

No. 698,839.

Patented Apr. 29, 1902.

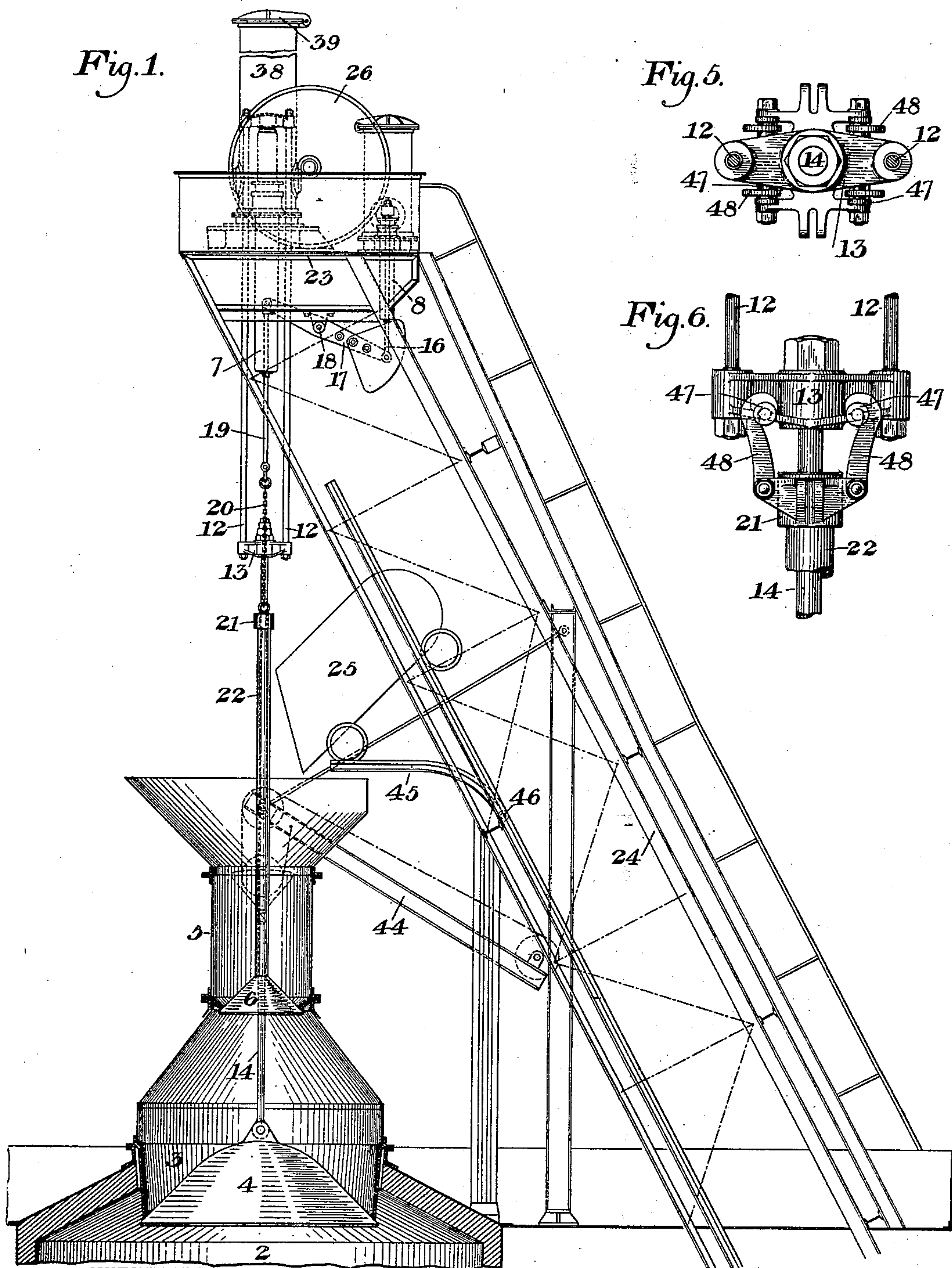
J. KENNEDY.

BLAST FURNACE FILLING APPARATUS.

(Application filed Apr. 16, 1901.)

(No Model.)

4 Sheets—Sheet 1.



WITNESSES

Warren W. Swartz.
H. M. Corum

INVENTOR

Julian Kennedy
by Baker & Byrnes
his attys

No. 698,839.

Patented Apr. 29, 1902.

