(No Model.) 2 Sheets—Sheet 1.

N. C. MITCHELL.

GRINDING MILL FOR REDUCING OLD RUBBER STOCK.

No. 419,464. Patented Jan. 14, 1890.

Fig. I.

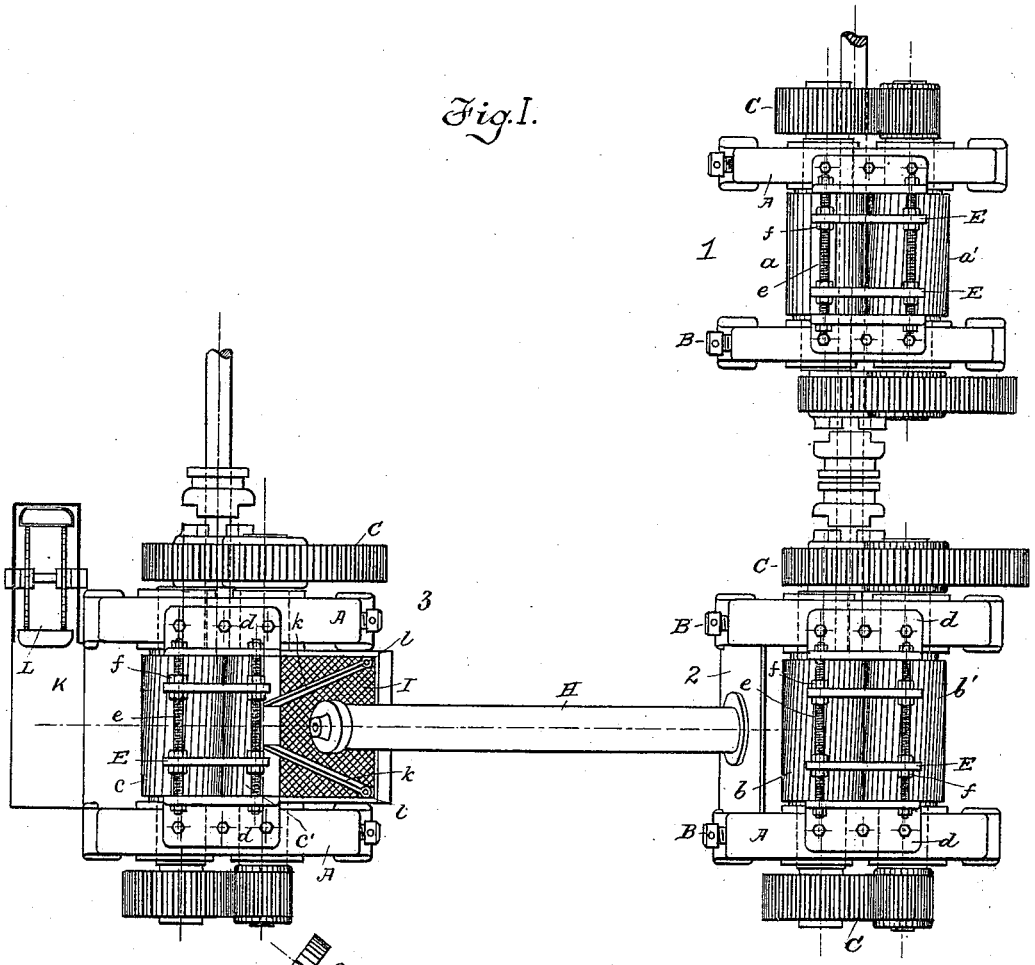
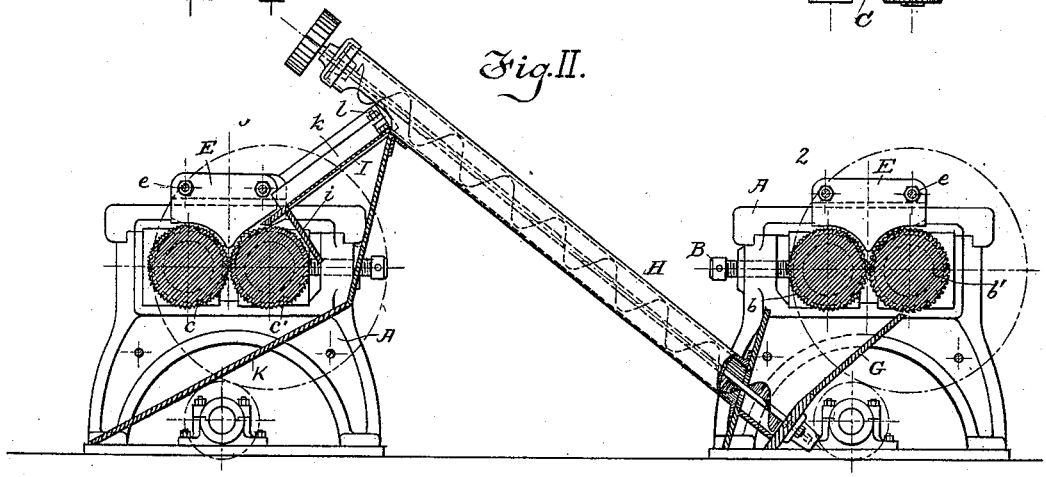


