

W. KENNEDY.
BLAST FURNACE CHARGING APPARATUS.
APPLICATION FILED FEB. 26, 1906.

955,885.

Patented Apr. 26, 1910

3 SHEETS—SHEET 1.

FIG. 1.

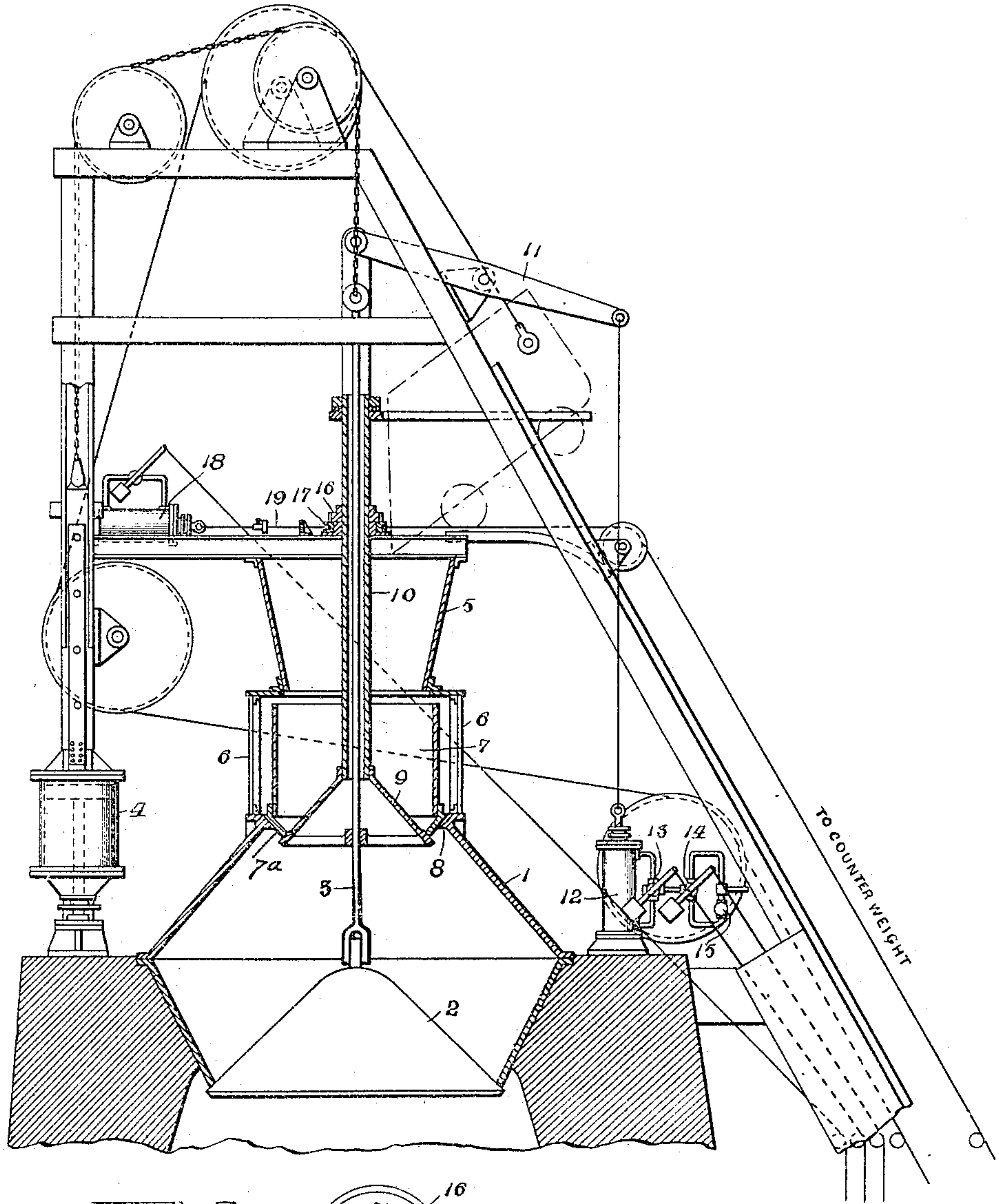
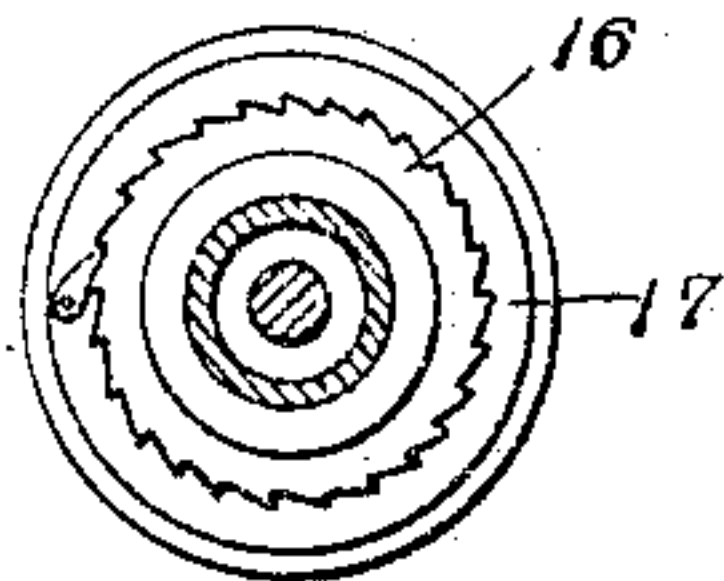


