R. H. ROGERS.

BLAST FURNACE CHARGING APPARATUS.

APPLICATION FILED APR. 3, 1909.

949,403. Patented Feb. 15, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

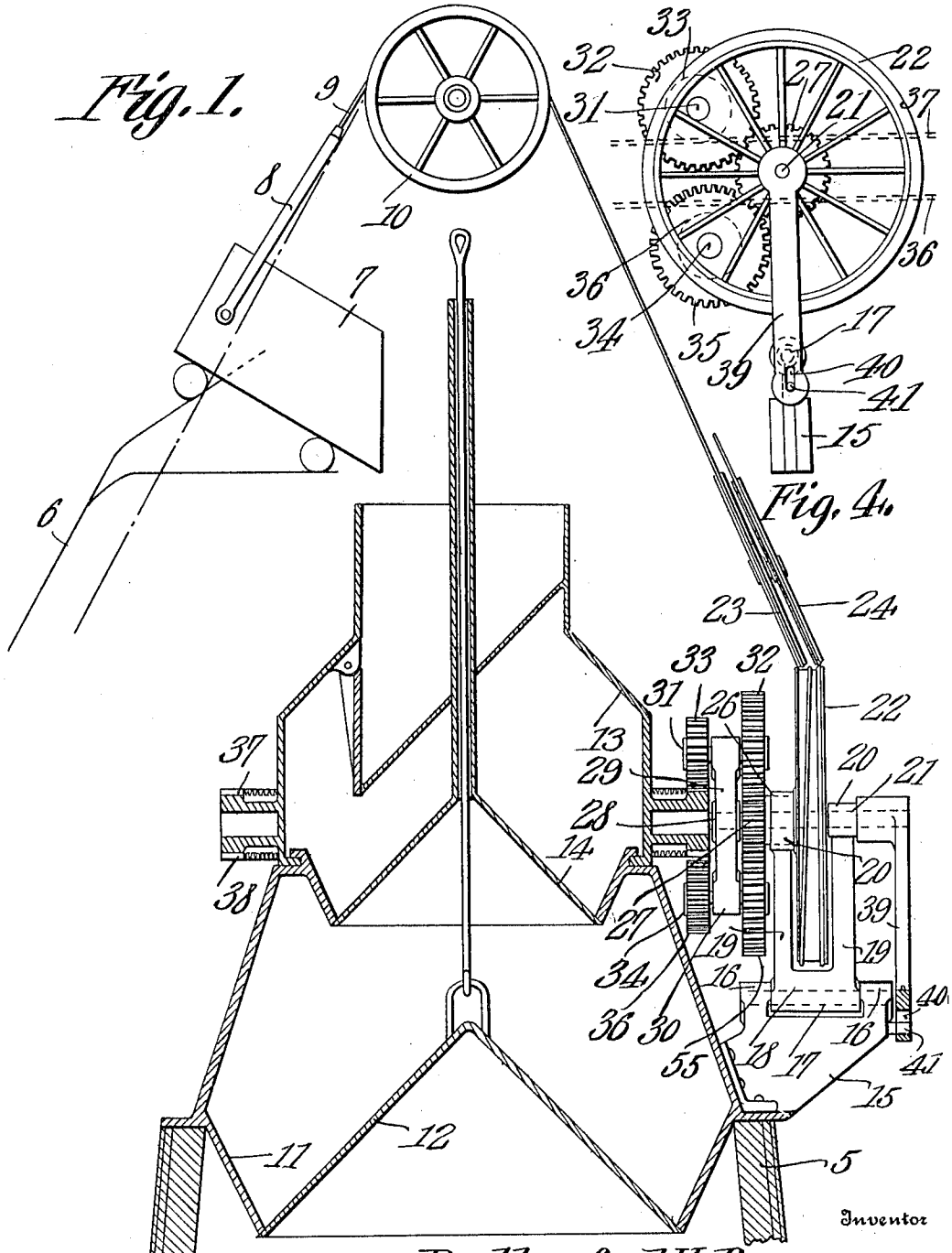


Fig. 4.

Witnesses

E. J. Stewart

M. A. Schmidt

Inventor

Rutherford H. Rogers.

By C. A. Snow & Co.

Attorneys

R. H. ROGERS.

BLAST FURNACE CHARGING APPARATUS.

