C. O. MICHAELSEN.

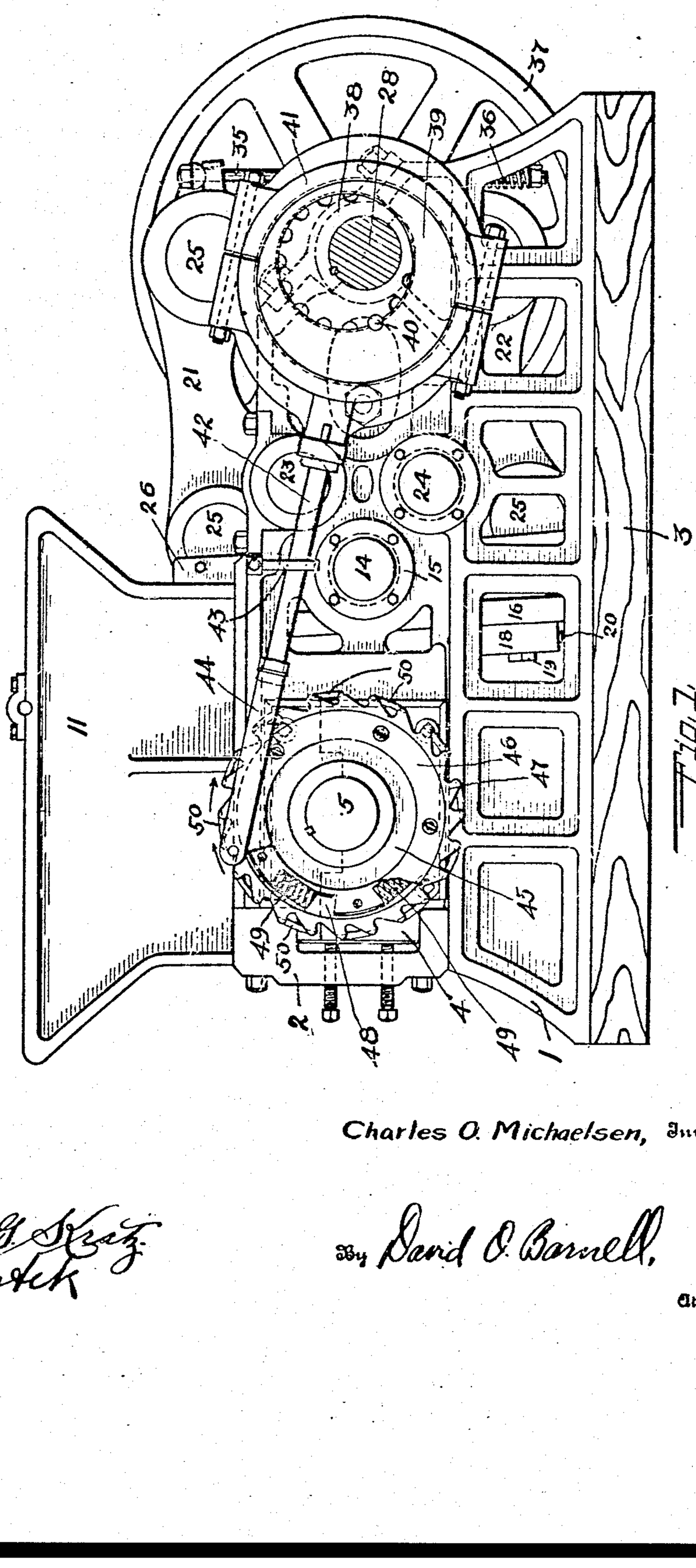
ORE CRUSHER.

APPLICATION FILED OCT. 15, 1909.

994,023.

Patented May 30, 1911.