FIG. 3.



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3 SHEETS—SHEET 2.

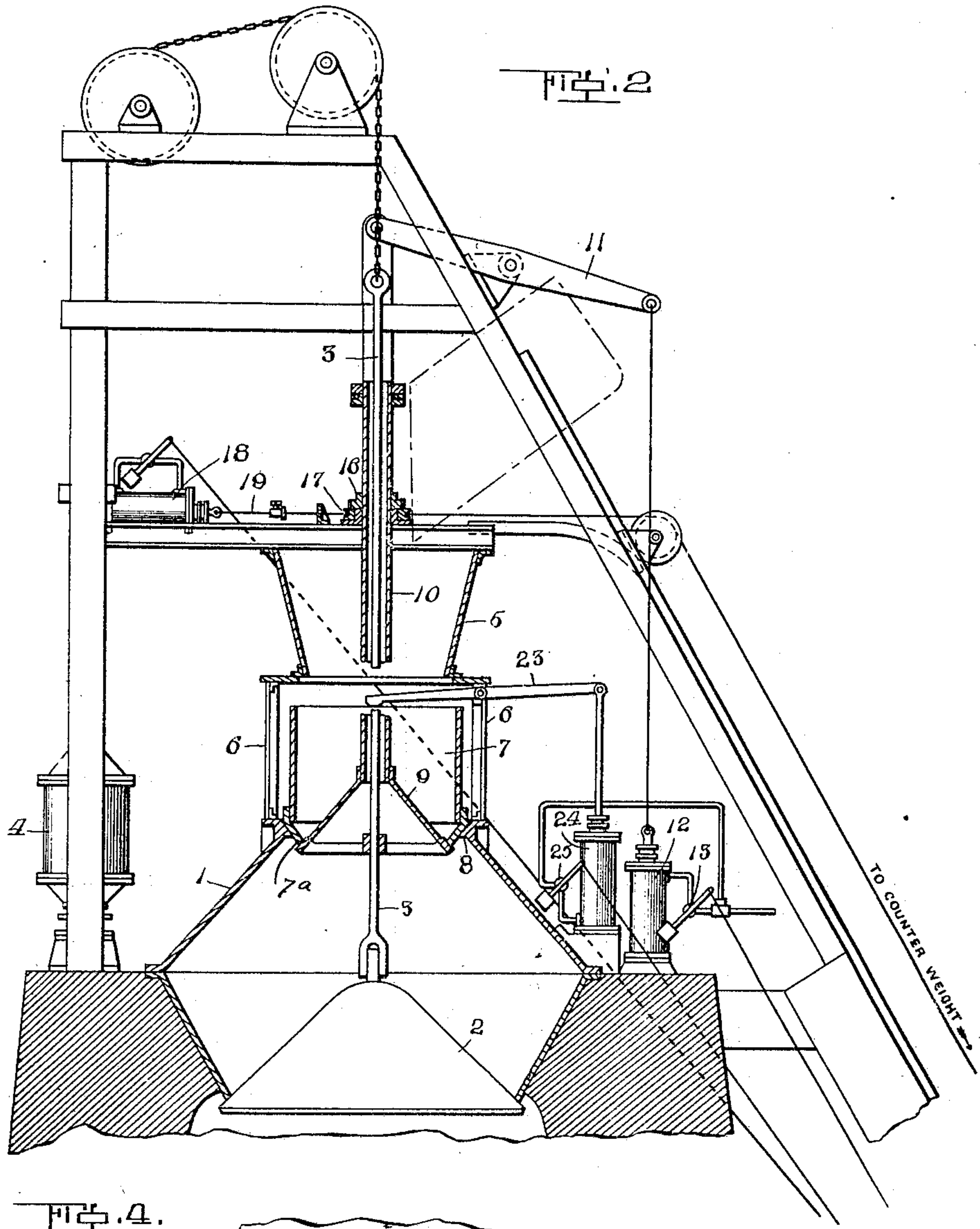


FIG. 2.

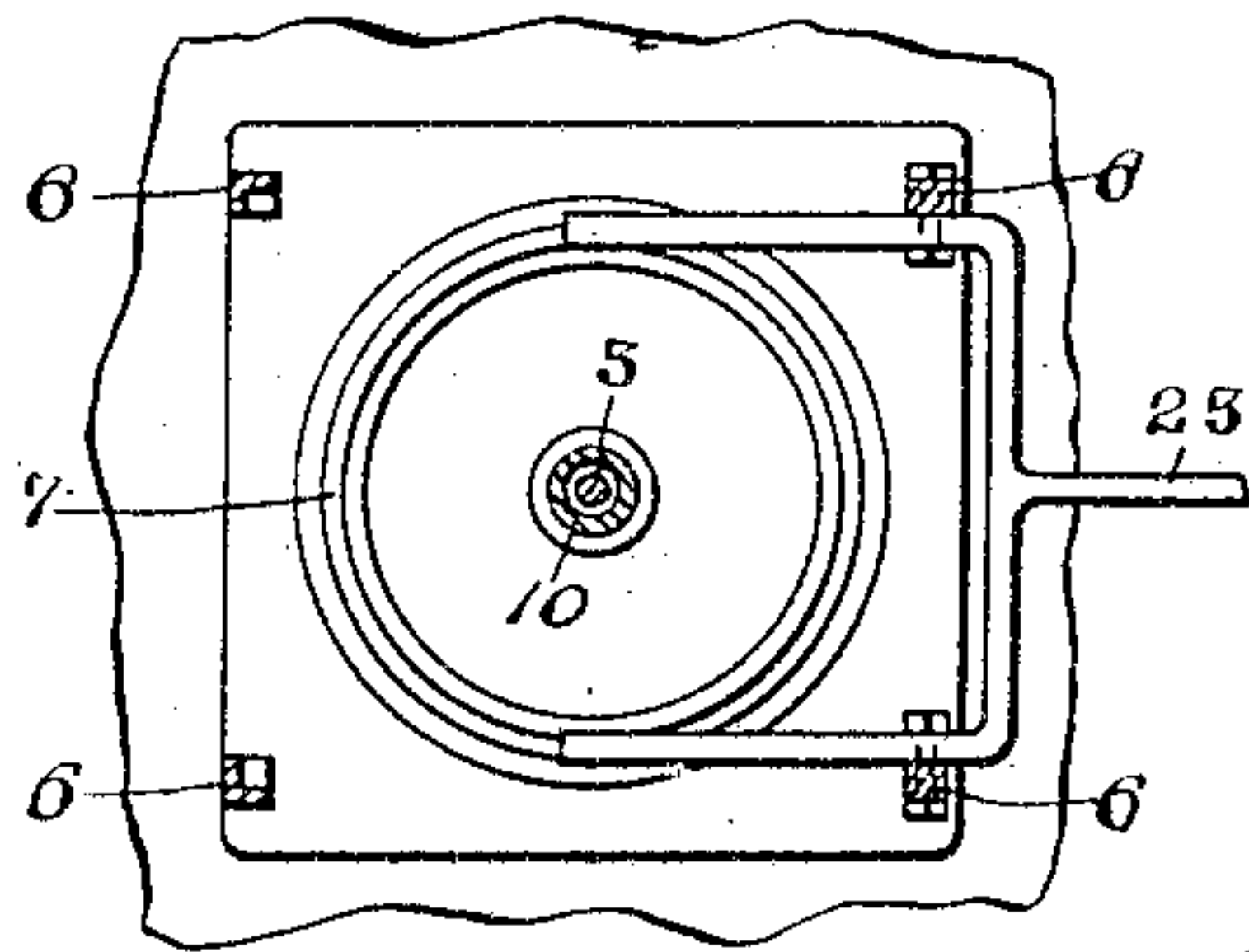


FIG. 4.

