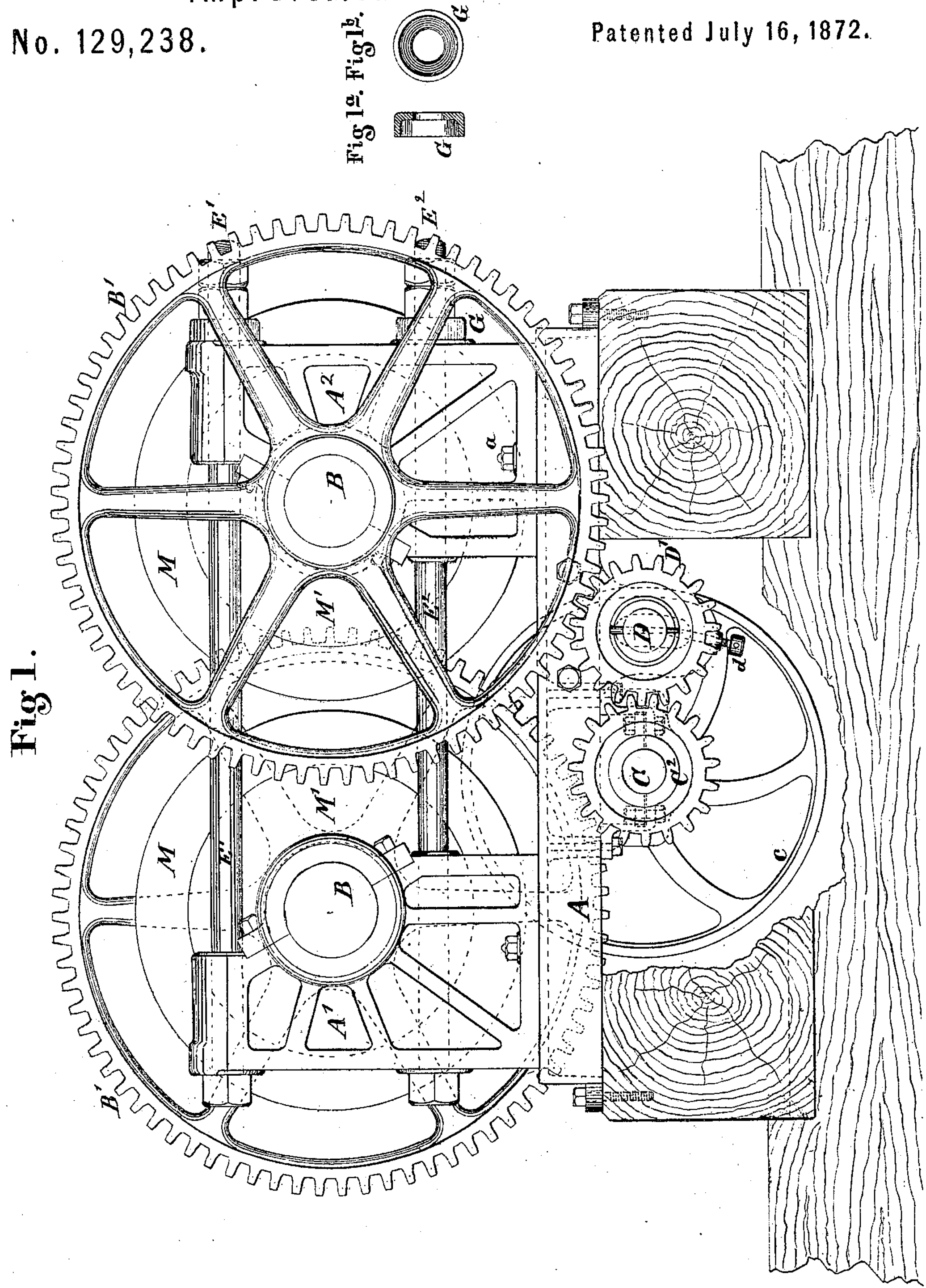
4 Sheets--Sheet 1.

S. R. KROM.

Improvement in Ore-Crushers.

