R. BERNHARD.

CRUSHING ROLLS.

APPLICATION FILED JULY 11, 1907.

1,065,998.

Patented July 1, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

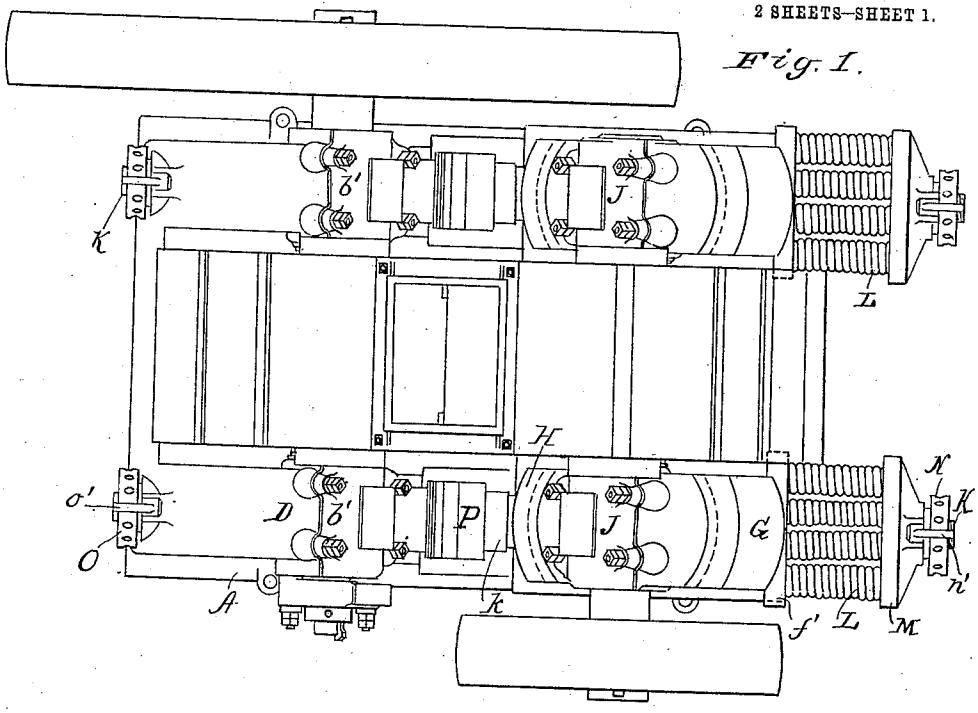
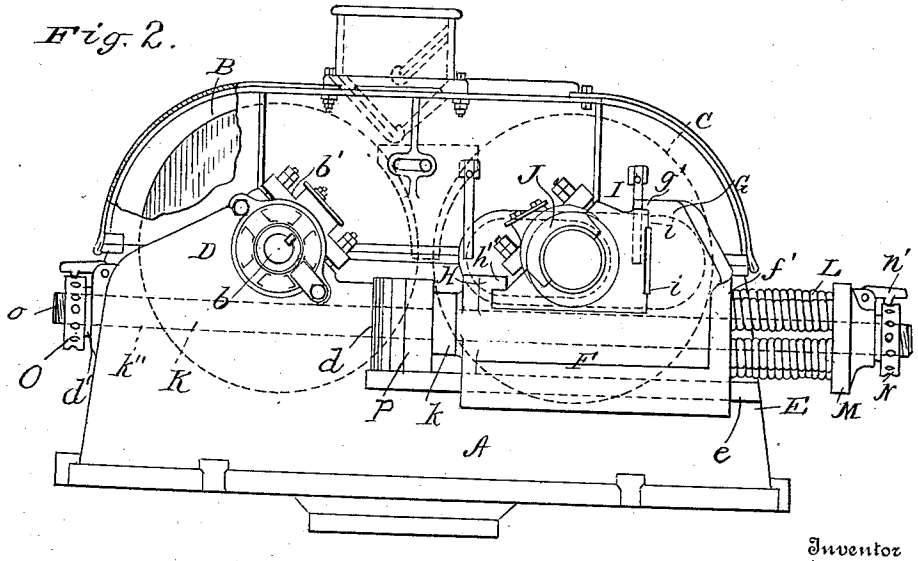


Fig. 2.



