(No Model.) 2 Sheets—Sheet 1.

# S. R. KROM.

## ORE CRUSHER.

No. 419,460. Patented Jan. 14, 1890.

Fig. 1

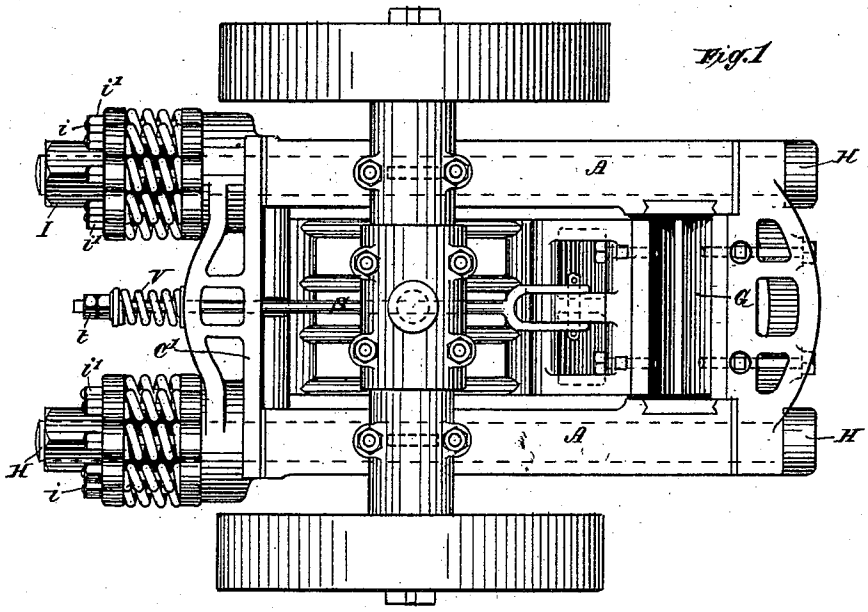



Fig. 2.

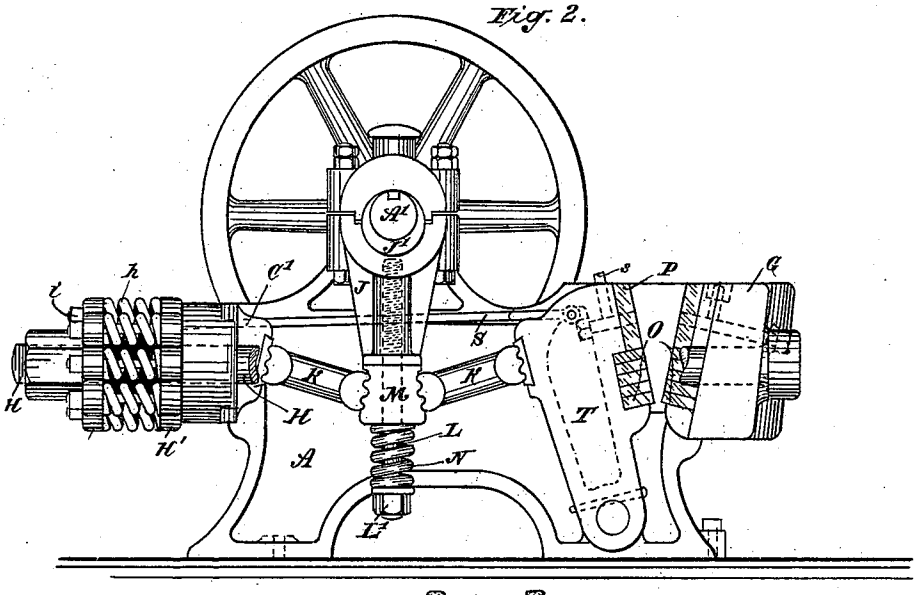
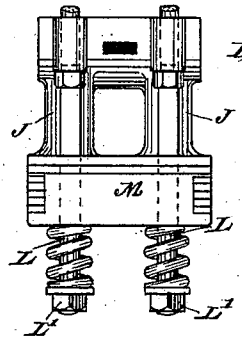



Fig. 4.




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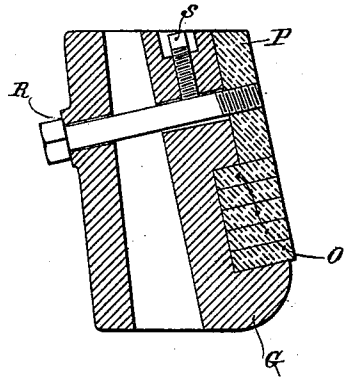
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*Fig. 3.*




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# UNITED STATES PATENT OFFICE.

STEPHEN R. KROM, OF PLAINFIELD, NEW JERSEY.

## ORE-CRUSHER.

SPECIFICATION forming part of Letters Patent No. 419,460, dated January 14, 1890.

Application filed December 3, 1888. Serial No. 292,457. (No model.)

*To all whom it may concern:*

Be it known that I, STEPHEN R. KROM, a citizen of the United States, residing at Plainfield, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Ore-Crushers, of which the following is a specification, reference being had to the drawings accompanying and forming part of the same.

This invention relates to rock or ore crushers of that class which are provided with reciprocating jaws, and comprises improvements in the construction of the same, the nature of which will appear from the following general description.

In a patent granted to me November 17, 1885, No. 330,408, I have shown an ore or rock crusher of the kind to which my present improvements are applicable. This machine consists, essentially, of a stationary jaw and a swinging or pivoted jaw retracted by a spring and forced forward or closed by toggles worked by a pitman, which is reciprocated by a crank-pin or eccentric on the main shaft.

