No. 850,596. PATENTED APR. 16, 1907.

J. MORIN.

CRUSHING MILL.

APPLICATION FILED OCT. 21, 1905.

3 SHEETS—SHEET 1.

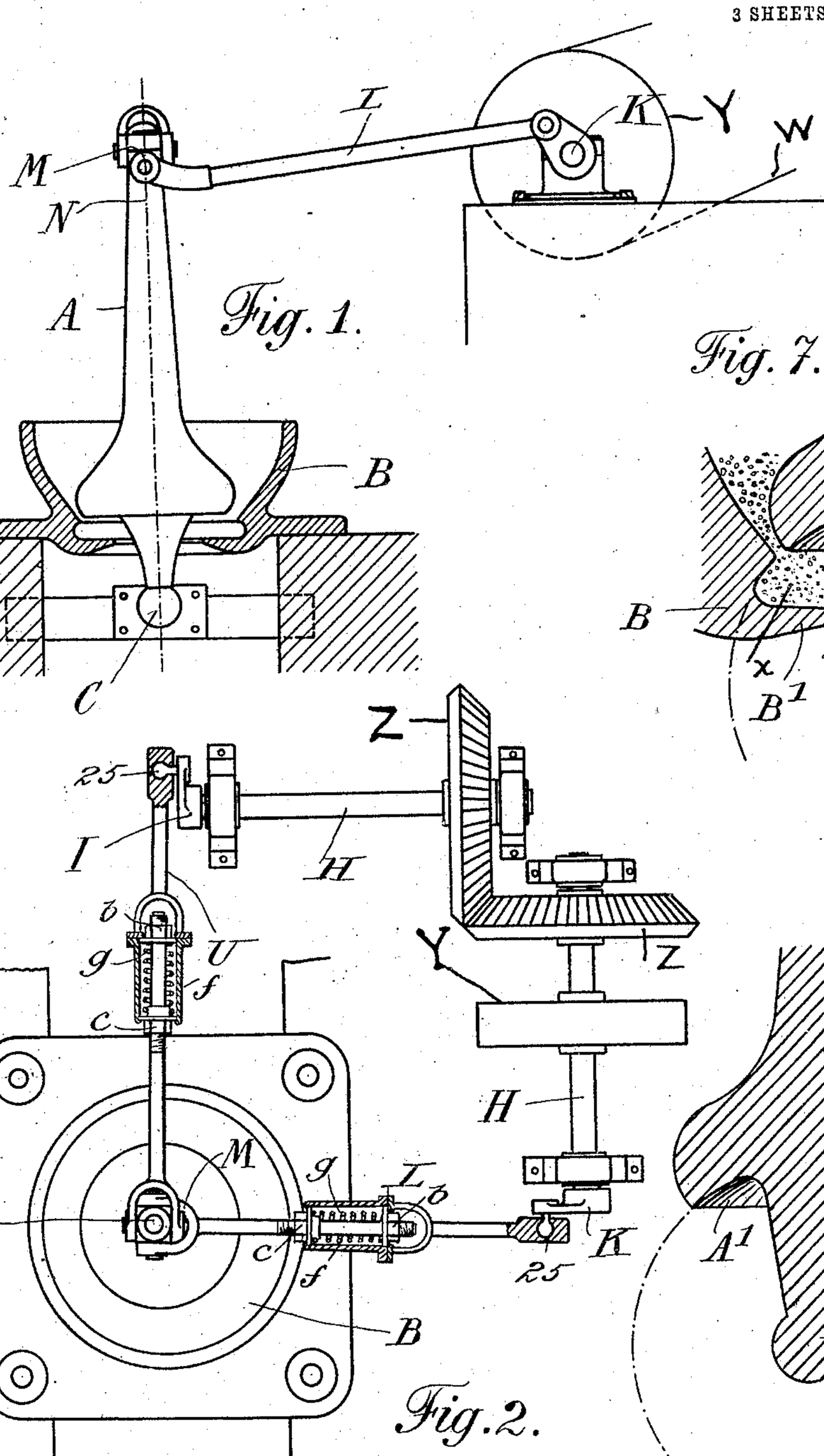


Fig. 1.

