

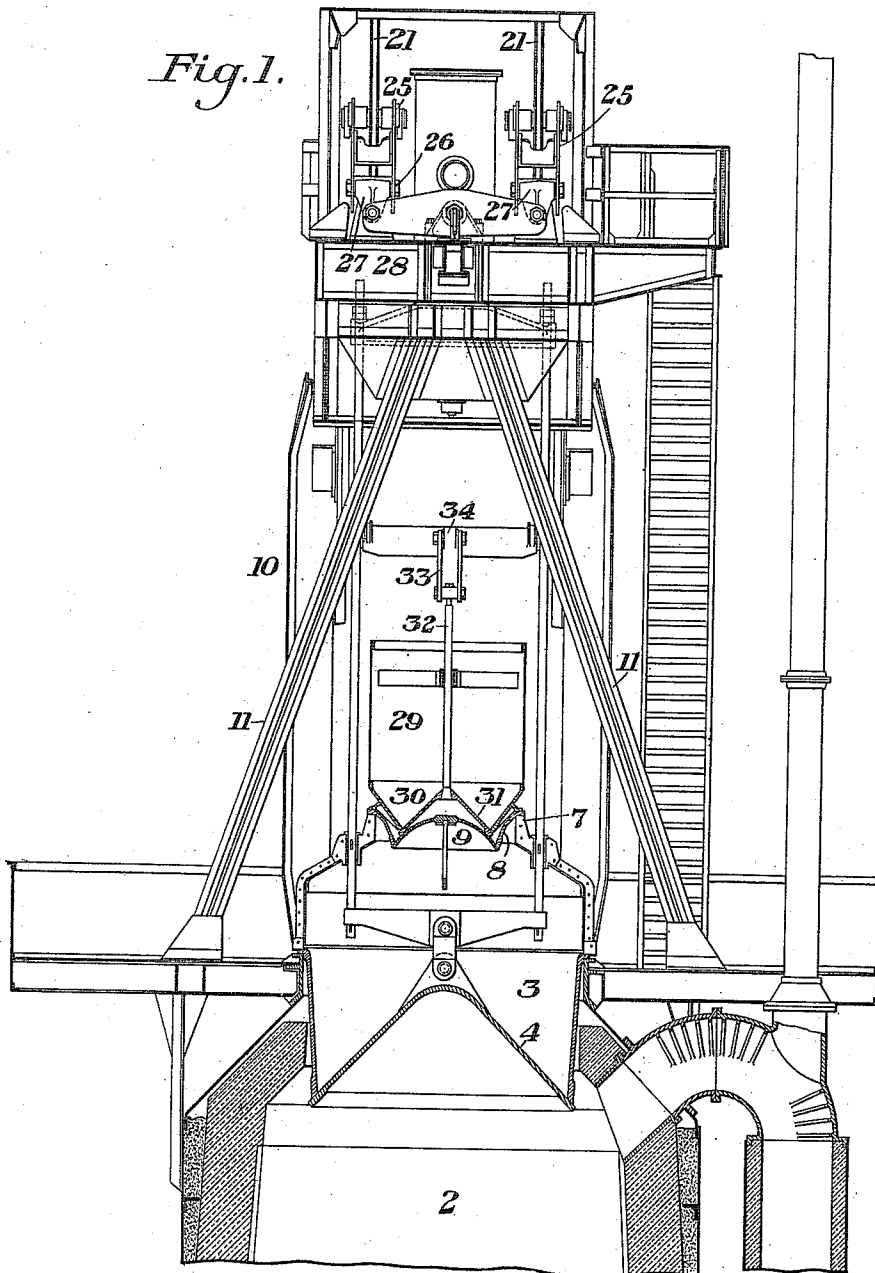
J. KENNEDY.
BLAST FURNACE CHARGING APPARATUS.
APPLICATION FILED MAY 26, 1909.

986,009.

Patented Mar. 7, 1911.

6 SHEETS-SHEET 1.

Fig. 1.



