No. 670,322. Patented Mar. 19, 1901.

J. KENNEDY.

BLAST FURNACE CHARGING APPARATUS.

(Application filed Jan. 5, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

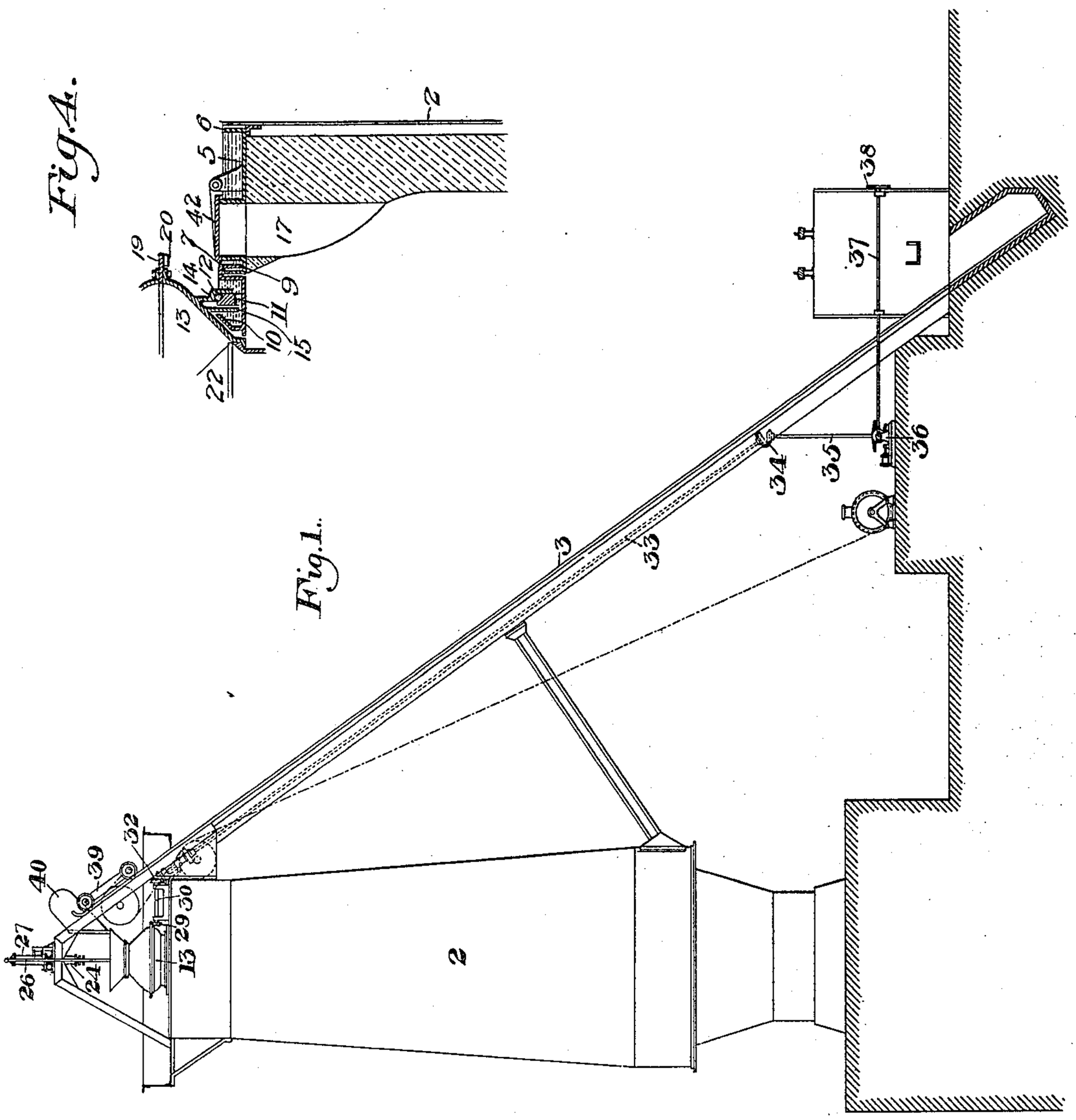

Fig. 4.

WITNESSES

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(No Model.) 3 Sheets—Sheet 2.