Fig. 7.

Fig. 2.

Fig. 8.

Witnesses:
G. L. Hamilton
M. Hamilton.

Inventor:
Jean Morin
by his Attorney,
James Hamilton

No. 850,596. PATENTED APR. 16, 1907.

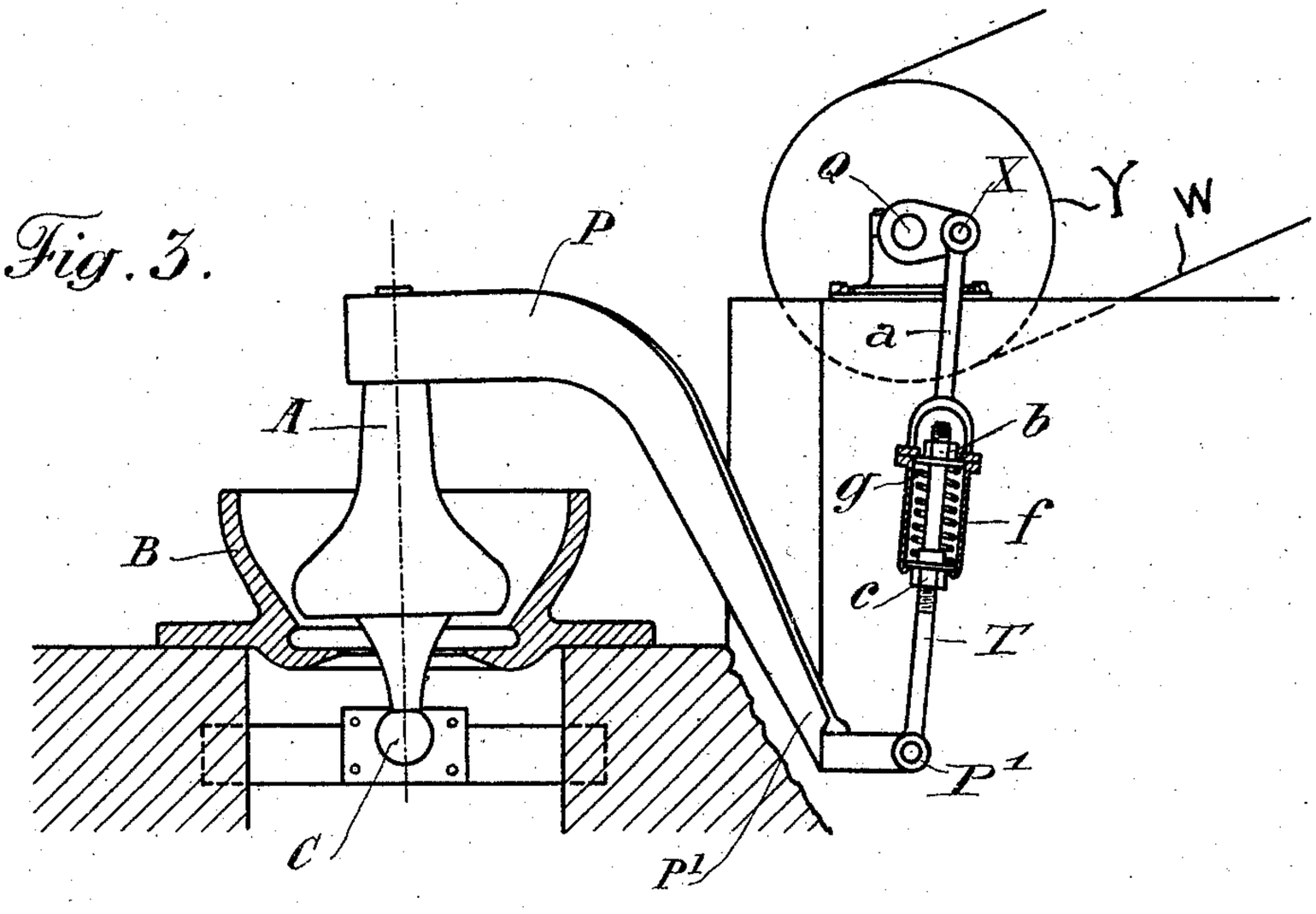
J. MORIN.