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3 SHEETS—SHEET 3.

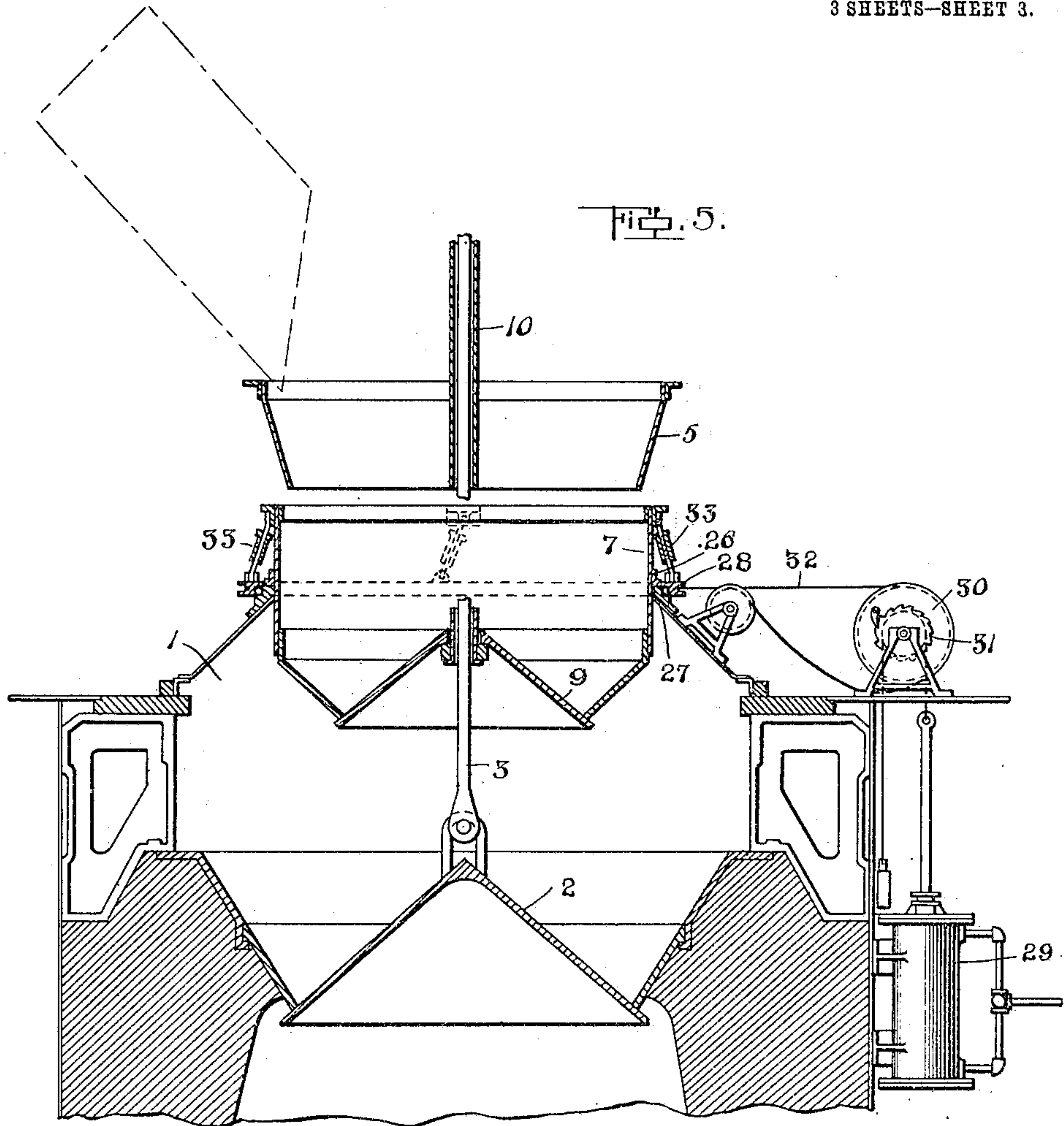
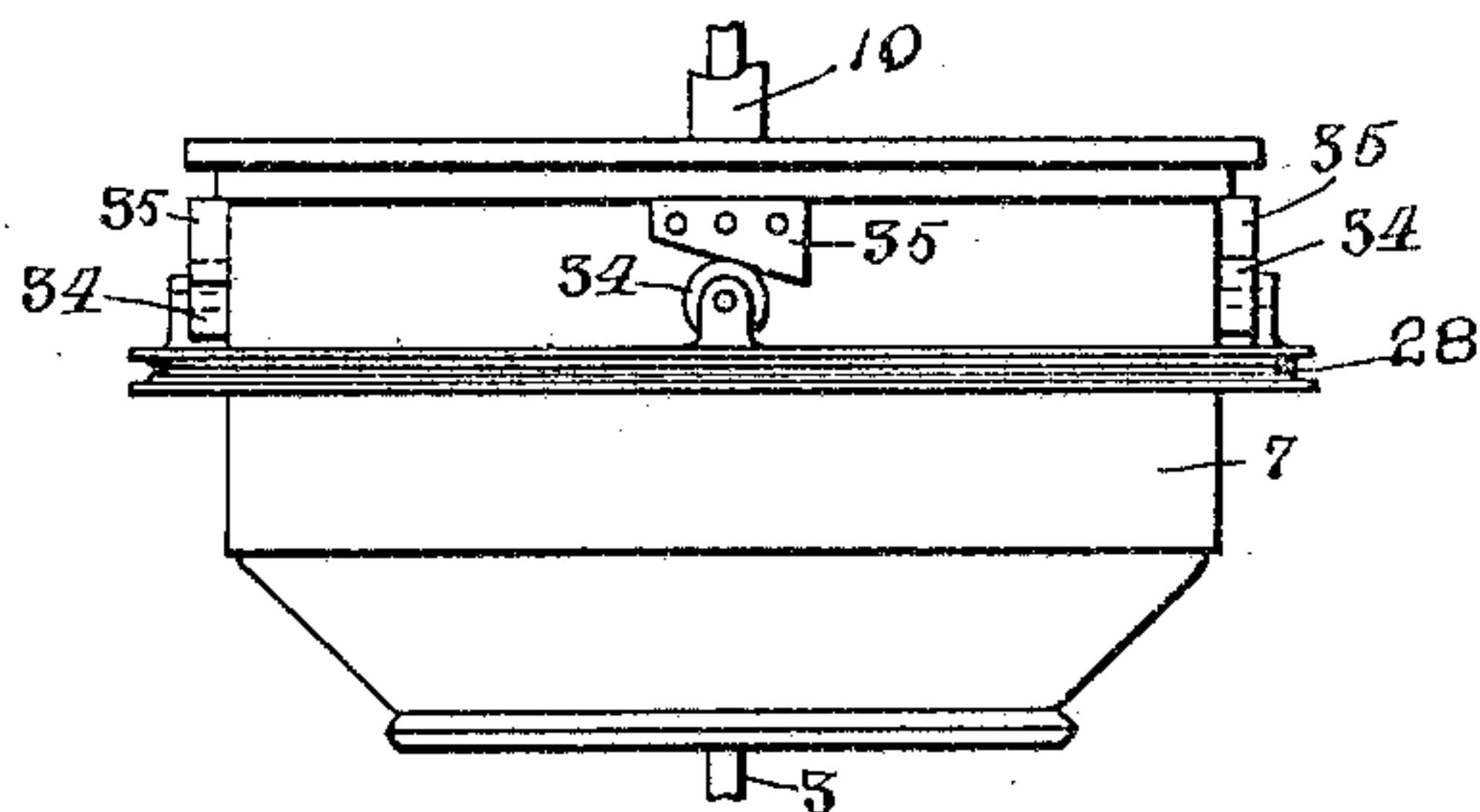


