

No. 733,125.

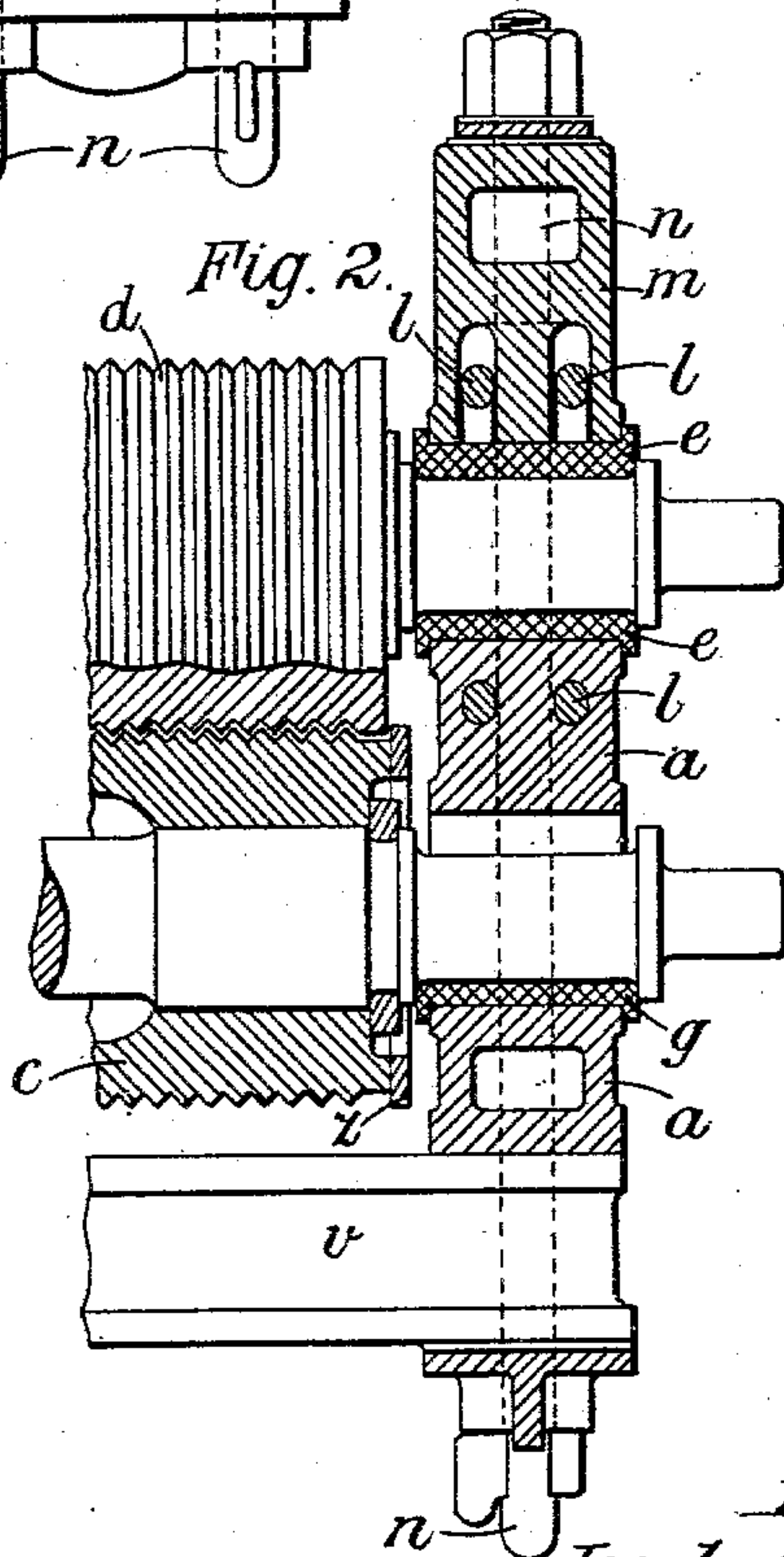
