

(No Model.)

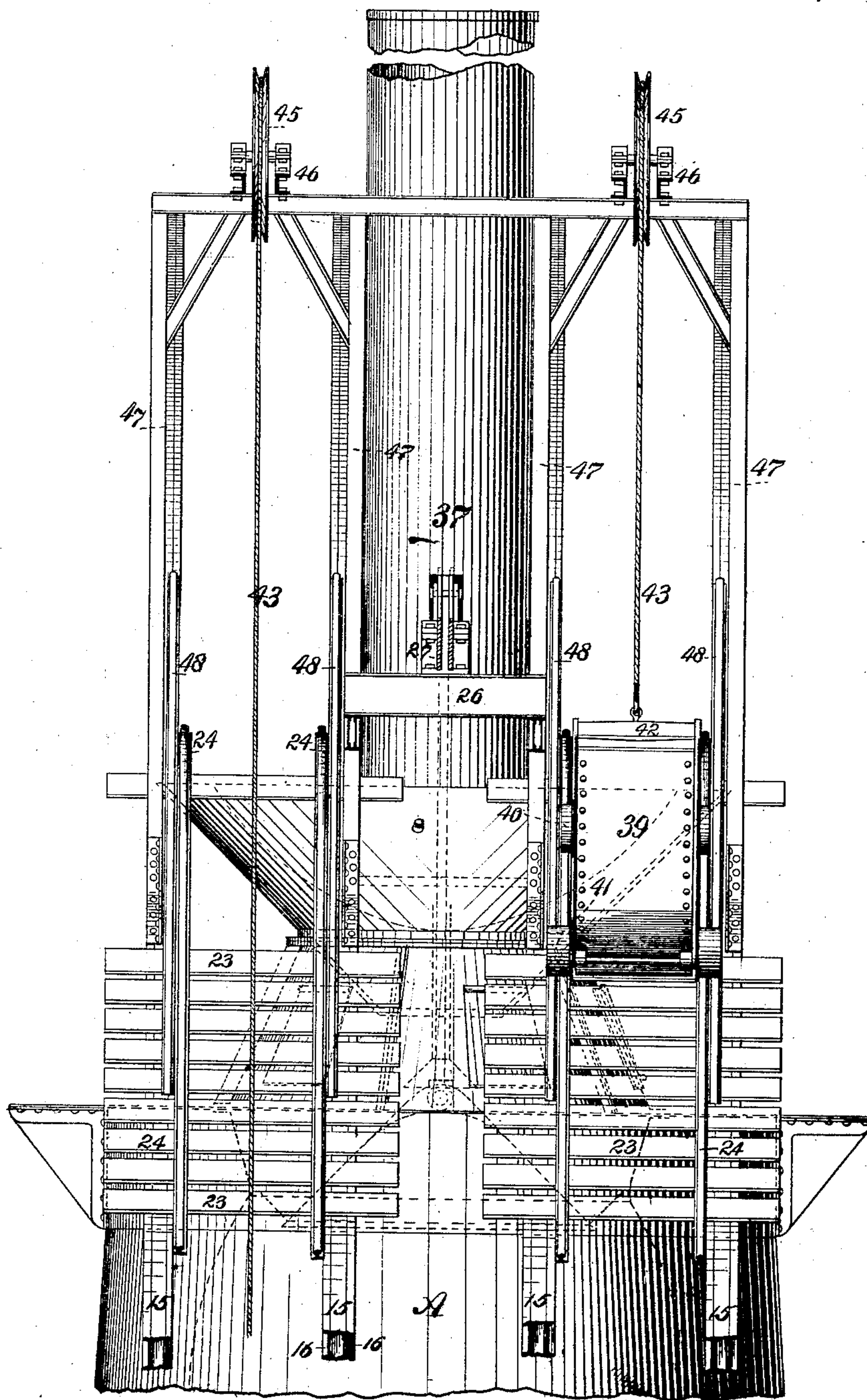
2 Sheets—Sheet 1

W. ROTHOFF.

BLAST FURNACE APPLIANCE.

No. 336,749.

Patented Feb. 23, 1886.



WITNESSES:

C. M. Clarke
Darwin B. Wolcott

Fig. 1.

