No. 696,129. Patented Mar. 25, 1902.

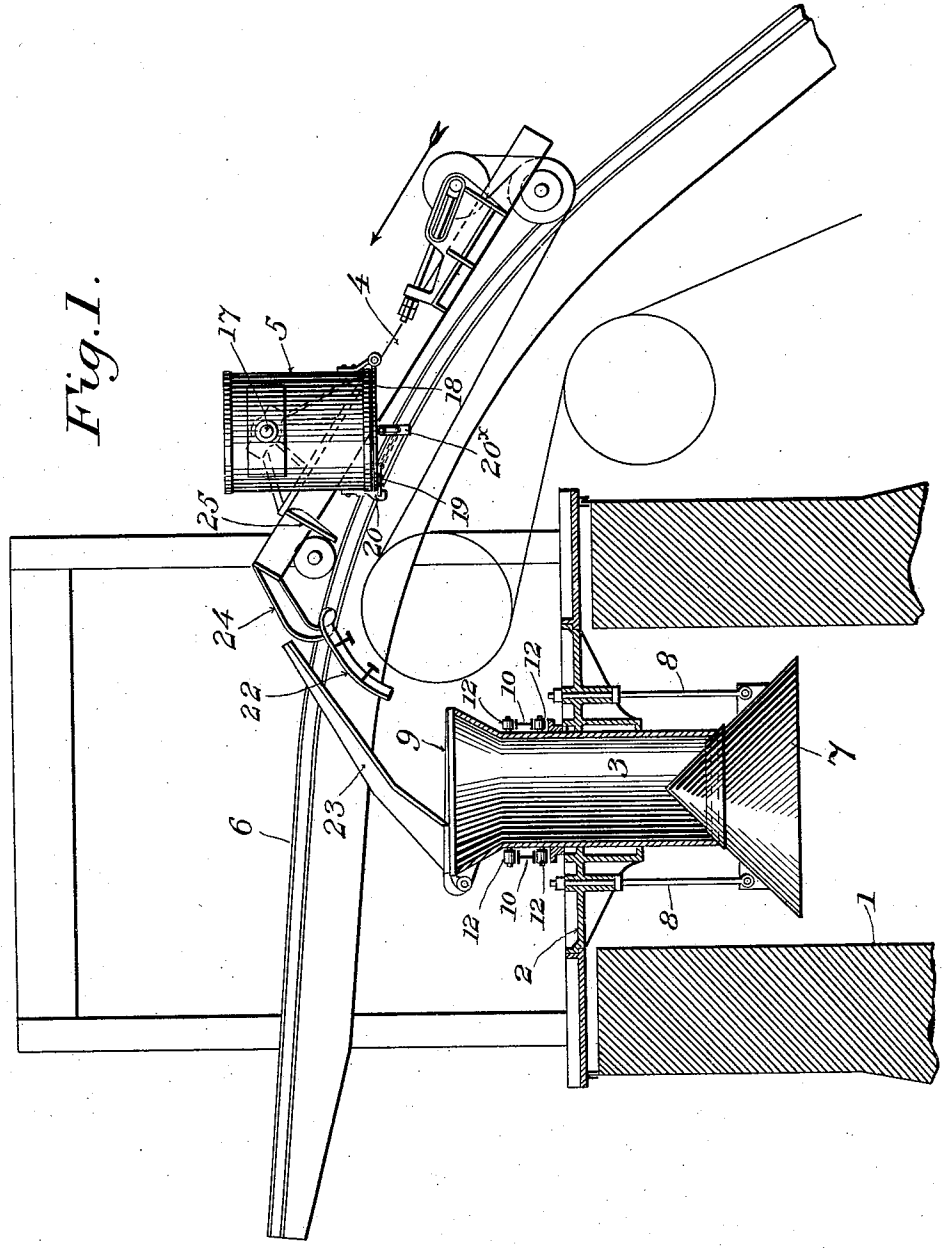
D. BAKER.

CHARGING MECHANISM FOR BLAST FURNACES.

