R. BERNHARD.

CRUSHER.

APPLICATION FILED SEPT. 5, 1914.

1,256,289.

Patented Feb. 12, 1918.

2 SHEETS—SHEET 2.

Fig. 2.

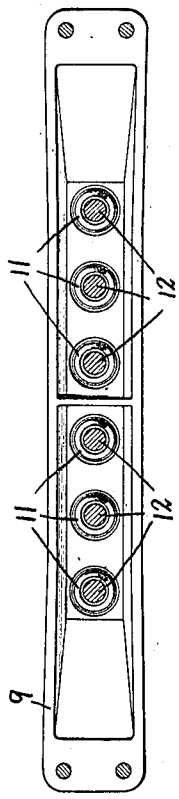



Fig. 3.

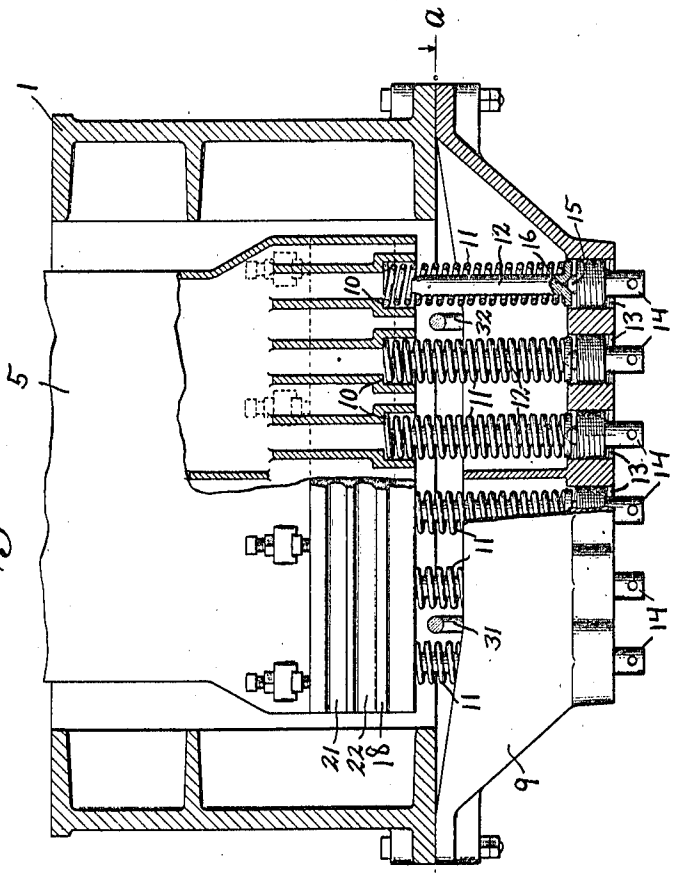
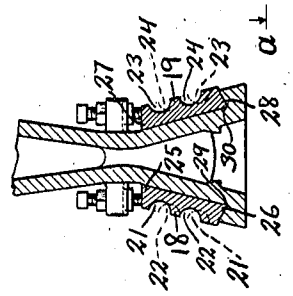



Fig. 4.




Witnesses:
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2 SHEETS—SHEET 1.

