

No. 666,129.

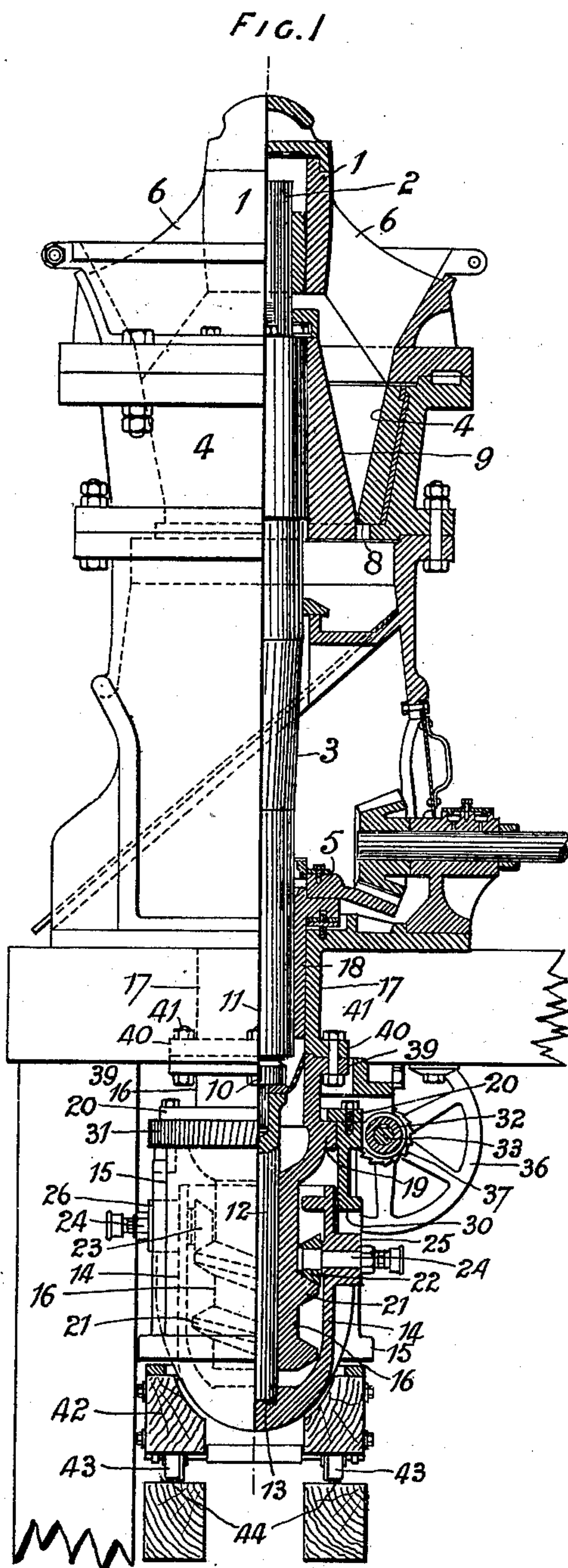
Patented Jan. 15, 1901.