No. 129,238. Patented July 16, 1872.



Witnesses,

Arnold Hoermann.

C. C. Livings

Inventor,

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by his attorney T D Stetson

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Improvement in Ore-Crushers.

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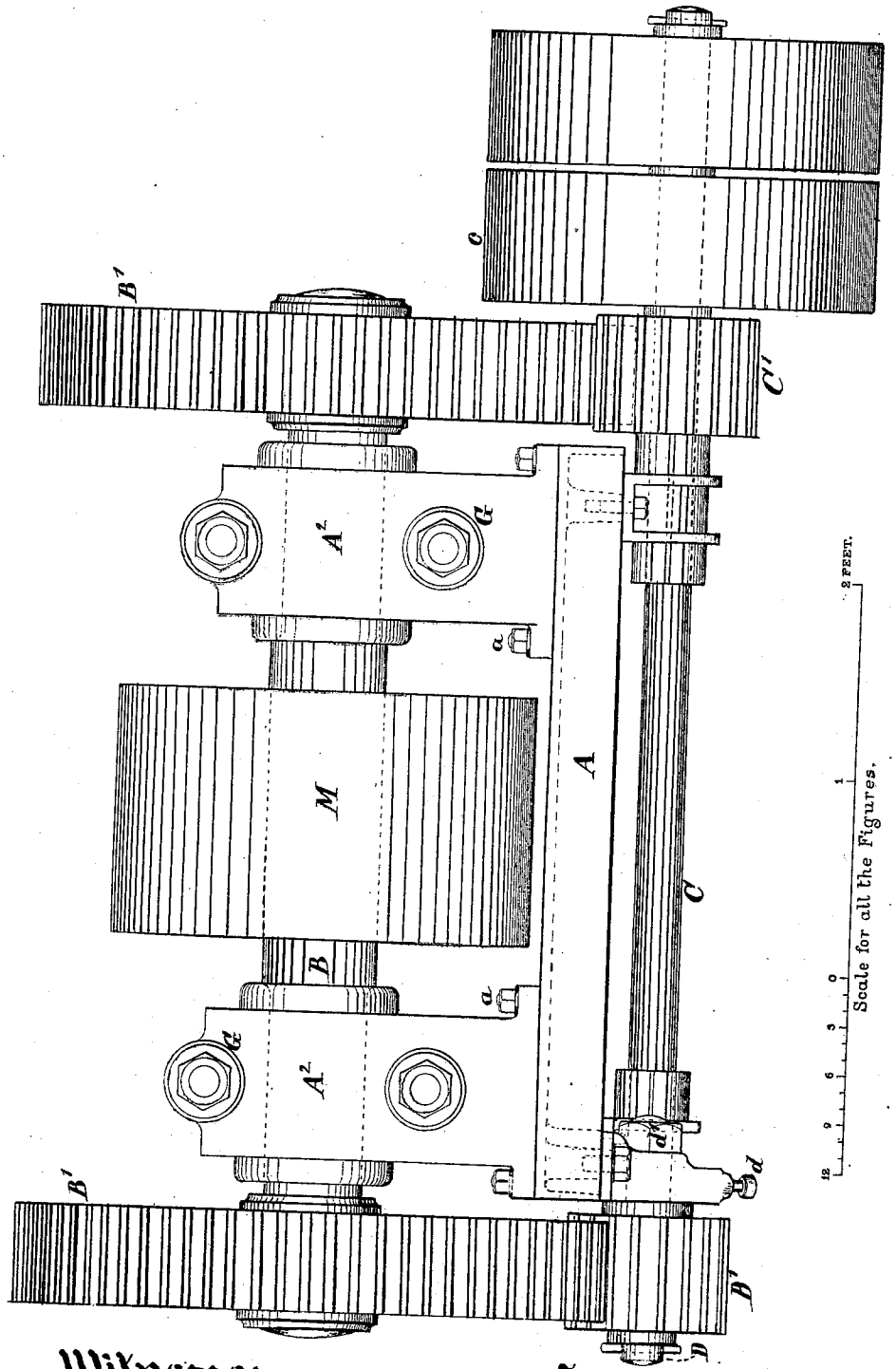

Fig 2.

