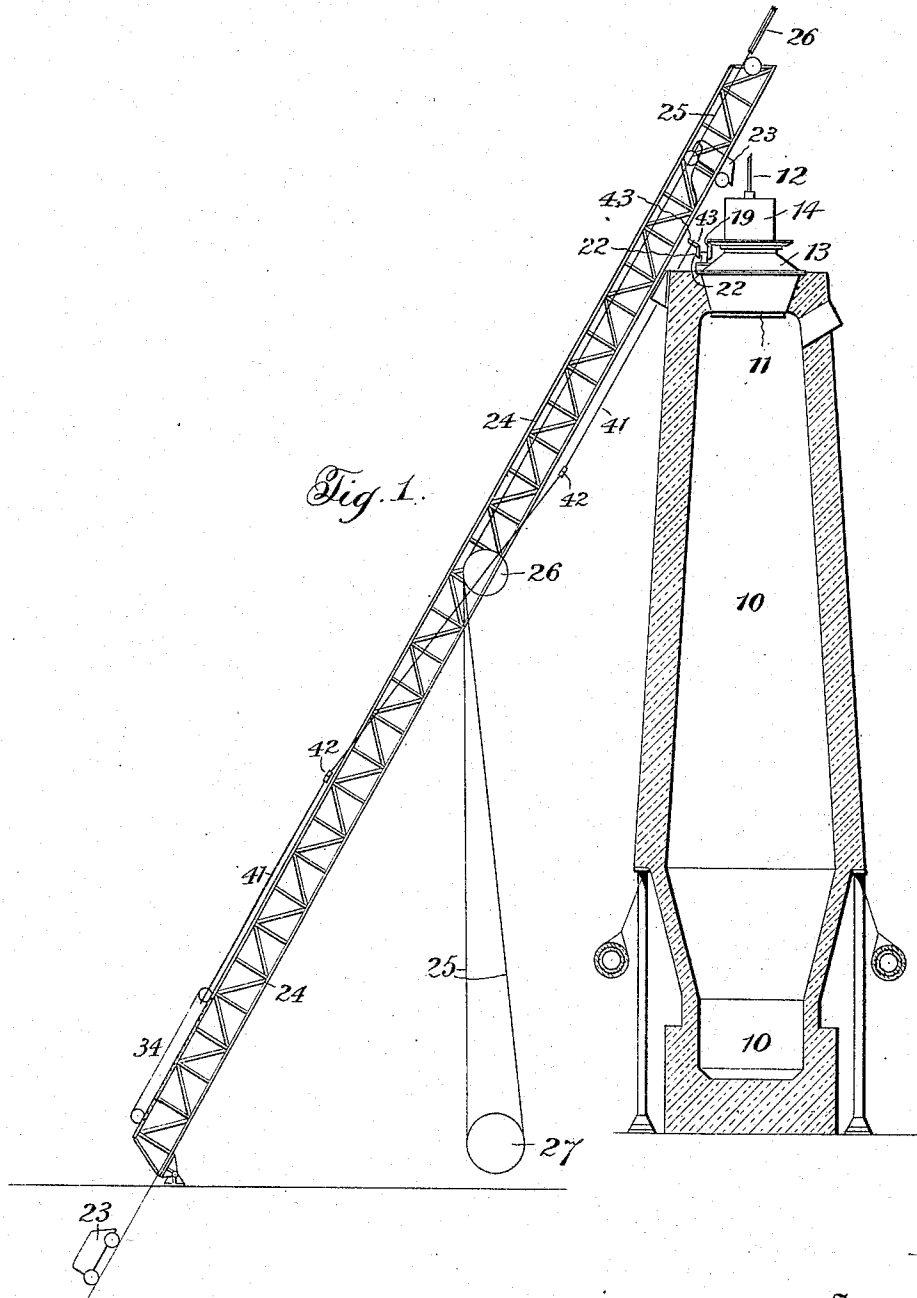


C. P. TURNER.
BLAST FURNACE CHARGING DEVICE.
APPLICATION FILED AUG. 14, 1907.

947,136.