E. D. CHESTER.

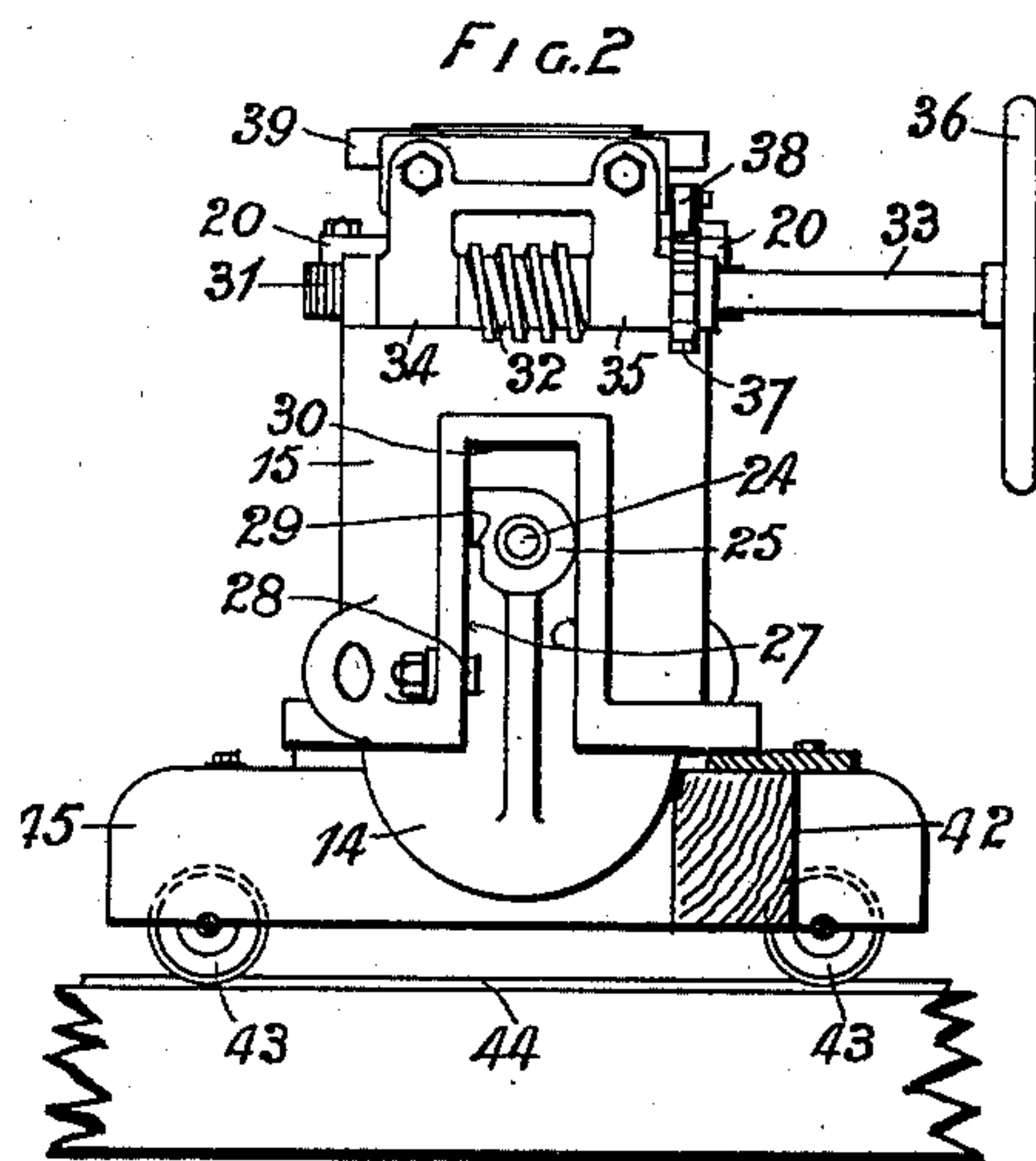