Fig. II.



Witnesses.
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(No Model.) 2 Sheets—Sheet 2.

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Fig IV

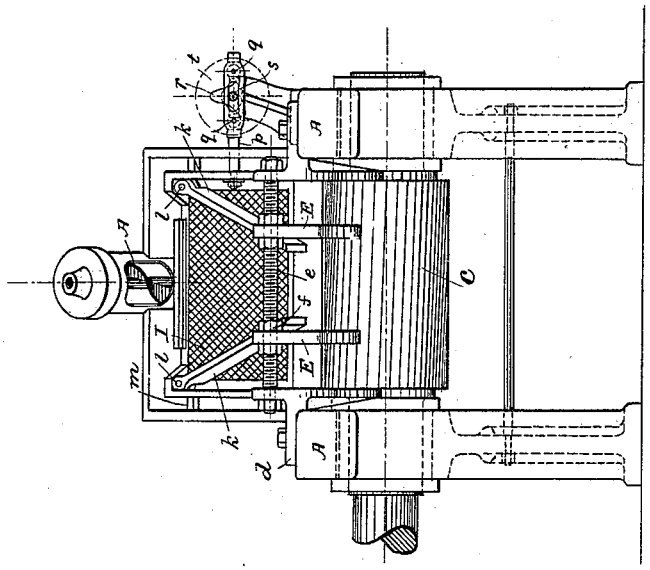
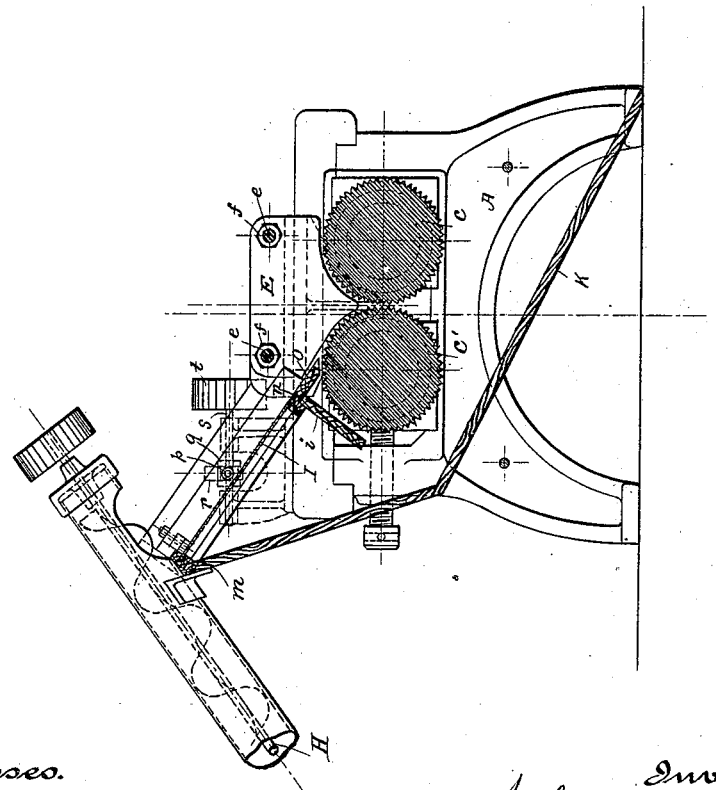


Fig III



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UNITED STATES PATENT OFFICE.

NATHANIEL C. MITCHELL, OF PHILADELPHIA, PENNSYLVANIA.