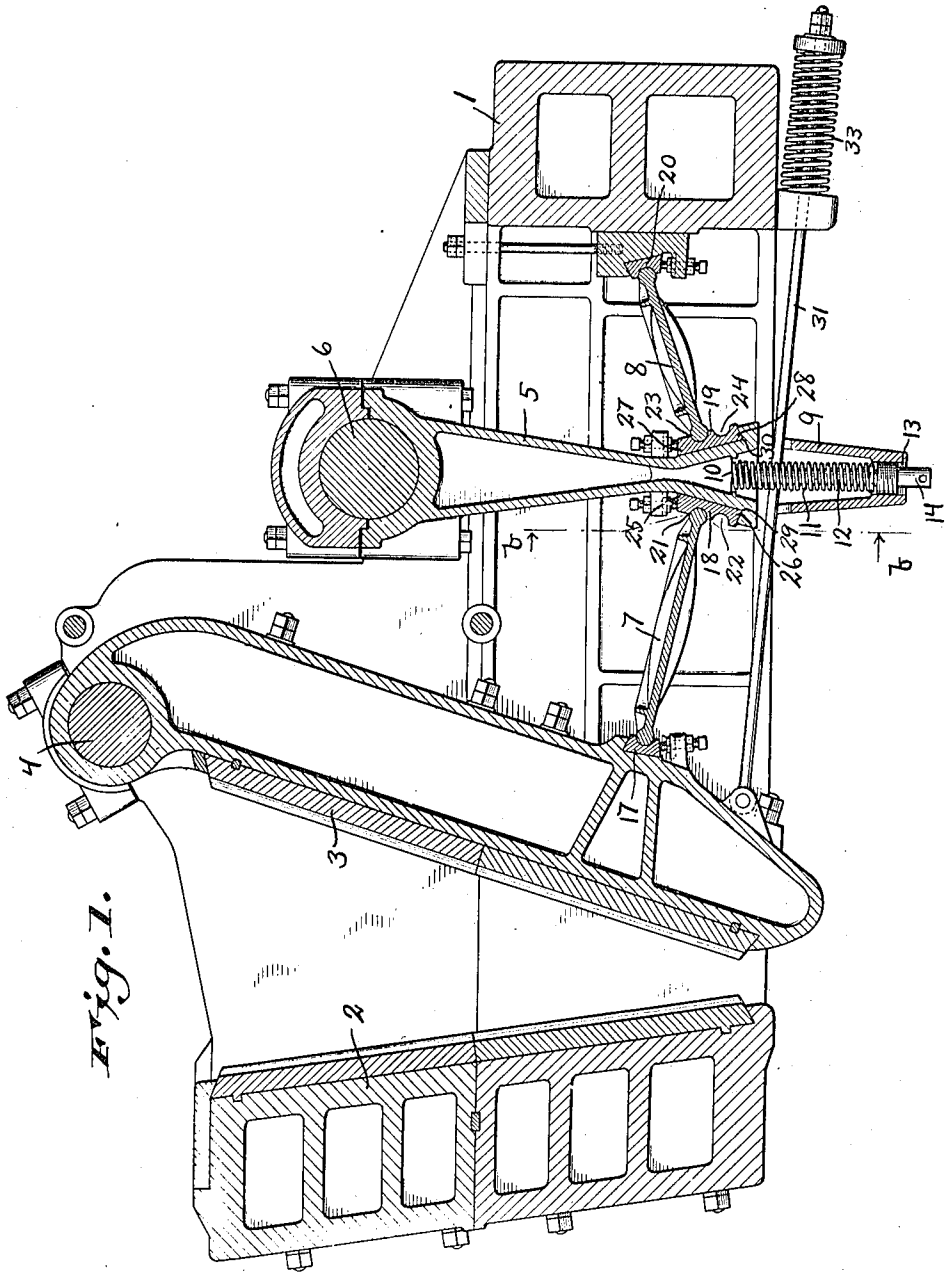



Fig. 1.

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# UNITED STATES PATENT OFFICE.

RICHARD BERNHARD, OF MILWAUKEE, WISCONSIN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO WORTHINGTON PUMP AND MACHINERY CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF VIRGINIA.

## CRUSHER.

1,256,289. Specification of Letters Patent. **Patented Feb. 12, 1918.**

Application filed September 5, 1914. Serial No. 860,325.

*To all whom it may concern:*

Be it known that I, RICHARD BERNHARD, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Crushers, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

This invention relates to crushers for rocks and minerals and the objects of the invention are to improve jaw crushers in the manner to be hereinafter described and claimed.

Referring to the drawings which accompany this specification and form a part hereof, on which drawings the same reference characters are used to designate the same parts wherever they may appear in each of the several views, and which drawings illustrate an embodiment of this invention, Figure 1 is a vertical longitudinal section of part of a crusher; Fig. 2 is a horizontal section taken on the line *a*—*a* on Fig. 3, looking in the direction indicated by the arrows; Fig. 3 is a vertical, transverse section of a part of the crusher taken on the line *b*—*b* on Fig. 1, looking in the direction indicated by the arrows; and Fig. 4 is a vertical, longitudinal section of the lower part of the pitman.