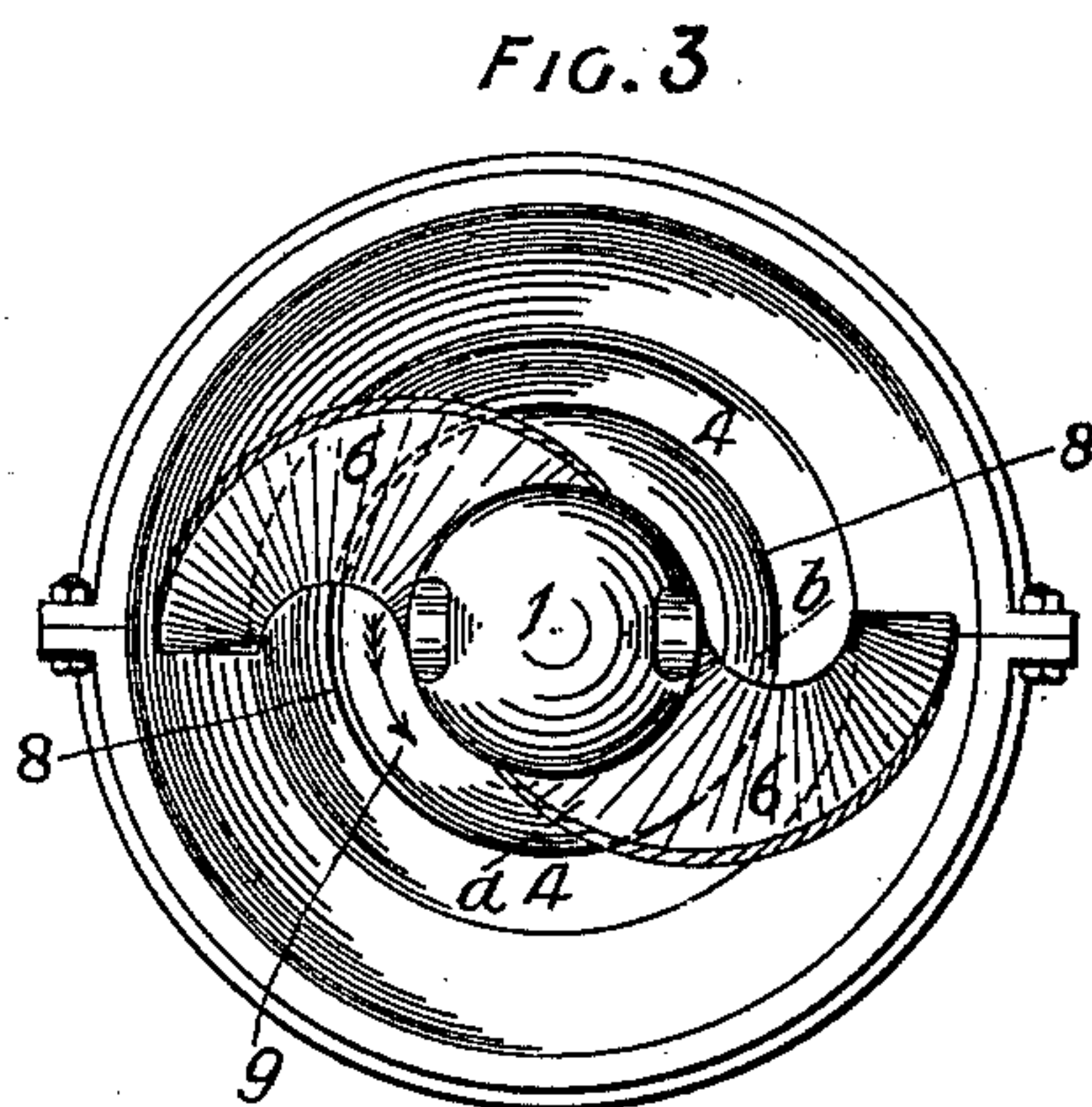