4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

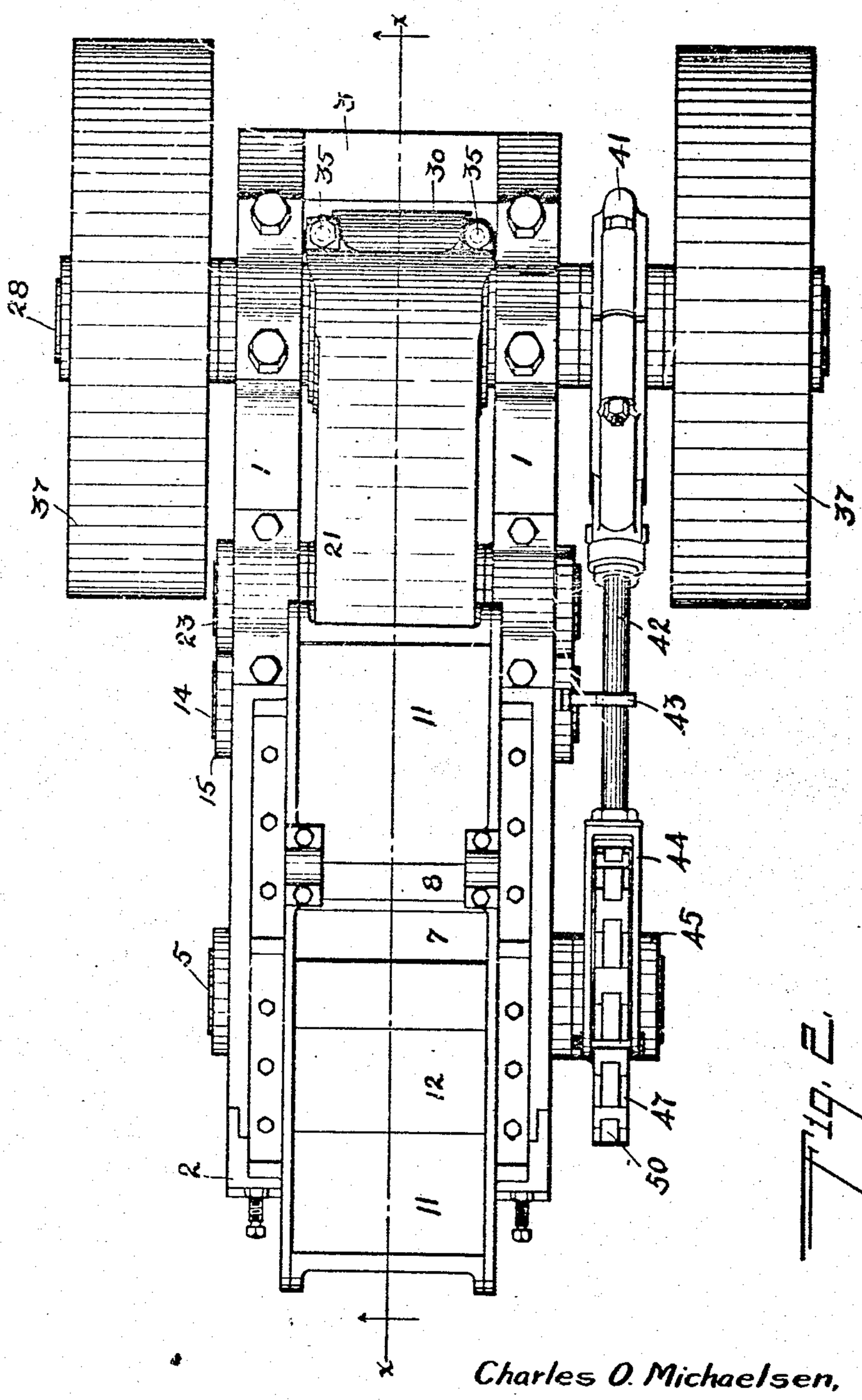

FIG. 2.

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4 SHEETS—SHEET 3.