INVENTOR,

William Rothoff

BY *George H. Christy*

ATTORNEY

(No Model.)

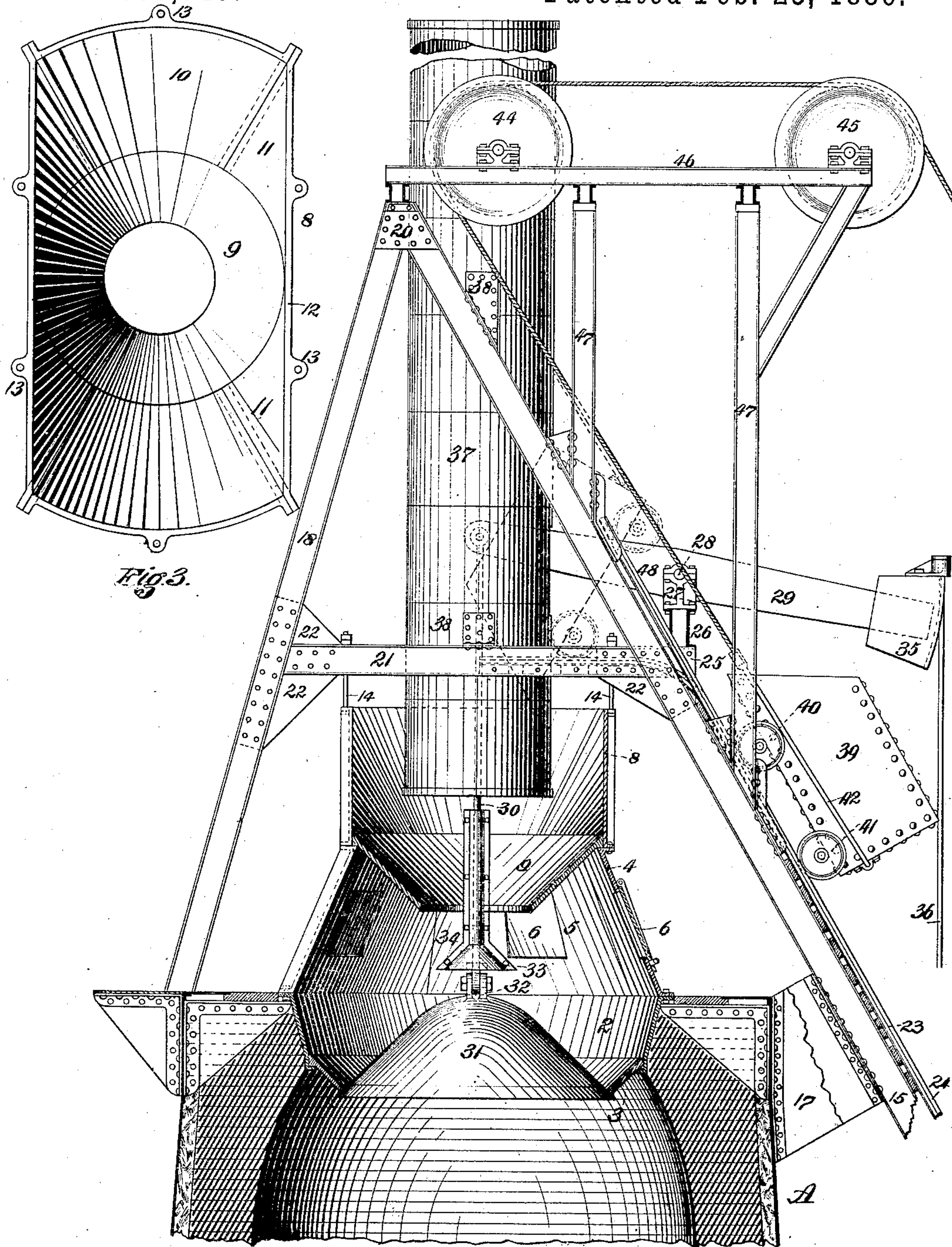
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Fig. 2.

INVENTOR.

William Rotthoff
BY *George H. Christy*
ATTORNEY.

UNITED STATES PATENT OFFICE.

WILLIAM ROTTHOFF, OF PITTSBURG, PENNSYLVANIA.