(Application filed Aug. 26, 1901.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



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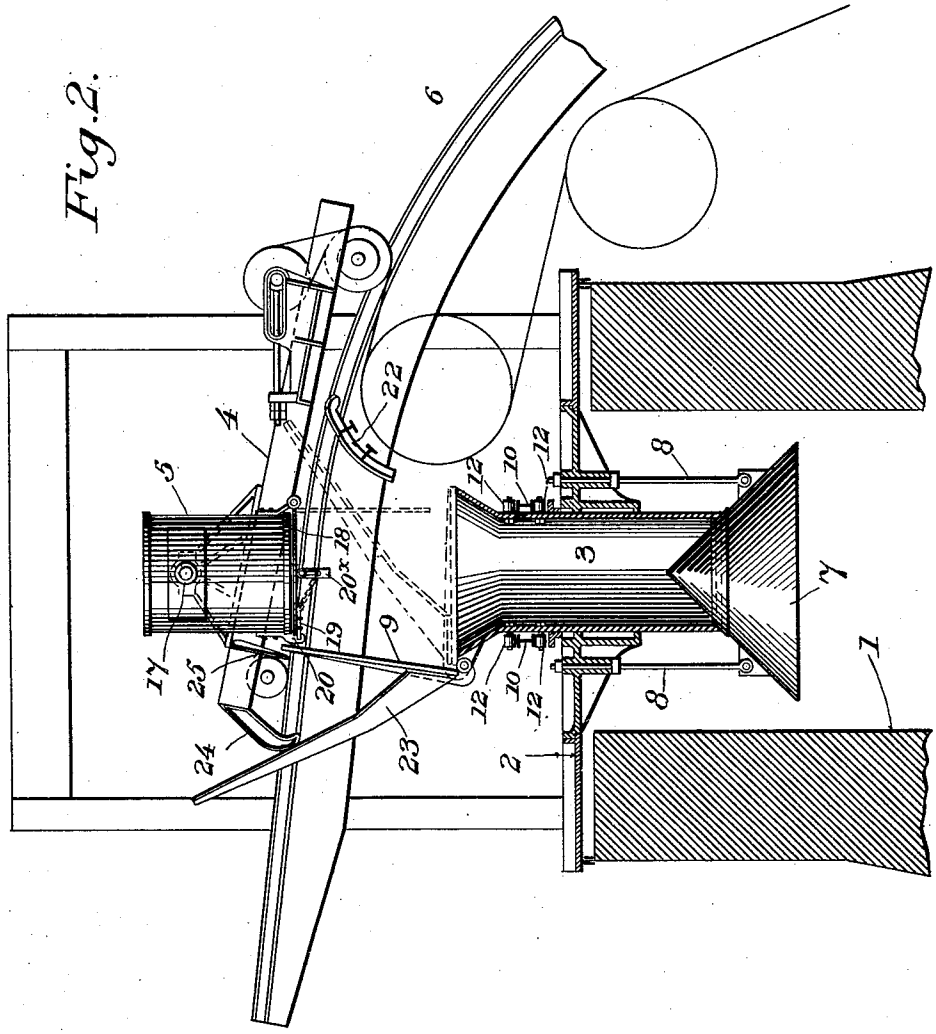
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Fig. 2.



