, the cap 12 at this time being up or open and the gate or door 13 being shut. When the desired amount of material has been delivered into the spout 5 the seal or cap 12 is lowered to cover or close the upper opening of said spout. When this takes place the spout is revolved to the desired degree, at which time the gate or door 13 is opened to release the stock therein which drops to the required place. The door 13 is then closed, following which the cap or seal 12 is lifted to permit the delivery of a further charge into the spout 5.

I provide a device which takes the place of the well known bell and hopper usually utilized for charging blast furnaces. The old device for obtaining the result in question is heavy and cumbersome and the using of the same breaks up badly the fuel employed. With the old apparatus difficulty is experienced in making repairs, and time is required in making the same and frequently the distribution of the stock is not what it should be. My apparatus wholly overcomes the difficulties mentioned and I am enabled to distribute stock with uniformity, preciseness and at exactly the requisite places.

As previously set forth, the capacity of the spout 5 is not essential, nor is it necessary to charge this spout in any particular way. One simple mode of supplying the spout with material is by skips, one of which is shown in the drawings and is designated by 5′. I ordinarily make said spout internally of a size to accommodate slightly more than one skip load of stock.

What I claim is:

1. The combination of a blast furnace, a revoluble spout extending into said blast furnace, a valve hinged to the lower end of the spout, chains connected with the valve, pipes carried by the spout through which said chains extend, means for operating the

chains in a direction to close said valve to cause it to support a mass in the spout, said valve when opened serving to release said mass, and a second valve supported independently of the spout and closable against the upper end thereof above the mass therein and to constitute a seal for said spout.

2. The combination of a blast furnace, a revoluble spout extending into said blast furnace, a valve mounted at the lower end of the spout, connecting means extending from the valve to a point exterior of the furnace, and means acting against said connecting means at a place outside of the furnace for holding the valve closed.

3. The combination of a blast furnace, a revoluble spout extending into said blast furnace, a valve mounted at the lower end of the spout, chains connected with the valve, means acting against the chains outside the spout to hold the valve closed, and a second valve operable between the chains to close the spout, a charge of material being contained within the spout between the valves.

4. The combination of a blast furnace, a revoluble charging spout extending thereinto, a drop-down valve hinged to the spout, means connected with the valve and extending therefrom to a point outside the furnace, and mechanism for acting against said means to hold said valve closed or to release the same.

5. The combination of a blast furnace, a revoluble charging spout extending thereinto, a drop-down valve hinged to the spout in the furnace, chains connected with the valve and extending therefrom to a point outside the furnace, means acting against said chains to hold the valves closed or to release the same, and a dished valve supported between the chains and mounted to move against the outer end of the spout to close the same.

6. The combination of a blast furnace, a revoluble charging spout extending into said furnace, a drop-down valve hinged to said spout, within the furnace, and means disposed exteriorly of the furnace for controlling the operation of said valve.

7. The combination of a blast furnace, a revoluble charging spout extending into the blast furnace and for containing material to charge the same, and means operable at will for retaining the material in the spout or for discharging the same, the revolution of the spout serving to effect the supply of the material at different points.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

GUY R. JOHNSON.

Witnesses:
G. MACFARLANE,
CLARA HOLMAN.