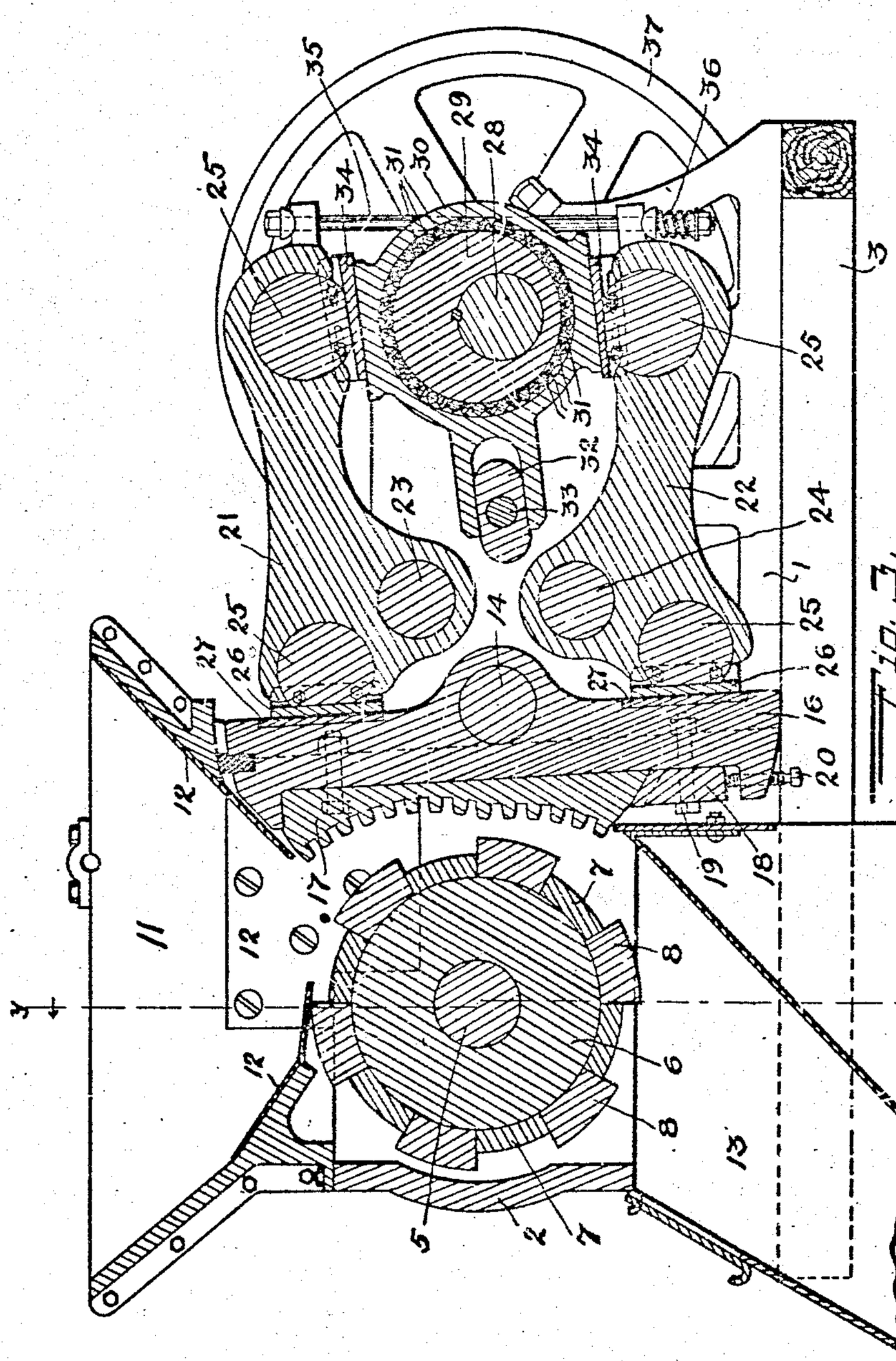

FIG. 3.

Witnesses:

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4 SHEETS—SHEET 4.