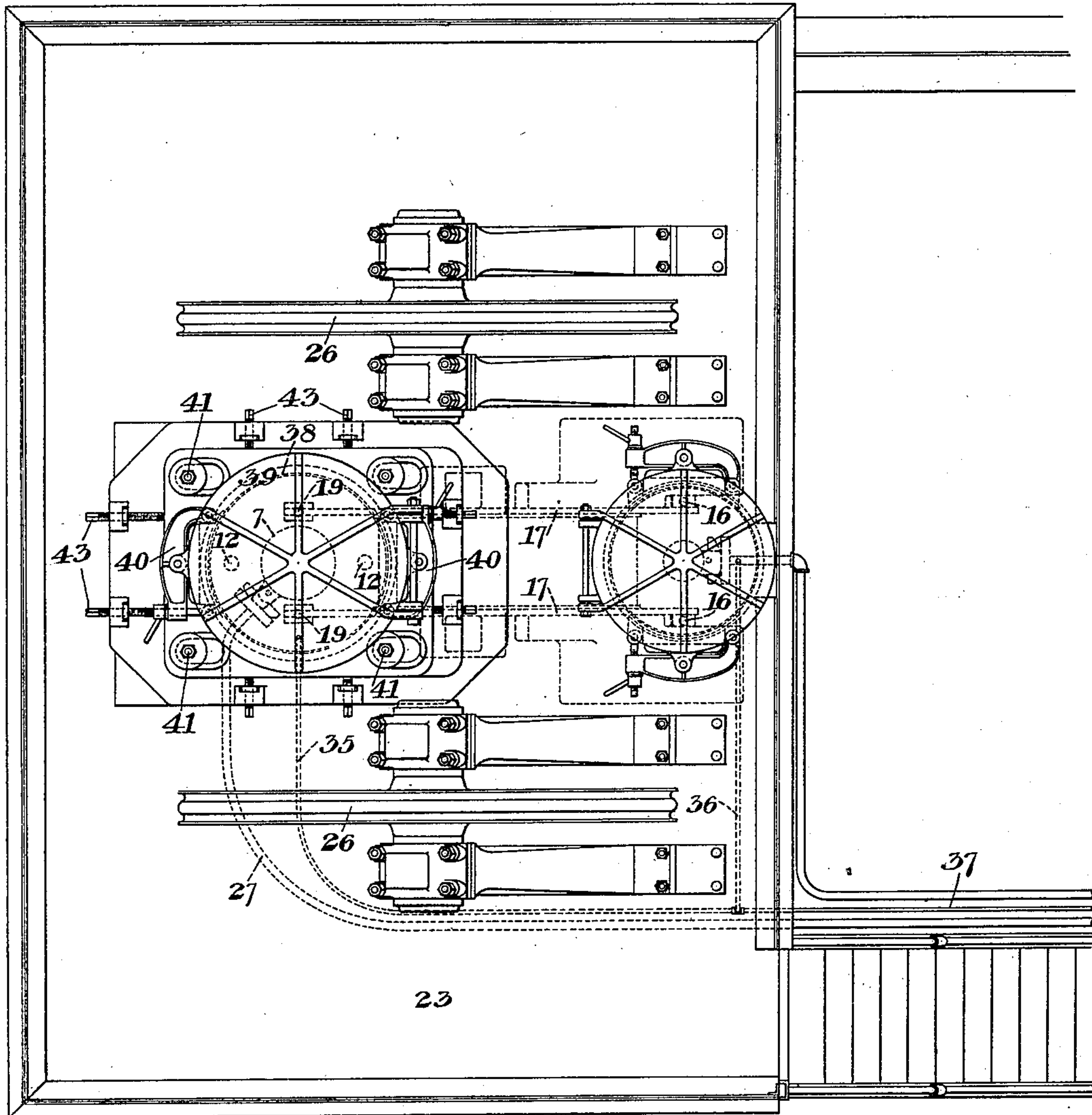
J. KENNEDY.
BLAST FURNACE FILLING APPARATUS.

(Application filed Apr. 16, 1901.)

(No Model.)

4 Sheets—Sheet 2.

Fig. 2.



WITNESSES

Warren W. Swartz
J. M. Corwin

INVENTOR

Julian Kennedy
by Baker & Byrnes
his attys.

No. 698,839.

Patented Apr. 29, 1902.