Witnesses,

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Improvement in Ore-Crushers.

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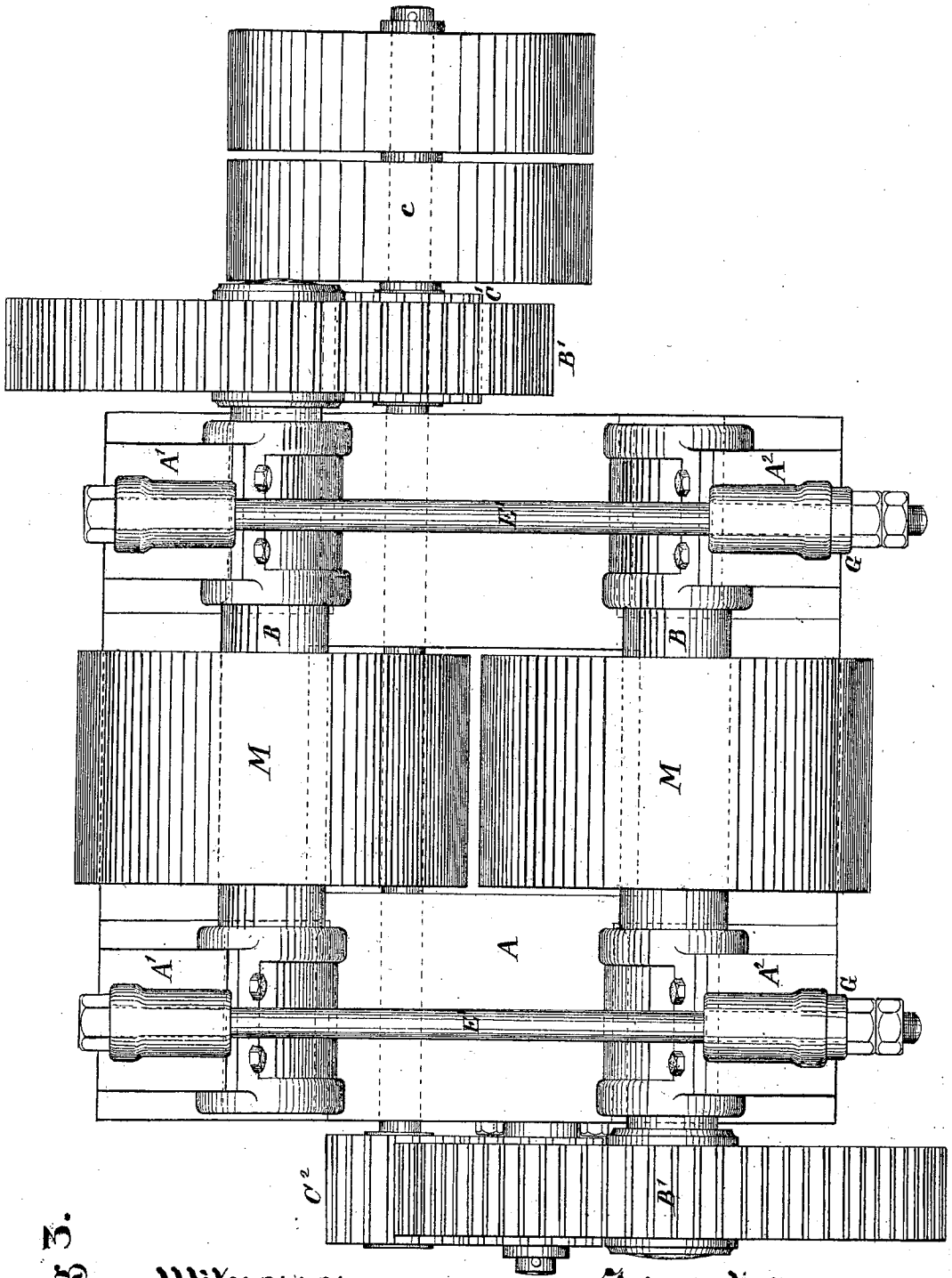

Fig 3.

