

No. 785,617.

PATENTED MAR. 21, 1905.

G. S. KNAPP.
STONE CRUSHER.

APPLICATION FILED DEC. 10, 1903.

2 SHEETS—SHEET 1.

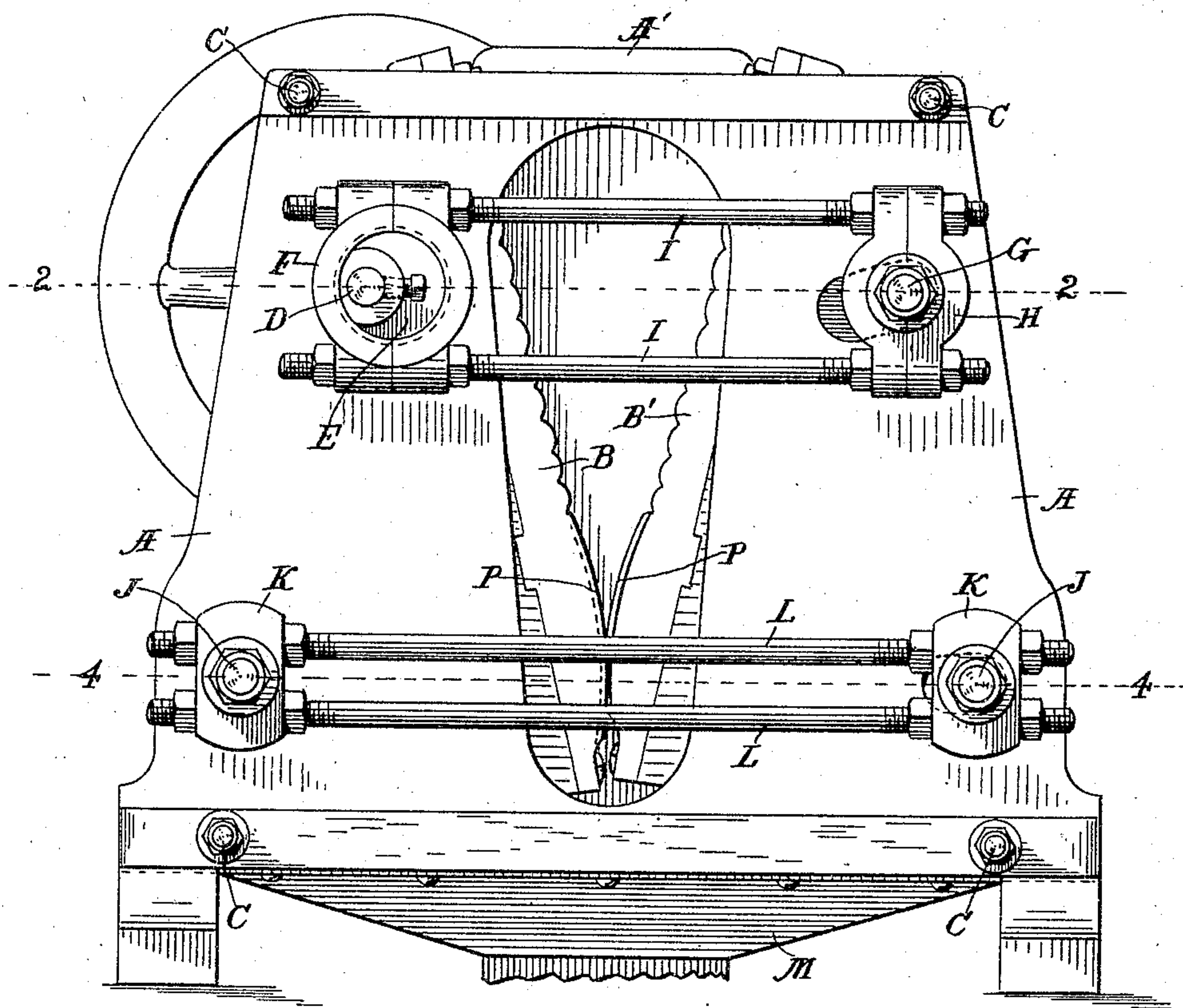


Fig. 1.