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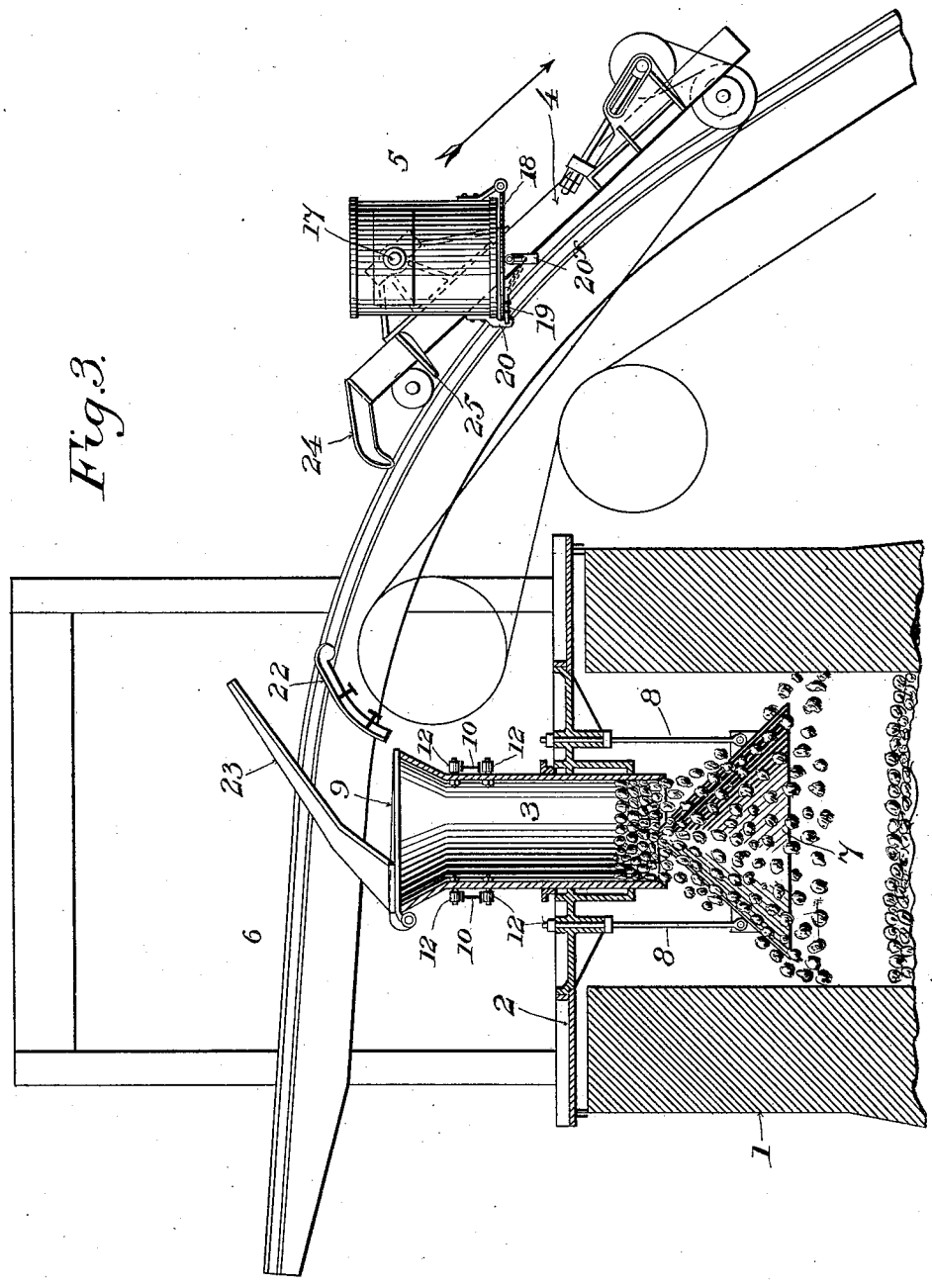
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Fig. 3.



Witnesses

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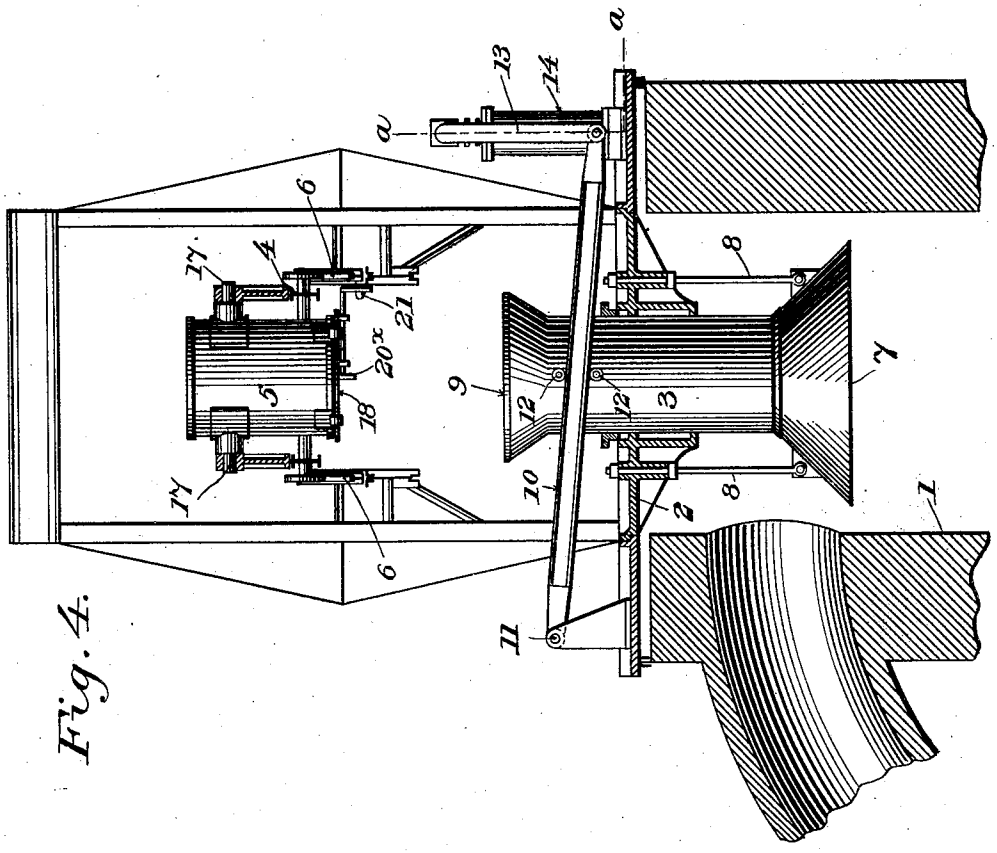


Fig. 4.