CRUSHING MILL.

APPLICATION FILED OCT. 21, 1905.

3 SHEETS—SHEET 2.

Fig. 3.



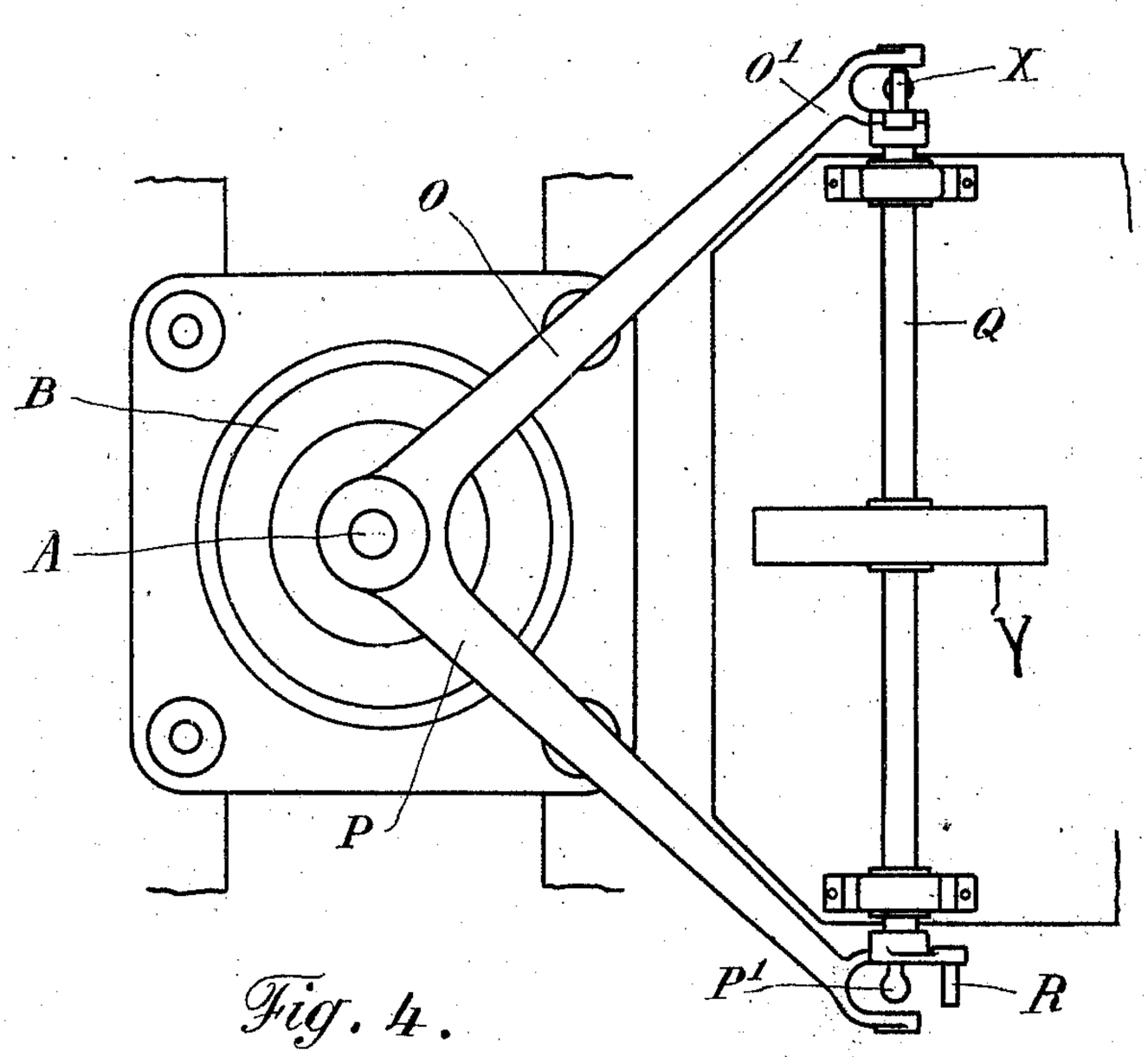


Fig. 4.