Witnesses,
Arnold Hoerman.
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4 Sheets--Sheet 4.

S. R. KROM.

Improvement in Ore-Crushers.

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Fig 4.

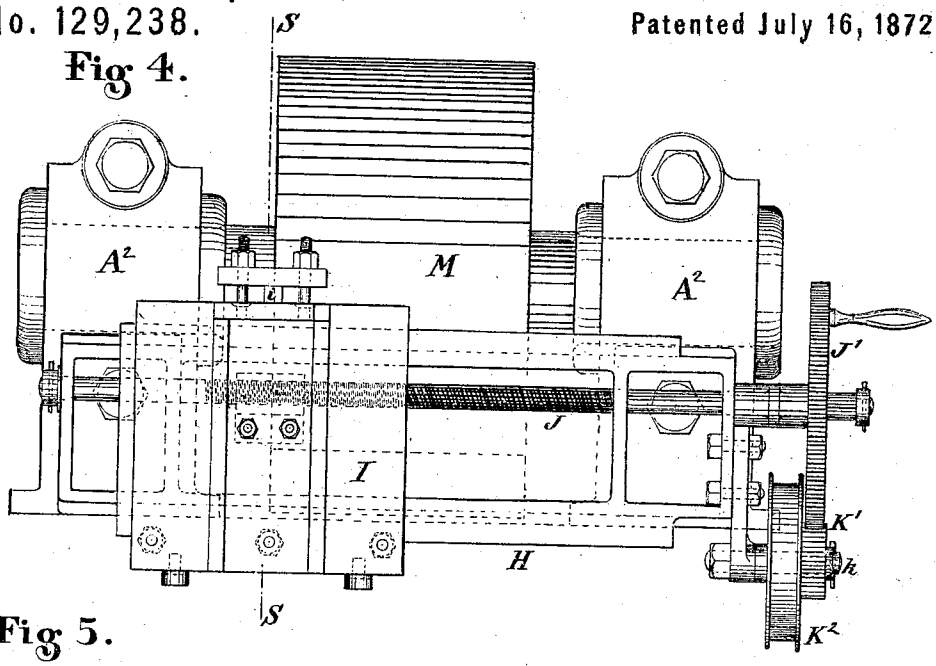


Fig 5.

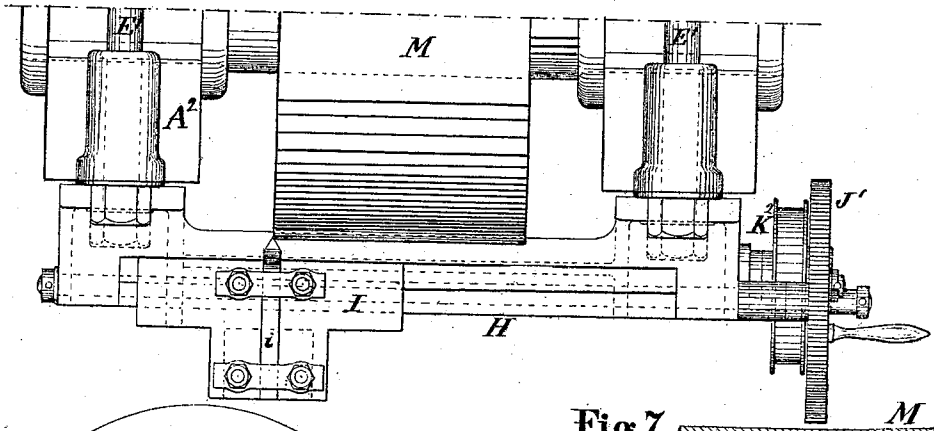


Fig 7.