APPLICATION FILED APR. 3, 1909.

949,403. Patented Feb. 15, 1910.

2 SHEETS—SHEET 2.

Fig. 2.

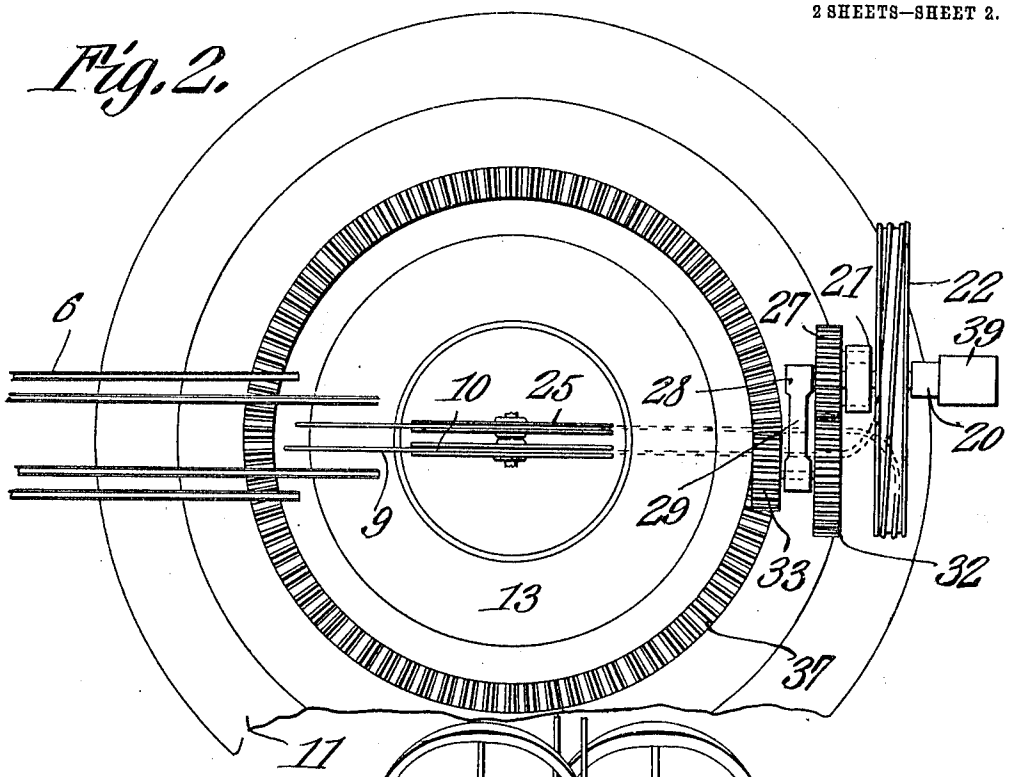
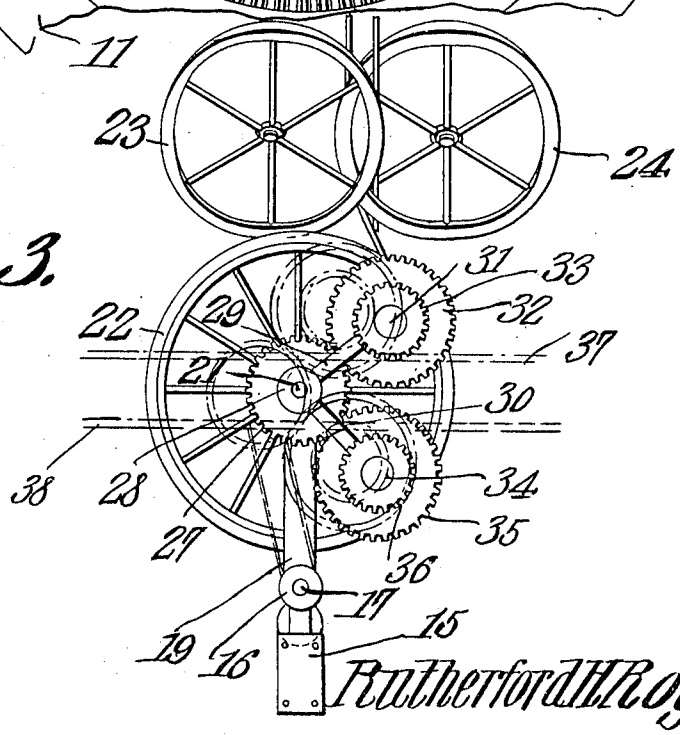


Fig. 3.