Referring to the drawings, the reference numeral 1 designates the frame of the crusher, provided with the stationary jaw 2, the movable jaw 3, the movable jaw shaft 4, the pitman 5, the pitman eccentric shaft 6, and the toggles 7 and 8, which may be of any ordinary or preferred construction. Means are provided to balance the pitman and toggles and to vary the motion of the movable jaw as follows: In crushers of large size the friction due to the weight of the pitman and toggles is a serious power loss. This friction develops in two places, viz: on the pitman eccentric shaft itself primarily and is then transferred to the bearings of this eccentric shaft on the frame. To balance, or counterbalance, the pitman and the toggles the pitman is supported by spring pressure applied below the pitman. The reference numeral 9 designates a saddle secured to the frame 1 below the pitman 5. The pitman is provided with seats 10 for supporting springs 11 which preferably rest upon the heads of alinement pins 12 which are adjustably supported by the saddle 9. Preferably, the saddle 9 is provided with screwthreaded apertures 13 of sufficient size to permit of the removal of a spring 11 and its pin 12, and screwthreaded plugs 14 screwed into the apertures 13 support the springs 11 and the pins 12. This construction enables a spring to be removed and replaced by another, if necessary. By placing the counterbalancing springs below, or under, the pitman, they are out of the way and are located where the least movement of the pitman toward and away from the stationary jaw 2 occurs so that they are not thrown seriously out of a vertical plane. The upper ends of the plugs 14 are provided with rounded projections 15 to engage in recesses 16 in the heads of the pins 12 to allow for the slight movements toward and away from the stationary jaw 2 without bending the springs.

Simple, strong and efficient means are provided for varying the stroke of the movable jaw 3 so that the crusher can be adjusted to crush the material according to its physical characteristics of hardness, softness or elasticity and according to the size of the discharge opening between the jaws. The reference numerals 17, 18, 19 and 20 designate knuckle plates provided with rounded recesses to receive the rounded knuckle ends of the toggles 7 and 8. These knuckle plates are provided with dove-tailed, or V-shaped, edges to seat in undercut dove-tailed, or V-shaped bearings in the directions to resist the stresses and may be held in position by set screws or any other suitable means. The knuckle plates 18 and 19 which are secured to the pitman are the ones which it is preferred to use for adjustment purposes and they are each provided with a plurality of recesses, two recesses 21 and 22 being shown in knuckle plate 18 and two recesses 23 and 24 being shown in knuckle plate 19 to fully explain the principle involved. Referring to Fig. 1 of the drawings, it will be readily apparent that by dropping the ends of the toggles 7 and 8 from recesses 21 and 23 into recesses 22 and

24 the extent of movements of the movable jaw 3 will be increased. Other adjustments are provided in the following manner: Both edges 25 and 26 and 27 and 28 of the knuckle plates 18 and 19 are made alike, that is to say, both edges of these knuckle plates are made dovetailed, or V-shaped to fit in the bearings 29 and 30 and the recesses in each knuckle plate are located at different distances from the adjacent edges of the knuckle plate so that when a knuckle plate is reversed in its bearing the recesses will lie in different vertical positions from what they did before reversal, as clearly shown by Fig. 4 of the drawings.

The reference numerals 31 and 32 designate the customary draw-back rods operated by springs 33, only one of which is shown by the drawings.

What is claimed is:

1. The combination with the pitman in a crusher of spring counterbalancing means located below the pitman to support the pitman and take the weight thereof from its bearing.

2. The combination with the pitman in a crusher of counterbalancing springs placed below the pitman to support it, and means to adjust the tension of said springs.

3. The combination with a crusher provided with a pitman, of a saddle located below said pitman, springs for supporting the pitman, and adjustable means carried by said saddle for supporting said springs.

4. The combination with a crusher provided with a pitman, of a saddle located below said pitman, springs for supporting the pitman, pins and plugs, the saddle being provided with apertures for said plugs of a size large enough for the removal of the springs therethrough, substantially as described.

5. The combination with a crusher provided with bearings for the edges of knuckle plates, of reversible knuckle plates having their opposite edges adapted to fit said bearings and provided with recesses for the knuckle of a toggle located at different distances from the adjacent edges of the knuckle plates.

6. A knuckle plate for crushers provided with similarly shaped edges so that either edge is adapted to seat in the same bearing and provided with recesses adapted to receive the knuckle of a toggle located at different distances from the adjacent edges of the knuckle plate.

In witness whereof I hereto affix my signature in presence of two witnesses.

RICHARD BERNHARD.

Witnesses:
JOHN H. HURLEY,
FRANK E. DENNETT.