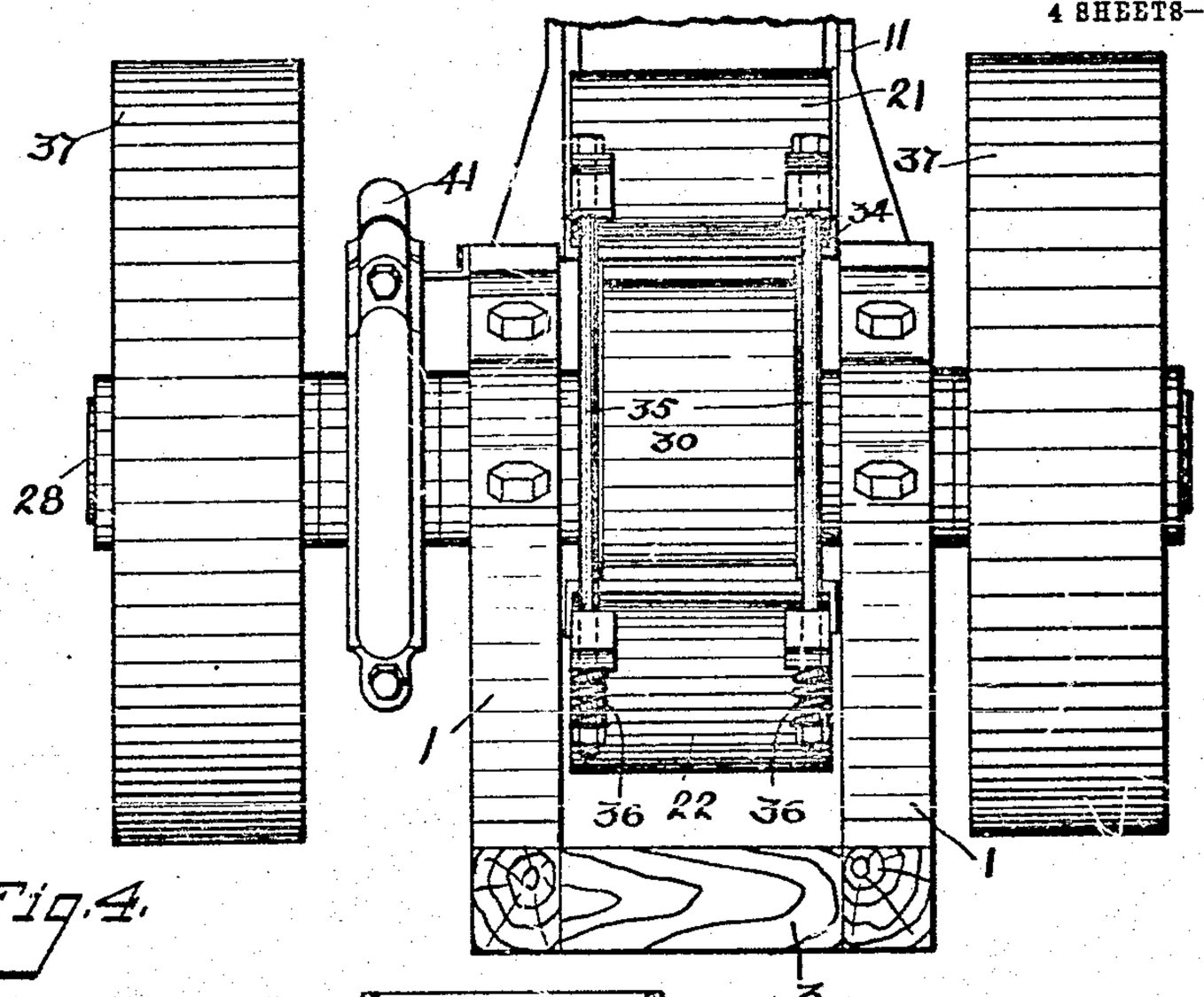

Fig. 4.