Witnesses:
G. L. Hamilton
M. Hamilton.

Inventor:
Jean Morin
by his Attorney
James Hamilton

No. 850,596. PATENTED APR. 16, 1907.

J. MORIN.

CRUSHING MILL.

APPLICATION FILED OCT. 21, 1905.

3 SHEETS—SHEET 3.

Fig. 5.

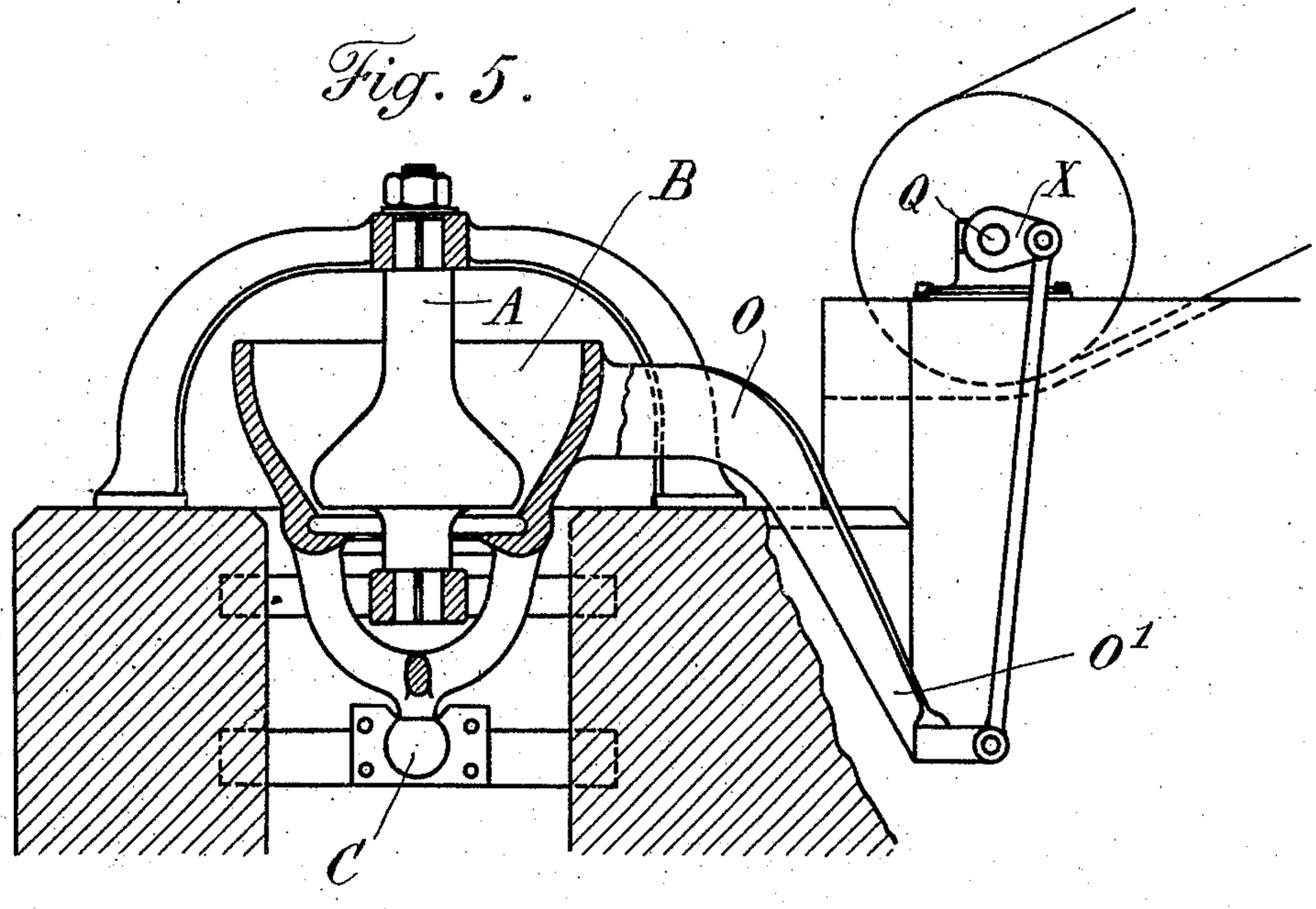


Fig. 6.