Witnesses

E. F. Kleinau

M. A. Schmidt

Inventor

Rutherford H. Rogers,

By Cushman & Co.

Attorneys

UNITED STATES PATENT OFFICE.

RUTHERFORD HAYES ROGERS, OF YOUNGSTOWN, OHIO.

BLAST-FURNACE-CHARGING APPARATUS.

949,403. Specification of Letters Patent. Patented Feb. 15, 1910.

Application filed April 3, 1909. Serial No. 487,654.

To all whom it may concern:

Be it known that I, RUTHERFORD H. ROGERS, a citizen of the United States, residing at Youngstown, in the county of Mahoning and State of Ohio, have invented a new and useful Blast-Furnace-Charging Apparatus, of which the following is a specification.

This invention relates more particularly to blast furnaces having a rotary receiving hopper for more evenly distributing the charge.

The object of the present invention is to provide an improved mechanism for rotating the hopper, said mechanism being actuated by the hoisting cable of the skips which carry the stock to the top of the furnace.

Another object of the invention is to provide a mechanism of the kind stated which will rotate the hopper continuously in one direction as long as the skips are running, and also one which is simple in construction and reliable and automatic in operation.

With the foregoing objects in view the invention consists in a novel construction and arrangement of parts to be hereinafter described and claimed, reference being had to the drawings hereto annexed in which—

Figure 1 is a sectional view of the top of a blast furnace showing the application of the invention. Fig. 2 is a plan view. Fig. 3 is a face view of the gearing hereinafter referred to. Fig. 4 is a front elevation of the apparatus.

Referring more particularly to the drawings, 5 denotes a blast furnace having an inclined track 6 leading to its top, on which track the skip car 7 by which the charge is hoisted, travels. The skip 7 is tipped at the upper end of its travel to dump the charge, the usual mechanism being employed for this purpose, and as the same is well known I have not thought it necessary to illustrate the same in detail. To the skip car is pivoted a bail 8 to which the hoisting cable 9 is attached. This hoisting cable passes over a pulley 10 which is mounted on a suitable support (not shown) above the top of the furnace.

On the furnace top is supported a main hopper 11 closed by a bell 12. Arranged above this main hopper, so as to discharge thereinto, is a receiving hopper 13 which is closed by a bell 14. This arrangement of hoppers and bells is a well-known one, the receiving hopper being rotatable. The bells may be operated in the usual manner.

Located on one side of the hopper 11, and rigidly secured thereto and to the furnace top in any suitable manner, is a bracket 15 provided with bearings 16 in which a shaft 17 is supported. On this shaft is mounted a swinging frame 18 formed with a pair of arms 19 having at their outer ends bearings 20 in which a shaft 21 is journaled. The shaft 17 serves as a pivot for the frame 18, and as said shaft extends in a horizontal plane, said frame swings in a vertical plane.

On the shaft 21 is loosely mounted a drum 22 over which the cable 9 passes, said cable being given one or more turns on the drum so as to prevent slipping. Before passing to the drum, the cable passes over a guide pulley 23. The cable extends from the pulley 10 to the pulley 23 and then to the drum, and from the drum it passes over a second guide pulley 24, and thence back to a guide pulley 25 along side the guide pulley 10. From the guide pulley 25 the cable passes down the incline to the other skip car, or, in case of a single skip furnace, to a counterweight.

It will be seen from the foregoing that by winding the cable 9 on the drum 22, said drum is alternately rotated in opposite directions as the two skip cars ascend and descend. This motion of the drum is communicated to the hopper 13 by a gearing which will now be described, said gearing being also arranged so as to change this alternating rotary movement to a continuous rotary movement in one direction.

The hub of the drum 22 on one side thereof, is elongated as indicated at 26, and mounted thereon so as to rotate therewith, is a pinion 27. The shaft 21 extends loosely through this pinion, and keyed or otherwise fastened on said shaft is a hub 28 from which project arms 29 and 30, respectively. The extremity of the arm 29 is formed with a bearing in which is mounted a shaft 31 carrying pinions 32 and 33, respectively, the pinion 32 being in mesh with the pinion 27. The extremity of the arm 30 is provided with a bearing for a shaft 34 carrying pinions 35 and 36, the pinion 35 being in mesh with the pinion 27.