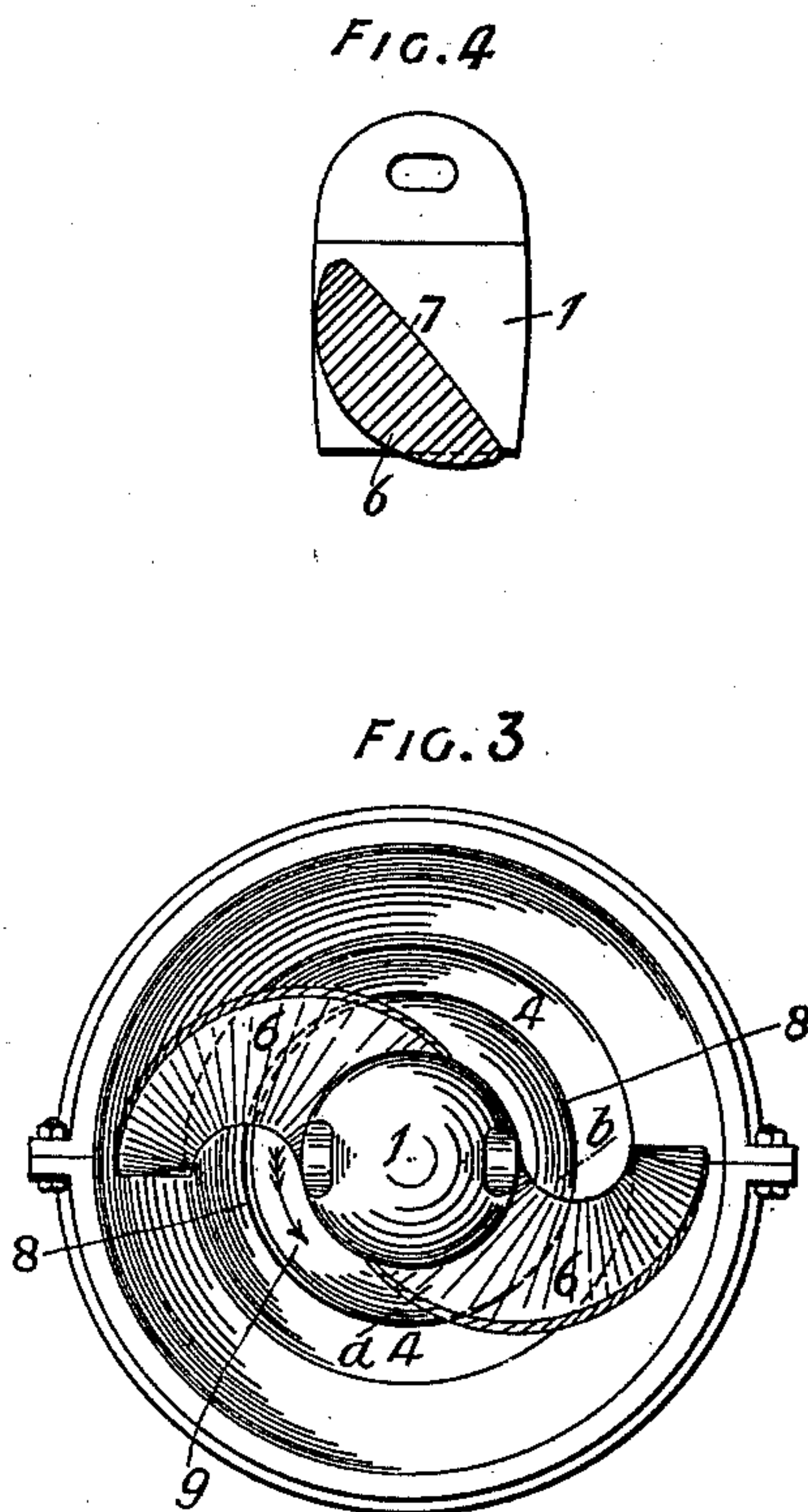
CRUSHER.