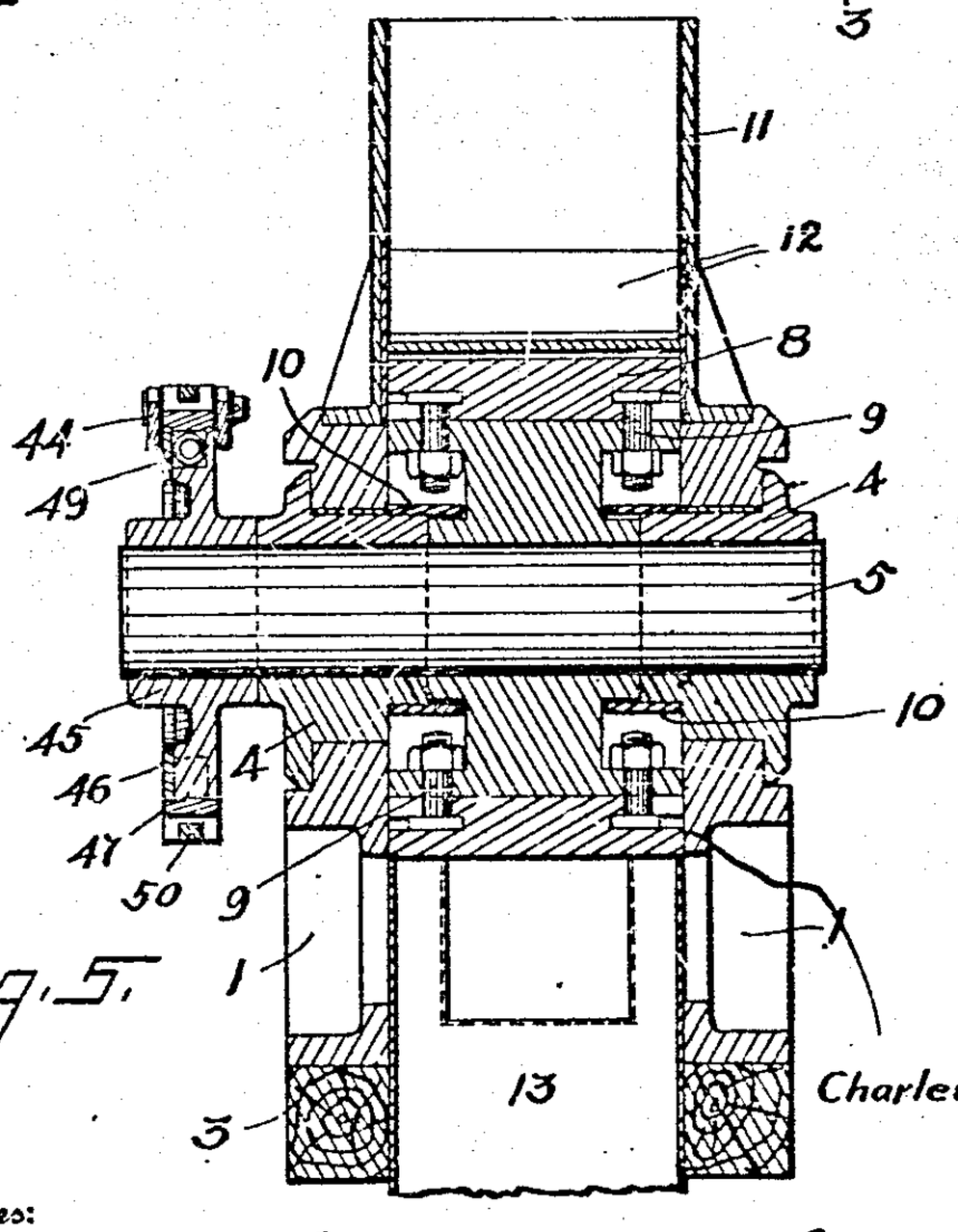

Fig. 5.

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UNITED STATES PATENT OFFICE.

CHARLES O. MICHAELSEN, OF OMAHA, NEBRASKA.

ORE-CRUSHER.

994,023. Specification of Letters Patent. Patented May 30, 1911.

Application filed October 15, 1909. Serial No. 522,896.

To all whom it may concern:

Be it known that I, CHARLES O. MICHAELSEN, a citizen of the United States, and a resident of Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Ore-Crushers, of which the following is a specification.

My invention relates to machines for crushing ore or the like and especially to machines of this class employing in combination a roller coöperating with an oscillatory jaw, and in which the roller serves to feed or carry the material into the space between the same and the jaw and to carry away the crushed material.

It is the object of my invention to provide certain improvements in the general construction and design of the ore-crusher shown in U. S. Letters Patent No. 931,210, issued to me August 17, 1909, and to especially adapt said machine for use in breaking up relatively large masses of material into medium sized pieces preparatory to further reductions thereof in other machines adapted for making such reductions.

The present invention relates particularly to the means for actuating the feeding and crushing roller, and provides a resilient driving wheel in combination with means whereby the roller is intermittently advanced to carry the material into the crushing-space, and then left stationary while the crushing-jaw is moved toward the roller to engage the materials between them.

A machine embodying my invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the machine with the adjacent fly-wheel removed in order to show clearly the roller-actuating mechanism, Fig. 2 is a plan view of the machine, Fig. 3 is a vertical longitudinal sectional view taken on the plane of the line *x—x* of Fig. 2, Fig. 4 is a rear end elevation, and Fig. 5 is a transverse vertical sectional view taken on the plane of the line *y—y* of Fig. 3.

