

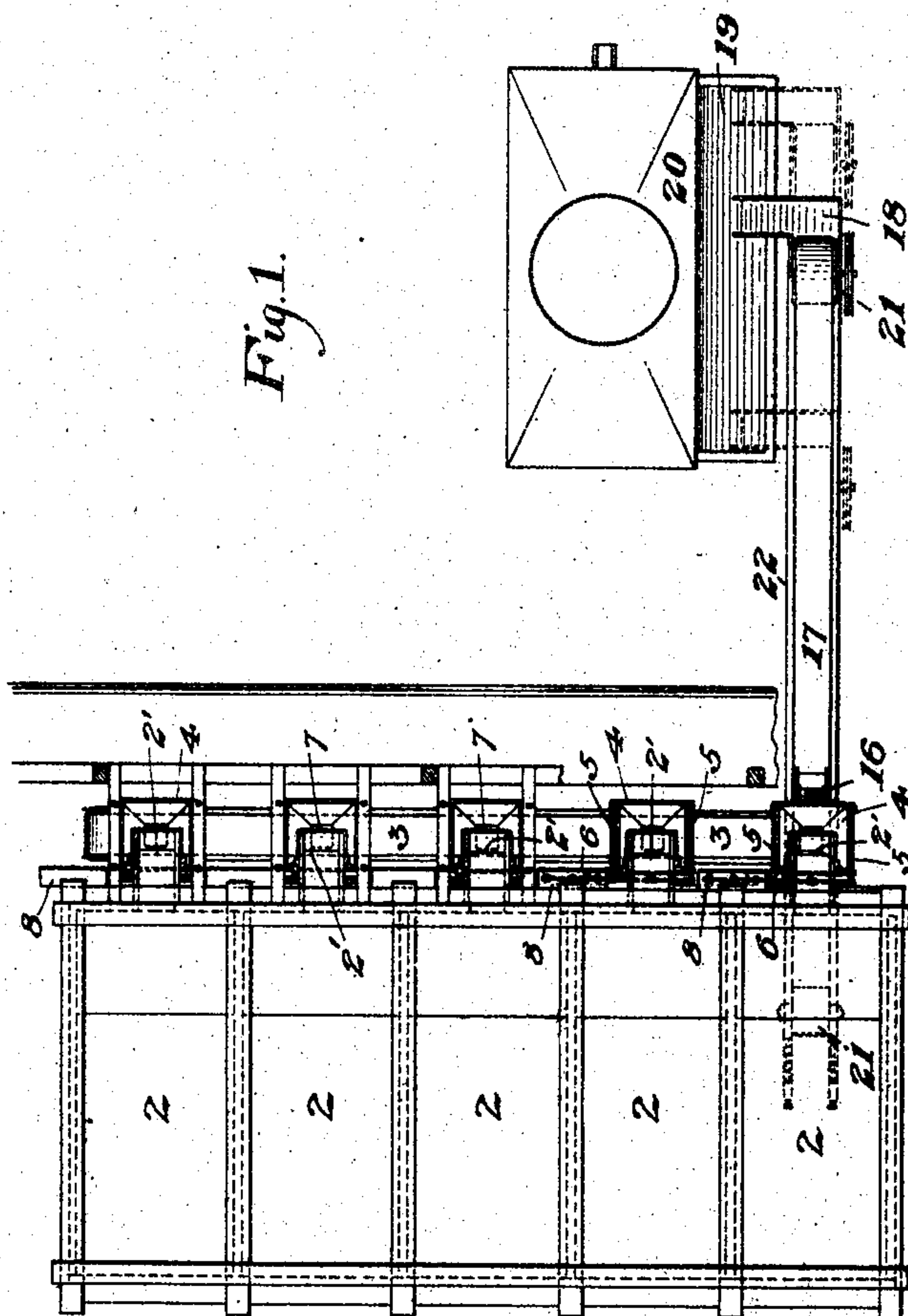
No. 781,150.

PATENTED JAN. 31, 1905.

E. W. LINDQUIST.  
FURNACE CHARGING APPARATUS.

APPLICATION FILED MAR. 24, 1903.

