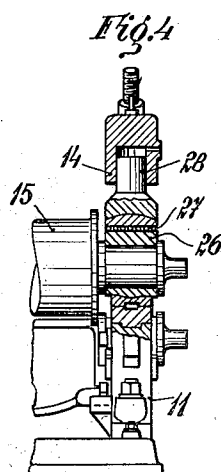
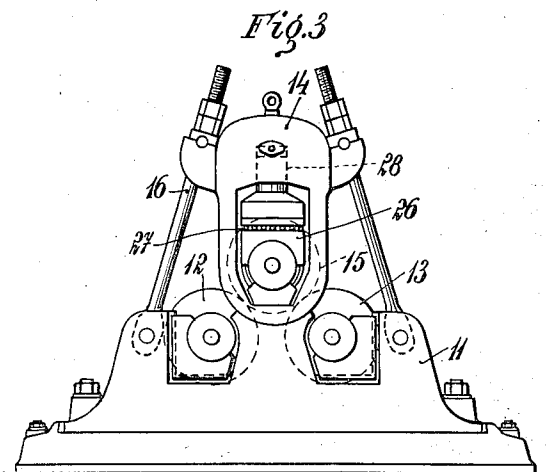
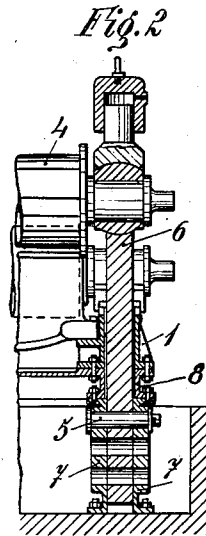
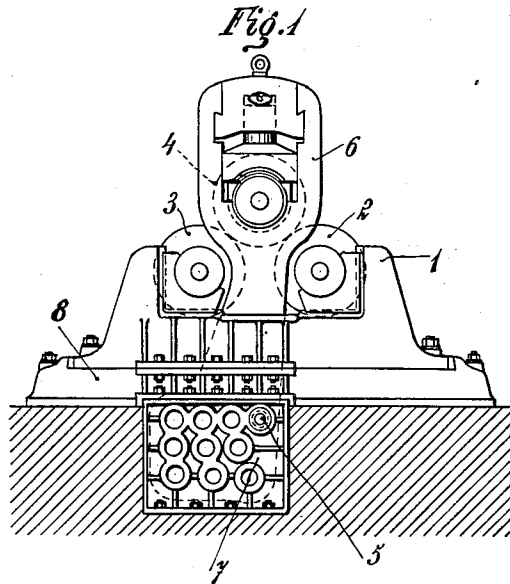


F. J. DE BRUIN.  
SUGAR CANE MILL.  
APPLICATION FILED FEB. 4, 1920.

1,372,006.

Patented Mar. 22, 1921.

2 SHEETS—SHEET 1.

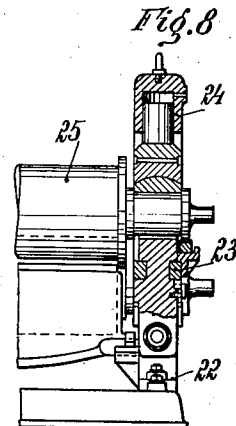
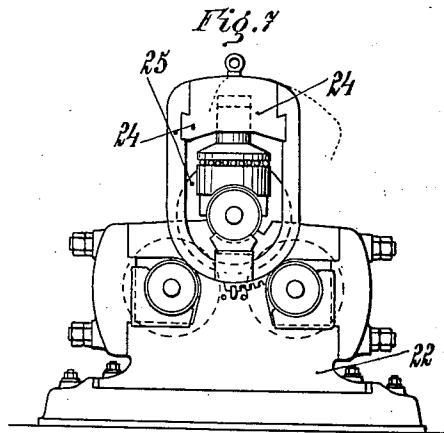
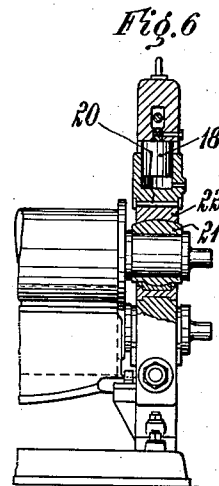
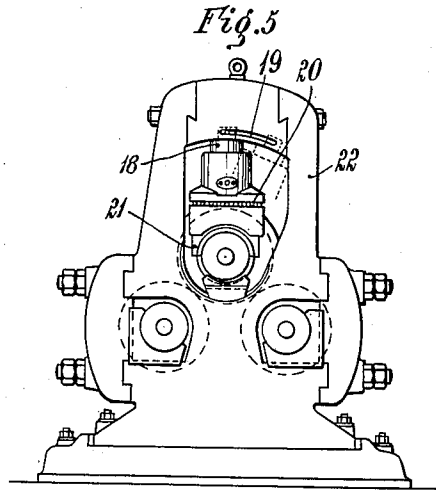


F. J. de Bruin <sup>INVENTOR</sup>  
By *J. J. J. J.* Attorney

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*F. J. de Bruin* INVENTOR  
*J. J. J. J.* Attorney

# UNITED STATES PATENT OFFICE.

FREDERIK JACOB DE BRUIN, OF ROTTERDAM, NETHERLANDS.