BLAST-FURNACE APPLIANCE.

SPECIFICATION forming part of Letters Patent No. 336,749, dated February 23, 1886.

Application filed June 27, 1884. Serial No. 136,133. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM ROTTHOFF, a subject of the Emperor of Germany, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Blast-Furnace Appliances, of which improvements the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1 is a view showing the top of a blast-furnace and the charge-hoisting mechanism in front elevation. Fig. 2 is a view showing the same parts in sectional side elevation. Fig. 3 is a top plan view of the feed-hopper.

My invention relates to an improved manner of constructing the ways and mechanism for hoisting and charging ores and other materials into a blast-furnace.

The object of my invention is to so construct the hoisting and charging mechanism that the materials charged in said furnace shall be evenly distributed, and that the gases escaping from the furnace may be so directed as to prevent their lateral escape on opening the top of the furnace for the admission of the charge, and to so construct the hoisting mechanism as to facilitate the hoisting and delivery of the material to the feeding-hopper; and to these ends my invention consists in the construction and combination of parts, all as more fully hereinafter described and claimed.

The blast-furnace A is of the usual form and construction, and in its top is secured the receiving-chamber, which consists of the annular metal band 2, secured in the mouth of the furnace, the conical band 3, supported on an inwardly-projecting flange of the band 2, and the conical top 4, bolted to an outwardly-projecting flange of the band 2 and formed of a series of flanged sections bolted together. These flanged sections are formed of cast-iron, and one or more are provided with apertures 5, which are closed by the hinged doors 6, as shown.

In place of forming the top 4 of a series of flanged cast-iron sections, as above described, said top may be formed of a number of T-irons secured to the flange of the band 4, the spaces between the T-irons being filled with metal plates riveted to the flanges of the T-irons.

On the top piece, 4, is supported the feed-hopper, which consists of the receiving-basin 8 and the funnel 9. The receiving-basin 8 is an oblong vessel, having its ends 10 curved and inclined inwardly, and its sides 12 being curved and inwardly inclined from their centers to their ends, as shown at 11, Fig. 3, said ends being secured to the edges of the curved end pieces, as shown. In the opening formed by the ends 10 and sides 12 is located the funnel 9, having a diameter at its upper and larger end equal to the width of the receiving-basin at its middle portion, as clearly shown.

This hopper, constructed as described, rests upon an outward-projecting flange formed around the upper edge of the top 4 of the receiving-chamber, the receiving-basin 8 being bolted to the top 4, and the funnel 9 merely resting on said top. Around the top edge of the hopper are formed the perforated lugs 13, through which pass the bolts 14, said bolts passing up through beams located above the hopper, as shown, the upper ends of these bolts being threaded and provided with suitable nuts, whereby said bolts may be drawn up through the beams, thereby raising the hopper from the top 4 when desired.

From the ground or stock-house floor are erected four inclined skids, 15, formed of two channel-irons, 16, arranged back to back and riveted to the flanges of two similar but narrower channels located between the channel-irons 16; or in place of the above construction the channels 16 may be united on their upper surface by a strip of metal extending longitudinally along them and riveted to their flanges, and the channels in their under edges may be united by a system of lattice-work. These skids extend up to and beyond the top of the furnace, to which they are secured by the brackets 17, riveted to the casing of the furnace at its top. The upper ends of these skids are supported by the inclined braces 18, which are supported at their lower ends by the brackets 19, riveted to the casing of the furnace in the side opposite the brackets 17. The skids and braces are firmly secured together at their top by a plate, 20, and are intermediately braced by the cross-beams 21, which extend between the channel-irons forming the skids and braces, as described, and are firmly secured to said braces and skids by

the bracket-plates 22. These skids are so arranged as to form two tracks from the stock-house floor to the top of the furnace, and on them are secured by any suitable means the cross-ties 23, on which rails 24 are fastened.