(Application filed June 25, 1900.)

(No Model.)



WITNESSES:
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UNITED STATES PATENT OFFICE.

EDWARD DESCOU CHESTER, OF LONDON, ENGLAND, ASSIGNOR TO THE
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CRUSHER.

SPECIFICATION forming part of Letters Patent No. 666,129, dated January 15, 1901.

Application filed June 25, 1900. Serial No. 21,465. (No model.)

To all whom it may concern:

Be it known that I, EDWARD DESCOU CHESTER, engineer, a resident of 120 Bishopsgate street within, in the city of London, England, have invented new and useful Improvements in Crushers for Ore and other Materials, (for which an application for patent has been filed in Great Britain, dated November 29, 1899, No. 23,816,) of which the following is a full, clear, and exact description.

This invention relates to crushers for ore and other materials of the type in which a crushing-cone carried by an upright spindle is caused to gyrate within a conical crushing-hopper or "concave," motion being communicated to the spindle by means of a driving-wheel mounted to rotate coaxially with the crushing-hopper and having an eccentric aperture through which the spindle passes freely, the spindle being held at top in coaxial alinement with the crushing-hopper and with the driving-wheel and supported at bottom upon a foot-step bearing, affording freedom for the gyratory movement of the spindle.

The invention relates, first, to means for adjusting the position of the crushing-cone vertically within the crushing-hopper in which it works, the object of such adjustment being to enable the size to which the material is crushed to be regulated with ease while the machine is working.

The invention relates, secondly, to means for enabling the whole of the mechanism whereby the adjustment just mentioned is effected to be readily removed for cleaning or repair.

The invention is illustrated in the accompanying drawings, forming part of this specification, wherein—

Figure 1 is a side elevation of the improved crusher, the right-hand side of the figure being shown in axial section. Fig. 2 is a rear elevation of the gearing by which the vertical adjustment of the crushing-cone is effected, shown separate from the machine as a whole and with the under carriage in section. Fig. 3 is a plan of the top of the machine. Fig. 4 is a section on line *a b*, Fig. 3. Similar reference-numerals denote like parts in all the figures.

According to this invention the head or cap 1, in which the upper end 2 of the gyratory spindle 3 is received and maintained in axial alinement with the crushing-hopper 4 and driving-wheel 5, is formed with supporting-arms 6 6, preferably two in number, each arm being curved in plan, as shown in Fig. 3, and sloped on the upper surface 7, as shown in Fig. 4, the concavity of the curvature and the direction of the slope being such as to cause the material thrown into the crushing-hopper on coming in contact with the arms 6 to be distributed around the circumference of the crushing edge 8 and in the direction of motion of the crushing-cone 9, as indicated by the arrow in Fig. 3. By this arrangement access of material to the crushing edge 8 is facilitated, choking of the hopper above the level of that edge is prevented, and every portion of the circumference of the crushing edge 8 is kept constantly supplied with material to be crushed, so that the output of the machine is increased in comparison with that of machines of the same class as usually constructed.

In order that the crushing-cone 9 may be raised or lowered within the crushing-hopper or concave 4, so as to regulate the size of the fragments that fall from the crushing edge 8, the foot-step 10, upon which the lower end 11 of the gyratory spindle 3 rests and works, is supported upon the top of a vertical shaft 12, whose lower end is stepped in a socket 13 within a box 14, having a limited vertical (but not rotary) movement within a casing 15, suspended from the framing and free to rotate about the vertical axis of the machine. The vertical shaft 12, which supports the spindle 3, passes down through and is maintained vertical by a cylindrical sleeve 16, rigidly attached to and depending from the framing of the machine or, as shown, from the bearing 17, in which the boss 18 of the driving-wheel 5 rotates. The sleeve 16 has on its outer surface toward the upper part a strong flange 19, serving to support and center the suspended casing 15, above referred to, the casing being for this purpose bored internally at its upper end to fit around the flange 19 and provided with a ring 20, bolted to the top of the casing and bearing upon the upper sur-

face of flange 19. On the exterior of the sleeve 16 is formed a strong screw-thread 21, adapted to support conical rollers 22 23, mounted to rotate on studs 24, projecting inwardly from the walls of the box 14, in which the vertical shaft 12 is stepped.