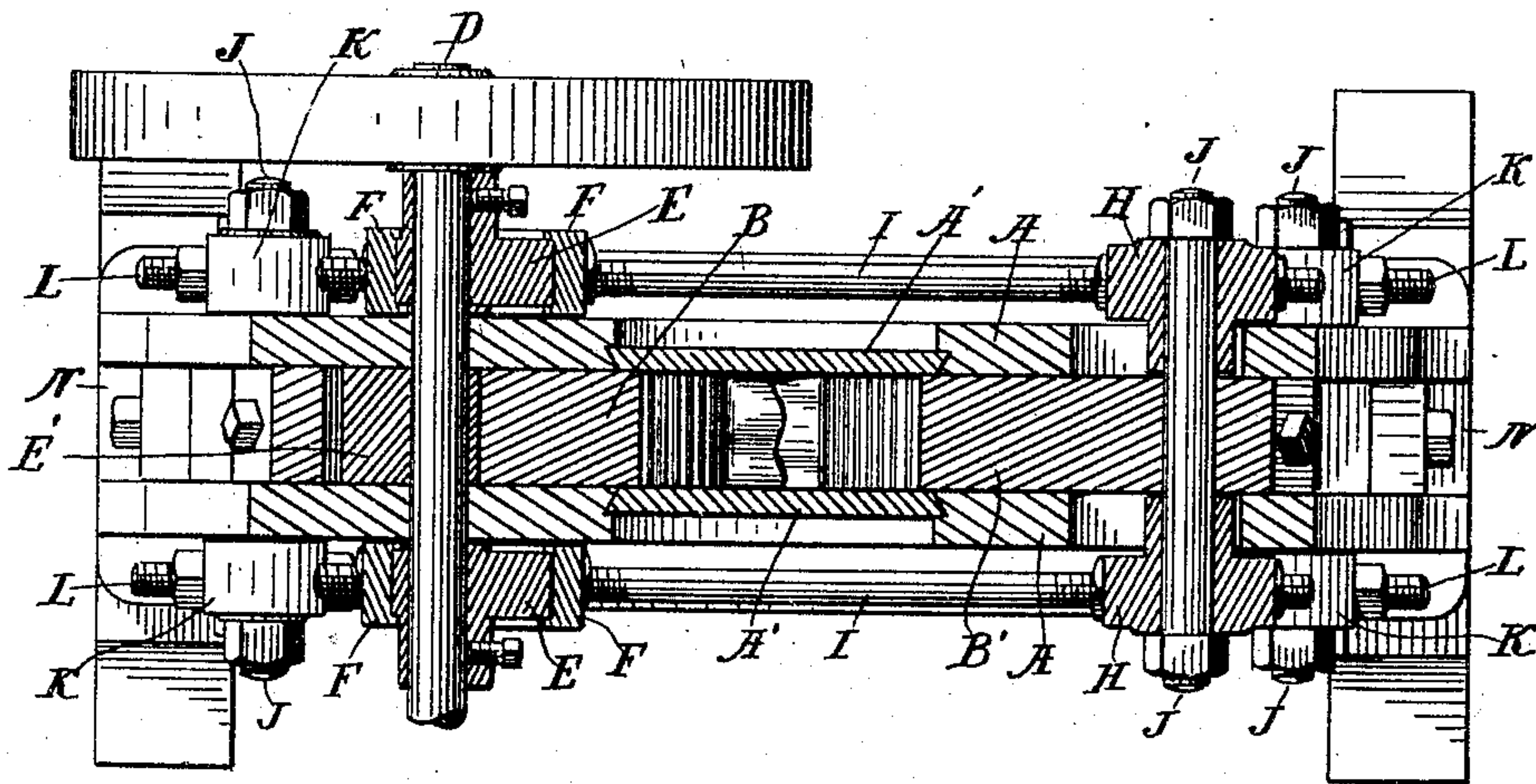


Fig. 2.

Witnesses
Palmar A. Jones.
Georgiana Chace

Inventor
George S. Knapp
By Luther V. Moulton
Attorney

No. 785,617.

PATENTED MAR. 21, 1905.

G. S. KNAPP.
STONE CRUSHER.

APPLICATION FILED DEC. 10, 1903.