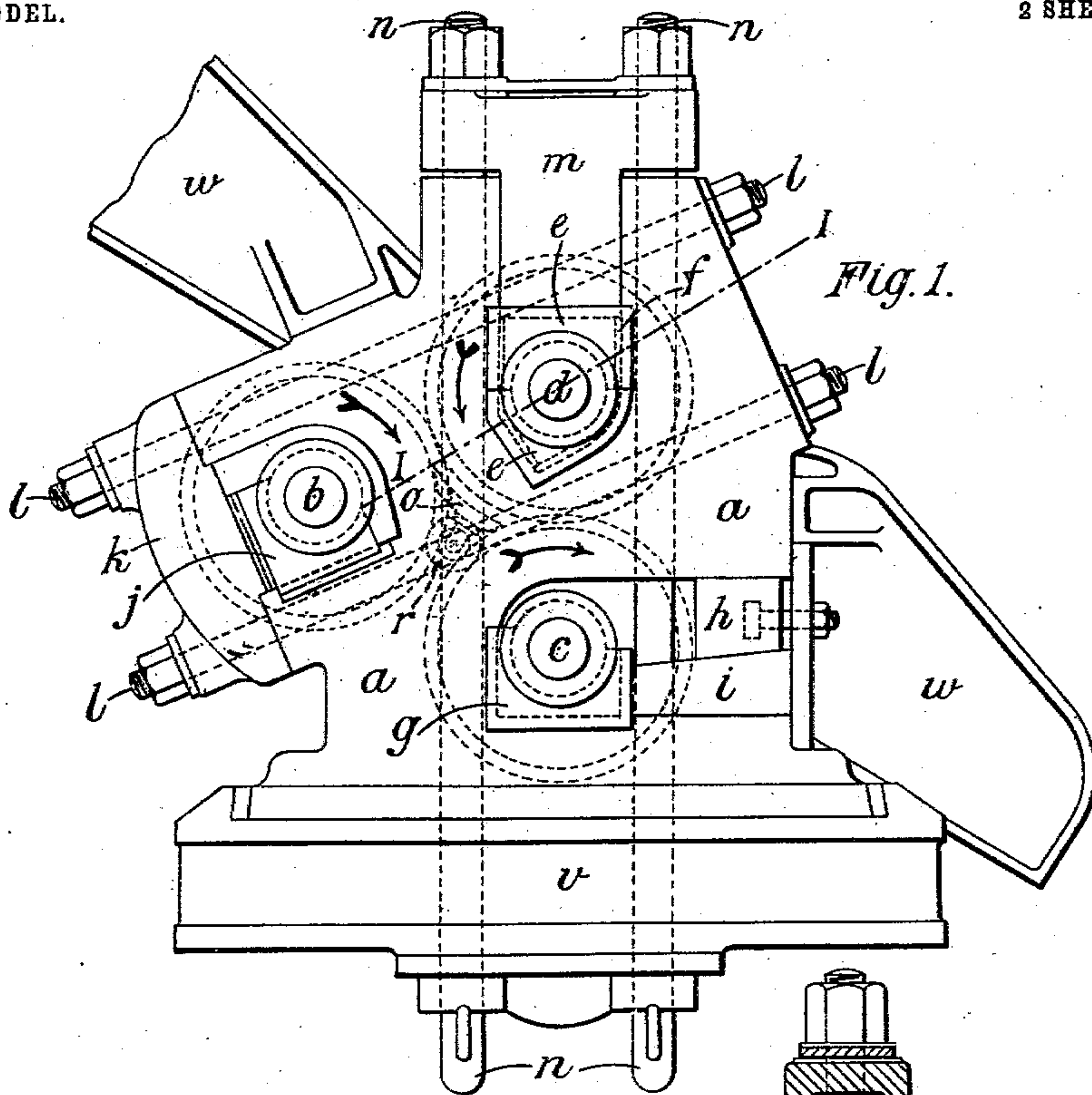
PATENTED JULY 7, 1903.