4 SHEETS—SHEET 1.



WITNESSES

*Ralph Baggaley*  
*Geo. J. Rockwell*

INVENTOR

*E. W. Lindquist*

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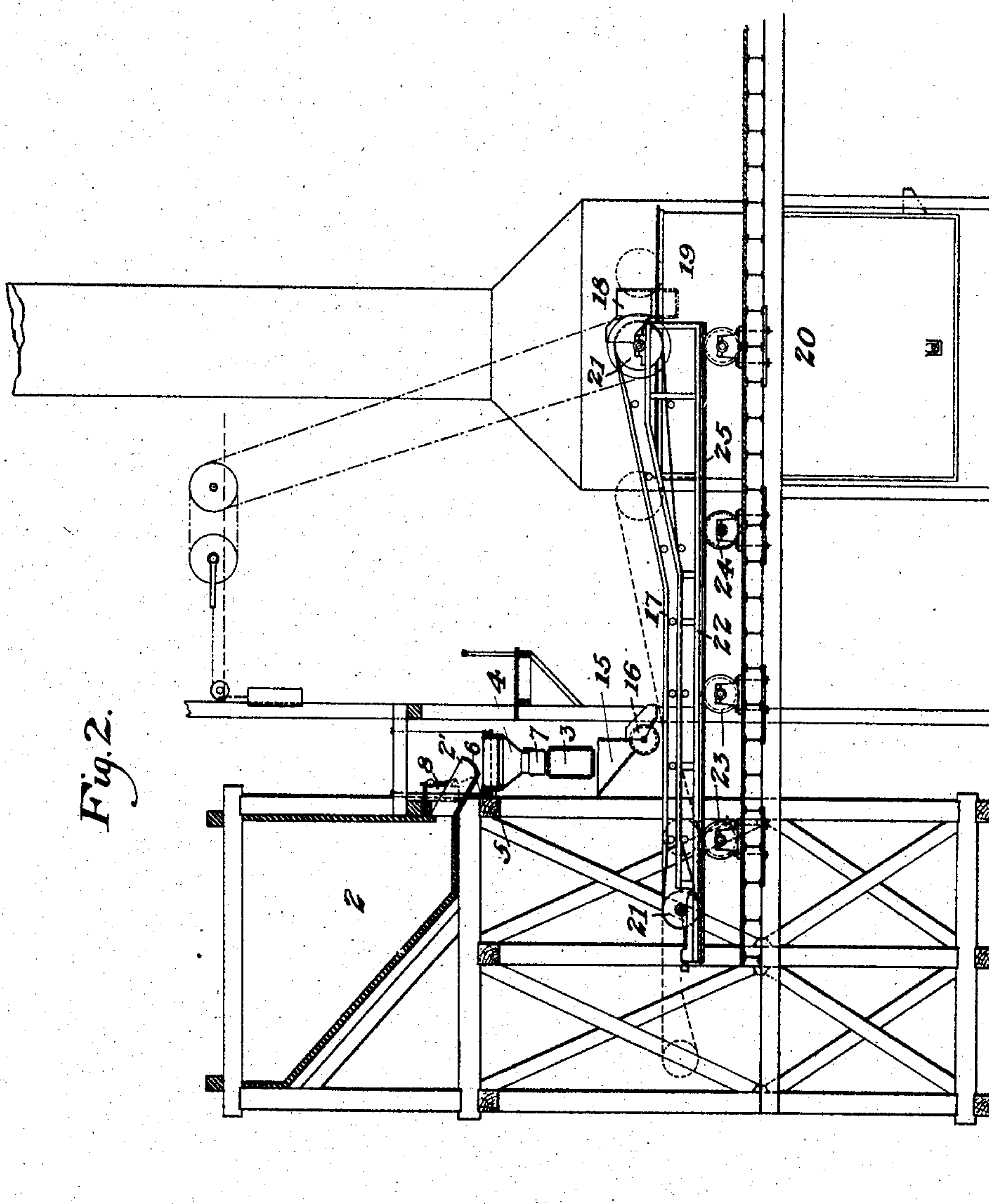
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Fig. 2.



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*Ralph Baggeley*  
*Geo. J. Rockwell.*