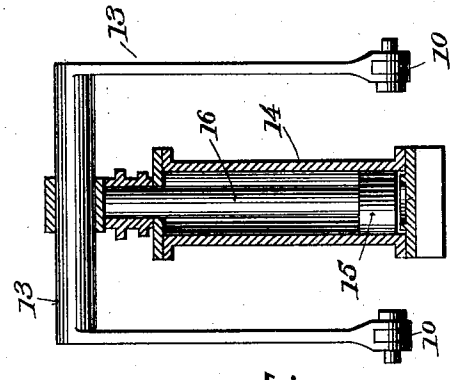


Fig. 5.

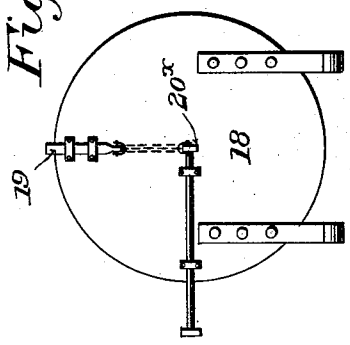


Fig. 6.

Witnesses

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UNITED STATES PATENT OFFICE.

DAVID BAKER, OF CHICAGO, ILLINOIS.

CHARGING MECHANISM FOR BLAST-FURNACES.

SPECIFICATION forming part of Letters Patent No. 696,129, dated March 25, 1902.

Application filed August 26, 1901. Serial No. 73,222. (No model.)

To all whom it may concern:

Be it known that I, DAVID BAKER, of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Charging Mechanism for Blast-Furnaces, of which the following is a specification.

This invention relates to that type of mechanism for charging blast-furnaces in which the charge is conveyed to the top of the furnace by cars traveling on ways or tracks leading from the ground-level and familiarly known in the art as "skip-hoists."

The main object of the invention is to dispense with the use of the vertically-movable bell or bells so commonly employed for closing the top of the furnace and the expensive superstructure which is required to support and operate these bells.

With this end in view the invention consists, primarily, of a vertical receptacle set movably in the top of the furnace and adapted to receive the charge from a skip-hoist or other source of supply and by its movements to discharge its contents into the furnace, means being provided to prevent the escape of gas when the receptacle is receiving its charge and when it is moved to discharge its contents into the furnace. I prefer to seal the upper end of the receptacle by means of a lid and its lower end by means of a distributing-shield in the form of a bell or cone fixed in the furnace and with relation to the receptacle, the arrangement being such that the lower end of the receptacle will close against this fixed bell while the charge is entering its upper end, and the latter will be closed by the lid when the receptacle is moved to separate its lower end from the bell to admit the charge to the furnace.

The invention consists also in combining with this receptacle a feeding-car adapted to be moved over the same and open its lid and discharge its contents therein.

The invention consists also in a track or way for the car of improved form and construction.

The invention consists also of a car of improved form and construction adapted for this track.

The invention consists, further, in various other features of construction and arrangement incidental to the main novel features of the invention, all of which will be fully described in the specification and pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical sectional elevation through the top of a blast-furnace having my invention applied thereto, showing the feeding-car ascending with the charge. Fig. 2 is a similar view showing the car in the position of charging. Fig. 3 is a similar view showing the car descending and the charge entering the furnace. Fig. 4 is an end elevation showing the means for elevating the charging-receptacle. Fig. 5 is a vertical section on the line *a a* of Fig. 4. Fig. 6 is a bottom plan view of the door of the feeding-receptacle on the car.