J. J. E. BEKKER.
THREE-ROLL CRUSHING MILL.

APPLICATION FILED APR. 15, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



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Fig. 3.

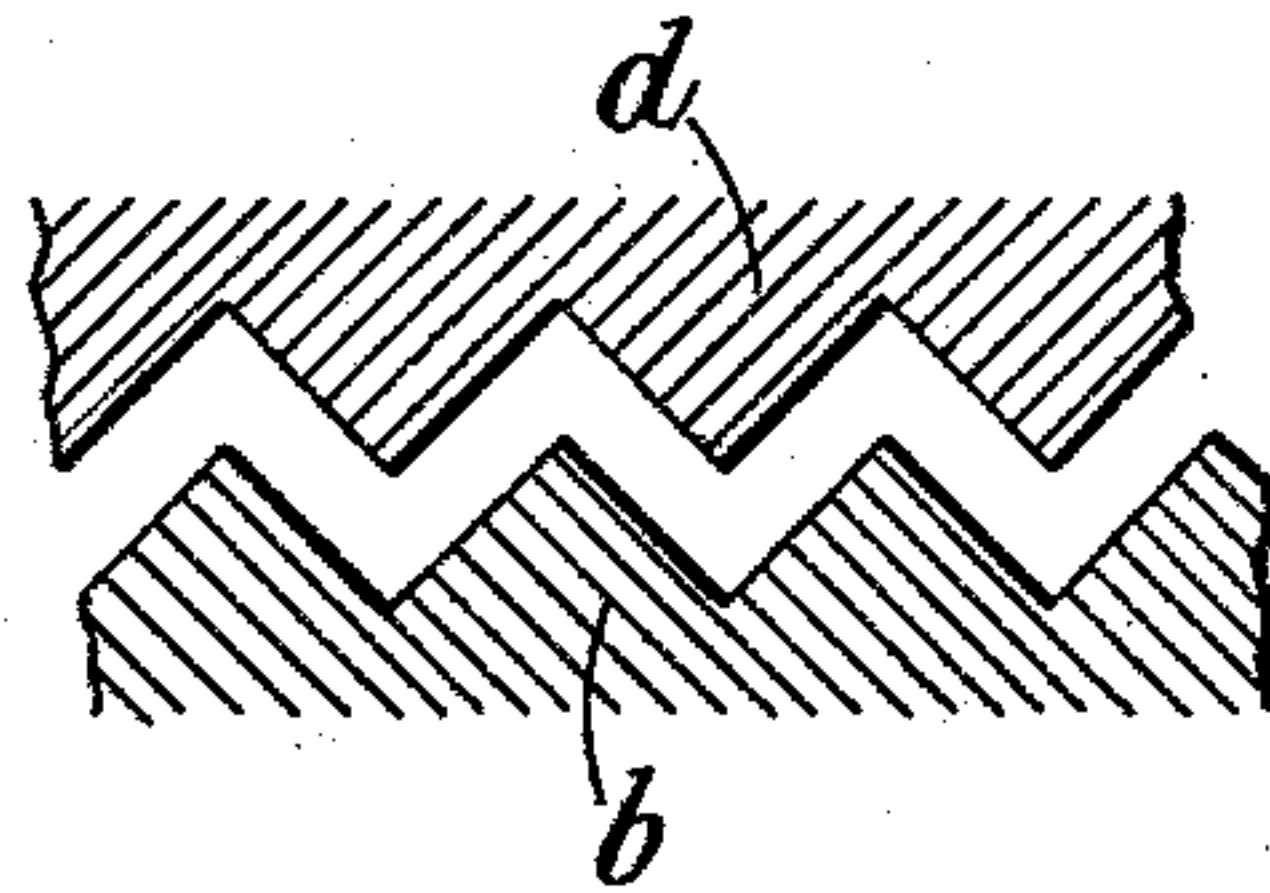


Fig. 4.