Patented Jan. 18, 1910.

4 SHEETS—SHEET 1.



Witnesses

James Hutchinson
W. Kommer

Inventor:

Charles P. Turner

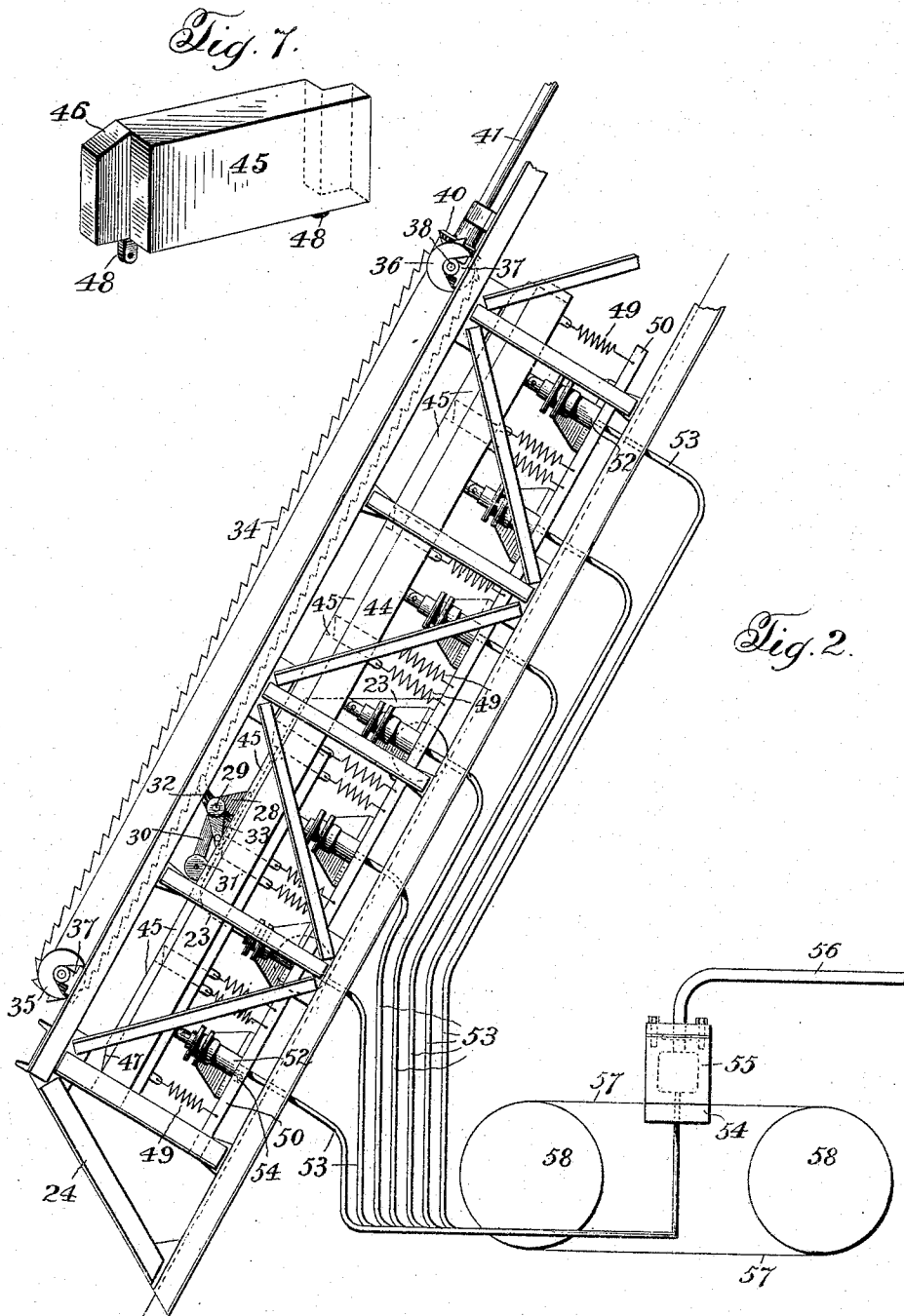
By *Henry Orth* Attorney.