2 SHEETS—SHEET 2.

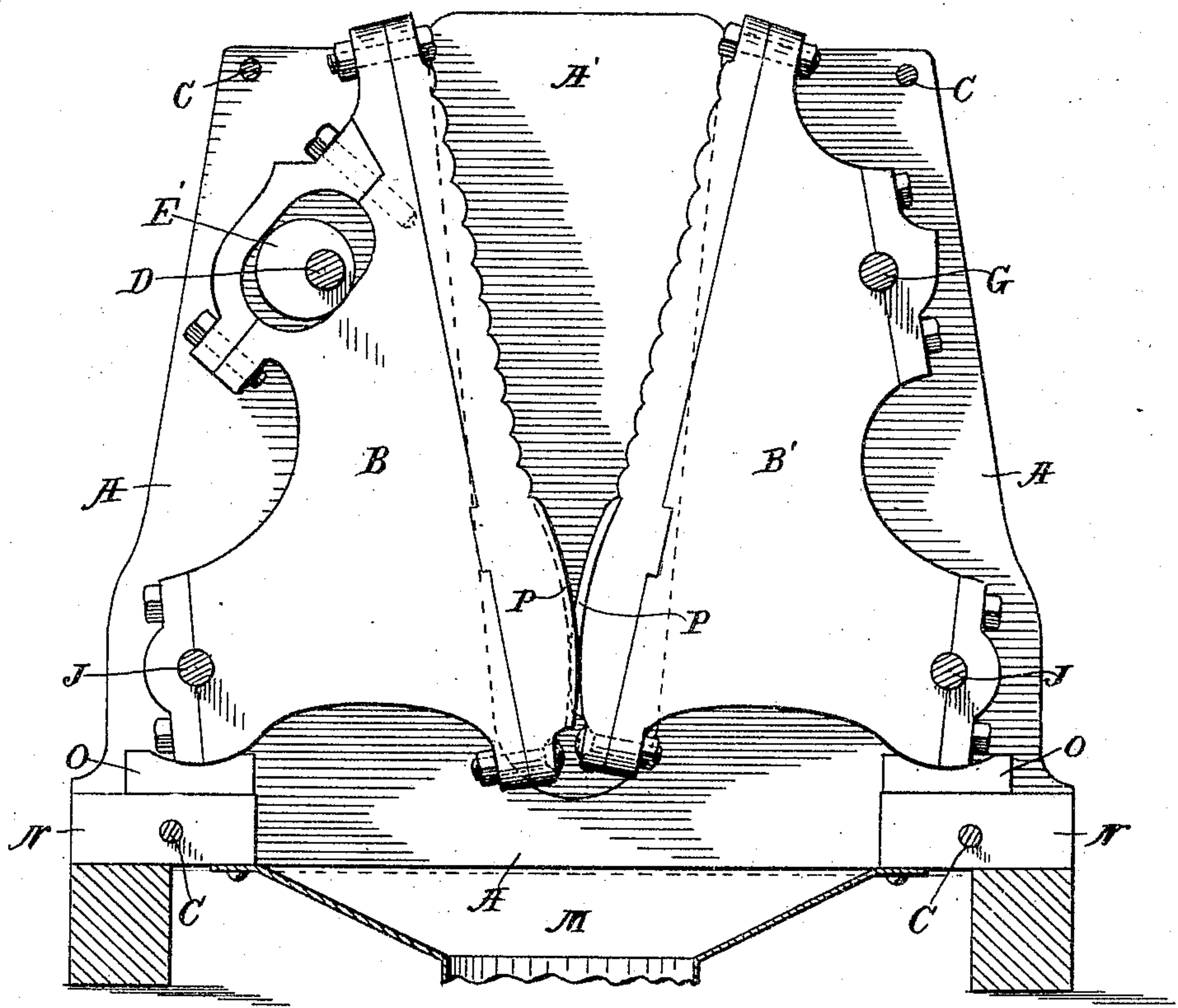


Fig. 3.