GRINDING-MILL FOR REDUCING OLD RUBBER STOCK.

SPECIFICATION forming part of Letters Patent No. 419,464, dated January 14, 1890.

Application filed September 20, 1889. Serial No. 324,578. (No model.)

To all whom it may concern:

Be it known that I, NATHANIEL C. MITCHELL, a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Grinding-Mills for Reducing Old Rubber Stock, which improvement is fully set forth in the following specification.

This invention relates more particularly to a grinding mill or apparatus for reducing old rubber stock, as boots and shoes, hose, belting, &c., to fragments or pieces of a size suitable for further treatment to recover the rubber free from all foreign matters. Such mill consists of a series of rolls, termed "cracker-rolls." In practice the first pair of rolls consists of one coarse corrugated roll and one smooth roll, the second of one coarse and one fine corrugated roll, and the third of two fine corrugated rolls; but this arrangement, while useful, is not absolutely essential. The cracker-rolls are about two feet in length. It has been found in using them to act upon waste rubber goods that serious difficulties are encountered. The rolls should be kept full from end to end; otherwise they are apt to lash and break; but if kept full the strain upon them is often too great and produces speedy deterioration. Moreover, the rolls are subject to unequal wear and are frequently nicked by pieces of metal in the stock. When one part is worn more than another, the product lacks uniformity and is unsatisfactory. These difficulties are wholly obviated by the use of guide-blocks disposed on the feed side of the rolls, and which reduce the acting face thereof to, say, sixteen or eighteen inches. It is easy to keep this length of face full and prevent breakage, while the strain resulting is not injurious. Uniformity of wear is thus insured, and when the portion of the rolls in use becomes worn or a piece is chipped off the rolls are not thereby rendered useless, but by adjustment of the guide-blocks new acting faces can be brought into operation and the grinding continued for a much longer period than was possible heretofore.

The importance of this improvement will be realized when it is understood that these rolls, which are very expensive, must be returned to the factory when worn to be recut, and that such recutting can only be done three or four times before the rolls are rendered unfit for further use.

A conveyer of any suitable description—such as a screw—may be employed to deliver the partially-reduced stock from one pair of rolls to the next. After passing the second pair of rolls the stock is fed onto an inclined screen having a mesh of about one-quarter of an inch. As the stock traverses this screen such fragments as are smaller than the mesh fall through. This portion of the stock is sufficiently reduced for further treatment. That remaining on the screen passes between the third pair of rolls, where the reduction is completed, and thence the stock falls into an elevator-boot and is hoisted to a chute leading to the magnetic separating apparatus described in my application, Serial No. 324,579, filed September 20, 1889. The inclined screen may, if desired, be provided with means for oscillating it to render the removal of the small fragments more certain.

In the accompanying drawings, which form part of this specification, Figure I is a plan view illustrating the arrangement of the several rolls and accessory devices constituting the mill. Fig. II is a view in vertical longitudinal section, illustrating the shaking-screen and the second and third pair of rolls. Figs. III and IV are views in vertical cross-section and front elevation, respectively, illustrating the third pair of rolls provided with an oscillatory screen.

Referring more particularly to Figs. I and II, the three sets of rolls (marked, respectively, 1, 2, and 3) are arranged in any convenient relation, as shown in Fig. I. Set No. 1 has a smooth roll *a* and a coarsely-corrugated roll *a'*. No. 2 has a roll *b* with fine corrugations, and another *b'* with coarse corrugations, and No. 3 has two rolls *c c'*, both with fine corrugations. The rolls are supported in bearings in suitable supporting-frames A and provided with driving-gears C,

the journal-boxes of one of each pair of rolls being provided with set-screws B, as usual, for regulating the space between the rolls.

Upon the top of side frames A of each pair of rolls are bolted angle-plates *d*, which support the two guide-rods *e*, extending parallel with the axis of the rolls and from end to end thereof. Rods *e* pass through and support the guide-blocks E, which can be moved lengthwise of said rods to any position. Rods *e* are screw-threaded, and a jam-nut *f* is placed on each side of each block E to hold it in place. The shape of blocks E is clearly shown in Figs. II and III.