WITNESSES

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INVENTOR

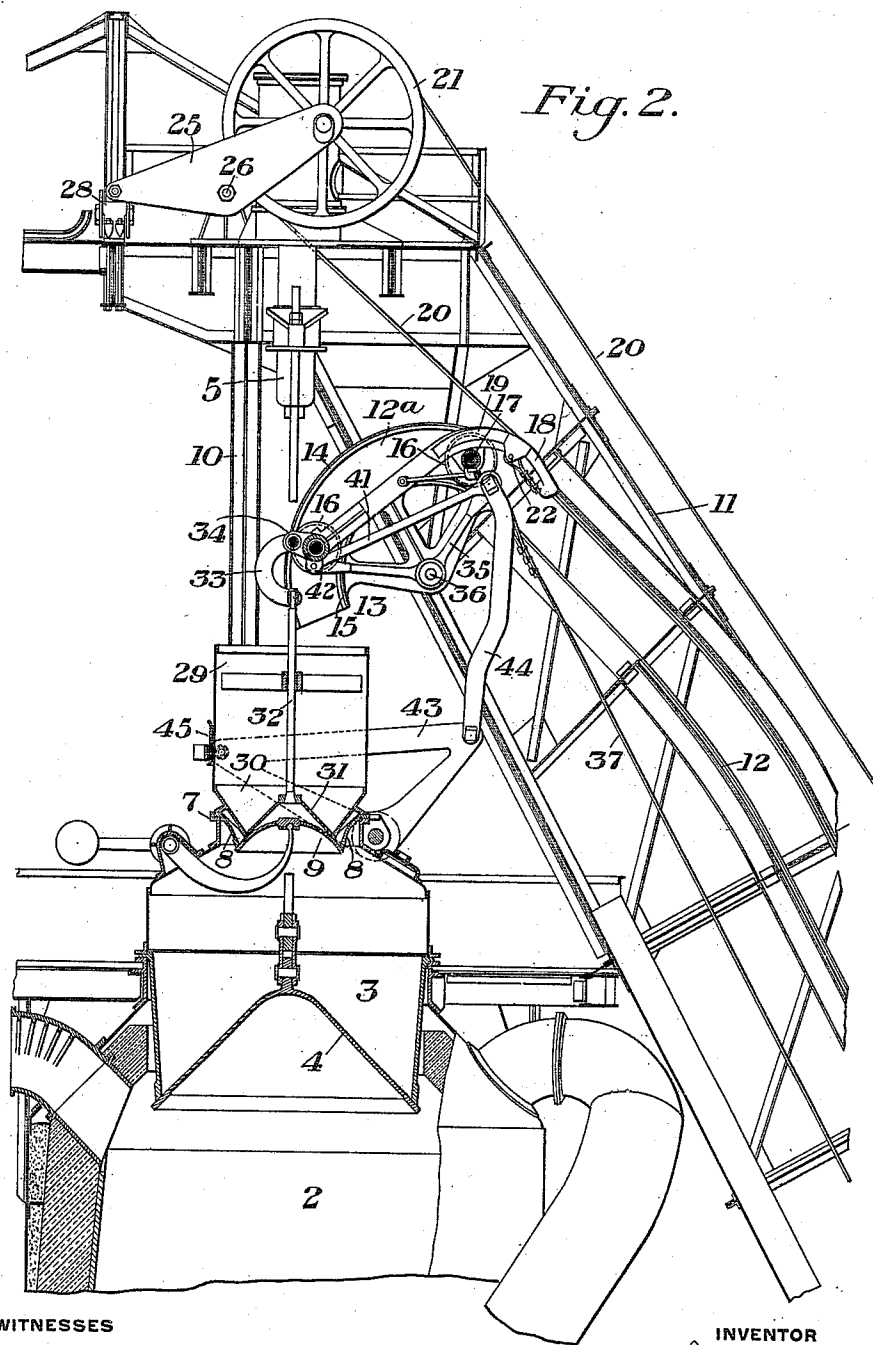
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6 SHEETS—SHEET 2.