INVENTOR  
*E. W. Lindquist.*

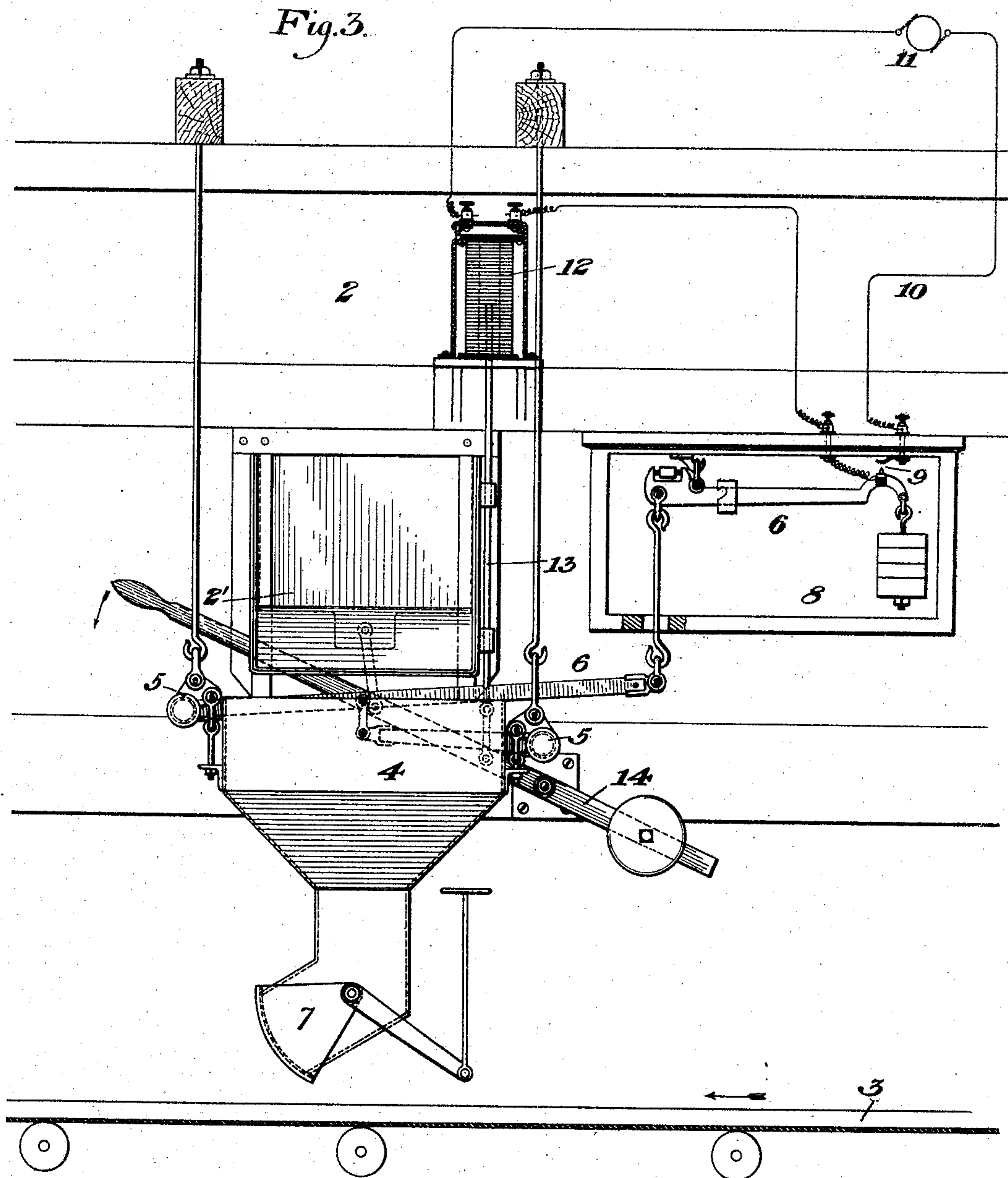
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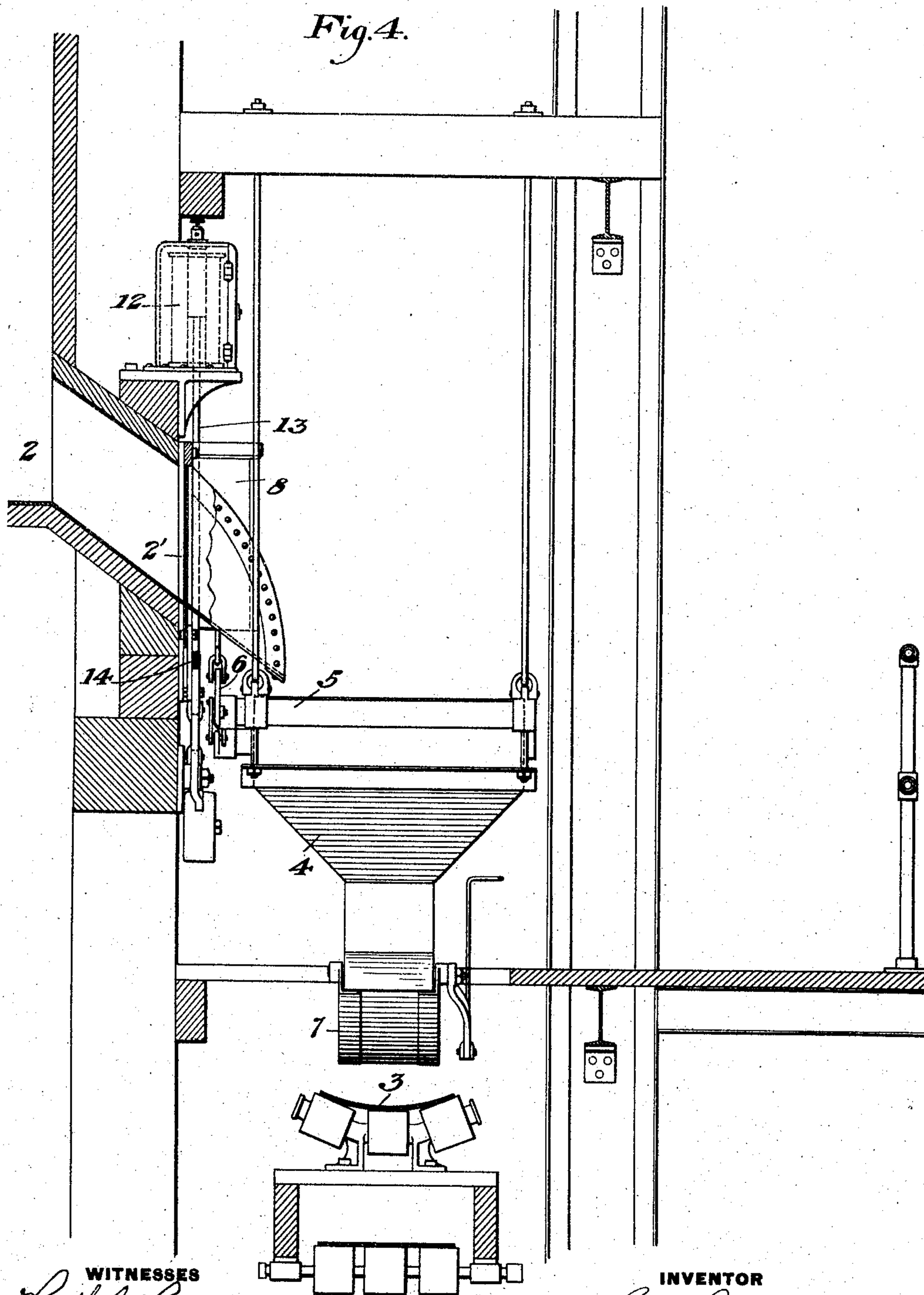
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INVENTOR