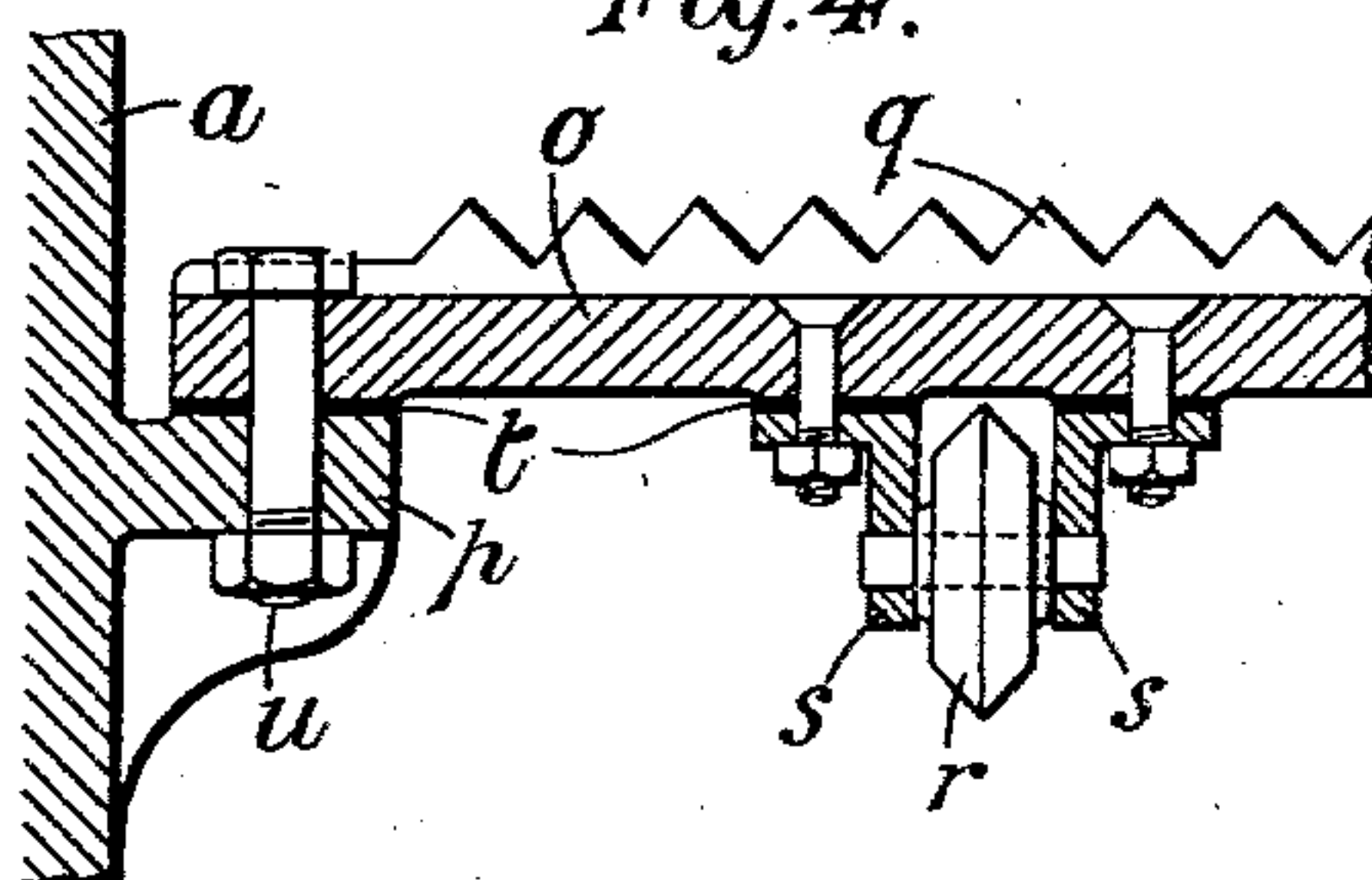
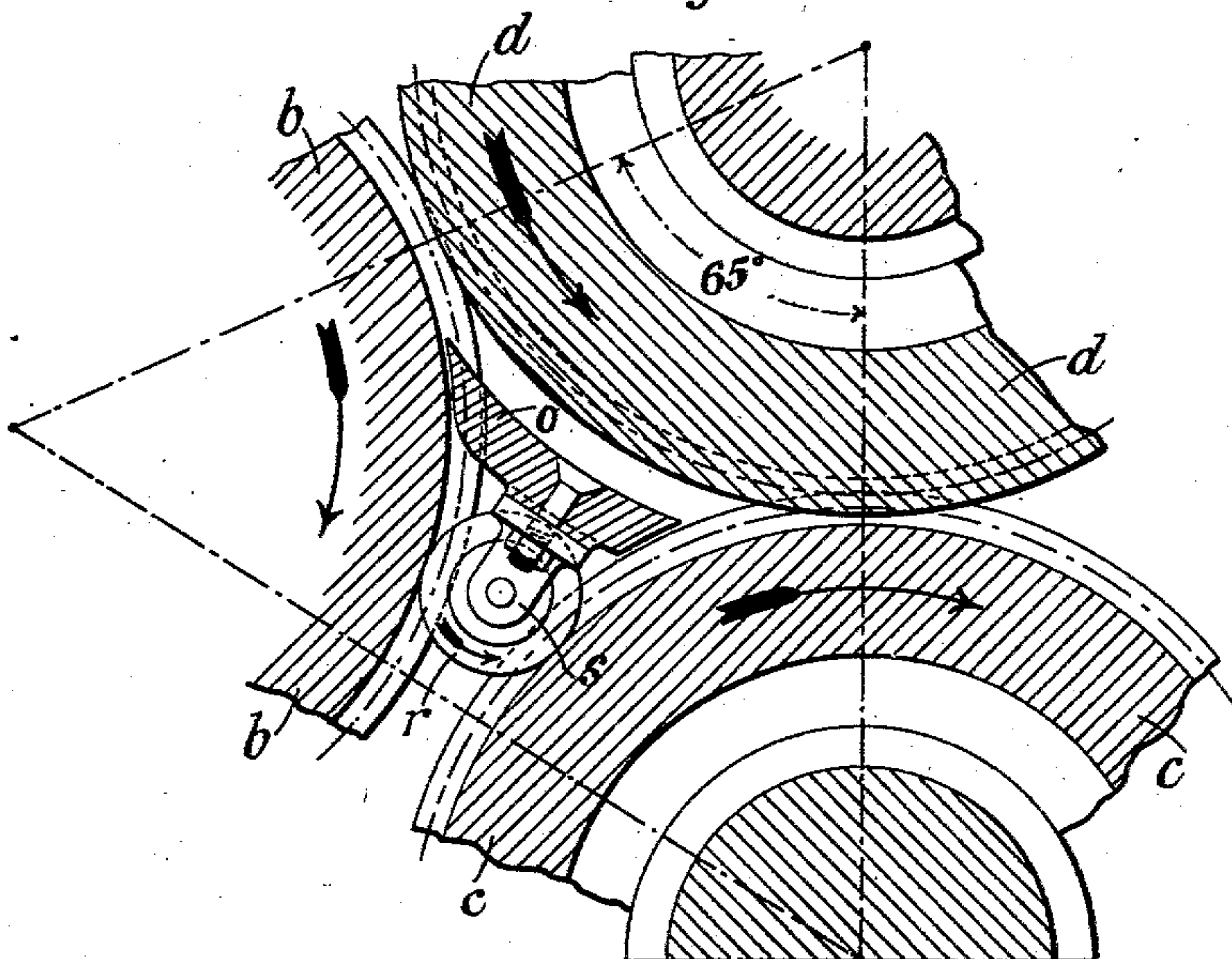