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Witnesses:

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W. Kommer

Inventor:

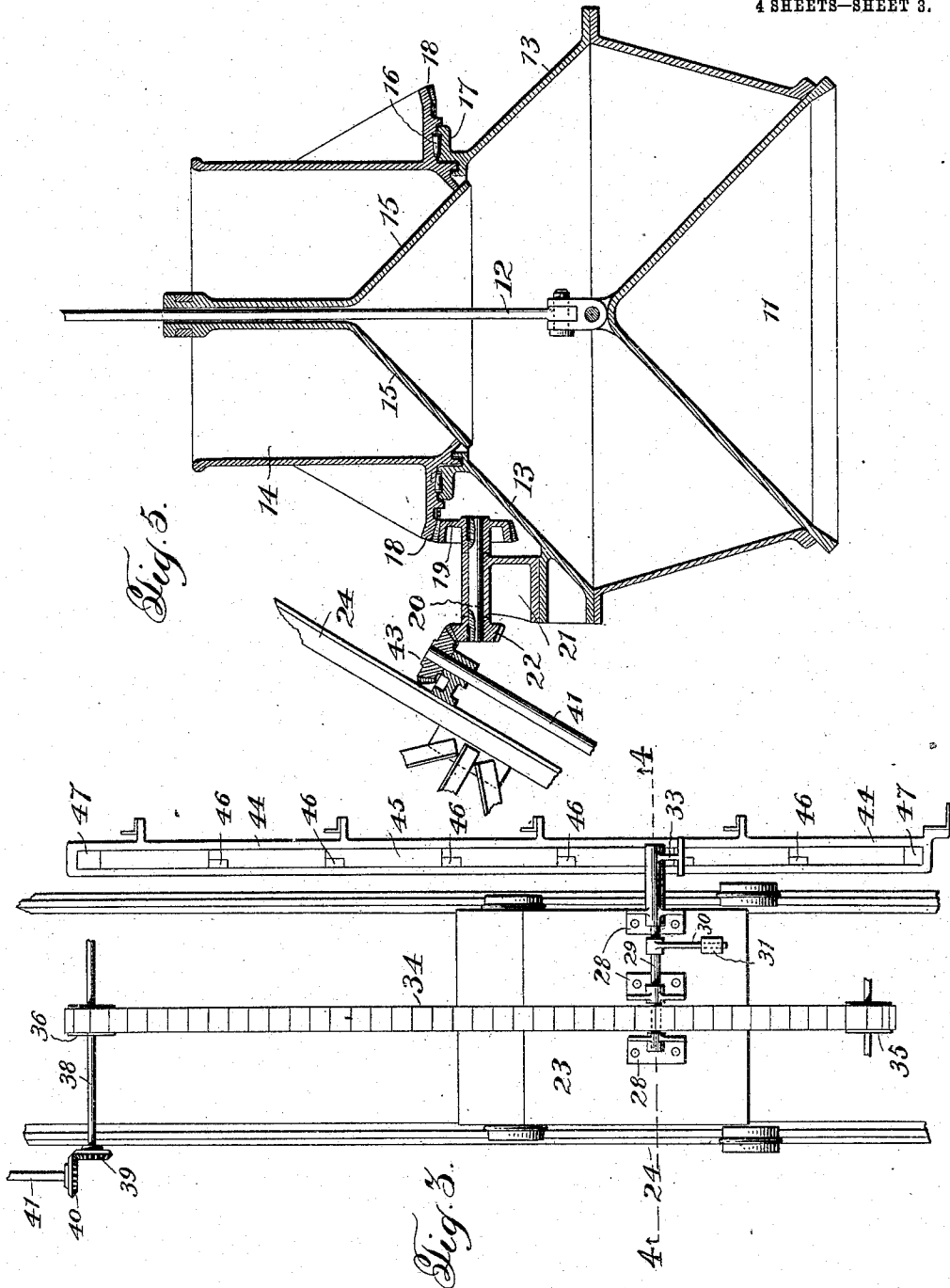
Charles P. Turner
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4 SHEETS—SHEET 3.