In the construction of the machine shown, I provide a frame consisting of the side-frames 1 which are connected by an end-block 2 and mounted upon a suitable base shown as consisting of timbers 3. At one end of the frame are formed guideways for longitudinally adjustable split-boxes 4 in which is journaled the roller-shaft 5. Between the side-frames said shaft 5 has secured thereon the crusher-roll which consists of a central cylindrical body 6 of ordinary soft cast-metal, upon the peripheral surface of which the hard-metal facing-plates 7 and 8 are removably secured by bolts 9 passed through the side-flanges of the body 6, the heads of the said bolts being disposed within T-slots formed in the ends of the facing-plates. The facing-plates 7 are of less depth than the alternate plates 8, so that the plates thus form on the surface of the roller a series of substantially rectangular grooves or channels extending longitudinally thereof. The inner sides of the boxes 4 have hubs on which are placed the sleeves 10 which extend over the ends of the hubs of the body 6 and form shields to prevent dust and small particles of the ore from entering the bearings of the roller-shaft. Above the crusher-roll is arranged a hopper 11 which is lined adjacent to the roll with steel plates 12, as shown. A discharge chute 13, made of sheet metal, is arranged below the roll, as shown in Fig. 3.

At about the center of the side-frames a transverse shaft 14 is journaled in bearings formed by bushings 15 removably secured in the side-frames by screws passed through the end-flanges of the bushings. On said shaft 14 between the side-frames is secured the beam 16 which carries, on the face thereof adjoining the crusher-roll, the transversely-serrated crushing-jaw 17. Said jaw is removably secured upon the beam by bolts passed through the upper end thereof and by a block 18 which engages the beveled lower end of the jaw, being secured to the beam by bolts 19 and engaged at the lower end by adjusting-screws 20 passing through a lug formed at the end of the beam.

The beam-actuating levers 21 and 22 are mounted on the transverse shafts 23 and 24 which are journaled in bearings formed in the side-frames behind the bearings of the shaft 14, and slightly above and below the same, respectively. In the arms of the levers adjacent to the upper and lower ends of the beam 16 are transverse cylindrical openings in which are disposed the segment-blocks 25. On the flat sides of said segment-blocks are facing-plates 26 of which the end-flanges extend over the ends of the blocks and are secured thereto by suitable screws. The said

facing-plates 26 normally engage the plates 27 which are held in recesses in the rearward face of the beam 16. The rearwardly-extending arms of the levers 21 and 22 terminate respectively above and below the main driving shaft 28, which is journaled in suitable bearings formed at the rearward end of the frame, as shown. Said shaft 28 carries between the frames an eccentric 29 around which is disposed the eccentric-slide 30, bearing-rollers 31 being arranged between the same, as shown. The forward end of the eccentric-slide is forked and passes over a block 32 tiltably mounted on a transverse shaft 33. Segment-blocks 25 are disposed in the rearward ends of the levers 21 and 22, as shown, and said segment-blocks have wedge-shaped facing-plates 34 adjustably secured on the flat sides thereof. Said facing-plates bear upon the upper and lower faces of the eccentric-slide, and are normally held in engagement therewith by means of the tension-rods 35. Said rods pass through lugs at the ends of the levers, and at the lower ends thereof carry springs 36 of which the degree of compression may be regulated by adjusting-nuts arranged as shown.

Fly-wheels 37 are carried at the ends of the driving shaft 28, and either of said wheels may be used as a pulley and connected by a belt with a suitable source of power. The action of the eccentric 29, eccentric-slide, and the levers 21 and 22 in imparting a rocking or oscillatory motion to the beam 16 and crushing-jaw, will be apparent from the foregoing description.