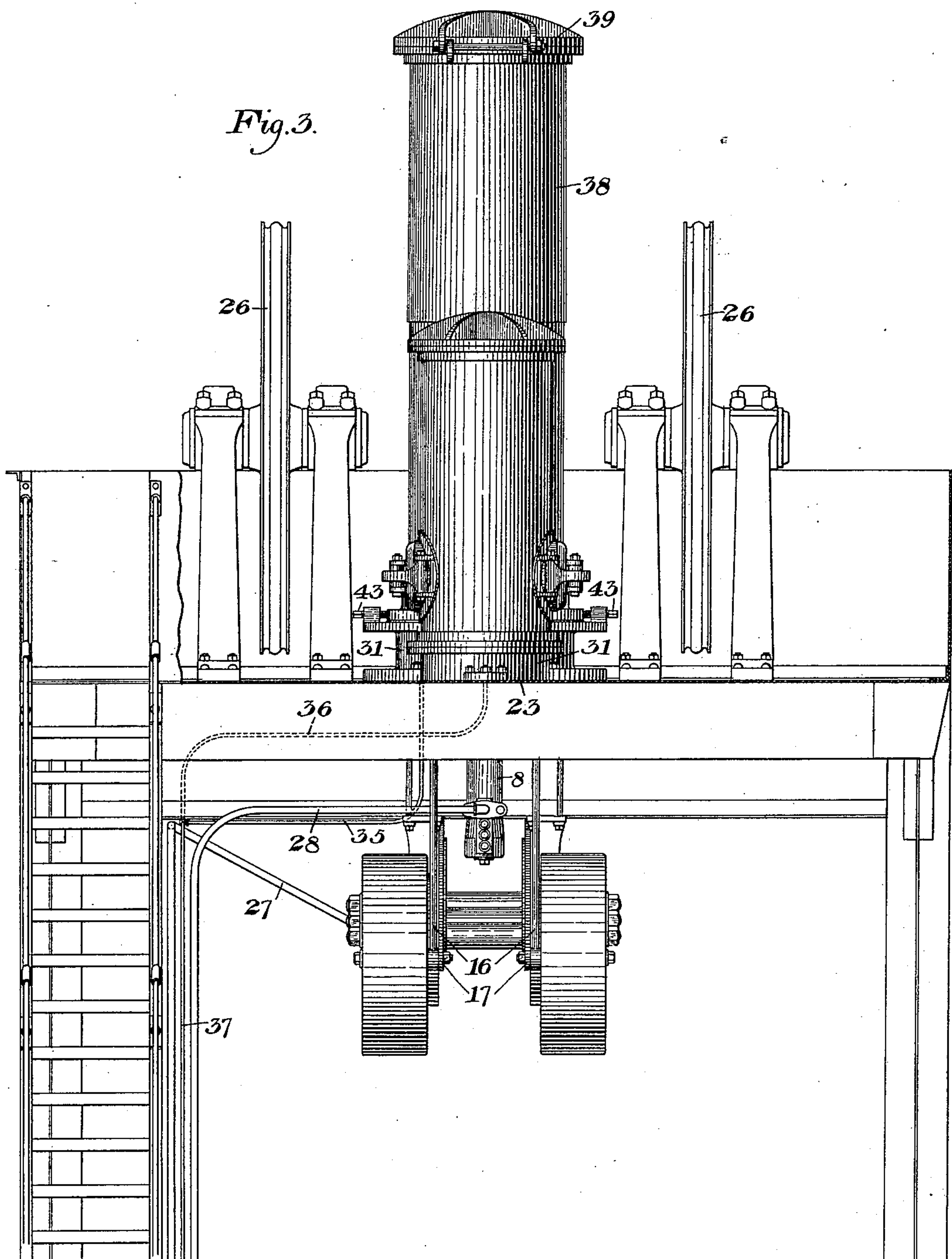
J. KENNEDY.

BLAST FURNACE FILLING APPARATUS.

(Application filed Apr. 16, 1901.)

(No Model.)

4 Sheets—Sheet 3.



WITNESSES

Warren W. Swartz
St. M. Corwin

INVENTOR

Julian Kennedy
by Barlow & Symes
his attys.

No. 698,839.

Patented Apr. 29, 1902.