The bosses 25 26, in which the studs 24 are fixed, project outwardly from the walls of the box 14 and engage in vertical slots 27 (see Fig. 2) in the walls of the casing 15, so as to prevent the box 14 from rotating relatively to said casing, but permit it to move vertically therein. In order to limit such vertical movement, a stop 28, fixed to the casing 15, projects into one of the slots 27 beneath and in the path of the corresponding boss 25, the latter having a shoulder 29, Fig. 2, adapted to engage with the stop 28 when the limit of movement in the downward direction is reached, the limit in the upward direction being determined by boss 25 meeting the upper end 30 of the slot 27. Fixed around the outside of the casing 15, at its upper part, is a worm-wheel 31, with which gears a worm 32, whose shaft 33 is journaled in bearings 34 35, attached to the upper part of the sleeve 16. The shaft 33 may be rotated at will by a hand-wheel 36, keyed upon it, so that by turning the hand-wheel in the one or the other direction the outer casing 15 may be caused to rotate and to carry around with it the box 14, which consequently ascends or descends by reason of the rollers 22 23, carried by it, running upon the helical path formed by the screw-thread 21 on the outer surface of the vertical sleeve 16. It follows that the vertical shaft 12, which is stepped in the box 14, will likewise ascend or descend, causing a corresponding vertical adjustment of the gyratory spindle 3 and crushing-cone 9, carried thereby. Hence there is left between the periphery of the cone 9 and the lower or crushing edge 8 of the crushing-hopper 4, within which it works, a space greater or less, according to such adjustment, through which space fragments of greater or less size are accordingly free to fall. As a safeguard against accidental movement of the spindle 3 and crushing-cone 9 in the downward direction, due to jarring or other cause, the worm-shaft 33 carries a ratchet-wheel 37, with which engages a detent-pawl 38, pivoted on the frame of the machine and capable of being thrown out of gear with the ratchet-wheel when it is desired to lower the spindle and crushing-cone.

Owing to the dust and grit inseparable from crushing operations, it is of great importance that all working parts of the machine should be readily accessible for purposes of cleaning and repair. To this end the gearing just described, whereby the vertical adjustment of the gyratory spindle 3 is effected, is made separable as a whole from the rest of the machine and provided with means whereby it may be easily removed from beneath the machine and replaced, as required. The sleeve 16, which supports the outer suspended ro-

tary casing 15 and the inner box 14, in which the vertical shaft 12 is stepped, has a flange 39 at or about the level of the foot-step 10, on which the spindle 3 rests, this flange being normally bolted to the machine-framing or, as shown, to the bottom flange 40 of the bearing 17, in which the boss 18 of the driving-wheel 5 rotates, by means of holding-up bolts 41, so as to be readily detachable, and the casing 15 is adapted to rest upon a carriage 42, having wheels 43, running on rails 44 beneath the machine, the height of the carriage being such that on merely unfastening the holding-up bolts 41 the weight of the entire adjustment mechanism comes upon the carriage 42. The level of the top of the carriage is, however, so far below the level of the bottom of the casing 15 when the latter is fixed in position on the machine that upon the bolts 41 being unfastened the casing is allowed to drop a short distance, just sufficient to permit of the foot-step bearing 10 clearing the lower end of the spindle 3, the weight of the spindle 3 and crushing-cone 9 being meanwhile supported by lifting-tackle made fast to an eyebolt screwed for the time being into a tapped hole provided in the upper end 2 of the spindle 3. The bolts 41 having been unfastened and the spindle and crushing-cone suspended, as described, the entire adjustment mechanism may be withdrawn on the carriage 42 from under the machine. When the adjustment mechanism is to be reattached in working position, it is run into place vertically beneath the machine, whereupon the bolts 41 being inserted and screwed up the entire adjustment mechanism is raised and secured again in its original position. It will be seen that by the arrangement above described any disturbance of the driving-gear or other portions of the machine during the removal and replacement of the adjustment mechanism is avoided.

One side of the framework of the carriage 42 is made open, as indicated at 45, Fig. 2, so as to facilitate running the carriage into and out of position beneath the machine.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In an ore-crushing machine of the kind specified the combination with the upright gyratory spindle and with the crushing-cone carried thereby, of means for supporting and vertically adjusting said cone within the crushing-hopper or concave of the machine so as to vary the size of the fragments produced by the machine while the latter is at work, said means comprising a foot-step bearing for the gyratory spindle; a vertical shaft supporting said bearing; a vertical guide-sleeve for said shaft fixed to the framework of the machine; a box carrying a step-bearing for the shaft and mounted upon rollers supported and adapted to run upon a helical rib in one with said guide-sleeve; a casing rotatably

slung from the framework of the machine externally of said box and adapted to afford the latter freedom of vertical but not of rotary movement relatively to the casing; and means for rotating said casing so that the rollers may be caused to ascend or descend upon the said helical rib to adjust the level of the crushing-cone while the machine is in operation, substantially as specified.