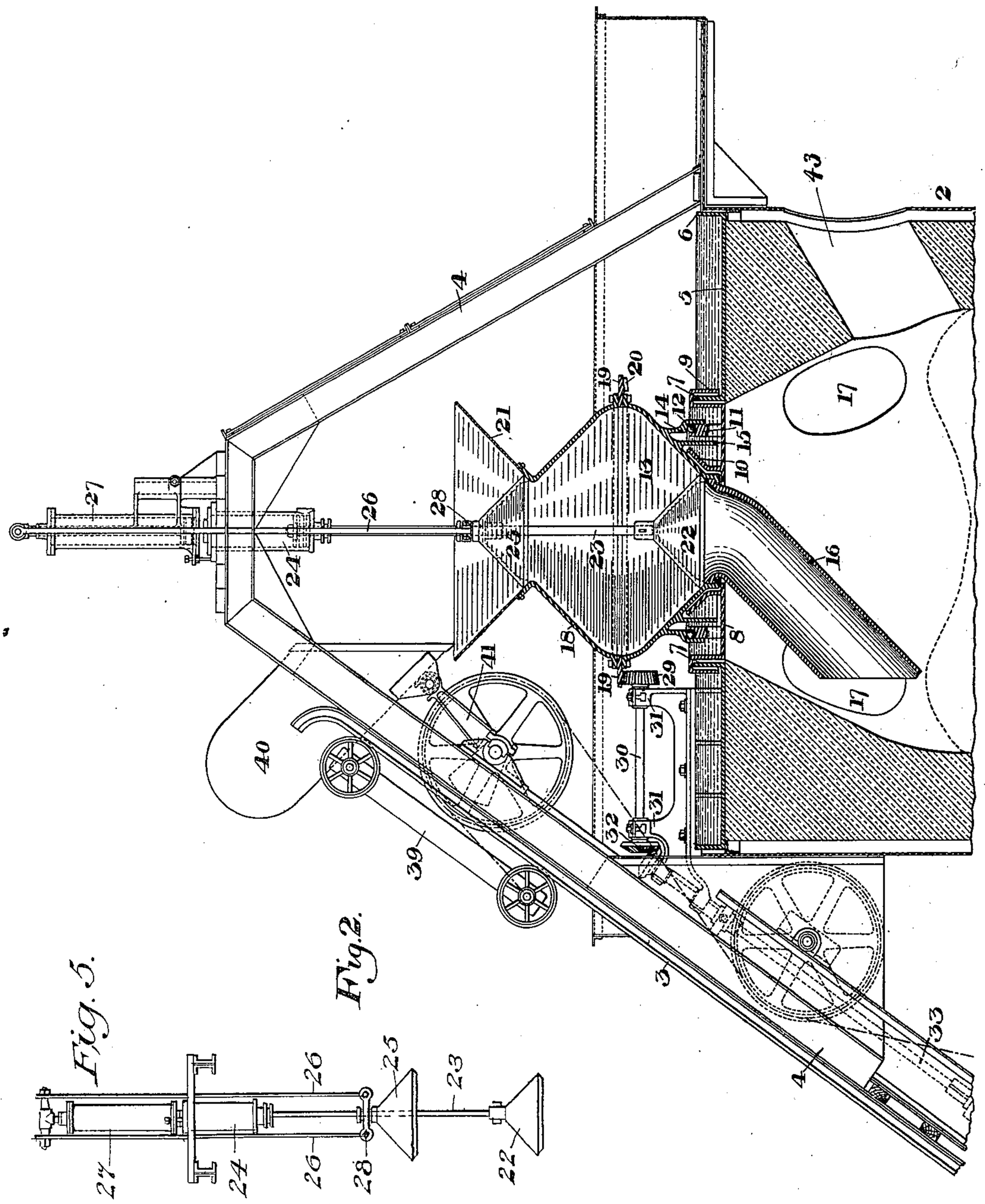

Fig. 2.

Fig. 5.