Witnesses:

Jas. E. Hutchinson.
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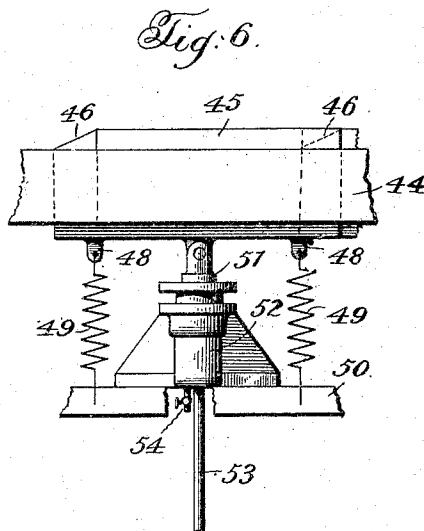
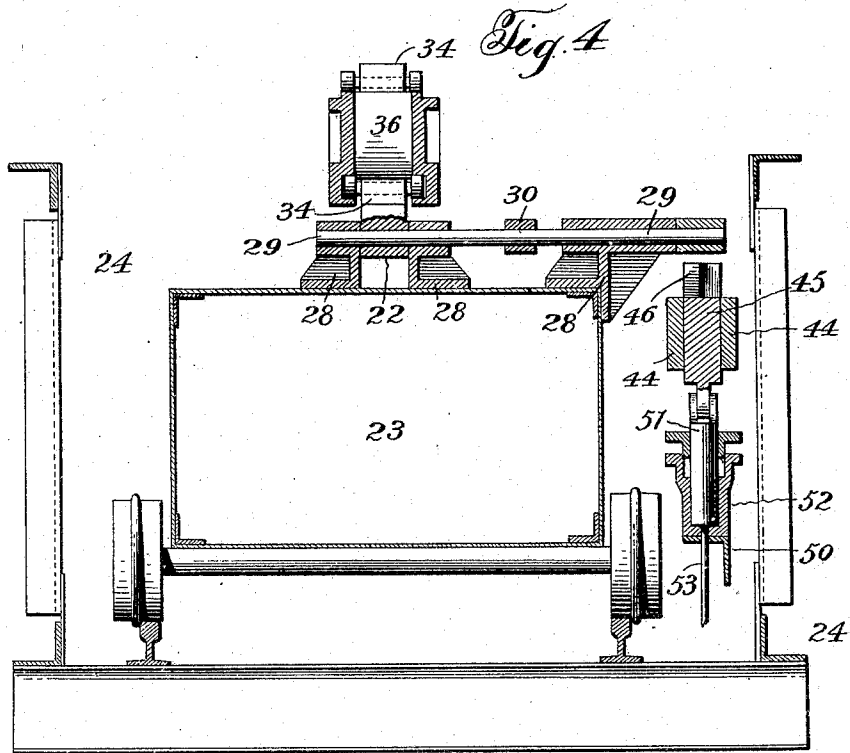
Attorney

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4 SHEETS—SHEET 4.



Witnesses:

James Hutchinson
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Inventor:

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UNITED STATES PATENT OFFICE.

CHARLES P. TURNER, OF HARRISBURG, PENNSYLVANIA.

BLAST-FURNACE-CHARGING DEVICE.

947,136.

Specification of Letters Patent. Patented Jan. 18, 1910.

Application filed August 14, 1907. Serial No. 388,486.