2. In an ore-crushing machine of the kind specified, the combination with the crushing-cone and with the gyratory spindle which carries it, of means for supporting and vertically adjusting said crushing-cone within the crushing-hopper or concave of the machine while the latter is at work, said means consisting essentially of a vertical support provided with an external screw thread or rib and a frame or box arranged when turned to screw vertically upon said support and carrying the foot-step bearing upon which the gyratory spindle rests, in combination with a member revoluble about but incapable of longitudinal movement relatively to the axis of the box or frame, and engaging with said box so as to impart rotary movement thereto, and gearing adapted to revolve said member and to hold it in any required position.

3. In an ore-crushing machine of the kind specified, the combination with the crushing-cone and its spindle, of a vertical support, a shaft adjustable vertically in said support and supporting at its upper end the foot-step bearing for the spindle, a box or frame in which the lower end of said shaft is stepped, the said box being vertically adjustable on the said support, and mechanism for adjusting the said box and carried by the said support, the said vertical support being detachably connected with the machine at or about the level of the foot-step bearing of the spindle, so as to enable said supporting and adjusting mechanism to be withdrawn by a horizontal movement from beneath the spindle without raising the latter and without disturbing the driving-gear or other parts of the machine.

4. In an ore-crushing machine, the combination with the crushing-cone and its spindle, of a vertically-arranged sleeve, having an external screw-thread and provided with a flange at its upper end by which it is detachably connected with the machine, a shaft guided by said sleeve and supporting the foot-step bearing for said spindle, a box in which the shaft is stepped the said box being mounted to turn on the sleeve and adjustable vertically thereon, a casing engaging said box to turn the same, and means for turning the casing, the said box and casing and means for turning the latter being supported by the said sleeve,

the flange by which the sleeve is detachably connected to the machine being located at or near the level of the foot-step bearing of the spindle, whereby the said sleeve and the mechanism carried thereby may be readily withdrawn from beneath the spindle, substantially as set forth.

5. In an ore-crushing machine, of the kind specified, the combination with the crushing-cone and with the gyratory spindle which carries it, of means for supporting and vertically adjusting said crushing-cone, said means comprising a frame or box carrying the foot-step bearing upon which the gyratory spindle rests, a helical rib upon which said frame or box is supported, the frame or box being provided with means whereby it may be raised or lowered at will by being rotated in contact with the helical supporting-rib, a casing mounted to rotate and provided with vertical slots in its walls adapted to be engaged by projections on the said box or frame, and means for rotating said casing, substantially as specified.

6. In an ore-crushing machine of the kind specified, the combination with the crushing-cone and with the gyratory spindle, of a frame or box carrying the foot-step bearing upon which the spindle rests, the said box having inwardly-projecting studs provided at their ends with rollers, a vertical support provided with a helical rib or screw-thread on which the said rollers are supported, a casing mounted to turn and engaging the said box to rotate the same, and means for rotating said casing, substantially as set forth.

7. In an ore-crushing machine of the kind specified, the combination with the crushing-cone and with the gyratory spindle which carries it, of a frame or box carrying the foot-step bearing upon which the gyratory spindle rests, a vertical support provided with a helical rib upon which said frame or box is supported, the frame or box being provided with means by which it may be raised or lowered at will by being rotated in contact with the said helical rib, a member mounted to rotate about the box and provided with vertical slots adapted to be engaged by projections on the said box or frame, to impart rotary movement thereto, means for rotating the said member, and means for limiting the vertical movement of the box or frame, substantially as described.

Signed by me, the said EDWARD DESCOU CHESTER, this 13th day of June, 1900.

EDWARD DESCOU CHESTER.

In presence of—

WALTER J. SKERTEN,
JOSEPH LAKE.