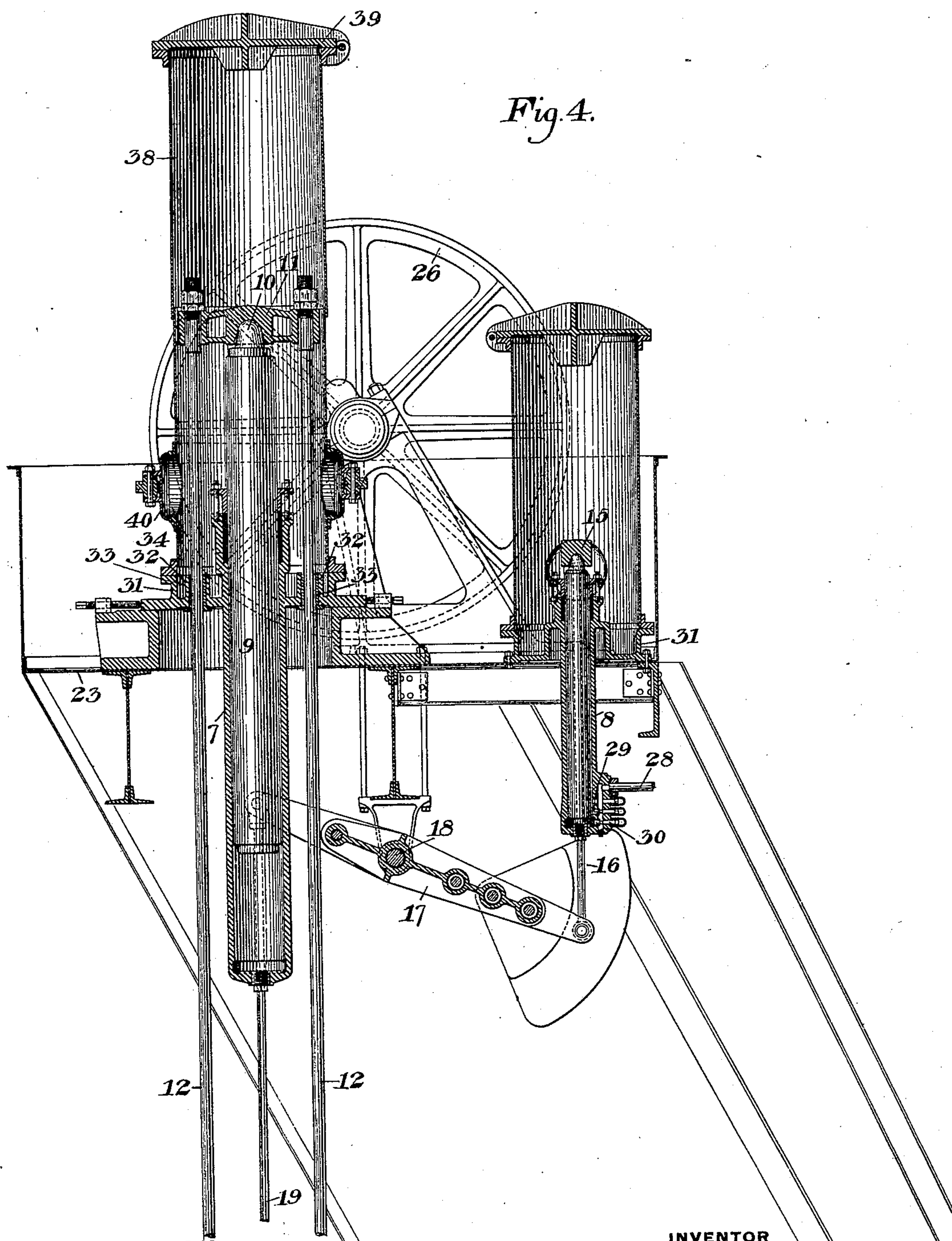
J. KENNEDY.

BLAST FURNACE FILLING APPARATUS.

(Application filed Apr. 18, 1901.)

4 Sheets—Sheet 4.

(No Model.)



WITNESSES

Warren W. Swartz
J. M. Corwin

INVENTOR

Julian Kennedy
by Baker & Byrnes
his attys.

UNITED STATES PATENT OFFICE.

JULIAN KENNEDY, OF PITTSBURG, PENNSYLVANIA.

BLAST-FURNACE-FILLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 698,839, dated April 29, 1902.

Application filed April 16, 1901. Serial No. 56,093. (No model.)

To all whom it may concern:

Be it known that I, JULIAN KENNEDY, of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Blast-Furnace-Filling 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, partly in section, showing a blast-furnace top provided with my improved apparatus. Fig. 2 is a top plan view of the same. Fig. 3 is a front elevation showing a portion of the apparatus. Fig. 4 is a vertical section at right angles to Fig. 3, and Figs. 5 and 6 are detail top plan and side elevational views of a cross-head connection I prefer to employ.