On the hopper 13 is an annular rack. This rack is double and located between the pinions 33 and 36, the surface 37 of the rack being engageable by the pinion 33, and the

surface 38 by the pinion 36. These pinions alternately engage the respective surfaces, and thus through the gearing herein described, the hopper is rotated continuously in one direction by the alternating rotary movement of the drum 22. The pinions 33 and 36 alternately engage the rack as herein stated by the movement of the frame 18. The mechanism is shown with the pinion 33 in mesh with the surface 37 of the double rack. As soon as the skip car starts in the other direction, the pull of the cable 9 across the top of the drum 22 will swing the frame 18 in a direction to disengage the pinion 33, and to engage the pinion 34 with the rack. The swing of the frame 18 is limited by an arm 39 connected at one end to the shaft 21, the arm having a bearing into which the shaft extends. At the other end of the arm is a slot 40, and from the bracket 15 projects a pin 41 which extends into this slot. The pin 41 is located below the axis of the pivot of the frame 18, and the slot 40 is of such a length, that the frame 18 is stopped when one pinion engages the rack and the other is disengaged therefrom. As soon as the swing of the frame 18 is stopped, the drum commences to rotate, and through the gearing the hopper is rotated. By varying the gear ratio the hopper can be rotated through any desired number of degrees.

The mechanism herein described is simple in construction, and entirely automatic in its operation. It can be cheaply installed as no great change in the furnace structure is necessary.

Although the preferred embodiment of my invention is herein described and shown, it will be understood that various changes in the structural details thereof may be resorted to without departing from the spirit or scope of the invention and I do not wish to be limited except as indicated in the appended claims.

What is claimed is:

1. In a blast furnace, the combination of a rotary receiving hopper; a double annular rack on said hopper; pinions alternately engageable with the rack; and means for actuating the pinions.

2. In a blast furnace, the combination of a rotary receiving hopper; a charge carrier and its hoisting cable; a double annular rack on the receiving hopper; pinions alternately engageable with the rack, and means actuated by the aforesaid cable for actuating the pinions to rotate the receiving hopper.

3. In a blast furnace, the combination of a rotary receiving hopper; a pair of pinions; a double annular rack on the hopper between the pinions, and engageable alternately thereby; and means for actuating the pinions.

4. In a blast furnace, the combination of a rotary receiving hopper; a charge carrier and its hoisting cable; a swinging frame; a shaft carried by said frame; a drum loosely mounted on the shaft over which drum the aforesaid cable passes; a double annular rack on the receiving hopper; pinions alternately engageable with the rack; gearing between the pinions and the drum; and means for limiting the swing of the frame.

5. In a blast furnace, the combination of a rotary receiving hopper; a charge carrier and its hoisting cable; a double annular rack on the receiving hopper; a swinging frame; a shaft carried by said frame; a drum loosely mounted on the shaft over which drum the aforesaid cable passes; a pinion rotatable with the drum; a support on the shaft; a pair of pinions carried by said support and alternately engageable with the aforesaid rack; shafts for said pair of pinions; pinions on said shafts in mesh with the pinion of the drum; and means for limiting the swing of the frame.

6. In a blast furnace, the combination of a rotary receiving hopper; a charge carrier and its hoisting cable; a double annular rack on the receiving hopper; a swinging frame; a shaft carried by said frame; a drum loosely mounted on the shaft over which drum the aforesaid cable passes; a pinion rotatable with the drum; a pair of arms mounted on the shaft; a pair of pinions carried by each of said arms, one set of the pinions being engageable alternately with the rack, and the other set being in mesh with the pinion of the drum; and means for limiting the swing of the frame.

7. In a blast furnace, the combination of a rotary receiving hopper; a charge carrier and its hoisting cable; a double annular rack on the receiving hopper; a support; a swinging frame; a shaft carried by the frame; a drum loosely mounted on the shaft over which drum the aforesaid cable passes; pinions alternately engageable with the rack; gearing between the pinions and the drum; and an arm connected respectively to the shaft and to the support, the connection with the support being a loose one.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

RUTHERFORD HAYES ROGERS.

Witnesses:
ALFRED LIEBMAN,
DAVID SHEEDY.