WITNESSES

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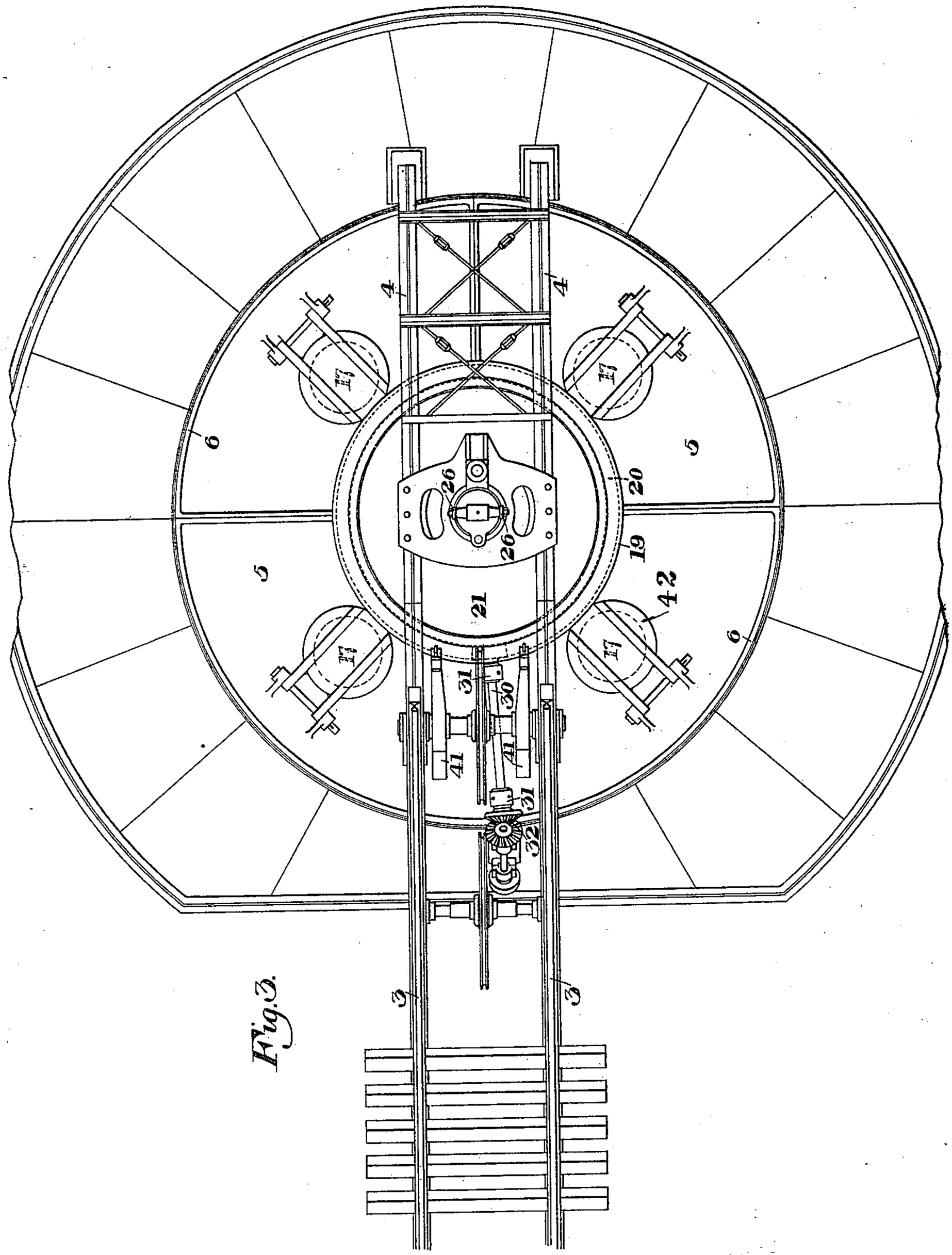

Fig. 3.

WITNESSES

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UNITED STATES PATENT OFFICE.

JULIAN KENNEDY, OF PITTSBURG, PENNSYLVANIA.

BLAST-FURNACE-CHARGING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 670,322, dated March 19, 1901.

Application filed January 5, 1900. Serial No. 524. (No model.)

To all whom it may concern:

Be it known that I, JULIAN KENNEDY, of Pittsburg, in the county of Allegheny and State of Pennsylvania, (whose post-office address is Smith Building,) 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 side elevation of a blast-furnace provided with my improved charging apparatus. Fig. 2 is a sectional side elevation, on a larger scale, of the upper portion of the furnace. Fig. 3 is a top plan view of the same. Fig. 4 is a broken vertical section showing the arrangement of the explosion-doors, and Fig. 5 is a detail side elevation of the bells and their operating-cylinders looking at right angles to Fig. 2.