*E. W. Lindquist.*



## UNITED STATES PATENT OFFICE.

EDWARD W. LINDQUIST, OF CHICAGO, ILLINOIS, ASSIGNOR TO RALPH BAGGALEY, OF PITTSBURG, PENNSYLVANIA.

## FURNACE-CHARGING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 781,150, dated January 31, 1905.

Application filed March 24, 1903. Serial No. 149,331.

*To all whom it may concern:*

Be it known that I, EDWARD W. LINDQUIST, of Chicago, Cook county, Illinois, have invented a new and useful Furnace-Charging Apparatus, 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 is a plan view of my improved apparatus. Fig. 2 is a side elevation, partly in vertical section. Fig. 3 is an elevation, on a larger scale, showing one of the beams and the automatic weighing mechanism. Fig. 4 is a side elevation thereof, partly in vertical section.

In order to secure the best results in the operation of copper-smelting furnaces, it is necessary that the charge should be supplied to the furnace slowly and evenly mixed or evenly stratified. Too rapid charging is apt to chill the furnace and cause it to work irregularly, and if large amounts are added at a time the shock of the falling material is severe and is apt to cause injury to the furnace structure and pack the charge in the furnace. Many attempts have been made to provide such furnaces with charging-machines; but so far as I am aware these machines have not given satisfactory results and the method ordinarily employed has continued to be the slow and expensive operation of feeding the charge by hand, a shovelful at a time. Such work is laborious and very expensive, and as it depends upon the intelligence of the workmen it is often imperfect and produces irregular working of the furnace.

My invention overcomes these defects and provides a charging-machine which is simple in its construction and will operate reliably and with certainty, so that a more efficient distribution of the charge is secured and the cost of labor is very materially reduced.

The invention is of especial importance when used with furnaces which smelt rapidly and require a large supply of ore and flux.

In Figs. 1 and 2 I show the apparatus arranged in connection with a series of bins 2 2, having gates 2', from which materials of the furnace charge is delivered upon a conveyer 3, composed, preferably, of an endless belt.

These bins contain the several components of the charge. One bin may contain copper ore, another silicious ore, another iron ore, and another coke, and in front of each is a weighing-hopper 4, supported upon the beams 5 of weighing-scales 6, so that a measured quantity of material may be received in the hopper and thence discharged upon the conveyer 3, which runs beneath the spout of the hopper, each hopper for this purpose being fitted with a gate 7.