The crusher-roll is intermittently and yieldably actuated so as to carry materials from the hopper 11 into the space between the roll and crushing-jaw, by the following mechanism: On the shaft 28, inside of one of the fly-wheels 37, is carried an eccentric consisting of an inner body 38 secured to the shaft and eccentric thereto, and an outer body 39 inclosing the body 38 and eccentric thereto by an amount substantially the same as the eccentricity of the inner body to the shaft. The inner and outer eccentric bodies are connected and held in adjusted relation to each other by a screw or pin 40 of which one-half fits into one of a number of recesses in the periphery of the inner body and the other half into a recess in the outer body. By varying the relative positions of the two bodies the eccentric formed thereby may be varied relatively to the shaft so that the throw thereof may be any amount from zero to a maximum of approximately twice the throw of the inner body 38. A band or strap 41 incloses the eccentric formed by the said bodies 38 and 39 and from said strap a rod 42 extends forwardly through a guide 43 carried on the frame, and at the end thereof is connected with a yoke 44 which straddles the resilient driving-wheel for the crusher-roll. The said resilient driving-wheel is carried on the end of the roller-shaft 5, and comprises a wheel 45 having a number of rectangular pockets formed in the periphery thereof, an annular plate 46 removably secured thereto and forming one side of the peripheral pockets, and a toothed ring 47 disposed around the wheel 45 and provided with internal lugs 48 extending into the peripheral pockets in the wheel and engaging helical springs 49 arranged in said pockets. The end-pin of the yoke 44 is adapted to engage the teeth of the ring 47 and, by the reciprocating movement imparted to the yoke by the adjustable eccentric, to intermittently actuate the resilient driving-wheel in the direction indicated. The springs 49 are so arranged in the driving-wheel that by compression thereof the forward movement of the crusher-roll will be cushioned and any abnormal resistance to the movement thereof will not result in undue stresses upon the driving mechanism. The teeth of the ring 47 have notches formed therein in which blocks 50 of wood or other suitable material may be driven to bridge or close up the space between the adjoining teeth. Whenever the throw of the adjustable eccentric is so adjusted that the end-pin of the yoke 44 will pass over two or more teeth at each stroke of the eccentric-rod, the said blocks 50 are employed to bridge the unused teeth and prevent hammering of the pin by dropping between the teeth over which it passes.

Now, having described my invention, what I claim and desire to secure by Letters Patent is:

1. In an ore-crusher, the combination with an oscillatory crushing-jaw, and a roller adapted to coöperate with said jaw to crush materials between them; of a driving-wheel connected with said roller, a means for actuating said driving-wheel, and yieldable means arranged in said driving-wheel to form a cushion between the roller and the actuating means.

2. In an ore-crusher, the combination with an oscillatory crushing-jaw, a roller adapted to coöperate with said jaw to crush materials between them, and a feed hopper arranged adjacent to the roller; of a means for actuating the roller to carry material from the hopper toward the crushing-jaw, a driving-wheel having two parts movable relatively to each other, one of said parts being rigidly connected with the roller, and resilient means arranged between said relatively movable parts.

3. In an ore-crusher, the combination with an oscillatory crushing-jaw, a hopper, and a roller adapted to carry materials from the hopper into the space between the roller and jaw; of a driving-wheel connected with said roller and consisting of a central wheel having pockets formed therein, a toothed ring

carried on said wheel and having portions extending into said pockets, and resilient means arranged in said pockets and adapted to normally retain each of said portions in engagement with one end of the respective pockets into which it extends.

4. In an ore crusher, the combination with an oscillatory crushing-jaw, and a roller adapted to coöperate with said jaw to crush materials between them; of a driving-wheel connected with said roller, and means for actuating said driving-wheel, the said driving-wheel consisting of two concentrically arranged parts one of which is rigidly connected with the roller and the other connected with the actuating means, one of said parts having lugs extending into recesses in the other part and normally held in abutting engagement with the ends of said recesses, and resilient means for maintaining the engagement between the lugs and the ends of the recesses.

5. In an ore-crusher, the combination with an oscillatory crushing-jaw, and a roller adapted to feed materials into the space between the same and the jaw; of a toothed driving-wheel connected with said roller, reciprocating means adapted to intermittently engage and actuate said wheel, means for adjusting the stroke of said reciprocating means, and blocks disposed in said wheel so as to bridge some of the inter-tooth spaces therein for the purpose described.

6. In an ore-crusher, the combination with an oscillatory crushing-jaw, and a roller cooperating therewith; of a toothed driving-wheel connected with said roller, reciprocating means adapted to engage said wheel to intermittently actuate the same, and an eccentric for actuating said reciprocating means, the said eccentric consisting of two bodies variable in relation to each other, and means for securing said bodies in adjusted positions such as to vary the throw of the eccentric.

7. In an ore-crusher, the combination with an oscillatory crushing-jaw, and a roller cooperating therewith to crush materials between the same; of means for intermittently and yieldably actuating said roller, said means comprising a reciprocating body, means for varying the stroke of said body, and connecting mechanism including resilient elements arranged between the reciprocating body and the roller.

In testimony whereof I have hereunto subscribed my name in the presence of two witnesses.

CHARLES O. MICHAELSEN.

Witnesses:

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