In practice blocks E are set about sixteen or eighteen inches apart and the rubber stock is fed in between them. Adjustment of blocks E, when desired, can be very quickly effected. One of the blocks E may be removed altogether and the other set near the middle, so as to utilize only the portion of the rolls between it and one of the side frames A. The construction and arrangement of the guide-blocks are the same for all the rolls. The stock, after being partially reduced by the rolls of mill No. 1, is delivered by hand or by any suitable mechanical appliance to No. 2 for further reduction. The result of the action of these two pairs of rolls is that part of the stock is already in fragments sufficiently small for the further operations for recovering the rubber, whereas part of it requires still further reduction, which is effected by mill No. 3. After passing between rolls *b b'* of No. 2 the stock slides down an inclined guide G, Fig. II, to the lower end of a screw conveyer H, by which it is raised and fed onto the upper end of an inclined screen I, which leads to the rolls *c c'* of No. 3. Any suitable mechanical lifter would be the equivalent of the conveyer H, and it may even be omitted altogether and the stock thrown onto the screen I by hand without departing from the spirit of the invention. As the stock slides by gravity down screen I the smaller fragments pass through it and fall upon an inclined guideway K, which delivers it under roll *c* directly to the elevator-boot L. A guard or deflector *i* is placed under the screen I to prevent the fragments passing through the latter from being caught by roll *c'*. The larger pieces of the stock are delivered by screen I between rolls *c c'*, and after being further reduced by these rolls they fall upon guideway K and are conveyed to the elevator-boot L.

Screen I is provided with guide-strips *k*, to convey the stock between blocks E. These strips are pivoted at *l* to the upper end of the frame of screen I, so that when the position of blocks E is changed the strips can also be adjusted properly.

Screen I in Figs. I and II is stationary. As shown in Figs. III and IV, it is arranged to oscillate transversely. The screen at its upper end rests upon a cross-piece *m*, and at its lower end has a tongue *n*, which is mortised in a groove in the stationary strip *o*, which forms a continuation of the screen. To one side of the screen-frame is bolted an arm *p*, which carries two small friction-rollers *q*. Between these rollers is a star-shaped cam *r* on a shaft *s*, to which motion is communicated through a pulley *t*. By means of cam *r* a rapid oscillatory motion is communicated to screen I, whereby the operation of sifting out the smaller fragments of the stock is performed more effectually.

Any suitable mechanism for shaking screen I may be substituted for that shown, and other details of construction may be modified without departing from the spirit of the invention. It is obvious, moreover, that some of the improvements described may, if desired, be used without employing the others.

Having now fully described my said invention and the manner in which the same is or may be carried into effect, what I claim is—

1. In a mill for reducing old rubber stock, the combination, with a pair of cracker-rolls, of a guide-block E on the feed side of the rolls arranged to confine the acting surface of the rolls to the portion on one side of said block and to cut off the portion on the other side thereof, substantially as described.

2. In a mill for reducing old rubber stock, the combination, with a pair of cracker-rolls, of a guide block or blocks E, arranged to confine the acting surface of the rolls to the portion on one side of said block or blocks, and means, as specified, for adjusting said block or blocks lengthwise of the rolls, substantially as described.

3. The combination, with a pair of cracker-rolls, of an inclined screen leading to the feed side of said rolls, and a guideway for conveying the fragments which pass through said screen under the rolls to the delivery side thereof, substantially as described.

4. The combination, with the cracker-rolls, of an inclined screen for conveying thereto the larger fragments of stock requiring further reduction, an inclined guideway under said screen and extending beneath said rolls for bringing together the two portions of the stock separated by said screen, and the guard or deflector for preventing the smaller fragments from being caught by the rolls, substantially as described.

5. In a rubber-grinding mill, the combination of two pairs of cracker-rolls, an inclined screen, and a conveyer, the conveyer being adapted to raise all the product of one of the pairs of rolls to the upper end of the inclined screen, and the latter being adapted to deliver the coarser fragments of stock to the other pair of rolls after sifting out the finer pieces, substantially as described.

6. The combination, with a pair of cracker-rolls and a guide block or blocks for reduc-

ing their acting surfaces, of an inclined screen leading to said rolls, and adjustable guide-strips for directing the stock to the space bounded by the guide-blocks, substantially as described.

7. The combination, with the cracker-rolls and the guide block or blocks, of an inclined screen provided with pivoted guide-strips, and means for oscillating said screen, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

NATHANIEL C. MITCHELL.

Witnesses:
PHILIP MAURO,
C. W. CROASDILL.