My invention relates to the filling apparatus employed for blast-furnaces and is designed to provide improved motive-cylinder apparatus for actuating the bells, to improve the supporting mechanism for the cylinders and remove a large part of the framework now used on blast-furnace tops, to improve the mechanism for removing and replacing the lower bell, and to simplify and cheapen the structure.

In the drawings, 2 represents a blast-furnace having a lower hopper 3, with charging-bell 4, and an upper hopper 5, with a charging-bell 6. These hoppers, with their bells, may be of any desirable form and are operated by hydraulic single-acting cylinders 7 and 8. The cylinder 7 is located above and in line with the axis of the bells, and its plunger 9 is provided with an upper rounded post 10, fitting in a central recess in cross-head 11, connected by depending rods 12 to cross-head 13. Secured to this cross-head is a rod 14, leading to the lower bell 4.

The plunger of the other cylinder 8 is connected by cross-head 15 and depending rods 16 to counterweighted levers 17, mounted upon shaft 18, the front extensions of these arms having depending rods 19, from which extend chains 20, connected to cross-head 21. The tubular rod 22, carrying the bell 6, is centrally secured to the cross-head 21. This arrangement of the connections and cylinders

may be varied without departing from the scope of my broader claims.

Both of the motive cylinders are mounted upon a platform or framework 23, secured to the extended and overhanging truss portion of the track-framework 24 for the skip 25. This inclined track is thus extended to form an overhanging cantaliver, to which the cylinders and the cable-pulleys 26 are secured. A large part of the framing now necessary on the top of the blast-furnace is thus done away with, and the top structure is simplified and cheapened, while giving greater facility for repairs or replacing of parts.

Each of the motive cylinders is preferably operated by oil or similar fluid which is forced into and exhausted from these cylinders through pipes 27 and 28, respectively leading from suitable hydraulic valves in the engine-room, and I preferably cushion the downward movement of the plunger or ram by providing a series of holes 29 in the cylinder, whose openings may be regulated in size by adjustable valves 30. By throttling the flow-out through these valves the descent of the plunger may be cushioned as desired.

In order to prevent leakage of the oil and protect the parts from dust or ore, I form the upper head 31 of each motive cylinder with an annular pocket or groove extending around it and through which the rods from the cross-head extend, and to prevent the oil from contacting with these depending rods I provide cups 32, which extend up from the bottom of the annular groove and contain bushings 33 for the rods. Any oil leaking from the stuffing-box 34 collects in the annular pocket around the cups or hollow posts for the rods and thence runs down through drip-pipes 35 and 36, leading to a common pipe 37, extending down into the engine-room, and under the end of which a receptacle may be placed. By watching the accumulation of oil in the receptacle the operator can easily learn the condition of the cylinder-packings at any time and if the leak is excessive can tighten or replace the packings.

Around the annular oil-pocket of each cylinder is a cylindrical casing 38, extending upwardly and having a hinged top lid 39

and side hand-holes, closed by hinged and clamped doors 40. By opening either of these hand-holes in the sides of the casing access is given to the packings and the head of the cylinder and plunger for repairs.

In order to keep the cylinder heads and casings in proper alinement, I provide them with flanged extensions having slotted openings through which extend the clamping-bolts 41, as shown in Fig. 2, and adjusting-screws 43 are used to adjust these heads. By loosening the screws on one side and screwing up those on the other the rod bushings or guides may be properly alined.

The main motive cylinder 7 is made with a much longer stroke than is necessary to operate its bell, the stroke being ordinarily about three times the usual stroke, and when the main bell is injured and needs to be replaced the main hopper hold-down-bolts are loosened, and the bell, with the entire hopper mechanism supported thereon, is raised above the top of the furnace. Rails are then slid under the bell, which is lowered upon them and detached from its supporting-rod. This bell is then moved sidewise and handled by a pivot-crane 44, which is mounted upon the top structure of the furnace, by which it is lowered to the ground. The other bell is then lifted and swung in by this crane, and being connected up the parts are lowered to their normal position and clamped in place. By thus making the operating-cylinder with a stroke long enough to lift the bell and parts entirely above the top of the furnace I reduce the time for replacing the bell to a small fraction of that now required.

The overhanging track-section 45 is preferably pivoted, as shown at 46 in Fig. 1, so that it will swing back and not obstruct the lifting of the hopper mechanism when replacing the bell.