Witnesses

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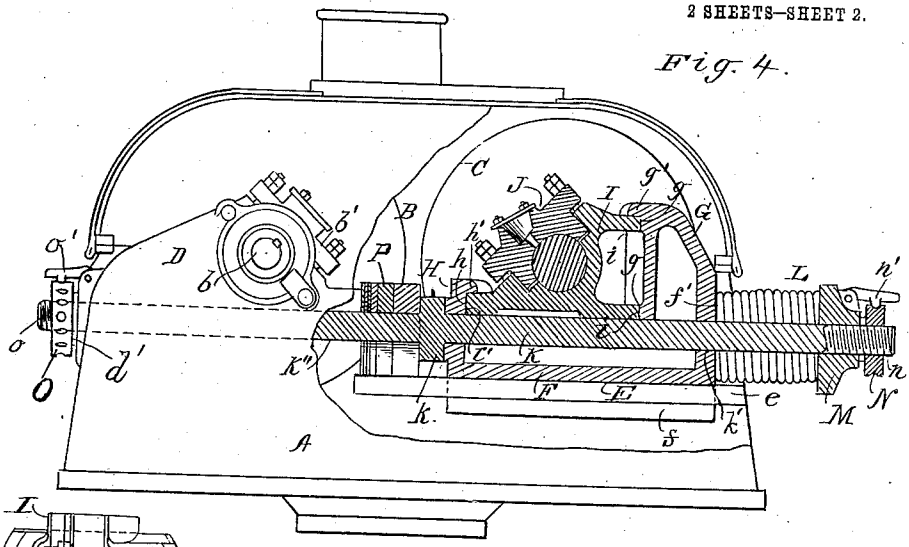
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2 SHEETS—SHEET 2.

Fig. 4.



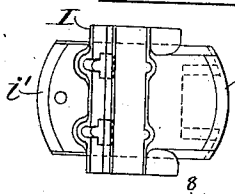
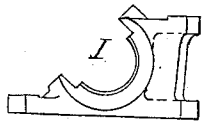


Fig. 5.

Fig. 6.



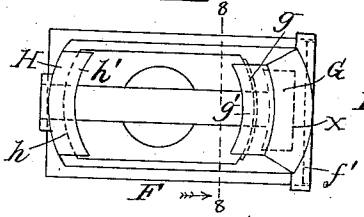


Fig. 7.

Fig. 3.

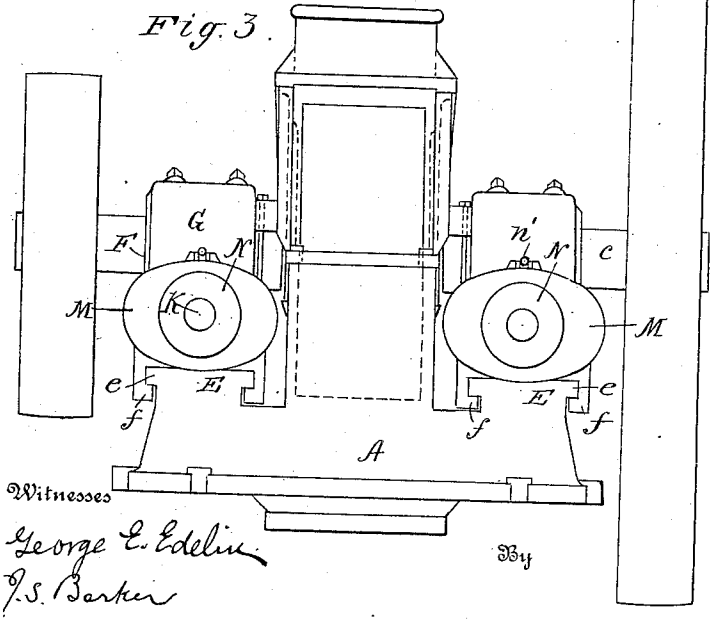
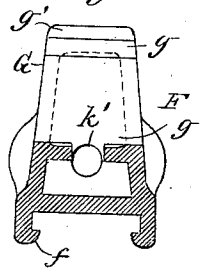


Fig. 8.



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UNITED STATES PATENT OFFICE.

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CRUSHING-ROLLS.

1,065,998. Specification of Letters Patent. Patented July 1, 1913.

Application filed July 11, 1907. Serial No. 383,311.

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 Crushing-Rolls, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to machines for crushing rock, ore and similar materials. These machines comprise a pair of rolls, one stationary as to any bodily movement, and the other movable toward or from the stationary roll, being held in normal working or crushing position by sets of very powerful springs. These machines are ponderous and of great power, and the tendency in recent years has been to increase the strength of the springs employed to hold the movable roll in working position, as thereby a more uniformly crushed product results. Whenever an unyielding mass of material passes between the rolls, the movable one is forced away from the stationary one, compressing the springs until the mass passes, when the springs return the roll to place; and, as the power of the springs is very great, this return movement is almost instantaneous. Owing to the great weight of the parts moved, including the roll, its shaft, the boxes and bearings in which the shaft moves, the sliding supports or pedestals in which the bearings are arranged, and usually the heavy rods through which the power of the springs is communicated to the sliding supports for the roll, the momentum or inertia developed by these moving parts under the influence of the springs is enormous; and as this is instantly arrested when the movable roll comes to working position, the wear and tear upon the machines has been very great.