Fig. 5.



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UNITED STATES PATENT OFFICE.

JACOBUS JOHANNES ERNST BEKKER, OF AMSTERDAM, NETHERLANDS.

THREE-ROLL CRUSHING-MILL.

SPECIFICATION forming part of Letters Patent No. 733,125, dated July 7, 1903.

Application filed April 15, 1902. Serial No. 103,026. (No model.)

To all whom it may concern:

Be it known that I, JACOBUS JOHANNES ERNST BEKKER, a subject of the Queen of the Netherlands, residing at Amsterdam, Netherlands, have invented certain new and useful Improvements in Three-Roller Crushing-Mills, of which the following is a specification.

This invention relates to improvements in crushing-mills such as are used in the cane-sugar industry, for pulverizing ores, and for like purposes.

In the crushing-mills heretofore known there are generally three smooth cast-iron rollers, which are connected together by driving and gear wheels and are operated in the following manner: In the cane-sugar industry the sugar-canes are crushed between the rollers. For this purpose three rollers are usually mounted with their axes at the angles of an approximately equilateral triangle—that is to say, at the bottom the first pressing or “cane” roller and the second pressing or “bagasse” roller and in the middle above these two rollers the top roller. The pressed-out canes (bagasse or trash) between the first pressing-roller and the top roller pass onto a “trash-turner” or returner-bar arranged between the first and second pressing-rollers and are fed forward over the said bar and are then again pressed out between the second pressing-roller and the top roller. The position of the returner-bar and the distance between the several rollers has a great influence on the capacity of the mill. Before the canes are introduced into the crushing-mill proper as a rule they first pass through an apparatus, either a cutting or shredding machine or a crusher, where they are subjected to a preparatory treatment—that is to say, the canes are there torn asunder and the fibers thereof separated from each other.