The ends of the cross-beams 21 which brace the two inner skids project beyond the skids, as shown at 25 in Fig. 2, and on these projecting ends 25 is supported the short cross-beam 26, on which are secured the journals 27 for the pivot-pin 28 of the bell-operating lever 29. The inner end of this lever extends over the center of the opening in the funnel and the discharge-opening in the bottom of the receiving-chamber, and from this end of the lever depends the rod 30, to the lower end of which is attached the bell 31, employed for the double purpose of closing the receiving-chamber and of distributing the materials which are charged into the furnace. The rod 30 is attached to the bell by a bolt passing through the rod and lugs 32, formed on the top of the bell. To protect this joint a heavy conical washer, 33, which is made in two parts, is secured around the rod by bolts passing through flanges on the two parts of the washer. This washer, when in place, rests upon a shoulder just above the coupling between the bell and rod. The edges of the washer extend on all sides beyond the coupling and protect it from impact of the material when charged into the receiving-chamber. The rod 30 is also protected by a sleeve, 34, also made in two parts, having its lower end supported by the washer 33, and extending along the rod some distance above the mouth of the funnel 9, as shown in Fig. 2. On the outer end of the lever 29 is attached a counter-weight, 35, for the purpose of holding the bell in a closed position, and to the weight 35 is attached a wire rope or chain, 36, which extends to the ground or floor, where it is attached to a steam winch or drum, for the purpose of raising the bell when it has been depressed by a charge of ore or other materials.

Immediately above the opening in the funnel 9 is arranged the stack 37, which has a diameter somewhat larger than the opening in the funnel 9. The stack is so secured, by means of the angle-plates 38, to the inner cross-beams and skids that its lower end is sufficiently above the funnel to permit of the passage of material to the funnel, and its upper end extends a considerable distance above the top of the skids, as shown.

By means of the construction and location of the stack 37 the gases which escape from the furnace when the bell is lowered pass up through the funnel and the stack, which, having a larger diameter than that of the opening in the funnel, will collect such gases and prevent their lateral escape. The stack 37 is slotted in one side to permit of the entrance and movement of the inner end of the lever 29.

The upper ends of the rails 24 of each track are bent inwardly to a horizontal plane, and are secured to the sides of the beams 21, just

over the receiving-basin 8, as clearly shown in Fig. 2. Outside of and in close proximity to the upper straight portions of the rails 24 are secured the auxiliary rails 48, which extend some distance beyond the bent portions of the rails 24. The purpose of this construction will be hereinafter stated.

On the rails 24 run the cars 39, which are provided with front and rear wheels, 40 and 41, the tread of the rear wheels, 41, being more than double the width of the front wheels. The front ends of these cars are made open, as shown, and to the back of the cars, near the bottom thereof, are pivoted the bails 42, through which said cars can turn. To an eye in the free end of the bail is attached one end of a wire rope, 43, which passes up over the sheaves 44 and 45, and down to a winding-engine on the floor of the furnace. These cars and their ropes and winding-engines are so arranged that as one car is ascending the other is descending.

The position of the car and its bail is while moving along the main portion of the tracks clearly shown in Figs. 1 and 2. As the front wheels, 40, reach the bent portion of the rails they will follow along said bent portion; but the rear wheels having the broad tread will leave the main rails and will move up along the auxiliary rails 48, thereby causing the rear of the car to rise, the front wheels moving in along the horizontal portion of the rails 24, thereby causing the car to assume the position shown by dotted lines in Fig. 2, and to discharge its contents into the hopper.

The sheaves 44 and 45 are mounted in bearings secured to the horizontal beams 46, which are supported on the posts 47, secured at their lower ends on the skids 15, as shown.

It will be observed that the hopper 7 is constructed to receive the charge at each end, and that said charge is directed by its curved and inclined sides to the central discharge-funnel, 9, by which the charge is directed upon the center of the distributing-bell, thereby insuring an even distribution of the charge in the furnace, no matter at which end of the receiving-basin the charge was dumped from the car.

By means of the nuts and bolts attached to the hopper, as above described, said hopper can be raised to allow of the removal and insertion of the sections composing the top 4 of the receiving-chamber, when for any reason any of said sections need renewal.

It will be observed that by making the hopper oblong I am enabled to bring the skids close to the edge of the furnace, thereby obviating the necessity for an excessive extension of skids in order to enable the cars on said skids to discharge on both sides of the central funnel, as would be the case were the hopper circular, as in the usual construction of furnaces.