It sometimes happens that a material—such as a piece of iron or steel—too hard to be crushed comes between the jaws of the machine, or that the material is fed too rapidly into the jaws, in which event, as one jaw is immovable, the machine is either injured or stopped; but I remedy this and provide against such accidents by providing spring-cushions which will be capable of yielding to permit the toggles to operate when the jaws are clogged or prevented from closing. This I accomplish by securing the stationary jaw to the main frame by tie-bolts, which extend through the stationary frame and through a block at the rear end which the toggles bear, and are provided with nests of spiral springs which form cushions not capable of being sensibly compressed by any strain less than would tend to injure or check the motion of the machine. In case a too refractory substance should fall between the crushing-jaws, or their closing should be prevented, as by overfeeding, the springs will be compressed by the movement of the toggle-block and allow the toggles to work without moving the jaws. When refractory substances prevent the proper crushing action of the jaws, the pitman which oscillates the jaws is also subjected to a severe strain.

Another feature of my invention is to obviate any unusual strain or injury resulting from this by interposing a spring or springs between the pitman and the toggle-levers, so that, in case the jaws are blocked, the pitman, by overcoming the resistance of the springs, will be permitted to play without working the jaws. This device I use in addition to the one above described to insure the safety of the machine, as in certain positions of the toggles one spring or set of springs might not respond as readily as the other.

Another improvement which I have made in this machine is in a detail of the jaws. The faces of these jaws are composed of a number of steel bars or plates applied as follows: The lower faces are formed of a number of plates laid upon a ledge or in a recess formed in the jaw, the plates being placed at right angles to or with their edges against the surface of the jaw. The upper faces of the jaws are formed by single plates somewhat thicker than the others and laid flat against the surface of the jaws and secured by bolts passing through and screwing into them. I use, also, set-screws, which pinch the said bolts and prevent them from turning or loosening and press down upon the same so that the upper plates are held tightly against the lower.

These improvements will be described in detail by reference to the accompanying drawings.

Figure 1 is a top plan view of a complete machine containing my improvements. Fig. 2 is a longitudinal vertical section of the machine. Fig. 3 is a vertical section of the back or stationary jaw. Fig. 4 is a side view of a portion of the pitman.

A A designate the main frame of the machine, on the sides of which are the bearings for the main shaft.

G is the stationary jaw. It is held in position by the tie-bolts H H, which pass through the frame. At the opposite side of the frame is set the block C′, against which one set of toggles bear. The tie-bolts H pass through this block and through cushions composed of the heads H′ H′, the immediate nests of

spiral springs *h h*, and bolts *i*, with adjustable nuts *i'*, which holds the heads together against the force of the springs, which are compressed to the requisite degree, as hereinbefore set forth. The large nuts I draw up the tie-bolts H H, so that in the ordinary use of the machine no sensible compression of the cushions will take place. Should the jaws be prevented from closing, the raising of the toggles forces back the toggle-block C' and compresses the spring-cushions. I regard it as preferable that the toggle-block should yield under this pressure, and not the stationary jaw, and for this purpose, when necessary, the tie-bolts H may be locked against movement.

J is the pitman reciprocated by an eccentric J' on the main shaft A'. Instead of engaging in the usual way with the toggles K, it is constructed with two rods or bars L L, which screw well up into the solid portion and are fitted with adjustable nuts or heads L'. Over these bars is passed a bearing on head M, with corrugations to receive the ends of the toggles, and held in place on the bars by spiral springs N, surrounding the lower ends of the bars and fastened by the nuts L'. These latter are adjusted so that only by an extraordinary strain will the springs be compressed and the pitman permitted to rise without lifting the head M and working the toggles.

O O are the plates which form the lower portions of the faces of the crushing-jaws. They are laid one over the other edgewise to the surface of the jaws on ledges or in recesses in the jaws, as shown. The upper plates P are laid flat against the jaws, and held in place by the screw-bolts R R passing through the casting forming the jaws. Small set-screws *s s* are caused to pinch the bolts to prevent their loosening and to keep the plates P firmly against the plates O, the holes through which the bolts R pass being somewhat larger than the bolts to permit this. The pivoted crushing-jaw T is retracted or drawn back from the jaw G by a rod S, pivoted to the jaw and extending through the toggle-block attached to the main frame, where it is surrounded by a spiral spring V held by nuts *t*.

What I claim is—

1. In an ore-crusher of the kind described, the combination of a main shaft, a pitman reciprocated thereby, a movable crushing-jaw, toggles operated by the pitman for oscillating the crushing-jaws, a toggle block connected to but movable independently of the main frame, and spiral springs between the toggle-block and the main frame, adjusted to permit the said block to yield and move under an extraordinary strain or pressure thereon by the toggles, as set forth.

2. The combination, in an ore-crusher, of an oscillating crushing-jaw, a pitman, and intermediate toggles engaging with a part of the pitman capable of movement in the direction of motion of said pitman, and a spring or yielding cushion interposed between the movable part and the free end of the pitman, whereby the strain of closing the crushing-jaw is received upon said spring-cushion, as set forth.

3. The combination of the main shaft, the pitman reciprocated thereby, the oscillating crushing-jaw, the toggles for connecting the same with the pitman, the sliding toggle-bearing carried by the pitman, with which the toggle-arms engage, and the spiral springs interposed between the toggle-bearing and the free end of the pitman, as set forth.

4. The combination, with the crushing-jaws, of the plates forming the lower faces thereof, laid edgewise to the surface of the jaws, and the upper plates clamped flat against the jaws, the bolts passing loosely through holes in the crushing-jaws and clamping the upper plates, and the set-screws bearing upon said bolts and forcing the upper plates against the lower, as set forth.

STEPHEN R. KROM.

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