WITNESSES

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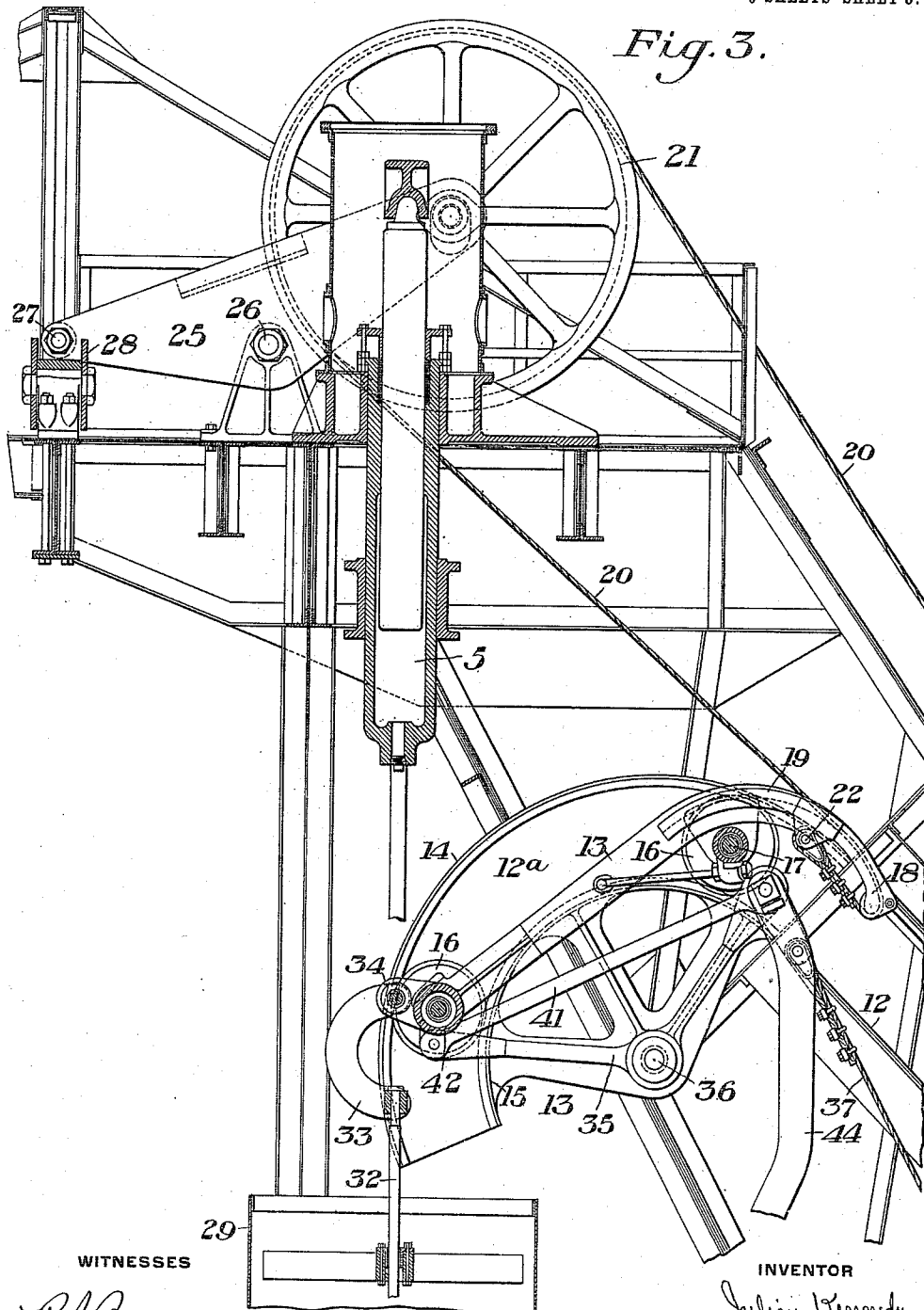
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6 SHEETS—SHEET 3.

Fig. 3.