In practice the person in charge of the furnace, knowing the proportions of ore, flux, and coke which are desired, sets the scales of each hopper so that it will balance at the weight proper for the particular material contained in the bin, and the workman having delivered such weight into the hopper opens the gate 7 and causes the material to discharge upon the conveyer. It is desirable that this weighing of the charge should be automatic not only because labor can thus be saved, but also because the weighing operation can thus be conducted secretly and the components of the charge not disclosed to others than the person concerned in the management of the furnace. For this purpose I prefer to inclose the beam of the scales in a box 8 and to provide it with a circuit-closer 9, controlling an electric circuit 10, in which is included a generator 11 and a magnet 12, preferably a solenoid-magnet, the armature of which is connected by a rod 13 to a lever 14, which in turn is connected to and is adapted to operate the gate 2' of the bin. The gate is opened by hand through the lever 14 and the material then flows from the bin into the hopper 4, and when sufficient material has collected therein to balance the scales the circuit is closed at 9, the magnet 12 is energized, and acting on the lever 14 raises the gate 2' and automatically closes the same so as to cut off the discharge of material from the bin. The operator then opens the gate 7 and causes the material to discharge upon the conveyer. It is desirable that the gate 2' should close by an upward movement, since in that way clogging of the gate by lumps of the material is prevented. If desired, the automatic operation above described may be ef-



fectured otherwise than by electrical means—for example, by a compressed-air cylinder or like devices.

The conveyer 3 discharges into a hopper 5 15 the orifice of which is preferably provided with a feeding device 16, which may be a corrugated roller, a feeding-disk, or other suitable appliance, and which being driven at the desired speed delivers the materials of the charge upon a conveyer 17, which likewise is 10 preferably an endless belt and leads to a spout 18 over the apron 19 of the furnace 20. The apron 19 is the receiving-opening of the furnace and is of considerably greater width 15 than the delivery end of the spout 18, so that the latter can be caused to travel back and forth along the same during the delivery of the charge in order to distribute the charge along the furnace. The conveyer 17 and the 20 pulleys 21 over which it passes are mounted upon a frame 22, which is supported on rollers 23, so as to be capable of being reciprocated lengthwise thereon by a pinion 24, meshing with a rack 25, so that its front end carrying 25 the spout 18 can be moved back and forth along the charging-apron 19.

The operation of the device is as follows: The material to be fed to the furnace is delivered upon the conveyer 3 from the weighing- 30 hoppers in determined amounts and is discharged into the hopper 15, from which the feed-roll 16 delivers it at the desired rate upon the conveyer 17. This conveyer carries the charge toward the furnace and discharges it 35 onto the apron 19, whence it passes into the furnace, and as the conveyer-frame travels back and forth at a regular speed it distributes the charge evenly from end to end of the furnace in a manner calculated to produce the most 40 satisfactory results in the smelting operation. The whole device can be operated by one man, who by regulating the passage of the charge upon the conveyer 17 can control perfectly the rate at which the furnace is charged.

45 Within the scope of my invention as defined in the claims the apparatus may be modified in various ways, since

What I claim is—

1. The combination of a furnace having a charge-receiving opening, a conveyer dis- 50 charging into said opening, and means for reciprocating the conveyer along the opening during the delivery of the charge, said opening being of greater width than the delivery end of the conveyer; substantially as described. 55

2. The combination of a furnace having a charge-receiving opening, a conveyer dis- charging into said opening, means for deliver- ing the charge at a regulated rate to the con- 60 veyer, and means for reciprocating the con- veyer along the opening during the delivery of the charge, said opening being of greater width than the delivery end of the conveyer; substantially as described.

3. Furnace-charging apparatus comprising 65 a conveyer discharging into the opening of a furnace, means for reciprocating said conveyer along said opening, and a supplementary conveyer arranged to receive the ingredients of the charge and to deliver it to the reciprocating 70 conveyer; substantially as described.

4. The combination with a furnace having a charging-opening, of a traveling carriage adapted to move along said opening in either 75 direction, a conveyer mounted on said carriage, and means for actuating the conveyer for any position of the carriage along said opening, whereby the quantity and disposition of the charge is controlled at will, substantially as described. 80

5. The combination with a furnace having a charging-opening, of a carriage adapted to travel along said opening, and a conveyer mounted in said carriage and adapted to dis- 85 charge and distribute the material into the furnace for any position of the carriage and at any desirable speed, substantially as set forth.

In testimony whereof I have hereunto set my hand.

EDWARD W. LINDQUIST.

Witnesses:

RALPH BAGGLEY,  
GEO. B. BLEMING.