My invention relates to the automatic charging of blast-furnaces, and is designed to provide improved apparatus which will distribute the stock in any desired manner under the control of the operator, which will reduce the amount of fine ore carried out with the gases and effectually seal the top of the furnace against leakage of gas. It is further designed to provide a simple and effective apparatus of this character which may be easily applied to existing furnaces.

In the drawings, 2 represents a blast-furnace having an inclined track 3 leading to its top, upon which is erected the framework 4. The furnace-top is closed by an annular plate 5, having a peripheral flange 6 and an inner similar flange 7. In the central opening of this plate is supported an annular closing-plate 8, having an outer reversely-bent or hook-shaped flange 9, resting upon the flange 7, and also an inner flaring flange 10. Between these flanges the plate is provided with an annular bearing 11, having a ball-receiving recess containing a series of balls 12. The lower or main hopper 13 is provided with a depending recessed bearing 14, which rests upon the balls, and with a depending flange 15, which surrounds the inner flaring flange 10 of the plate 8. The inner portion of this main hopper extends down within this flaring flange and is provided with an outwardly-inclined chute or tubular channel 16, which preferably extends downwardly to near the normal level of the stock, so as to convey the ore downwardly through a closed channel across the gas-currents which pass out through the offtake 43. The carrying out of fine ore by the gas-currents is thus largely prevented.

The upper part of the main hopper consists of a downwardly-flaring plate 18, which is secured to the lower part of this hopper by suitable bolts extending also through an intermediate annulus 19, having a projecting portion provided on its lower side with an annular rack 20. The upper or supplemental hopper 21 is secured to the top portion of the main hopper and revolves with it. The main hopper is closed by a bell 22, having its rod 23 connected to the piston-rod of a motive cylinder 24, supported in the upper portion of the framework 4. This rod extends upwardly through a central hole in the bell 25 for the upper hopper, this latter bell being carried on depending links 26, pivoted to a cross-head secured to the upper end of the piston-rod of a second motive cylinder 27, supported on the top of the framework. The connection 28 between the links 26 and the upper bell is preferably of swivel form, as shown, to allow rotation of this bell.

The entire hopper device is turned by means of a pinion 29, secured to a shaft 30, supported in bearings 31 at the top of the furnace and having bevel-gear connections 32 with a shaft 33, which extends downwardly along the inclined track and is connected by bevel-gearing 34 with a vertical shaft 35, which is actuated by a suitable motor 36. The shaft 35 is also connected with a horizontal shaft 37, to the other end of which is secured a pointer or indicator, which moves over a suitable circular dial-plate 38. The turning of the chute 16 is thus under the control of the operator, who is visually shown the position of this chute at any time and can turn it to any desired position. This is an important feature of my invention, as it enables the operator to distribute the charge so as to correct uneven working of the furnace or in any desired way.

The stock may be hoisted and dumped into the upper hopper by any of the usual devices for this purpose, and I have shown a car 39,

movable on the track 3 and carrying a tipping skip 40, which is tipped at the upper end of its travel by counterweighted swinging arms 41, engaging a cross-bar upon the skip.

In order to seal the top of the furnace, I supply the top plate with water or other fluid or granular material, the flanges holding this in a pool. The bearing 11 for the balls is perforated or slotted in its lower portion, so as to allow free communication of the fluid therethrough and extended down to give, with the flange 15, a double seal for the main-hopper connection. The ports 17 for the explosion-doors 42 are provided at their upper ends with vertical flanges to hold the pool of water in place.

In operating the apparatus the stock is hoisted in the usual manner and dumped into the upper hopper. Fluid is supplied to the motive cylinder 27 to lift the upper bell 25 when desired and allow the material to drop into the lower hopper, the bell of which is actuated as desired by the other motive cylinder to allow the stock to pass down through the chute in the furnace, the upper bell being closed when the lower bell is raised, and vice versa. Between the successive discharges of the main hopper the operator turns this hopper and chute into different radial positions, so that the material will be directed through the inclined chute to the different parts of the blast-furnace area.