WITNESSES

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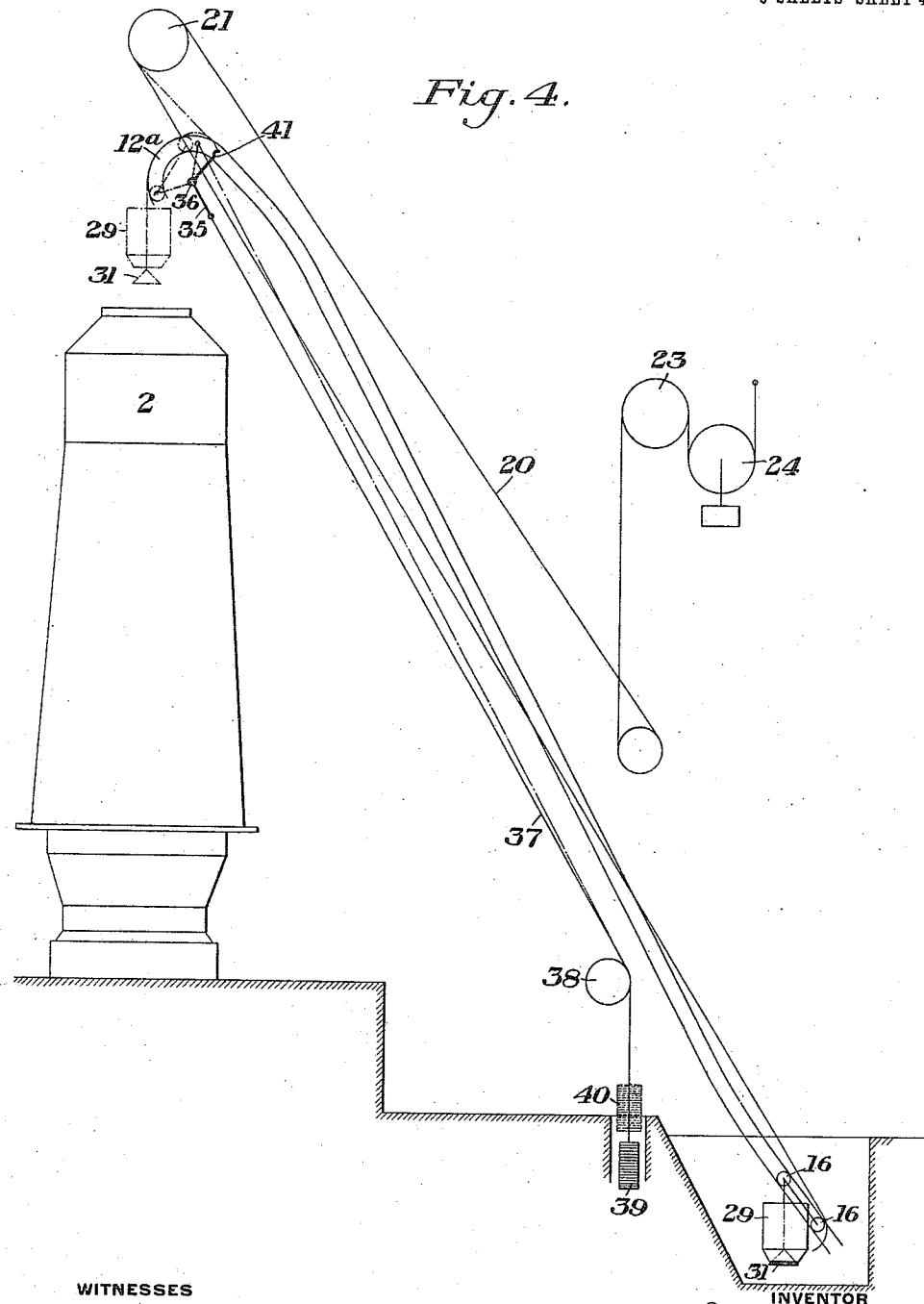
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6 SHEETS-SHEET 4.

Fig. 4.



WITNESSES

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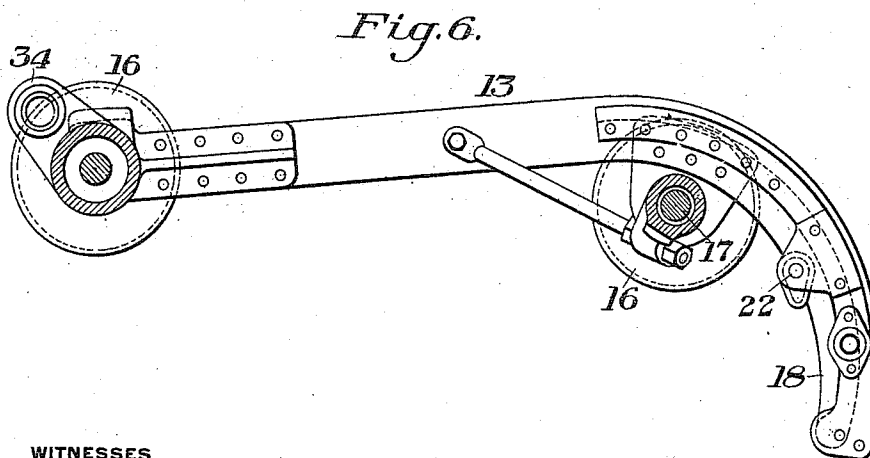
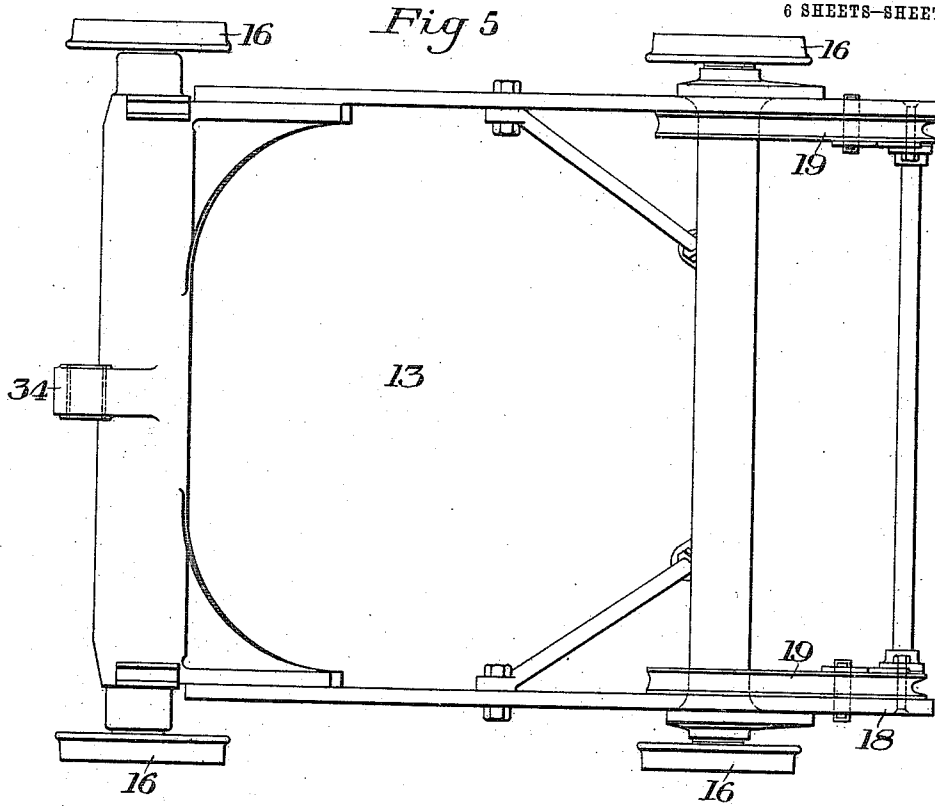
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6 SHEETS—SHEET 5.