One of the objects of my invention is to reduce to a minimum both the number and the weight of the parts that are moved when the adjustable roll is moved, thus reducing the destructive pounding action or shocks incident to the use of the very powerful springs; and to so support and arrange the several parts of the apparatus that the said shocks and strains shall be received and taken by those parts of the machine best adapted to resist them.

The invention has for a further object to improve the mounting of the adjustable or movable roll.

In the accompanying drawings—Figure 1 is a top plan view of a machine embodying my improvements. Fig. 2 is a side view, a portion of the casing being broken away. Fig. 3 is an end view. Fig. 4 is a view partly in side elevation and partly in longitudinal section. Fig. 5 is a top plan view of one of the bearing boxes for the movable roll shaft. Fig. 6 is an end view of the same. Fig. 7 is a top plan view of one of the sliding supports for the movable roll; and Fig. 8 is a vertical section taken on the line 8—8, of Fig. 7.

In the drawings, A represents the base of the apparatus, upon which are mounted the two crushing rolls, B and C, the former being stationary, as to any bodily movement, and the latter movable bodily toward or from the former. The shaft b of the stationary roll B is mounted in bearings supported in suitably formed recesses or seats in pedestals D rising from the base. The faces of the pedestals on which the cap pieces b', that confine the bearings in place, rest, are inclined at an angle, preferably one of 45°, to a plane cutting the axes of the two rolls, in order to give a strong backing support to the roll B. The portion of the base frame A that is under the roll C is shaped to form two slide-ways or bearings E, E, upon which are mounted the sliding supports, F, F, for the movable roll. These supports have overhanging or inturned flanges f, f, that take over the flanges e at the edges of the bearings E, such engaging parts serving to direct the movements of the supports F on lines at right angles to the axis of the stationary roll B. Each support is formed with a rear or outer wall G, and a front or inner wall H, between which is mounted and supported the box I, for one set of bearings for the shaft c of the movable roll. That face of the box I on which the cap J, that confines the bearings for the roll shaft C in place, rests, is inclined at an angle, preferably one of 45°, to a plane cutting the roll axes, and of 90° to the faces on which the cap pieces b' rest.

K, K represent rods, one at each side of the machine, mounted in close fitting holes k'' and k' formed respectively in the pedestals D and the sliding supports F. Each rod is preferably screw-threaded near each

end, and is provided intermediate its ends with an abutment fixed thereon, preferably in the form of a heavy collar *k* integral with the rod.

L, L, represent strong springs interposed between the faces *f'* of the sliding supports F, and spring compressing devices supported upon and carried by the rods K. Any suitable form of spring compressing means may be employed; those shown consisting of a heavy bearing ring or washer M loosely mounted on the rod near its outer end, and an adjusting nut N engaging with the screw-threaded portion *n* of the rod. A locking latch *n'* serves to hold the nut in the position to which it may be adjusted.

It will be seen that the springs L are arranged at the end of the machine nearest the movable roll, bearing directly against the sliding supports therefor; and that the rods K and the parts carried thereby, such as the bearing washers M and the other spring adjusting parts, may, and do, remain stationary whenever the roll C is moved, the sliding supports F being freely movable over and relative to such rods. This arrangement of parts reduces very considerably the mass of material that is moved each time the movable roll is forced away from the stationary one, with the incident advantages that have been heretofore pointed out.

In order that the shocks resulting from the arrest or stoppage of the inward movements of the sliding supports F shall be taken by the base, I support the rods rigidly in the frame as follows: P, P, represent a series of spacing pieces interposed between the collars *k* on the rods K, and suitable bearings *d* on the stationary frame, these pieces being preferably strung upon or set over the rods. Upon the screw-threaded ends *o* of the rods, on the side of the machine opposite the springs L, are mounted nuts O, adapted to engage with bearing surfaces *d'* on the stationary frame. When the nuts O are drawn tightly against the bearing surfaces *d'* the rods are tightly clamped in place in the frame, the collars *k* being drawn against the spacing pieces and the latter in turn against the frame at *d*. The nuts O are held in place against accidental turning by a suitable latch *o'*.