To all whom it may concern:

Be it known that I, CHARLES P. TURNER, a citizen of the United States, residing at Harrisburg, county of Dauphin, State of Pennsylvania, United States of America, have invented certain new and useful Improvements in Blast-Furnace-Charging Devices; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to figures of reference marked thereon, which form a part of this specification.

This invention relates to means for automatically turning a stock receiving hopper or other receptacle of a blast furnace charging device, in such a manner that the stock will be uniformly distributed over the charging bell of the blast furnace charging device, and from which bell the stock will be dropped into the furnace in uniform distribution with respect to the axis of the furnace.

The invention comprises means for automatically and selectively rotating the hopper, the movement of the hopper being accomplished by suitable devices operated by the movement of a skip-bucket or other hoisting device and in conjunction with means to selectively control the coöperating elements that cause the movement of the hopper, as will hereinafter be more fully described and claimed.

In the drawings in which like parts are similarly designated, Figure 1 is a diagrammatic side elevation, partly in section, of this invention shown in connection with a typical blast furnace. Fig. 2 is a side elevation of the mechanism for controlling the rotation of the hopper. Fig. 3 is a plan thereof. Fig. 4 is a section on the line 4—4 of Fig. 3. Fig. 5 is a section of the bell and hopper at the top of the furnace. Fig. 6 is a detail of one of the trips and its operating mechanism. Fig. 7 is a perspective view of one of the trips.

The blast furnace 10 is provided with the usual charging bell 11 suspended by a bell rod 12, which bell rod is connected to any suitable mechanism to permit the bell to be operated when it is desired to deliver stock which has been deposited on it to the interior of the furnace. Over the bell 11 is casing 13 on which is supported the recepta-

cle or hopper 14 closed at its bottom by a small bell 15. The hopper 14 is supported on anti-friction rollers 16, in the roller way 17 on the casing 13 so that the receptacle or hopper 14 is free to be turned about its vertical axis; and in order to permit it to be turned, it is provided with a circular rack 18 with which engages the gear wheel 19 keyed to the short shaft 20 and supported by the bracket 21 on the casing 13, the other end of said shaft 20 carrying a beveled wheel 22. The materials with which the furnace is to be filled are hoisted in skip buckets 23 up an inclined way 24 by means of ropes 25 guided over sheaves 26 and driven by a winding drum 27 actuated by any suitable source of power.

The construction just described is all of a well known type and does not form a part of this invention and so far as the present invention is concerned, may be varied or changed in any respect whatever so long as there is retained in the structure the revoluble receptacle or hopper 14, with means for dropping its contents when rotated in any horizontal angular position.

The novel feature of the present invention consists in the mechanism by means of which the receptacle is turned about its vertical axis in such a manner that the successive loads of material delivered to it by the skips 23 may be automatically dropped into the revoluble receptacle 14 and onto the bell 11 in any required number of angular positions about the vertical axis of the bell 11 and receptacle 14, the sequence of these positions being automatically controlled.

On the skip-bucket 23, Figs. 2 and 3, I provide suitable brackets 28 in which are mounted a shaft 29 carrying a lever arm 30 provided with a weight 31 adjustable along the arm and on one end of the shaft, preferably but not necessarily, at the center line of the skip-bucket is keyed a pawl 32 projecting upward and on the other end of the shaft is keyed a pawl 33 projecting downward to trail over the controlling trips to be described. The upwardly projecting pawl 32 is adapted to engage and operate a bodily movable rack, here shown as an endless rack 34 comprising an endless belt or endless chain passing at its ends over pulleys or rollers 35 and 36 mounted in brackets 37 on the way. The upper pulley 36 is carried by shaft or spindle 38 that has

on one end a bevel gear wheel 39 that meshes with a similar gear wheel 40 on the end of the flexible shaft 41 the sections of which are connected by universal or Cardan joints

5 42. This shaft drives at its upper end a pinion 43 meshing with the pinion 22, Fig. 5, to drive or rotate the receptacle 14. The movable rack 34 is given such a length that the greatest angular motion required by