WITNESSES

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6 SHEETS—SHEET 6.

Fig. 7.

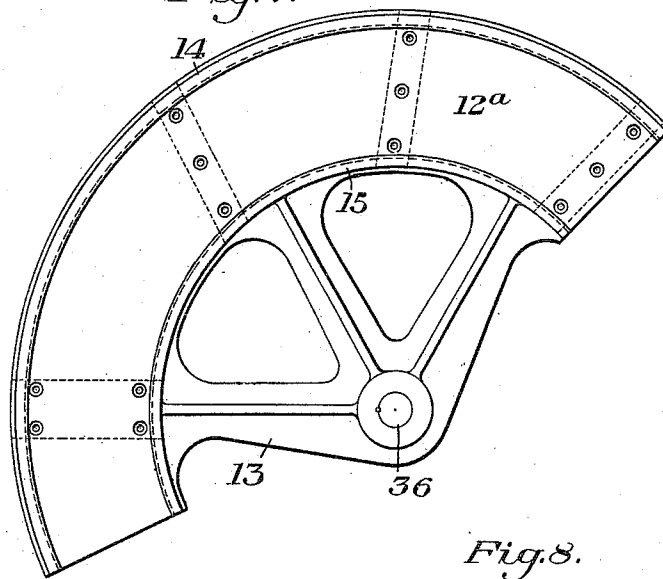


Fig. 8.

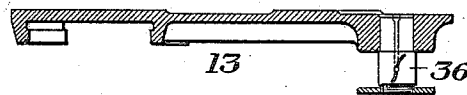


Fig. 9.

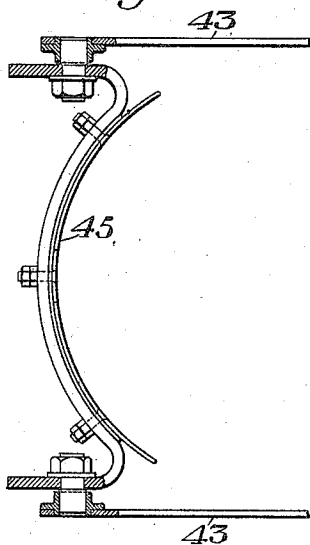
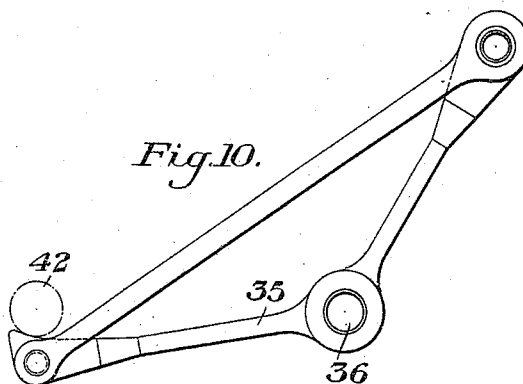


Fig. 10.