The advantages of my invention result from the apparatus for turning the discharge-chute at the will of the operator, from the downwardly-extending tubular form of this chute, which reduces the amount of ore carried out by the gases, from the efficient sealing of the top of the furnace, and generally from the simplicity of the structure and the ease with which it may be applied to existing furnaces.

Many changes may be made in the form and arrangement of the parts without departing from my invention, since

I claim—

1. A blast-furnace having a top-closing plate with a central hole opening into the gas-chamber of the furnace, a revoluble hopper centrally mounted above the hole and provided with a downwardly-extending inclined chute arranged to deposit material within the furnace-chamber, mechanism for stopping flow of gas through the chute and mechanism for turning the hopper; substantially as described.

2. A blast-furnace having a top-closing plate, a centrally-located revoluble hopper mounted thereon, and having a bottom-closure, an inclined inclosed chute depending from the hopper below the closure, and mechanism for turning the hopper; substantially as described.

3. A blast-furnace having a top-closing plate with a central hole opening directly into the furnace-chamber, a revoluble hopper centrally mounted above the hole, and having a depending inclined chute arranged to deposit material within the gas-chamber of the furnace, mechanism for preventing flow of gas upwardly through the chute and mechanism under the control of the operator for turning said hopper to any desired point; substantially as described.

4. A blast-furnace having a top plate provided with a central hole opening directly into the furnace-chamber, a revoluble hopper centrally mounted above the hole and having an inclined chute, mechanism for preventing flow of gas upwardly through the chute, means for turning the hopper, and a water-sealing device between the hopper and the top plate; substantially as described.

5. A blast-furnace having a top-closing plate, means for water-sealing its edges, a revoluble hopper having an inclined discharge-chute leading through the plate, mechanism for preventing flow of gas upwardly through the chute into the gas-chamber of the furnace and means for turning said hopper; substantially as described.

6. A blast-furnace having a revoluble main hopper with an inclined discharge-chute, an upper supplemental hopper secured to the main hopper, closing-bells for both hoppers, and mechanism for turning the hoppers; substantially as described.

7. A blast-furnace having a top-closing plate with a water-sealing trough and a central hole opening at the furnace-chamber, a revoluble hopper centrally mounted over the hole and having a depending inclined chute arranged to deposit material within the furnace, a depending flange on the hopper entering the sealing-trough, mechanism for preventing flow of gas upwardly through the chute and mechanism for turning the hopper; substantially as described.

8. A blast-furnace having a top-closing plate arranged to receive a pool of water, and explosion-doors in pool-covered portion of said plate; substantially as described.

9. A blast-furnace having a top-closing plate arranged to receive a pool of water and having a central hole opening into the gas-chamber of the furnace, a revoluble hopper supported centrally over the hole upon anti-friction-bearings carried on the top plate, said hopper having a depending inclined chute arranged to discharge material within the furnace, mechanism for preventing flow of gas upwardly through the chute and mechanism for turning the hopper; substantially as described.

10. A blast-furnace having an upper hopper and a lower hopper with closing-bells therefor, and two cylinders each independently connected to a bell to operate it, at least one of said cylinders being located above both bells and having its longitudinal axis passing through the centers of the bells; substantially as described.

11. A blast-furnace having a revoluble hopper with a depending inclined chute, said

hopper having two depending concentric annular flanges, and a water-sealing trough into which the flanges extend, one of the flanges having a bearing resting on a supporting-bearing on the furnace; substantially as described.

12. A blast-furnace having a top plate provided with a water-sealing trough, a revoluble hopper mounted over the plate and having an inclined chute, the hopper having depending flanges dipping into the sealing-trough, and a supporting-bearing for the hopper between said flanges; substantially as described.

13. A blast-furnace having a top-closing plate, a centrally-located revoluble hopper mounted thereon and having a downwardly-extending inclined chute arranged to deposit material within the furnace, mechanism for turning the hopper, and sealing mechanism for stopping flow of gas upwardly through the chute; substantially as described.

14. A blast-furnace having an upper hopper and a lower hopper with closing-bells therefor, and two cylinders arranged in line and having their longitudinal axes passing through the center of the bells said motive cylinders being directly and independently connected to the bells to operate them; substantially as described.

In testimony whereof I have hereunto set my hand.

JULIAN KENNEDY.

Witnesses:
G. I. HOLDSHIP,
G. B. BLEMING.