I am aware that it is not new, as in United States Patent No. 267,819, to arrange a single vertical lift or elevator along and parallel to the body of the furnace, and to provide an

inclined chute extending from one side of the receiving-hopper to the vertical lift; but this fails to embody my invention in that by the use of double tracks extending to and over the ends of an oblong hopper the materials can be discharged into the hopper at opposite ends alternately, thereby insuring not only a more constant supply of material, but also a more equable distribution of the same.

It will be observed that by the above-described construction of hopper and arrangement of tracks or skids I am enabled to regulate the charging in accordance with the working of the furnace and the character of ore employed—as for example, if the furnace is working down evenly, the charge is delivered alternately at opposite ends of the hopper, the cars being tipped with sufficient rapidity to give the charge the requisite impetus to cause it to drop through the center of the funnel of the hopper onto the apex of the bell, thus insuring an even distribution; but in case the furnace is working more rapidly on one side than the other the charge is delivered in that side only and the car is tipped slowly, so that the material will move slowly down the incline of the hopper, and in dropping through the funnel will strike the bell on one side of the apex and will be directed to the side desired. It is an important characteristic of my apparatus that the charging and the above-described regulation can be effected from the ore-floor, thus avoiding the necessity of the presence of a workman or attendant at the top of the furnace.

I claim herein as my invention—

1. As an improvement in mechanism for charging furnaces, an oblong hopper arranged with a common central discharge therefrom directly over and onto the apex of the bell, and having a receiving-chamber at each end and on opposite sides of the central discharge, in combination with inclined double tracks or skids suitable for the movement of cars thereon, and extending upward one to and over one end of the oblong hopper and the other to and over the other end, substantially as set forth.

2. As an improvement in blast-furnace-charging apparatus, an oblong hopper having a central discharge orifice or funnel, in combination with a receiving-chamber located in the mouth of the furnace, a bell for closing the discharge-opening in the receiving-chamber, and hoisting mechanism arranged to deliver furnace material at opposite ends of the hopper alternately, substantially as set forth.

3. As an improvement in blast-furnace-charging apparatus, a receiving-chamber located in the mouth of the furnace, in combination with a hopper located above the receiving-chamber and adjustable to and from the receiving-chamber, substantially as set forth.

4. A receiving-chamber located in the mouth of a blast-furnace, in combination with a bell arranged in the discharge-orifice of the receiving-chamber, the suspending-rod connecting said bell and its operating-lever, and the protecting sleeve and washer surrounding said rod, substantially as set forth.

5. In a blast-furnace, a receiving-chamber in combination with a hopper located above said chamber and provided with a central discharge orifice or funnel, and a stack arranged centrally above the opening in the hopper and having an internal diameter greater than the diameter of said orifice or funnel, substantially as set forth.

6. In a blast-furnace-filling apparatus, an oblong hopper arranged with a common central discharge therefrom, and having a receiving-chamber at each end and on opposite sides of the central discharge, in combination with inclined double tracks provided with suitable rails and extending from the ore-floor to the top of the furnace, said rails having their upper ends bent so as to project horizontally over the top of the furnace, similarly-inclined auxiliary rails arranged outside of the main rails extending beyond the bent portion of the main rails, a car provided with front and rear wheels, the tread of the rear wheels having a width sufficient to ride upon the auxiliary rails, a bail pivoted to the rear end of the car, and a double receiving-basin, substantially as set forth.

7. As an improvement in blast-furnace-charging apparatus, a receiving-chamber located in the mouth of the furnace and having its walls extending above the top of the furnace, in combination with a hopper supported by such extended walls and provided with a central discharge-orifice, substantially as set forth.

8. As an improvement in blast-furnace-charging apparatus, a receiving-chamber located in the mouth of the furnace and its walls extending above the top of the furnace and composed of partible sections, in combination with a hopper resting upon such extended wall-sections and adjustable to and from the same, substantially as set forth.

9. As an improvement in blast-furnace-charging apparatus, a receiving-chamber located in the mouth of the furnace and having its walls extending above the top of the furnace, such extended walls being provided with doors, in combination with a hopper supported by the receiving-chamber, substantially as set forth.

In testimony whereof I have hereunto set my hand.

WILLIAM ROTHOFF.

Witnesses:

R. H. WHITTLESEY,
DARWIN S. WOLCOTT.