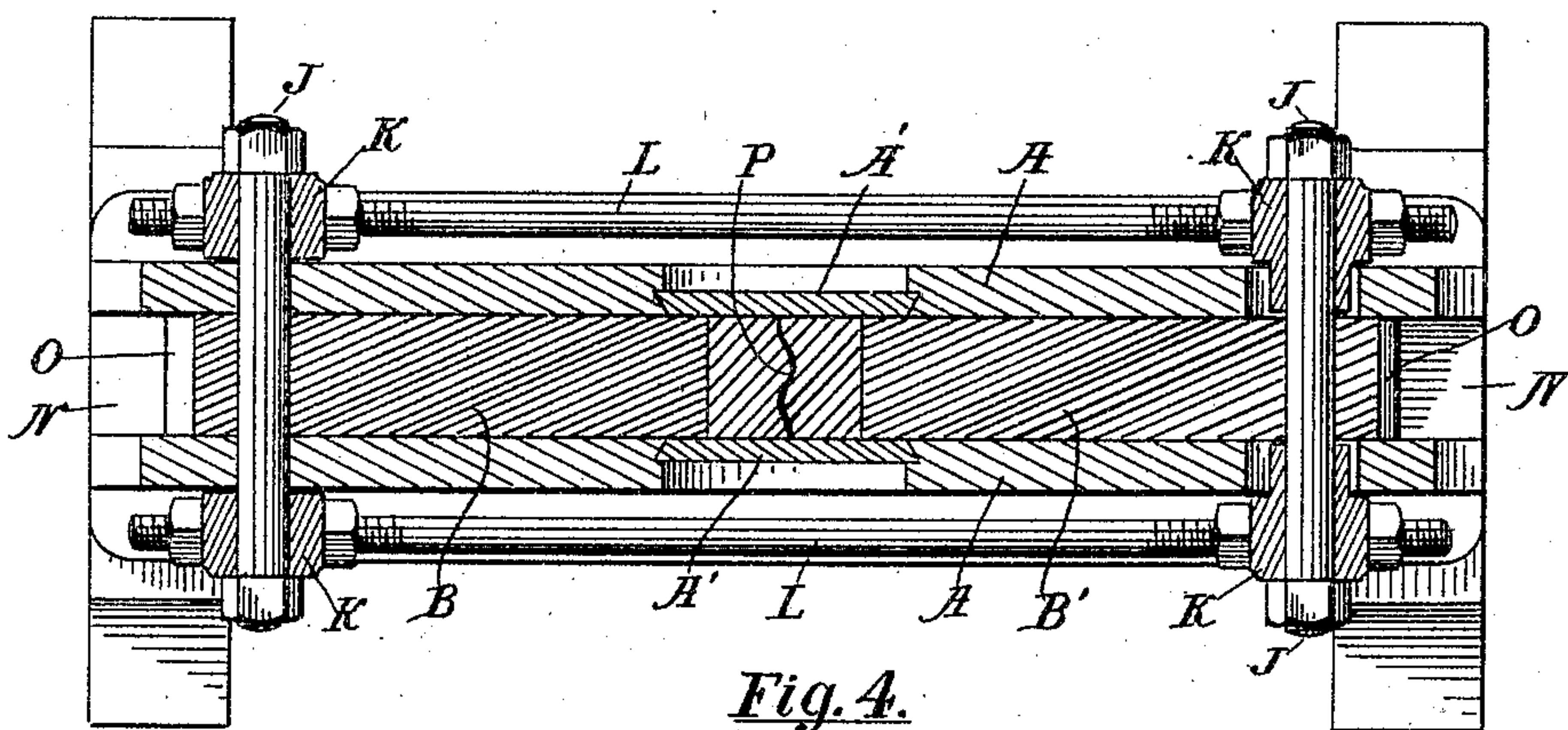


Fig. 4.

Witnesses

Palmer A. Jones.
Georgiana Chase

Inventor

George S. Knapp
By *Luther V. Moulton*
Attorney

UNITED STATES PATENT OFFICE.

GEORGE S. KNAPP, OF GRAND RAPIDS, MICHIGAN, ASSIGNOR TO
DIFFERENTIAL ORE CRUSHING MACHINE COMPANY, LIMITED,
OF GRAND RAPIDS, MICHIGAN, A CORPORATION OF MICHIGAN.

STONE-CRUSHER.

SPECIFICATION forming part of Letters Patent No. 785,617, dated March 21, 1905.

Application filed December 10, 1903. Serial No. 184,549.

To all whom it may concern:

Be it known that I, GEORGE S. KNAPP, a citizen of the United States, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Stone-Crushers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in stone-crushers; and its object is to provide a simple, strong, and effective device, to provide for readily changing the capacity of the same, and to provide the same with various new and useful features hereinafter more fully described, and particularly pointed out in the claims.

My device consists, essentially, of the means for operating the jaws and comprising pivots adjustably connected by rods and a driving-shaft provided with relatively adjustable cams to operate the respective jaws, together with the construction and arrangement of the jaws, together with side plates, spacing-blocks, concave blocks, and a hopper, and in various details of construction and arrangement of parts, as will more fully appear by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a device embodying my invention; Fig. 2, a horizontal section of the same on the line 2 2 of Fig. 1; Fig. 3, a side elevation with one side of the frame and parts outside of the same removed, and Fig. 4 a horizontal section on the line 4 4 of Fig. 1.

Like letters refer to like parts in all of the figures.

A A represent the side plates between which the jaws are supported. These plates are spaced apart a suitable distance by spacing-blocks N and connected by bolts C. These plates are also provided with detachable wear-plates A' opposite the spaces between the jaws, which plates are readily removed and

replaced by new ones as they become worn and which also serve to close openings in the side plates, through which openings the operation of the jaws may be observed by removing one of the plates A'.