To assist in removing and replacing the bell, I preferably provide mechanism for connecting both bells to one cylinder to be used in lifting these bells. Thus in Figs. 5 and 6 I show the upper cross-head 13 as provided with laterally-projecting spool-shaped supports 47, and the lower cross-head 21 has four swinging hooks 48, which may be thrown into engagement with the supports 47, as shown in these figures. In normal operation of the furnace these hooks are swung back and hang down; but in taking out the bell they are engaged with the upper cross-head, so that the main cylinder lifts both bells together.

The advantages of my invention will be apparent to those skilled in blast-furnace practice. The use of the hydraulic cylinders gives a simple and positive means for actuating the bells which will not freeze in cold weather. The inclosing of the parts around the head protects them from dust, which would cut the parts, and by the oil-drip recess the oil is kept away from the rods, while the amount of leakage can be constantly de-

termined, thus informing the operator of the condition of the packings. The mounting of the operating mechanism above the overhanging cantaliver clears away from the top a large proportion of the framework formerly necessary, reducing the cost and making the construction and replacing easy.

The use of the long-stroke cylinder for the main bell greatly simplifies and cheapens the replacing of this bell, and the entire operating mechanism is of two parts and not liable to get out of order.

Many changes may be made in the form and arrangement of the operating-cylinders, the bell and hopper mechanism, and the other parts without departing from my invention.

I claim—

1. A blast-furnace having an inclined track leading to its top, with an overhung cantaliver portion, a bell, and bell-operating mechanism supported on said cantaliver; substantially as described.

2. A blast-furnace having an inclined track leading to its top, with an overhung extension, a plurality of bells and bell-operating cylinders mounted upon the overhanging cantaliver extension and connected to the bells, at least one of the cylinders being above and in line with the axes of the bells; substantially as described.

3. A blast-furnace having a charging bell and hopper, and a cylinder arranged to raise and lower the bell and connected thereto, said cylinder having at one movement a stroke of sufficient length to lift the bell above the blast-furnace top for replacing it; substantially as described.

4. A blast-furnace having a charging bell and hopper, and a motive cylinder above and in line with the axis of the bell and connected thereto, said cylinder having at one movement a stroke of sufficient length to lift the bell entirely above the top of the furnace; substantially as described.

5. A blast-furnace having a charging bell and hopper, a motive cylinder above the bell and containing a plunger carrying at its upper end connections leading downwardly to the bell, a valve-controlled source of non-freezing liquid under pressure leading to the cylinder, and a casing inclosing the plunger and the upper parts of its connection; substantially as described.

6. A blast-furnace having a charging-bell, a motive cylinder connected thereto, said cylinder having a plunger, an oil-pocket at the head of the cylinder, a cross-head carried on the plunger and a rod extending from the cross-head down through the pocket and connected to the bell; substantially as described.

7. A blast-furnace having a bell, and a motive cylinder having a plunger connected to said bell, said cylinder having a stationary casing or cover extending upwardly from its

head and containing a cross-head with rods extending down to the cylinder connection; substantially as described.

5 8. A blast-furnace having a bell-operating cylinder containing a plunger, an annular liquid-receiving pocket surrounding its head portions, and a stationary casing surrounding the pocket and arranged to inclose the plunger in its movements; substantially as described.

10 9. A blast-furnace having a bell-operating cylinder provided with packing, and having a liquid-pocket arranged to receive the liquid from the packing; and a drip-pipe leading from the pocket down to near the ground-level; substantially as described.

15 10. A blast-furnace having a bell-operating cylinder provided with a liquid-receiving recess around its head, a plunger within the cylinder, and a hollow post in the recess through which extends a rod connected to the plunger; substantially as described.

20 11. A blast-furnace having a bell-operating

hydraulic cylinder provided with a cross-head secured to the plunger, rods depending from the cross-head, guide-sleeves through which the rods extend, and means for adjusting the cylinder laterally and clamping it in adjusted position; substantially as described.

12. A blast-furnace having a main bell and hopper, and a supplemental bell and hopper, a motive cylinder operating each bell, and means for connecting both bells to one of said cylinders; substantially as described.

13. A blast-furnace having a main bell and hopper and a supplemental bell and hopper, motive cylinders having cross-head connections with said bells, and detachable locking devices for securing the cross-heads together; substantially as described.

In testimony whereof I have hereunto set my hand.

JULIAN KENNEDY.

Witnesses:

C. P. BYRNES,

H. M. CORWIN.