WITNESSES

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UNITED STATES PATENT OFFICE.

JULIAN KENNEDY, OF PITTSBURG, PENNSYLVANIA.

BLAST-FURNACE-CHARGING APPARATUS.

986,009.

Specification of Letters Patent.

Patented Mar. 7, 1911.

Application filed May 26, 1909. Serial No. 498,511.

To all whom it may concern:

Be it known that I, JULIAN KENNEDY, of Pittsburg, Allegheny county, Pennsylvania, have invented a new and useful Improvement in Blast-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 view partly in elevation and partly in vertical section of the upper portion of a blast furnace and superstructure having my invention applied thereto; Fig. 2 is a similar view looking from another position; Fig. 3 is a view partly in vertical section and partly in elevation showing a portion of the apparatus on a larger scale; Fig. 4 is a diagrammatic view illustrating the operation of the charging apparatus; Fig. 5 is a plan view of the truck or carriage; Fig. 6 is a longitudinal section of the truck or carriage; Figs. 7 and 8 are detail views of the upper curved portion of the track; Fig. 9 is a sectional plan view of the buffer or bucket-steadying device; and Fig. 10 is a detail view of one of the levers employed.

My invention has relation to blast furnace-charging apparatus, and more particularly to charging apparatus of that class in which the charge material is taken to the top of the furnace in buckets, as distinguished from skip cars.

One object of my invention is to provide furnace-charging apparatus of this character which will be simple and effective in its construction, arrangement and mode of operation, and in which the buckets can be raised to the top of the furnace and their contents discharged by a single continuous hoisting movement of the engine.

A further object is to provide means of novel character for steadying the buckets and centering them as they come to discharging position at the top of the furnace.

A still further object is to provide novel means for equalizing the action of the hoisting ropes or cables for elevating the buckets.

Other objects and advantages of my invention will hereinafter appear.

The nature of my invention will be best understood by reference to the accompanying drawings, in which I have shown the preferred embodiment thereof, it being premised, however, that various changes can be

made in the details of construction and arrangement of parts, without departing from the spirit and scope of my invention as defined in the appended claims.

Referring to the drawings, the numeral 2 designates the upper portion of a blast furnace upon which is supported a feed hopper 3, the discharge of which is controlled by the usual vertically movable bell 4, actuated by a power cylinder 5 or any other suitable or usual bell-actuating mechanism. The hopper 3 is provided with a contracted upper portion terminating in a neck, having a supporting flange 7, at its upper end.

8 is a hopper or funnel which is arranged within the neck 7, and which is normally closed by a counterweighted bell or valve 9.

10 designates the frame work of the furnace superstructure, and 11 an inclined frame-work extending upwardly from the base of the furnace to this superstructure and supporting the inclined tracks 12, for the bucket-elevating carriage or truck 13. The tracks 12 extend inwardly at their upper ends over the upper end of the furnace and terminate in the inwardly and downwardly curved portions 12^a (one of which is shown in detail in Figs. 7 and 8). These track extensions or guides 12^a are formed with the inner and outer guide flanges 14 and 15, between which the wheels 16 of the truck or carriage 13 are arranged to travel as the bucket moves into and out of dumping position, as shown in Figs. 2 and 3. The front pair of wheels 16 is journaled at the forward end of the carriage, while the rear pair is journaled on an axle 17, which is supported underneath the downwardly curved rear portion 18 of the carriage frame. These portions 17 of the carriage frame are provided with guides 19, for the hoisting ropes or cables 20, which pass over the wheels 21 at the top of the furnace superstructure, and thence downwardly through these guides and around the lower ends of the portions 18 of the carriage frame, the ends of the ropes or cables being connected to the under side of said portions at 22. The opposite ends of the ropes or cables 20 are connected to the hoisting drum 23 of the engine in the usual manner, as indicated diagrammatically in Fig. 4, and are counterweighted at 24. In order to compensate for variations in the lengths of the two ropes or cables 20, the

wheels 21 at the top of the furnace super-structure are each journaled in an arm of a pivoted lever 25, as shown in Figs. 1 and 2, the said levers being fulcrumed at 26, and their opposite arms being connected by links 27 with the opposite end portions of a pivoted equalizing beam 28. It will be readily seen that any variations which may occur in the lengths of the two ropes or cables, due to unequal stretching or other causes, will be readily taken care of by this device, since the shorter rope or cable will act to pull down the arm of the lever 25, in which this wheel 21 is journaled, thereby raising the opposite arm of said lever and the corresponding end of the equalizing beam 28. This depresses the opposite end of the beam 28 and causes a reverse movement of the other equalizing lever 25 to thereby raise the other wheel 21 and take up the slack of the other cable. The device in this manner automatically compensates for all variations which may occur in the lengths of the two ropes or cables.