It will now be seen that the rods K which are rigidly held in the base frame of the machine carry normally fixed abutments for the springs L, these being, in the particular embodiment of my invention shown, the rings or washers M, and that the springs operate directly against the movable supports carrying the roll C to force the latter against the collars *k*, which thus serve to limit the approach of the adjustable or movable roll toward the stationary one. By forming the collars *k* integral with the rods, they may be made of great strength and capable of resisting the powerful blows which they receive as the movable supports F and the rolls they carry are forced toward the stationary roll by the springs L. The spacing pieces P operate to transmit the shocks just referred to directly to the frame. None of the parts that are put under great strain and subjected to severe shock are screw-threaded, or supported by screw-threads. Thus the collars *k* are, as stated, integral with the shaft and not screw-threaded thereto; and the rods are connected with and held rigidly in the frame by the spacing pieces interposed between the collars *k* and the pedestals D of the frame, and not by screw-threaded nuts which engage with the rods. The advantages incident to dispensing with screw-threaded connections at the points indicated, where they have heretofore been employed, are great, because not only is it difficult to keep a screw-threaded part in proper adjustment, but it is almost impossible to make a screw connection that will resist the wear and tear and strains to which it is subjected in a machine of the character to which my improvements are applied.

The rear wall G of the sliding support F is considerably higher than is the front wall H in order to allow for the ready application or removal of the cap-piece J, as well as to reduce the weight of the support. These walls G and H, are provided with bearing surfaces, *g*, *g*, and *h*, respectively, with which engage the bearing surfaces *i*, *i* and *i'*, formed on the boxes I. The bearing surfaces *g*, *g*, of the outer wall G are preferably situated respectively near the top and bottom portions thereof, and are separated from each other, thus reducing the extent of the bearing surfaces that have to be machined and otherwise accurately fitted to receive the engaging faces *i* of the box. The support F is provided with overhanging flanges *g'* and *h'*, arranged respectively adjacent to the upper bearing surface *g* and the bearing surface *h*. These flanges overlie parts of the box I and hold the latter down in place upon the support G. The bearing surfaces *g*, *g*, *h*, *i*, *i*, and *i'*, are curved, as clearly represented in Figs. 1, 5 and 7, the curves being struck from a center in line with the axis of the shaft of the roll C. This manner of supporting the adjustable or movable roll permits the latter to run smoothly either in parallelism with the roll B, which is the normal arrangement of parts, or in angular relation thereto, as when a piece of rock of unusual size and hardness is passing between the rolls near one end thereof, thus tending to force apart the rolls at such end to a greater extent than at the other.

The supports F are preferably hollow castings, as indicated in Figs. 4 and 8, in order to reduce as far as possible, consistent

with the requisite strength, the weight of these parts.

In order to get the boxes, I, for the bearings of the adjustable roll into their seats in the sliding supports, it is necessary to rotate or turn them, so that one end can be inserted under the overhanging retaining flange before the other end, the movement of the box into its seat being thus an endwise sliding and rotary movement.

By providing the bearing boxes with removable caps J, arranged between the overhanging flanges g', h', the caps can be removed, exposing the roll shafts so that they can be taken out, without disturbing the boxes, which are held down and in place by the aforesaid flanges. After the shaft has been removed the boxes may be separated from the sliding supports in the manner already stated. By constructing the boxes as represented in Figs. 4, 5 and 6, that is with the faces on which rest the removable caps J inclined so as to face inward, the weight of the boxes is reduced, while, at the same time the shaft is given ample support on the outer side—the side against which the greatest pressure is exerted.

The bearing boxes for the movable or adjustable roll have flat bottoms and rest upon flat bearing surfaces formed on the supports F so that the boxes are firmly seated and maintained in fixed horizontal planes when in operation. They may, however, as has been described, oscillate horizontally, means being provided for holding each bearing box down upon its horizontal support. The boxes are detachable from the sliding support independently of the means which hold them down in position.

What I claim is:

In a two-roll crusher, the combination of a frame, a pair of rigid roll carrying standards, two roll carrying holders slidable rectilinearly on said frame, two holding rods each with a rigid stop intermediate of its ends, said stops lying between the standards, and the rods extending from the stops in opposite directions each through one of the fixed standards and one of the sliding roll holders, a spring on each rod outside of the sliding holder, a nut on each rod abutting against the spring and a nut on the opposite end of each rod abutting against a fixed standard, and separable stops adapted to be interposed between the fixed stops on the rods and the inner ends of the fixed standards and to be detached laterally from said rods, substantially as set forth, whereby the adjustable roll and its holders together with the rods can be rectilinearly moved away from the fixed roll without modifying the tension adjustment of the springs, substantially as set forth.

In testimony whereof I affix my signature, in presence of two witnesses.

RICHARD BERNHARD.

Witnesses:
LEON P. FENSTMAN,
LEON F. SNYDER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."