10 the receptacle 14 at any one time will be obtained while the bucket 23 passes under the rack. Motions of less amplitude are obtained by disengaging the pawl 32 from the rack after the desired angular movement has

15 been obtained and this is accomplished by means of trips acting on the disengaging pawl 33. These trips operate in the frame 44 secured to or forming a part of the inclined way and the individual height of the

20 trips may be varied in respect to the plane of movement of the tail of pawl 33, for example as shown in Fig. 2, there are seven trips 45 in alinement, the first three of which at the bottom of the way are depressed so as

25 to permit the pawl 33 to ride over them and allow the pawl 32 to be held in engagement with rack 34 by the counterweight 31. When the pawl 33 rides on the elevated trips 45, the pawl 32 is disengaged from the rack

30 34 thereby stopping the angular movement of the receptacle 14. These trips have rabbeted ends, more clearly shown in Figs. 3 and 7, and one end of each trip is beveled on the rabbeted portion at 46 and the end

35 trips of the alined set have only one rabbeted end, and are beveled as shown at 47. These bevel faces are so constructed that they form a continuous surface between the inactive and the active trips to permit the pawl 33 to

40 ride over them readily and when adjacent trips are not elevated the beveled portion 46 of one trip lies behind the rabbet on the other so that pawl 33 will move or trail over practically a continuous surface. Each

45 trip 45 is provided at its bottom and near its ends with perforated ears 48 in which are hooked one end of coiled retracting springs 49 whose opposite ends are secured in a suitable rail 50 on the way. Between the ears

50 48 is pivotally secured a single acting piston 51 of an air cylinder 52, supplied by air through a pipe 53 so that when it is desired to throw any one or a number of successive trips into operative position, air is forced

55 into the cylinder or cylinders 52 to move the piston or pistons 51 and the trip or trips 45 connected thereto against the stress of their respective springs 49. Each cylinder 52 is provided with a vent cock 54 that is

60 normally open and the degree of opening thereof can be regulated so that after the piston 51 has been moved outward by the compressed air and the air supply has been shut off, the cylinder will be automatically

65 vented through the cock 54 by reason of

the springs 49 pulling the trip 45 and the piston 51 pivotally connected thereto downward. Each pipe 53 terminates in a manifold 54 and slightly distant from the manifold is a fluid pressure chamber 55 supplied 70 by air from a pipe 56. The bottom of chamber 55 is perforated and moving between the manifold and chamber 55 is an endless perforated controller band 57 moving over

75 guide rollers or cylinders 58, the structure of which manifold and the method of controlling and selectively operating the trips is shown and described in application Serial Number 357,439 filed February 14, 1907.

The operation is as follows: The skip 23 80 is loaded with stock and is drawn up the way by means of the ropes 25 operated by the hoist 27. As the bucket passes along the way the pawl 33 trails along the alined trips 45, the weight 31 holding pawl 32 in 85 such a position as to engage the endless chain or rack 34 so that this chain or rack will be moved in unison with the bucket thereby rotating the spindle 28, the bevel gears 39 and 40, the flexible shaft 41, bevel 90 gear wheels 43, 22 and 19, to rotate the receptacle or hopper 14. As soon as the pawl 33 strikes the bevel face 46 of the first trip that is raised, shaft 29 will be rotated to cause the pawl 32 to rotate out of engage- 95 ment with the movable rack 34 so that the rotating movement of the receptacle 14 will cease, the bucket then continues its movement to the top of the way and is dumped into the receptacle 14. The air supply 100 through the manifold may have meanwhile been cut off and all the trips be returned to their normal position, the bucket descends, the endless band 57 is moved to select the next successive series of trips to be lifted, 105 air is passed through the manifold into the pipe or pipes 53 to lift the selected series of trips and the skip ascends to the top of the hoist repeating the same operations. The flexible driving connection between the end- 110 less rack 34 and the receptacle 14 is not necessarily confined to the particular arrangement here illustrated as this may be varied at will and grooved wheels may take the place of the miter gears on the spindles 115 28 and 20 and these wheels be connected by a driving rope guided where necessary by suitable sheaves.