29 designates one of the buckets for conveying the charge, said bucket having a conical or hopper-shaped lower end portion 30, which is normally closed by a bell 31, carried by a rod 32, which extends upwardly through the bucket and is connected at its upper end to a curved link or arm 33, which is pivotally connected to the central forward portion of the frame of the car or carriage 13 at 34.

35 is a bell crank lever, which is pivoted at 36 concentrically with the center of the track portions 12^a, one of these levers being provided adjacent to each of these track portions. Connected to one arm of each of these levers is a rope or cable 37, which is shown as extending to the base of the furnace, passing over an idle drum or roller 38, and having counterweights 39 and 40, at its lower end which are designed to be successively picked up by the rope or cable as said lever moves from the position shown in full lines in Fig. 4 to the position shown in dotted lines in said figure. The opposite arm of the lever is provided with a catch or projection 41 (see Figs. 4 and 10) which is designed to be engaged by the front bar 52 of the carriage frame when the latter has been raised to a position adjacent to the beginning of the curved guide portions 12^a of the tracks, thereby moving said lever from the position shown in full lines in said figure to the position shown in dotted lines against the action of the counterweights 39 and 40. Connecting one arm of each of these levers 35 with an arm of a second bell crank lever 43, pivotally mounted on the upper portion of the hopper 3, is a link 44. Supported between the free arms of the two levers 43 is a buffer or steadying device 45 (see Fig. 9) which is of segmental curved

form and is adapted to fit a portion of the circumference of the bucket 29, to prevent swinging or swaying thereof as it is lowered to discharging position on the top of the furnace hopper 3.

The operation will be readily understood. The loaded buckets are engaged with the car or carriage 13 and the latter, with the buckets suspended therefrom, is hoisted to the top of the furnace, the wheels 16 passing between the flanges 14 and 15 of the guides 12^a, as shown in Figs. 2 and 3, thereby moving the bucket inwardly and downwardly over the hopper 3. As the front wheels of the car enter these guides 12^a the levers 35 are engaged and are gradually swung to the position shown in dotted lines in Fig. 4, against the action of the counterweights 39 and 40, thereby steadying the movement and descent of the bucket. At the same time, the levers 43 are actuated by the links 44, so that the buffer 45 is held in contact with the bucket and swaying or swinging thereof is prevented. When the bucket comes to rest over the hopper 3, as shown in Figs. 1 and 2, further movement of the car or carriage actuates the bell-supporting rod 32 to open the bell 31 and discharge the contents of the bucket into the hopper. The lowering of the bucket on to the top of the furnace, together with the opening of the bell 31, is effected by a continuous hoisting movement of the engine, it being unnecessary to stop or reverse the engine in order to discharge the contents of the bucket. When the bucket is emptied, the hoisting engine is reversed, the first movement of the car or carriage being to close the bell 31, after which the bucket is raised from the hopper and is then lowered with the car or carriage.

The advantages of my invention result from the simplicity and efficiency of the mechanism for lowering the buckets into discharging position, and for discharging them without stopping or reversing the hoisting engine; from the provision of the means for steadying and centering the buckets as they are lowered, and from the means for equalizing variations in lengths in the hoisting ropes or cables.

It will be obvious that many changes may be made in the details of construction and arrangement of the parts. Thus, any suitable form of bucket may be employed, the manner of connecting the buckets to and suspending them from the car or carriage may be changed, the track guides may be differently constructed, and changes may be made in the form of the device for centering and steadying the buckets.

I claim:

1. In blast furnace charging apparatus, inclined tracks leading to the top of the furnace and terminating at their upper ends

in inwardly and downwardly curved guide portions, a car or carriage adapted to run on said tracks, a bucket adapted to be suspended from the car or carriage on said tracks, the curvature of said guide portions being such that the suspended bucket may be lowered into discharging position on the top of the furnace wholly by forward movement of the rear axle of the car; substantially as described.