## SUGAR-CANE MILL.

1,372,006.

Specification of Letters Patent.

Patented Mar. 22, 1921.

Application filed February 4, 1920. Serial No. 356,271.

*To all whom it may concern:*

Be it known that I, FREDERIK JACOB DE BRUIN, a subject of the Queen of the Netherlands, residing at Rotterdam, Netherlands, have invented certain new and useful Improvements in Sugar-Cane Mills, of which the following is a specification.

This invention relates to improvements in sugar cane mills.

In the usual mills with three rollers, in which the vertical direction of the hydraulic pressure acting on the top roller cannot be varied, great fluctuations are caused in the pressure by irregularities in the charging of the mill.

Various means have already been proposed and some of them tried in practice for the purpose of removing these great fluctuations in pressure.

The majority of these cases is based on the following consideration, viz., owing to the unavoidable irregularities in the charging of such mills with sugar cane, the top roller must be adapted so that it may select its own position in relation to the two side rollers, with the result that the size of the admission and outlet gaps is automatically adjusted in accordance with the thickness of the layer of sugar cane present at any particular moment in either of these gaps.

This consideration resulted in the employment of the so-called floating top rollers, two forms of which are in general use.

According to one of these forms the two mill housings each consist of a lower portion comprising the trunnions of the side rollers mounted therein, and an upper portion, movable in relation to the lower portion and connected by a tie rod, to a pivot located vertically beneath the top roller, the tie rod being attached to the upper portion and traversing the lower housing portion.

In the other form of construction of these existing mills the bushes of the bearings of the top roller, which, accurately fitting in the slots in the top of the housings, are ordinarily only capable of a vertical movement, are narrower in their width to such an extent that the top roller is enabled to move also in a lateral direction to an extent sufficient to allow of an adaption to the fluctuations in the supply of sugar cane to the mill. In order to diminish the friction between the bearing brasses and the hydraulic plungers bearing thereon, roller bearings were provided. By means of these

top rollers, which were thus capable of movement in every direction, it was actually possible to exert an almost absolutely uniform pressure on the sugar cane. There existed however the great disadvantage that the pressure in the rear opening of the mill was much too slight to insure an efficient total squeezing and crushing effect.

This must be attributed to the fact that the pressure exerted by the hydraulic means on the top roller, owing to the unalterable vertical direction of the same, was necessarily distributed equally over the two side rollers.

At any rate this applied to mills when brought to a standstill while in full running. During crushing, the front pressure, owing to the action of the circumferential force residing in the top roller, which is driven by the steam engine, was even considerably higher than the rear pressure.

As the front pressure of the mill cannot be increased beyond a certain maximum without causing a slipping of the rollers over the sugar cane, the rear pressure, when using the well known top rollers with pendulum motion, became so slight that an efficient squeezing effect was quite out of the question.

The object of this invention is to remove this disadvantage, and substantially consists in allowing a floating top roller of known construction to act by means of the hydraulic pressure in such a direction on the lower rollers that both in the front opening and in the rear opening of the mill a pressure will always be exerted, which is most suitable for insuring an efficient squeezing and crushing of the sugar cane.

Several forms of the invention are illustrated by way of example in the accompanying drawings in which:

Figure 1 shows one form in end elevation, and Fig. 2 a half sectional front elevation respectively, whereas Figs. 3 and 4, 5 and 6 and 7 and 8, are similar views of other forms of the improved mill, constructed in accordance with the invention.

In the form of mill shown in Figs. 1 and 2, the lower portions of the mill housings contain only the two side rollers 2 and 3, which are free to rotate but are otherwise fixed with respect to their bearings, whereas a floating top roller 4, belonging to the well known tie rod type, is mounted by means of pins 5 and of pendulums 6 in bearing

blocks 7, which are fixed parts of the bed plate 8 of the mill.

The under parts of the pendulums 6 as well as the bearing blocks 7 possess a number of holes into which the pins 5, one at each side of the mill, can be set, so that the resultant of the two forces transmitted by the top roller to the side rollers are adjusted in a correspondingly oblique direction by which means the desired regulation of the front and rear pressure is obtained.

The adjusted relationship between this front pressure and rear pressure in each particular case can no longer be influenced even by the most negligent charging of the mill with sugar cane, whereas the total pressure can be regulated by varying the pressure of the accumulator.