The object of this invention is to produce an arrangement which will render superfluous these three machines for the preliminary treatment of the cane, so that the work of the mills heretofore employed, together with that of a cutter—a “Ross cutter,” for example—or of a shredder or of a crusher, can now be performed by a single mill of my improved construction. For this purpose I have provided the three rollers on their periphery

with grooves which are arranged transversely to the axis of the rollers and engage in each other. By reason of the difference in the peripheral speeds of the rollers at the root or bottom of the grooves and at the point of the ribs formed between said grooves the canes are not only pressed out, but are also drawn asunder and torn up. Moreover, instead of supporting the trash-turner, as has been usual heretofore, on a bar extending between the rollers it is mounted on brackets cast onto the sides of the frame and is allowed to rest on bearer-rollers, which run in two oppositely-arranged grooves in the two lower rollers. This arrangement enables the two lower rollers to be moved closer together, whereby the angle formed by lines drawn from the center of the top roller to the center of the first and second pressing-rollers can be reduced to a minimum. By this arrangement also the bearings can be so mounted that the whole pressure in the bearing is taken by the bearing-bolts.

My improved crushing-mill is shown in the accompanying drawings, in which—

Figure 1 is a side elevation, and Fig. 2 a partial longitudinal section, of the crushing-mill, while Fig. 3 is a section, drawn to an enlarged scale, showing the form of the grooves; and Figs. 4 and 5 show the returner-bar in longitudinal or transverse section, respectively, also drawn to an enlarged scale.

Like letters indicate corresponding parts throughout the drawings.

In the frame *a* are mounted the first pressing or cane roller *b*, the second pressing or bagasse roller *c*, and the top roller *d*, the top roller being arranged perpendicularly over the second pressing-roller and the first pressing-roller laterally at an angle of sixty-five degrees to the two former rollers, Fig. 5. The first and second pressing-rollers *b* and *c* thus lie so near together that a space of about an inch, for example, is left between the teeth of the gear-wheels driving these two rollers.

Of the three rollers only the top roller *d* is adjustably mounted, this adjustment taking place in the direction of the line *II*, Fig. 1. The space between the pitch-circles of the first pressing-roller *b* and top roller *d* amounts to about three-fourths of an inch, for exam-

ple, and between the second pressing-roller *c* and the top roller *d* to about one-fourth of an inch, for example, Fig. 5. In the adjustment of the top roller in the direction I I these distances increase in the proportion of two to one, and the whole capacity of adjustment at the side of the first pressing-roller amounts to six millimeters, for example, and at the side of the second pressing-roller to three millimeters, for example. The bearing-steps *e e* of the top roller *d* in the adjustment are packed up at the two side edges and the two inclined lower edges by liner-plates, as shown at *f* in Fig. 1.

The bearing-steps *g* for the second pressing-roller *c* are introduced at the side and secured in position in the frame by wedges or keys *h* and *i*, Fig. 1, of which *h* can be drawn up by bolts. The bearing-steps *j* and the cover-pieces *k* for the first pressing-roller *b* are arranged in the direction of the pressure set up between the roller *b* and the top roller *d*, and this pressure is thus entirely taken up by the four bolts *l*, which are arranged transversely through the frame *a* up to positions behind the top roller *d*. The cover-piece *m* of the top roller *d* is held by the two bolts *n*, which extend through the frame, and the pressure set up between the top roller and the second pressing-roller is taken by these two bolts *n*. From Fig. 2 it can be clearly seen how the bolts *n* are arranged between the two bolts *l* in the frame.

The grooves in the periphery of the rollers are shown in Fig. 3. Their cross-section is preferably rectangular and their height about one inch, for example.

From Fig. 5 it can be seen how the grooves of the various rollers engage in each other. As usual, only the first and second pressing-rollers have a projecting interchangeable collar *z*, Fig. 2. The groove next to this collar is removed in order to reduce the lateral pressure of the bagasse or "trash" against the collar *z* as much as possible.

The form of the trash-turner or returner-bar is shown in Figs. 4 and 5. It consists of a plate *o* about two inches thick, which rests at its two ends on brackets *p*, cast on the frame *a*. At the side turned toward the first pressing-roller *b* are provided teeth *q*, which lie in the grooves of the first pressing-roller *b*. The other side, turned toward the second pressing-roller, is arranged at a distance of about one-half inch from the points of the ribs between the grooves of this roller. At two or three places on the under side of the returner-bar are provided bearer-rollers *r*, which run in two oppositely-arranged grooves in the rollers *b* and *c*. Both with the brackets *p*, as well as with the bearings *s* of the bearer-rollers *r*, liners *t* are employed in order to enable the position of the returner-bar to be altered as required. For the same purpose the holes in the brackets *p* for the fasteningscrews *u* are made oval.

The frames *a* are mounted on a heavy beam

v, and supply and delivery chutes *w* are provided for feeding in the canes and conducting away the bagasse.