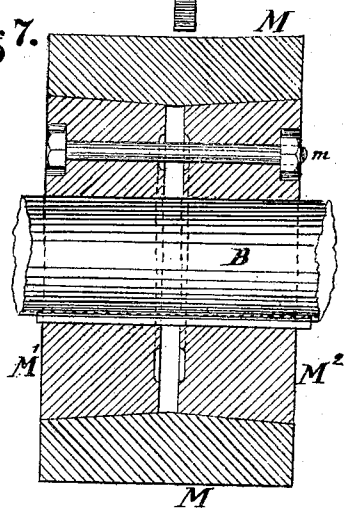
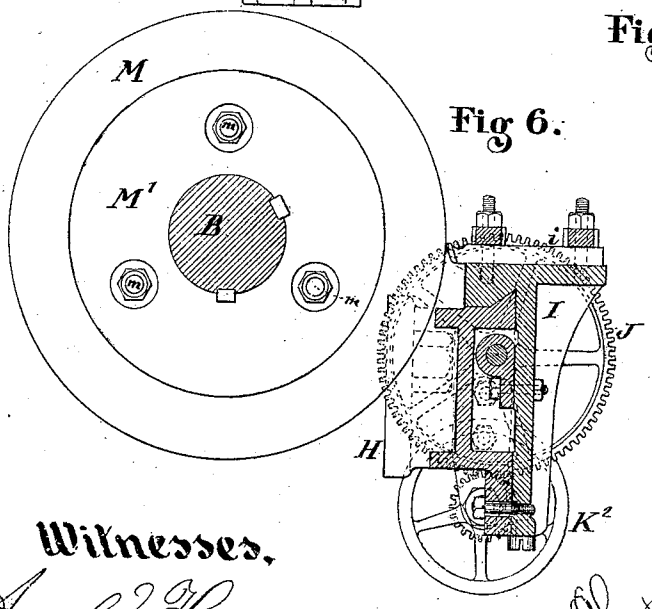


Fig 6.



Witnesses.

Arnold Hornaman.

C. C. Livingst.

Inventor,

S. R. Krom

by his attorneys, F. P. Stetson

UNITED STATES PATENT OFFICE.

STEPHEN R. KROM, OF NEW YORK, N. Y.

IMPROVEMENT IN ORE-CRUSHERS.

Specification forming part of Letters Patent No. 129,238, dated July 16, 1872.

To all whom it may concern:

Be it known that I, STEPHEN R. KROM, of the city and county of New York and State of New York, have invented certain new and useful Improvements in Crushing-Machines, adapted for crushing ores and analogous materials, of which the following is a specification:

The invention relates to the surfacing with rings of hard material; to gearing the rollers from opposite ends; to means for conveniently adjusting the distance of the axes of the rollers as they become smaller; provisions for conveniently turning off the surfaces; the construction of the framing for strength and conveniently putting together and taking apart; and provisions for allowing the rolls to yield apart when they receive material which cannot be crushed.

The employment of springs for the latter purpose involves expense and nice adjustment to accomplish the purposes of holding rigidly up to a certain point, and then yielding to a considerable distance without materially increasing the strain. I consider it preferable to provide easily replaced parts, which will break when the strain becomes too great. The entire machine is planned with a view to great efficiency with moderate expense, and limited bulk and weight.

Following is a description of what I consider the best means of carrying out the invention.

The accompanying drawing forms a part of this specification.

Figure 1 is a side view with a portion of the foundation broken away. Fig. 2 is a front view, and Fig. 3 is a plan view, of the entire machine. Fig. 4 is a front view of the machine as provided with an attachment arranged according to my invention for turning off the working surfaces of the rolls. Fig. 5 is a plan view of the front portion of the machine with the same attachments. Fig. 6 is a cross-section through the front portion of the machine on the line S S in Fig. 4. Fig. 7 is a sectional view, showing the construction of the rolls. It is a section in the plane of the axis. Figs. 1^a and 1^b represent certain crushable washers or shells of cast-iron or analogous material detached, as will be described further on.

Similar letters indicate like parts in all the figures.

The scale is—one and a half inches equal one foot.