Fig. 6.



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UNITED STATES PATENT OFFICE.

WALTER KENNEDY, OF BELLEVUE, PENNSYLVANIA.

BLAST-FURNACE-CHARGING APPARATUS.

955,885.

Specification of Letters Patent.

Patented Apr. 26, 1910.

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To all whom it may concern:

Be it known that I, WALTER KENNEDY, residing at Bellevue, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Blast-Furnace-Charging Apparatus, of which improvements the following is a specification.

10 The invention described herein relates to certain improvements in charging apparatus for blast furnaces. In charging blast furnaces the material, as ore, coke, etc., is drawn up by a skip and discharged usually from one side into a hopper. By reason of this side discharge the material is unevenly distributed on the bell of the main hopper and consequently unevenly distributed in the furnace.

20 The present invention has for its object a construction of apparatus interposed between the skip and the main bell whereby the material although discharged always from one side may be evenly distributed upon the main bell.

25 In general terms the invention consists in the employment of a receptacle intermediate between the receiving and main hopper and provided with a movable closure in combination with means for rotating such receptacle any desired distance so that the material contained in such receptacle may be discharged at any desired point upon the bell of the main hopper.

35 The invention is hereinafter more fully described and claimed.

40 In the accompanying drawings forming a part of this specification, Figure 1 is a view partly in section and partly in elevation of the upper part of a blast furnace having my improved distributing apparatus applied thereto; Fig. 2 is a view similar to Fig. 1 illustrating certain modifications of my distributing apparatus; Fig. 3 is a detail view illustrating a form of connection between the receptacle for the material and the means whereby the latter is rotated; Fig. 4 is a detail view illustrating the means for holding the receptacle on its seat in the mouth of the main hopper; Fig. 5 is a view similar to Fig. 1 illustrating a further modification of my improvement and Fig. 6 is a view of the receptacle shown in Fig. 5 in combination with a modification of the means for vertically moving the same.

55 In the practice of my invention, the fur-

nace is provided with a main hopper, 1, having a bell, 2, which can be raised and lowered through the medium of a rod 3 by any suitable means such as the fluid pressure cylinder 4 connected to the rod 3 by a chain or wire rope passing over guide-pulleys on the frame of the furnace. A distributing hopper 5 is arranged above the main hopper 2, being supported by the main hopper through the medium of posts or uprights, 6. A receptacle, 7, is arranged intermediate of the main and distributing hoppers and has its lower end 7^a, which may be detachable, constructed to form a tight bearing with a seat, 8, at the inlet end of the main hopper, so as to prevent the escape of gases except when the receptacle is raised as hereinafter described. This receptacle which for convenience will be termed the distributing receptacle, has a suitable closure, such for example as the bell, 9, which is connected to a sleeve, 10, surrounding the rod, 3, and connected at its upper end to any suitable means whereby the bell may be shifted vertically as hereinafter described. A suitable means for raising and lowering this bell or closure, 9, consists of a lever, 11, connected to the sleeve, 10, at one end and at its opposite end to the piston of the fluid-pressure cylinder, 12. The ends of the cylinder, 12, are connected to a fluid-pressure supply through a three-way valve mechanism, 13, and regulating valves, 14 and 15. The pressure of the fluid employed is such that acting on the piston in the cylinder, 12, it will raise the bell, 9, receptacle, 7, and the charge contained therein. But, as during a portion of the time it is simply required to hold the bell in a closed position without raising the receptacle, 7, from its seat, the pressure operative to effect such holding is reduced by the valve, 15, and the valve 14 is normally held in position to prevent the flow of the high-pressure to the upper end of the cylinder, but open to permit of the pressure reduced by the valve 15 to flow to the upper end of the cylinder. After the material has been charged into the receptacle by the skip, and it is desired to rotate the receptacle so as to discharge its contents on the main bell, 2, at a point different from the previous discharge, the valve 14 is shifted so as to permit high-pressure to flow past the valve, 13, to the upper end of the cylinder, 12, and thereby raise the bell, 9, and the receptacle, 7, which is then rotated as

hereinafter described, to any desired length of arc. After the receptacle has been thus rotated the valve, 13, is shifted so as to cut off the flow of high-pressure to the upper end of the cylinder, 12, and open such end to the exhaust. This will permit of the lowering of the receptacle, 7, onto its seat in the main hopper and the further lowering of the bell, 9, to permit the discharge of the contents of the receptacle onto the bell, 2. As soon as the contents are discharged, the valve, 13, is again shifted thereby allowing reduced fluid pressure to flow to the upper end of the cylinder, 12, and close the bell, 9, the valve, 14, having been previously restored to normal position, whereby the flow of high-pressure to the cylinder is prevented and the flow of low pressure permitted.