Witnesses:
G. L. Hamilton.
M. Hamilton

Inventor:
Jean Morin
by his Attorney
James Hamilton

UNITED STATES PATENT OFFICE.

JEAN MORIN, OF DAYTON, OHIO.

CRUSHING-MILL.

No. 850,596. Specification of Letters Patent. Patented April 16, 1907.

Application filed October 21, 1905. Serial No. 283,727.

To all whom it may concern:

Be it known that I, JEAN MORIN, engineer, a citizen of the Republic of Switzerland, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Crushing-Mills, of which the following is a specification.

The invention refers to improvements in and relating to crushing-mills, and particularly to crushing-mills of the type which consists of a crushing-roller performing a conical rotation in a stationary grinding-mortar or the complementary form or arrangement of a grinding-mortar performing a conical rotation with regard to a stationary crushing-roller.

In the crushing-mills of this said type as they have been heretofore constructed the conical rotary motion is usually imparted to either the crushing-roller or to the crushing-mortar by means of a transmission which is always placed in line with the vertical axis of the crushing-mortar. This involves a difficulty in the construction and operation of the machine, since a very great effort has to be imparted to the movable parts of the same, and the frames which are intended to support the said movable parts and comprise bearings therefor are thrown out of true.

According to the present invention a conical motion is imparted to the crushing-roller (or to the crushing-mortar) by means of two cranks and suitable connecting-rods, and the shape or configuration of the grinding-mortar is devised in such a way as to allow the grist to be retained until all the particles are thoroughly crushed.

In the accompanying drawings, Figure 1 shows a sectional elevation, and Fig. 2 a plan, of one form of construction of the crushing-mill according to the present invention, the conical rotation being imparted to the crushing-roller. Figs. 3 and 4 show, respectively, a sectional elevation and a plan of a modification of the crushing-mill shown in Figs. 1 and 2. Figs. 5 and 6 show, respectively, a sectional elevation and a plan of a crushing-mill in which the conical rotation is imparted to the crushing-mortar. Fig. 7 shows, on a larger scale and in section, the profile of the lower portion of the crushing-mortar and the crushing-roller; and Fig. 8 is a similar section of the whole crushing-roller, showing the concave surface or groove A′ of the same.

In the device, as shown in Figs. 1 and 2, the crushing-roller A is driven by two horizontal shafts G and H, arranged at right angles to one another and connected, by means of two cranks K and I and their respective bifurcated connecting-rods L and U, to the stem of the crushing-roller A. The latter is placed in the center of a stationary crushing-mortar B. The two cranks K and I are connected by a ball-and-socket joint 25 with the rods L and U, respectively, and tend to impart, each in its plane, to the crushing-roller A, an oscillatory motion around the part C, which forms one member of a ball-and-socket joint; but if the arrangement of the cranks is such that one of them has reached the end of its stroke when the other one is at but half-stroke a conical motion will be imparted to the crushing-roller.

In order to obtain the same angular speed for the two crank-shafts G and H, they are, in the example shown, connected to one another by means of two bevel gear-wheels Z. These wheels may of course be replaced by any equivalent device whatever. The shaft G is driven by means of a pulley Y and its driving-belt W. The two shafts G and H may also be arranged at any other angle to each other; but in any case the cranks must be placed at an angle to each other which corresponds to the angle made by the shafts G and H in order that the conical rotation of the crushing-roller may be obtained.

As shown in Fig. 1, the connecting-rods U and L are pivotally secured at N and M, respectively, to a block swiveled on the reduced end of the stem of the roller A, and the pivots N and M are in different horizontal planes. In this case the rods U and L must be of unequal length, as is clearly shown in Fig. 2; but I do not desire to be understood to limit myself to this particular form of construction, which may be departed from without departing from the spirit of my invention.