A is a cast-iron bed, supported firmly on a foundation of timber or other suitable material. A^1 A^2 are stout movable frames, adjustable in position thereon by the aid of bolts *a a* standing in long slots in the lower portion, as will be readily understood. These adjustable frames or housings, A^1 and A^2, support the axes of rolls M, and by reason of one of them being changeable in position, may adjust the distances of the axes apart as may be required. B B are the stout shafts which support the rolls M M. They are mounted in the housings A^1 A^2, as shown, and each carries on an overhanging end a stout gear-wheel, B′ B′. These rolls are arranged so that their gear-wheels stand on opposite ends. They may be thus much larger than would be practicable if they were made to mesh directly together. The driving-shaft C receives motion by means of a pulley, *c*, actuated by a belt, not represented, from a steam-engine or other motor. The driving-shaft C carries two stout spur-gear-wheels, C^1 C^2. One of these, C^1, meshes directly into one of the gear-wheels, B′, and consequently drives directly one of the rolls. The other and corresponding gear-wheel, C^2, meshes into a corresponding gear-wheel, D^1, which is mounted loosely on an adjusted pivot, D, and meshes into and drives the other gear-wheel, which is fixed on the other roller. Thus the two rolls B B are turned toward each other with a strong and steady motion precisely as if they geared together, but with the advantage of having larger gear-wheels, and consequently a larger leverage and less strain on the teeth, and a degree of adjustability toward and from each other which would not be otherwise attainable. The pivot D of the wheel D^1 is adjustable up and down in a slot indicated in dotted lines, and controlled in position by the nut *d′* and screw *d*. When the rolls are required to be drawn together or moved apart it is accomplished by slacking the bolts *a* and moving one of the housings A^2 into the required position by screwing up or slacking off the nuts on the four bolts E^1 E^1 E^2 E^2, and again screwing down the bolts *a*, at the same time

raising or lowering the gear-wheel D so as to accommodate it to the new position of the wheel which it is to drive. It is, of course, understood that only one roll is moved—the one drawn by the loose gear-wheel D^1. The other always revolves in the same position and in the same relation to the shaft C and gears C^1 C^2. The bolts simply hold the bearings steady and in proper position on the solid frame or bed A. They receive no strain of the crushing. This strain is received on the stout bolts E^1 E^2 which extend directly through and across between the housings A^1 A^2, and are provided with stout nuts and jam-nuts. They are threaded for a sufficient distance to allow of all the adjustment which may be necessary.

It will be understood, then, that in the act of adjusting the parts as above described, or immediately afterward and before the machine is used, the nuts on the bolts E^1 E^2 must be also adjusted. The hold by means of the bolts *a* is slight. I prefer to set down the nuts on these bolts lightly, so that in case of any great strain when the hold, by means of the stout bolts E^1 E^2, is relaxed, the housings A^1 A^2 may slip apart. I provide for this yielding of the bolts E^1 E^2 by making hollow and weak washers of cast-iron, as shown by G.