My improved crushing-mill has the following advantages:

a. Since the peripheral speed at the root or bottom of the grooves is smaller than at the points of the ribs between the said grooves, the canes are not only pressed out between the grooves to the same degree as in mills with smooth rollers, but they are also drawn asunder and torn up at the same time. The arrangement of the grooves thus renders superfluous the employment of any of the machines for the preliminary treatment of the canes—viz., Ross cutters, shredders, or crushers—whereby working becomes simpler and less expensive.

b. The grooves turned in the rollers increase the effective surface of the rollers by about forty per cent., whereby the capacity of the mill is increased in the same degree. By this means my improved mills can treat a much larger quantity of cane than if the mills were provided with smooth rollers of the same length and diameter.

c. The form and method of supporting the returner-bar permits the first and second pressing-rollers to be moved close together, whereby the breadth of the returner-bar can be considerably reduced, and the rollers can be mounted with the first and second pressing-rollers at an angle of sixty-five degrees to each other.

d. By this arrangement of the rollers the bagasse is always conducted in a downward direction over the returner-bar, whereby the pressure on the said returner-bar is reduced and the vibration of the returner-bar and of the three rollers, which is caused by the pushing of the bagasse over the returner-bar, is almost entirely obviated, so that the breakage of the axles or trunnions of the rollers, which has frequently occurred heretofore, is prevented. Moreover, by this arrangement the introduction-surface on the first and second pressing-rollers is increased, which results in a better gripping of the canes thereby.

e. The returner-bar *o* by means of its teeth *q* closes the grooves of the first pressing-roller *b* and scrapes off the cane fibers from the surface of these grooves. By this means the fibers cannot set fast between the grooves and wind onto the roller.

f. All forces set up between the rollers are taken by the bolts *l* and *n* and transferred by the latter to the frame *a*. The frames can thus be made considerably lighter and simpler than is the case in the mills heretofore known and in which this pressure must be partly taken directly by the frame.

What I claim is—

1. The combination in a crushing-mill, of a frame, a plurality of pressing-rollers mounted to revolve in said frame, a returner-bar in proximity to one of said rollers, and wheels on said returner-bar that turn on the periph-

ery of said last-mentioned roller and on the periphery of the next succeeding roller.

2. The combination in a crushing-mill, of a frame, a plurality of pressing-rollers mounted
5 to revolve in said frame, interengaging grooves in said rollers, a returner-bar in proximity to one of said rollers, said returner-bar being provided with teeth that register with the grooves of said roller, and wheels on said
10 returner-bar that turn in the grooves of said last-mentioned roller and in the grooves of the next succeeding roller.

3. The combination in a crushing-mill, of a frame, first and second pressing-rollers, a top
15 roller coacting therewith, interengaging grooves in said rollers, a returner-bar in proximity to the first of said rollers, said returner-bar being provided with teeth that register with the grooves of said first roller, and
20 wheels on said returner-bar that turn in the grooves of said first and second rollers.

4. The combination, in a crushing-mill, of a frame, first and second pressing-rollers, oppositely-arranged grooves in said rollers, a top
25 roller coacting with said pressing-rollers, a returner-bar, brackets on said frame for supporting the ends of said returner-bar, and rollers on said returner-bar turning in said grooves in said pressing-rollers, substantially
30 as described.

5. The combination, in a crushing-mill, of a

frame, first and second pressing-rollers, oppositely-arranged grooves in said pressing-rollers, a top roller coacting with said pressing-rollers, interengaging grooves in said pressing and top rollers, a returner-bar, brackets
35 on said frame for supporting the ends of said returner-bar, rollers on said returner-bar for turning in said oppositely-arranged grooves in said pressing-rollers, and teeth on said returner-bar for coacting with the grooves in
40 said first pressing-roller, substantially as described.

6. The combination in a crushing-mill, of a frame, a second pressing-roller mounted in
45 said frame, a top roller mounted approximately perpendicularly above said second roller, a first pressing-roller mounted at the side of said top roller, interengaging grooves in said rollers, a returner-bar in proximity to
50 said first roller, said returner-bar being provided with teeth that register with the grooves in said first roller, and wheels on said returner-bar that turn in the grooves of said first and second rollers.
55

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

JACOBUS JOHANNES ERNST BEKKER.

Witnesses:

THOMAS HERMANUS VERHAVE,
AUGUST DE SIEGFRIED DOCEN.