Referring to the drawings, 1 represents a blast-furnace having its upper end closed by the plate 2, containing a circular opening in which extends a vertically-movable cylindrical receptacle 3, which I term the "charging-receptacle" and which is adapted to receive the charge from a car 4, carrying a receptacle 5 of cylindrical form, which I term the "feeding-receptacle." This car is adapted to travel on tracks 6, leading from the ground-level to the top of the furnace and over the charging-receptacle, so that the two receptacles may be brought in register to admit of the transfer of the charge from the one to the other. The charging-receptacle constitutes the mouth of the furnace and closes at its lower end against the apex of a conical distributing-bell 7, suspended fixedly within the furnace vertically beneath the charging-cylinder by means of rods 8, fixed at their upper ends to the plate 2 and at their lower ends to the bell. This bell closes the lower end of and serves as a gas-seal for the charging-receptacle when the charge is being introduced into its upper end, and when the charging-receptacle is raised and separated from the bell the charge enters the furnace and is distributed by the sides of the bell evenly and uniformly within the furnace. The upper end of the charging-receptacle is closed by a lid 9, adapted to be opened automatically when the skip-car is moved over the receptacle and which when closed serves as a gas-seal for the top of the charging-receptacle when it is raised to open its lower end.

The charging-receptacle may be raised by

any suitable and appropriate means; but I prefer to adopt the construction shown in Figs. 4 and 5, in which two parallel horizontal bars 10 are pivoted to the top of the furnace on a horizontal axis 11 to one side, from which point they extend along the opposite sides of the charging-receptacle and between rollers 12 on its upper end to the opposite side of the furnace, where they have their ends jointed to the lower ends of an arched frame 13. This frame extends over and across the upper end of a cylinder 14, fixed to the top of the furnace and in which is mounted a piston 15, provided with a piston-rod 16, extending upward through the cylinder-head and engaging the arched frame. On the admission of fluid under pressure to the cylinder beneath the piston the latter will rise and through the engagement of its rod with the arched frame will lift the latter and raise the parallel bars 10, which, engaging beneath the rollers on the charging-receptacle, will elevate the same. The weight of the charging-receptacle and connected parts will serve to exhaust the cylinder when the supply of pressure is cut off and return the parts to their former position.

The feeding-cylinder 5, carried by the car, is mounted on trunnions 17, to the end that it may occupy at all times a vertical position without regard to the inclination of the track. This feature of construction I deem of advantage, in that the track may be slightly inclined at the top of the furnace, where it extends over the charging-receptacle, and horizontal, or substantially so, at the ground-level, where the feeding-receptacles are filled and where less excavation is required, so that the starting of the load by the engine on its upward course will be easy. The lower end of the feeding-receptacle is closed by a door 18, Figs. 2 and 6, mounted on a horizontal axis at one side of the receptacle and provided on its under side with a locking-bolt 19, adapted to engage in a keeper 20 on the receptacle and hold the door locked in a closed position. The latch is adapted to be withdrawn automatically to allow the door attached by a chain to be opened when the receptacle arrives at a point vertically above the charging-receptacle. This is accomplished by an operating-lever $20^{\times}$, pivoted to the under side of the door and to the locking-bolt and extending laterally, with its end in position to engage a fixed stop 21 on the track when the car arrives at the point where the two receptacles will be in register. By the engagement of the lever with the stop the bolt will be withdrawn and the door quickly thrown open by the weight of the charge, which will pass into the charging-receptacle below. After the charge has been thus transferred to the charging-receptacle the car is moved back, which will allow the door to be closed automatically by a buffer 22, fixed to the track and projecting in the path of the door.

In order that the lid 9 of the charging-receptacle may be automatically opened when the car is moved to bring the charge into position to be transferred, the lid is provided with an arm 23 at one side, which when the lid is closed extends upward at an inclination in the path of a finger 24 on the front end of the car. As the car advances this finger will engage the arm 23 and will positively lift the lid to the position shown in Fig. 2, in which position it is held by the finger while the charge is being transferred, after which and on the retreat of the car the lid will be automatically closed by means of a depending arm 25, carried by the car. It is seen, therefore, that as the car advances to position it automatically opens the lid of the charging-receptacle and the door of the feeding-receptacle, both of which are automatically closed when the car retreats after the charge has passed to the charging-receptacle.