Figs. 1^a and 1^b show detached views of one of these hollow and brittle washers, 1^a being a central section in the plane of the axes, and 1^b a rear or interior view. These washers are sufficiently strong to bear all the strain to which the machine may be properly subjected; but in case a very extraordinary strain is thrown on the machine by reason of something harder than the rack—the quartz or ore getting between the rolls M M—the washers G will crush or break and allow one of the housings to move on the bed A, and consequently let the rollers M M separate. After such an occurrence the machine will of course be incapable of proper action until it is again adjusted and new washers G supplied; but this can be done in a few minutes with little labor or skill. I can construct the rolls M M of chilled iron, franklinite, or various other materials at the surface; but I will describe them as of cast-steel. They may have various degrees of hardness imparted by the ordinary or any suitable processes; but I will describe them as being of steel in its ordinary condition, due to moderately rapid cooling. The periphery is in the form of a solid ring of the proper width. Its exterior is cylindrical and its ends or edges plain, but its inner surface is bored or otherwise produced with a slight taper in two directions. The material is thickest in the middle, and is thinner toward each end. M is the surface-ring. It is supported on nearly the whole of its double-tapering inner face or faces by means of the two tapering rings M^1 M^2. The latter are secured by keys or feathers, so that they are compelled to revolve with the shaft B, and are nicely finished around their peripheries to match to the respective inclined surfaces on the interior of the surface-ring M. The under rings M^1 M^2 are drawn firmly together by bolts *m*, having their heads and nuts sunk in the rings, as represented in Fig. 7, to increase the firmness with which the rings can be put together. A tolerable high degree of hardness imparted to the surface-ring M increases its durability in crushing quartz or other refractory materials; but it interferes with the process of turning, which I will now describe. H is a temporary frame, which is bolted in place on the front of the housing A^2 by means of temporary bolts inserted in place of the lower bolts E^2, which are removed for the purpose. This temporary frame H carries all the mechanism for a slide-rest, I, which receives a proper tool with a point of hardened steel adapted to cut into the hard ring M and turn it off true. I can, if preferred, carry on this slide-rest a revolving stone of very hard grit or any other approved means of treating hard surfaces; but I will describe the mechanism briefly as carrying simply a turning-tool. I is the slide-rest, and *i* is the turning-tool carried therein. The tool may be set forward by the aid of a screw, wedge, or other means not represented; or it may be simply driven forward by a blow of a hammer or other means to the right spot, and there held by the cross-pieces and bolts represented. J is an actuating-screw, actuated by a wheel, J′, which is mounted on the overhanging end, and may be turned by hand when required. In the regular operation of the machine I introduce the gear-wheel K^1 fixed to a pulley, K^2, and mounted on the pin *k*, which is supported, as represented, on the removable frame H. This pulley K^2 is driven by a narrow belt, not represented, from one of the shafts B or one of the links of the large gear-wheel B′, as will be readily understood. In the operation of the turning of the rolls the machine must be driven by a smaller pulley from the main shaft, or by slowing the engine or otherwise at a very moderate rate of speed. The feed-screw J gives a slow traverse to the tool *i* across the face of the ring M, so as to turn it off in the same manner as any ordinary lathe-work. In addition to the modifications above suggested in the device *i*, which removes the material from the surface of the rings M, I can employ with good results two plain simple tools, *i*, mounted side by side on the same slide-rest, the first to remove the main portion and prepare the surface for the better action of the other. The necessity of this mode of operation becomes greater in proportion as the chances are increased of finding very hard crystals or other flinty matter embedded in the rolls. The material of the surface portion of the rolls M M may be formed by casting, forging, or any improved method. I can turn both the shafts M M by placing the mechanism H I successively on the front and back of the machine.

I believe it practicable to make the surfaces of my crushing-rolls of Martin, Bessemer, or similar steel rings or bands, manufactured in

the same manner as locomotive-tires or car-wheel tires; or they may be forged bands. The Martin steel, as already manufactured for me for this purpose, produces a material which is hard and tough, but not so hard as to prevent fitting and turning true whenever worn by use.

I claim as my invention—

1. The housings A^1 A^2 fixed slightly on the supporting-bed A, and held together by the direct bolts E^1 E^2, attached in the manner and arranged substantially as and for the purpose herein set forth.

2. The hollow fragile washers G, serving, as represented, relatively to the crushing-rolls and housings A^1 A^2, adapted to move apart, as specified.

3. The adjustable gear-wheel D′, arranged and serving, as represented, relatively to the adjustable crushing-rolls M with gears B′ at opposite ends, and the actuating-shaft C and gears C^1 C^2.

4. The hard-surface ring M, having a double taper on its inner face, and supported, as shown, by the under rings M^1 M^2 and holding means *m*, the whole being constructed and matched together to form a hard-surface roll, as specified.

5. The removable slide-rest I and guiding-frame H with the proper holding-bolts, arranged relatively to the crushing-rolls M, the housings A^2, and their holding or tie bolts E^1 E^2, substantially as and for the purpose herein set forth.

In testimony whereof I have hereunto set my name in presence of two subscribing witnesses.

S. R. KROM.

Witnesses:
THOMAS D. STETSON,
C. C. LIVINGS.