2. In blast furnace charging apparatus of the bucket type, inclined tracks extending to the top of the furnace and terminating in end portions which are curved downwardly and inwardly over the top of the furnace, said end portions having track-surfaces which form fixed curved continuations of the inclined tracks, a car or carriage mounted on said tracks and having its wheels adapted to said guide portions, and hoisting mechanism connected to the car or carriage; substantially as described.

3. In blast furnace charging apparatus of the bucket type, a car or carriage having its frame provided with downwardly curved extensions at its lower end, and rope guides carried by said extensions, substantially as described.

4. In blast furnace charging apparatus of the bucket type, inclined tracks extending to the top of the furnace and terminating in guide portions curved inwardly and downwardly over the top of the furnace and having inner and outer guide flanges, a car or carriage having wheels adapted to said guide portions, and hoisting mechanism connected to the lower rear portions of the car or carriage, said guide portions having a curvature to permit the continued advancing movement of the rear axle of the carriage to move the front axle downwardly therein; substantially as described.

5. In blast furnace charging apparatus, a car or carriage, separate hoisting ropes or cables connected thereto, separate top wheels at the top of the furnace over which the ropes or cables respectively pass, and supporting means for said wheels whereby said wheels may move in unison to compensate for variations in the length of the two ropes of furnaces; substantially as described.

6. In blast furnace charging apparatus, a hoisting car or carriage, two separate hoisting ropes or cables connected thereto, separate top wheels mounted on the top of the furnace and over which the ropes or cables respectively pass and equalizing beams or levers supporting the said wheels compensating for variations in the lengths of the two ropes or cables, substantially as described.

7. In blast furnace charging apparatus, a hoisting car or carriage, a pair of separate hoisting ropes or cables connected thereto, guide wheels for the said ropes or cables,

supported on the furnace superstructure, levers in which the said wheels are journaled, and an equalizing member to which the two levers are connected, substantially as described.

8. In blast furnace charging apparatus of the bucket type, the combination with track ways leading to the top of the furnace and terminating in inwardly and downwardly curved end portions, of a bucket-steadying device adjacent to said portions, substantially as described.

9. In blast furnace charging apparatus, the combination of inclined track-ways leading to the top of the furnace and terminating at their upper ends in inwardly and downwardly extending portions, a car or carriage adapted to said trackways, and a bucket-steadying device arranged to be engaged and operated by the car or carriage, substantially as described.

10. In blast furnace charging apparatus, inclined tracks leading to the top of the furnace and terminating in downwardly and inwardly curved end portions having fixed track surfaces which form an unbroken continuation of the inclined tracks, and a car or carriage mounted on said tracks; substantially as described.

11. In blast furnace charging apparatus, the combination with a track-way extending to the top of the furnace and terminating in downwardly and inwardly extending portions, a car or carriage mounted on the track-way and having means for suspending buckets therefrom, a bucket-steadying lever arranged to be engaged by the car or carriage, and a counterweight connected to said lever, substantially as described.

12. In blast furnace charging apparatus of the bucket-type, inclined tracks extending to the top of the furnace and terminating in end portions which have a continuous downward curvature, and a car or carriage mounted on said tracks, the curvature of said end portions permitting the forward movement of the rear axle of the car to move the front axle downwardly toward the top of the furnace; substantially as described.

13. In blast furnace charging apparatus of the bucket type, the combination with means for raising buckets to the top of the furnace and for discharging them, of a buffer arranged to engage the bucket to prevent swaying or swinging thereof, and connections for causing the buffer to be actuated by the movement of the bucket-elevating means, substantially as described.

14. In blast furnace charging apparatus, inclined track-ways leading to the top of the furnace, a bucket-elevating car or carriage mounted on said track-ways, a buffing device for holding the buckets against swinging and swaying movement as they are lowered into discharging position on the

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furnace, and lever mechanism arranged to be engaged by the carriage to operate the buffing device, substantially as described.

15 15. In blast furnace charging apparatus
5 of the bucket-type, inclined tracks extending to the top of the furnace and terminating in end portions which have a continuous downward curvature, and a car or carriage mounted on said tracks, a bucket arranged to be suspended from the car or carriage and having a vertically movable bottom closure, and hoisting mechanism connected to said car, the curvature of said end

portions of the track permitting the bodily forward movement of the car on said tracks, 15
by a continuous hoisting movement of the hoisting motor, to elevate the bucket to the top of the furnace, then lower it into discharging position on the furnace, and then open said closure; substantially as described. 20
In testimony whereof, I have hereunto set my hand.

JULIAN KENNEDY.

Witnesses:

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C. P. BYRNES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