A very simple driving device is shown in Figs. 3 and 4. The shaft of the roller A carries an angle-lever having two arms O and P of suitable form, the lower portions O′ and P′ of which are at mid-stroke in the same horizontal plane as the point C. The vertical planes of the said two levers are preferably at right angles to one another, Fig. 4; but any other angular position may be adopted for them. The said portions O′ and P′ are each pivoted to a connecting-rod T, the upper end of which is pivotally connected

to one of the cranks X or R, as is shown, Fig. 5.

A horizontal shaft Q, arranged above or below the part O′ or P′, will, by means of two cranks X and R, impart an oscillatory motion to the parts O′ and P′. If said cranks X and R are at the same angle to one another as are the vertical planes of the arms O and P, the resulting motion of the crushing-roller will be a conical one.

The crushing-mill may be constructed as shown in Figs. 5 and 6, in which the grinding-body A is stationary, the mortar B being made to describe a conical rotation.

With a view to preventing the particles of the grist from escaping from the mill before being thoroughly ground the profiles of the crushing-roller and of the mortar are shaped as shown in Figs. 7 and 8.

The mortar B is provided at its outlet with an interior projection B′ for retaining and storing the grist, which will thus be made to form an annular mass before escaping through the opening. The crushing-body A is provided with a groove A′, resembling in shape a spherical zone, at the center of which is the part C. (See Fig. 8.)

The crushed material is retained by the projection B′ and forms an annular mass having an inward slope. This mass will retain the grain in the gaps which are formed in those places where the grinding-body A moves from the mortar B and through which the matter to be ground is likely to fall at each rotation of the grinding-body. The material to be crushed will thus be retained by the dam *x* of the grist already ground and pressed between the crushing-body A and the mortar B. While being crushed it will push downward the material already ground and stored up on the projection B′, and in so doing it will itself form a dam for retaining the superincumbent corn until the latter is seized in its turn by the crushing-body.

Figs. 2 and 3 show a connecting-rod equipped with means which tend to prevent rupture of the parts of the machine in case a very hard body should happen to come between the crushing members. This connecting-rod consists of a spring *f*, surrounding the end of the rod *a′*, and a second rod *a*, one end of which is forked and fastened to a casing *g*, the said spring being inserted between the nuts *b* and *c*, which engage the rod *a′*. Thus the connecting-rod is prevented from transmitting a greater pressure than can be endured by the spring without yielding. Said spring must therefore be calculated for the pressure required for crushing a given kind of material. As soon as a greater resistance is offered to the crushing-body the spring will yield, so that no part of the machine will be subjected to a stress exceeding that for which the springs are calculated.

Having thus fully described my invention, I claim—

1. A crushing-mill consisting of complementary crushing members, one of which is movable and susceptible of being given a conical rotation; and means for giving said movable member a conical rotation, said means comprising a driving mechanism; a pair of coöperating connecting-rods; means for connecting said connecting-rods to said movable member; and means comprising a ball-and-socket joint for connecting said connecting-rods separately to said driving mechanism.

2. A crushing-mill consisting of complementary crushing members, one of which is movable and susceptible of being given a conical rotation; and means for giving said movable member a conical rotation, said means comprising a driving mechanism; a pair of coöperating connecting-rods; means for connecting said rods to said movable member; and means separately connecting said connecting-rods to said driving mechanism.

3. A crushing-mill consisting of complementary crushing members, one of which is movable and susceptible of being given a conical rotation; and means for giving said movable member a conical rotation, said means comprising a pair of coöperating shafts; and a pair of coöperating connecting-rods, one end of each of said connecting-rods being attached to said movable member, and the other end of each of said connecting-rods being operatively connected with one of said shafts.

4. A crushing-mill consisting of complementary crushing members, one of which is movable and susceptible of being given a conical rotation; and means for giving said movable member a conical rotation, said means comprising a driving mechanism; a pair of coöperating connecting-rods, each of which is provided with yielding means for preventing rupture of parts of the machine; means connecting said connecting-rods with said movable member; and means which separately connect said connecting-rods with said driving mechanism.

In testimony whereof I have affixed my signature in presence of two witnesses.

JEAN MORIN. [L S.]

Witnesses:
THOMAS B. HERRMAN,
L. LEGUIN.