Another form of the invention for solving this problem is shown in Figs. 3 and 4 in which the mill housings are each divided into a lower section 11, containing the two fixedly mounted side rollers 12 and 13, and an upper section or cap 14, containing a top roller movably mounted therein and constructed on the roller bearing principle, the said movement taking place along a circular path, the center of which coincides with the axis of the top roller.

By placing these pivoting upper sections or caps of the housings in an oblique position, the desired regulation of the front and rear pressure is obtained. This can be done by lengthening one of the two bolts 16 and 17, which connect the upper section or cap to the lower section of the housings, and by simultaneously shortening the other of these two bolts.

This intended oblique adjustment of the hydraulic means could also be effected, as shown in Figs. 5 and 6, by moving the plungers 18 of the hydraulic rams over circular sliding tracks 20 fixed to the housings 19.

In this form the top roller is movably mounted on roller bearings arranged between the bearing bushes 21 and the cylinders 22 of the hydraulic rams.

Further, as shown in Figs. 7 and 8, the direction in which the hydraulic pressure acts, could be changed by partially rotating or oscillating closed ring shaped yokes 24, pivotally mounted between the lateral faces of the housings 23, two of which yokes are always rigidly connected to one of the cylinders 22 of the hydraulic rams. In this form of the invention the movably mounted top roller is also a floating roller of the well known roller bearing type.

In order to avoid a one-sided load on the trunnions of the mill rollers and roller bearings and a consequent heating of these trunnions and a breaking of the bearing rollers, the bearing bushes of the upper roller in all the four forms of the invention hereinbefore described are movable in all directions.

In mills as shown in Figs. 1 and 2, 5 and 6 and 7 and 8, this result is insured by providing spherical surfaces after the type of the well known Seller's transmission bearing blocks, whereas in the form shown in Figs. 3 and 4, where the hydraulic contrivance presses on the bearing brasses by means of balls instead of rollers, cylindrical intermediate members 26 are provided between the ball bearings 27 and the hydraulic pistons 28.

These intermediate members, on occurrence of a one-sided raising or lowering of the top roller, will move in an axial direction with reference to the bearing brasses, thus enabling the balls to roll in the longitudinal direction of the mill rollers.

The reduction of friction between the bearing brasses and the hydraulic rams, see Figs. 3 to 8, may also be effected by other means than the well known roller bearings or ball bearings, for instance by introducing lubricating oil under high pressure between flat and slightly concave sliding faces.

This invention is not restricted to the above described forms of construction, on the contrary it applies to all three-roller-mills with movably mounted, so-called floating top rollers, in which the direction of the resultant of the forces, transmitted by the top roller to both the side rollers, is not vertical and can be chosen arbitrarily within certain defined limits.

I claim:

1. In a three roller sugar cane mill, two housings parts fixedly bolted on the bed plate, two side rollers not adjustably mounted therein, two upper housing parts independently movable with respect to said fixed housing parts, a floating top roller having hydraulic adjustment mechanism movably mounted in the upper housing parts, said upper parts being adjustable to distribute in unequal parts the amount of pressure exerted by said floating top roller on the side rollers, for the purpose of insuring adequately powerful squeezing of the sugar cane in the rear gap of the mill, substantially as described.

2. In a three roller sugar cane mill, two housings divided in fixed under and movable upper parts, two not adjustable side rollers, a floating top roller with hydraulic adjustment mechanism and means for regulating the amount of pressure on the side rollers, for the purpose of obtaining the desired relationship between the pressure at the inlet and outlet gaps of the mill, substantially as described.

3. In a three roller sugar cane mill, two housings divided in fixed under and movable upper parts, two not adjustable side rollers, a floating top roller with hydraulic adjustment mechanism, means for regulating the amount of pressure on the side rollers

ers, comprising pendulum extensions on the upper housing parts, pivots in the under parts thereof and means for changing the location of said pivots, substantially as and for the purpose described.

4. In a three roller sugar cane mill, two housings divided in fixed under and movable upper parts, two not adjustable side rollers, a floating top roller with hydraulic adjustment mechanism, pendulum extensions on the upper housing parts, pivots in the pendulum under parts and means for changing the location of said pivots, said means consisting in a number of pivot holes in the pendulum and coöperating pivot holes in a fixed part of the mill.

5. In a three roller sugar cane mill, two housings divided in fixed under and movable upper parts, two not adjustable side

rollers, a floating top roller with hydraulic adjustment mechanism, pendulum extensions on the upper housing parts, pivots in the pendulum under parts and means for changing the location of said pivots, comprising a number of pivot holes in the under parts of pendulums, bed plate extensions having an equal number of pivot holes spaced the same distance apart as those in the pendulums, each pivot locatable in selected holes at each side of the mill, substantially as and for the purpose described.

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

FREDERIK JACOB DE BRUIN.

Witnesses:

A. ROTSTEGE,  
J. KOOLMAN.