It is evident that the sequence of the angles through which the receptacle 14 will 120 be turned by successive trips of the skip can be any desired number of degrees by perforating the belt 57 with rows of holes whose numbers correspond respectively with the magnitude of the successive angles 125 through which the receptacle is to be turned.

I claim:

1. In a furnace charging device, the combination with a movable stock receptacle, a stock carrier, a way on which the carrier 130

travels; of a movable rack, a device on the carrier to engage the rack and means on the way to control said device, and mechanism between the receptacle and rack to move the
5 receptacle.

2. In a furnace charging device, the combination with a movable stock receptacle, a stock carrier and a way on which the carrier travels; of a bodily movable rack, a device on the carrier to engage the rack as the carrier moves along the way and trips on the way to control the engagement of said device with the rack and mechanism between the receptacle and rack, and operated by the movement of the rack to move the receptacle.
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3. In a furnace charging device, the combination with a rotatable stock receptacle, a stock carrier and a way on which said carrier travels; of a flexible endless rack, a pulley at each end of the rack and over which the rack travels, flexible driving means between one of said pulleys and the receptacle, a pawl pivoted on the carrier and normally held in the path of the rack as the carrier travels past the rack to engage and move the rack, a plurality of movable, alined trips to control the engagement of the pawl and rack and means to selectively control the movement of the trips.
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4. In a furnace charging device in combination; a plurality of alined movable trips interfitting at their adjacent ends, the interfitting portion of one of two adjacent trips being beveled and adapted to be covered by the interfitting portion of the other adjacent trip when the trips are at the same level, a stock receptacle, mechanism to rotate it, and means cooperating with the mechanism and alined trips to actuate said mechanism.
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5. In a furnace charging device, in combination; a plurality of movable trips having interfitting ends, one of the ends of each of the adjacent trips beveled at the top, means to selectively control the number of trips to be moved into operative position, a stock receptacle, mechanism to rotate it and means cooperating with the mechanism and trips to actuate said mechanism.
45

6. In a furnace charging device, a plurality of alined movable trips having inter-

fitting rabbeted ends, one of the rabbeted ends of each of the adjacent trips beveled at the top, means to selectively control the number of trips to be simultaneously moved into operative position, a stock receptacle, mechanism to rotate it and means cooperating with the mechanism and trips to actuate said mechanism.
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7. In a furnace charging device, the combination with a rotatable stock receptacle, a skip and a way on which the skip travels; of an endless rack chain mounted on the way, a pulley driven by the chain, gearing between the pulley and receptacle, a pawl on the skip to engage the chain, alined trips and means cooperating with the trips and pawl to release the latter from the chain when desired.
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8. In a furnace charging device, the combination with a movable stock receptacle, a skip and a way on which the skip travels; of a movable rack and mechanism actuated by the movement of the rack to move the receptacle, a number of trips, a fluid pressure cylinder and piston to move each trip, means to selectively control the supply of motive fluid to the cylinders, and mechanism carried by the skip and controlled by the trips to engage and move the rack.
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9. In a furnace charging device, the combination with a movable stock receptacle, a way, a skip or hoist traveling on said way and mechanism to move the receptacle variable distances including actuating means moved along controllable distances with the skip or hoist during a portion of its travel.
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10. In a furnace charging device, the combination with a movable stock receptacle, a way, a skip or hoist traveling on said way, mechanism to move the receptacle including actuating means moved along in engagement with the skip or hoist during a portion of its travel, and means to control and vary the extent of said movement.
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95

In testimony that I claim the foregoing as my invention, I have signed by name in presence of two subscribing witnesses.

CHARLES P. TURNER.

Witnesses:

GEO. W. PARSONS,
H. B. HAIN.