In the operation of charging the furnace by the mechanism described the feeding-car is filled at the ground-level with the charge, and by suitable means, usually an endless cable passing over guide-pulleys, the car is carried upward on its track to the top of the furnace, where it passes on the track over the charging-receptacle to bring the feeding-receptacle into register therewith. Just before the car arrives in its final position the finger 24 on its front end engages arm 23 on the lid of the charging-receptacle and opens the same, and when it arrives in position the end of lever 20 on the door of the charging-receptacle engages fixed stop 21 on the track, which withdraws the locking-bolt and releases the door. The latter is now opened by the weight of the charge, which falls by gravity into the charging-receptacle. The car now retreats, allowing the door of the feeding-receptacle to be closed by the buffer 22 and the lid of the charging-receptacle to be closed by the depending arm 25, thereby sealing the top of the furnace. As the car descends for another charge fluid under pressure is admitted to cylinder 14, which, raising piston 15, elevates parallel bars 10 and raises the charging-cylinder 3, thereby separating its lower end from the fixed distributing-bell 7. The charge descends over the sides of the bell and uniformly into the furnace onto the underlying fuel-bed. On pressure being cut off from the cylinder, the weight of the parts returns the piston and lowers the charging-cylinder, so that its lower end closes against the apex of the bell.

Among the advantages of the construction described are the saving of the expense of the extensive and high superstructure which is usually employed to support and operate the customary cumbersome movable bell. In my arrangement the superstructure is very light and simple, consisting only of the single track leading over the mouth of the furnace. The operating mechanism for raising the charging-cylinder is not required to be of extraordinary strength or size by reason of

the very slight resistance which the vertically-movable cylinder encounters.

In the use of the mechanisms now employed for charging furnaces, either where a single vertically-movable bell is employed or a series of coöperating bells, there is an excessive breakage of the coke by the successive falls to which it is subjected or there is an uneven distribution of the stock, causing a rolling of the lumpy portion of the charge to one side of the receiving-hopper and its accumulation in one side of the furnace. In my apparatus, on the other hand, the stock descends vertically upon the main distributing fixed bell under the best possible conditions for perfect distribution in the furnace, and the breakage of the coke by reason of its easy and direct fall is reduced to a minimum.

Having thus described my invention, what I claim is—

1. In combination with a furnace, a movable charging-receptacle extending into the same and adapted to receive the charge, a relatively fixed distributing-surface within the furnace against which the end of the receptacle is adapted to close, means for moving the receptacle with relation to the fixed device in order to discharge the contents, and a gas-seal for the receptacle at its opposite end.

2. In combination with a furnace, a vertically-movable receptable extending into the top of the same and adapted to receive and hold the charge, a fixed distributing-bell within the furnace against which the lower end of the receptacle is adapted to close, means for raising the receptacle to discharge the charge into the furnace, and means for sealing its upper end when it is raised.

3. In combination with a furnace, a plate closing its upper end and provided with an opening, a vertical receptacle in the form of a shell fitting in said opening and adaped to receive and hold the charge and movable vertically, a fixed distributing-bell against which the lower end of the receptacle is adapted to close, said bell being sustained within the furnace from said plate, means for raising the receptacle to discharge its contents directly into the furnace, and a lid on the upper end of the receptacle serving as a gas-seal.

4. In combination with a furnace, a movable charging-receptacle extending into the same and adapted to receive the charge, a relatively fixed distributing-surface within the furnace against which the receptacle is adapted to close, means for moving the receptacle with relation to the fixed surface to discharge its contents, and means for sealing the receptacle against the escape of the gases when it is thus moved.

5. In combination with a furnace, a vertically-movable charging-receptacle in the top of the same adapted to receive the charge, a lid hinged to the upper end of the receptacle on a horizontal axis, and a car adapted to convey the charge to the receptacle and movable over the top of the same, and means controlled by the car for swinging the lid upward on its axis.

6. In combination with a furnace, a vertically-movable charging-receptacle in the top of the same adapted to receive the charge, a lid hinged to the top of the same on a horizontal axis and provided with an upwardly-projecting arm, a car movable over the top of the receptacle and adapted to engage the arm and swing the lid upward on its axis, and a projection on the car adapted to engage the lid on the return of the car and swing the lid downward.

7. In combination with a furnace, a vertically-movable cylindrical charging-receptacle in the top of the same, a lid closing the top of said receptacle, a skip-car, a cylindrical receptacle on the car movable over the charging-receptacle and adapted to register therewith, a door closing the bottom of the feeding-receptacle, means for opening the lid of the charging-receptacle on the approach of the car, means for opening the door of the feeding-receptacle when the two receptacles are in register; whereby the charge will pass to the charging-receptacle, and means for raising said receptacle to discharge its contents to the furnace.

In testimony whereof I hereunto set my hand, this 20th day of May, 1901, in the presence of two attesting witnesses.

DAVID BAKER.

Witnesses:
W. J. MELVIN,
J. L. KAHN.