In order to rotate the receptacle, 7, when raised as heretofore described, a toothed-wheel, 16, is secured to the sleeve, 10, and a wheel, 17, loosely mounted on such sleeve is provided with a pawl-and-ratchet or other suitable means for connection with the toothed-wheel, as shown in Fig. 3, so as to drive the latter when the disk or wheel, 17, is rotated in one direction. The rotation of this disk or wheel, 17, is effected in one direction by means of a fluid-pressure cylinder, 18, having its piston connected to a rope, 19, passing around the wheel, 17, and connected at its lower end to a counterpoise weight. These parts are so arranged that when the rope is drawn by the piston of the cylinder, 18, the wheel, 17, will be rotated and through the pawl engagement with the toothed wheel, 16, the receptacle, 7, and bell, 9, will also be rotated. The reverse rotation of the wheel, 17, is effected by the counterweight.

In the construction shown in Fig. 1, the vertical movements of the receptacle and its closure are effected by a variation in the pressure of the actuating fluid employed. In Fig. 2 is shown a construction whereby fluid of uniform pressure sufficient to reduce the pressure of the receptacle on its seat is employed for this purpose, but in such case means are preferably employed for holding the receptacle on its seat.

While ordinarily the weight of the receptacle, 7, will be sufficient to maintain a tight joint between the receptacle and its seat, 8, the lifting force employed for holding the closure, 9, to its seat will always tend to lift the receptacle, and with careless operators such receptacle might be slightly lifted so as to permit of the escape of gases. In order to prevent this I employ means for holding the receptacle to its seat as against the lifting action of the bell, 9. A convenient means to this end consists of a lever, 23, pivotally mounted on one of the posts or standards, 6, and having one end forked so as to bear upon the upper edges of the receptacle,

7, as shown in Fig. 4. The opposite end of this lever, 23, is connected to the piston of the cylinder, 24, connected through a valve, 25, to a fluid pressure supply. When it is desired to lift the receptacle, 7, this valve, 25, is shifted so as to permit the escape of the fluid-pressure from the cylinder. The vertical movement given the receptacle as heretofore described need only be sufficient to permit of a free movement of rotation of the receptacle, and need not necessarily be sufficient to lift the receptacle from contact with its seat.

In Figs. 5 and 6, I have shown a construction in which the application of power to the receptacle to rotate the same will at the same time sufficiently relieve the friction between the receptacle and the seat to permit of such rotation. In the construction shown, the receptacle 7 is provided with a flange, 26, resting upon the seat, 27, on the upper wall of the main hopper. A ring or annulus, 28, is mounted upon the main hopper, 1, and is adapted to be rotated by a cylinder, 29, through any suitable means, such for example as a drum 30, which is positively rotated in one direction by the piston of the cylinder through the medium of a pawl-and-ratchet interposed between the wheel 31, which is shifted by the piston of the cylinder, and the drum, 30. An endless rope, 32, is passed around the annulus, 28, and around the drum 30. When it is desired to rotate the receptacle, 7, the drum 30, is rotated and with it the annulus, 28, in such direction that a lifting force is applied to the receptacle, 7, to relieve its pressure on its seat. This lifting force can be transmitted from the annulus to the receptacle in many ways, as for example in Fig. 5 I have shown arms 33, pivotally connected to the annulus and the receptacle, and normally arranged in a position forming a slight angle with the axis of the receptacle. The resistance to rotation presented by the bearing of the receptacle on its seat, will cause upward force to be applied to the receptacle thereby lifting it and permitting its free rotation. In Fig. 6 the annulus is provided with a series of rollers, 34, and inclined blocks 35 are secured to the receptacle. When the annulus is rotated, the rollers will pass under the blocks, 35, lift the same and when the frictional resistance is sufficiently relieved, will carry the receptacle around with the annulus.

I claim herein as my invention:

1. In a blast furnace charging apparatus, the combination of a main hopper and bell, a receptacle movably mounted on the main hopper, a closure for said receptacle, means for shifting the closure and means for reducing the frictional resistance between the receptacle and its seat and for rotating the receptacle.

2. In a blast furnace charging apparatus,

the combination of a main hopper and bell, a receptacle movably mounted on the main hopper, a closure for said receptacle, means for shifting the closure and receptacle and means for rotating the receptacle.

3. In a blast furnace charging apparatus, the combination of a main hopper and bell, a receptacle having a seat on the main hopper and closing the same, means tending to move the receptacle from said seat, a closure for said receptacle and means for shifting the closure.

4. In a blast furnace charging apparatus,

the combination of a main hopper and bell, a receptacle arranged above the main hopper, a closure for the receptacle, means for applying a lifting force to the receptacle, means for rotating the receptacle and means for shifting the closure.

In testimony whereof, I have hereunto set my hand.

WALTER KENNEDY.

Witnesses:

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