B and B' are the crushing-jaws, having a substantially triangular form and pivoted near the lower outer angles on bolts J, on the respective outer ends of which bolts are mounted blocks K, connected by tie-rods L, made longitudinally adjustable in said blocks by means of suitable screw-threads and nuts, whereby the lower opposing portions P P of the jaws may be accurately adjusted and the pivots J J strongly connected to each other. The upper part of these jaws are vibrated toward and from each other by means of a driving-shaft D, extending through the upper part of one of the jaws and provided with an inner eccentric E', arranged within a slotted or elongated opening in the said jaw, said eccentric preferably being fixed on the shaft D. On the respective outer ends of said shaft are mounted eccentrics E E, adjustable about the axis of the shaft D and surrounded by suitable straps F, which straps are connected by tie-rods I to blocks H, mounted on the respective ends of a suitable bolt G, which bolt extends through the upper part of the other jaw and vibrates the same as the eccentric rotates in the straps. The eccentrics E are adjustable nearly but not quite opposite to the eccentric E', so that the jaws simultaneously oscillate at their upper ends toward and from each other and at the same time have a relative sliding movement as well as a rolling movement relative to each other. The lower part of the inner faces of these jaws are convex and concentric to the axis of the pivot-bolts J. They thus oppositely engage the material and roll or rock together and also slide relative to each other as they are oscillated. They are also preferably provided with intermeshing vertical tongues and grooves in this lower portion to increase the effective surfaces, and the upper portions of the adja-

cent faces of the jaws are corrugated transversely to prevent slipping of the material. The connecting-rods I are also longitudinally adjustable to determine the distance between the driving-shaft D and the bolt G.

In operation the eccentrics E are preferably adjusted, more or less, out of direct opposition to the eccentric E', and thus the movement of the respective jaws will not be quite simultaneous, the result being the sliding movement in connection with the rocking movement, heretofore referred to. This facilitates the crushing and prevents clogging of the material by giving the same a slight rolling movement between the jaws. It will thus be noted that these jaws are connected to each other at the top and bottom by directly-extended and strong connecting-rods I and L, whereby the crushing strain is directly upon the rods without bringing the stress upon the inclosing frame. It will also be noted that to enlarge the lateral dimensions of the jaws, and thus increase the capacity, it is only necessary to put in longer bolts and wider spacing-blocks and to increase the thickness of the jaws.

To close the lower portion of the machine and prevent the escape of dust therefrom, the lower side of the jaws directly below the pivots are made with the surface concentric with the axis of the pivot-bolts J, and concave blocks O, having their concave surfaces in contact with these convex surfaces of the jaws, are mounted upon the spacing-blocks N and made slidable thereon, whereby they will automatically adjust to the adjustment of the distance between the pivot-bolts J. The hopper M can then be attached to the lower sides of the plates A and spacing-blocks N, and the space below the jaws will be effectually inclosed and no dust will escape therefrom.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a stone-crusher, opposing pivoted jaws, one of said jaws having a slotted or elongated opening, a driving-shaft and eccentric in said opening, adjustable eccentrics on the shaft and means for connecting said adjustable eccentrics with the other jaw to operate the same.

2. In a stone-crusher, pivot-bolts connected by longitudinally-adjustable rods, opposing jaws pivoted on said bolts, one of said jaws also having an elongated opening, a driving-shaft, an inner eccentric on said shaft and in said opening, two outer eccentrics on said shaft, straps on the outer eccentrics and rods connecting the straps and the other jaw.

3. In a stone-crusher, opposing jaws having engaging and coacting convex surfaces, a pivot for each jaw, located at the axis of the convex surface of the same, a driving-shaft, an inner eccentric on the driving-shaft and con-

nected to one jaw to operate the same, and outer eccentrics on the driving-shaft, said outer eccentrics being adjusted in angular relation to the inner eccentric, and connected to the other jaw to operate the same.

4. In a stone-crusher, opposing pivoted jaws having engaging and coacting convex surfaces at their adjacent sides, and separate convex surfaces at their respective under sides, both of said convex surfaces of each jaw being concentric with the axis of the pivot for said jaw, a plate at each side of said jaw, separate concave blocks engaging the convex surfaces at the under sides of the jaws, a hopper connected to the plates and blocks, and means for operating the jaws.

5. In a stone-crusher, opposing pivoted jaws having convex surfaces beneath their pivots and concentric therewith, adjustable pivots for said jaws, a plate at each side of said jaws, spacing-blocks between the plates, and spaced apart, concave blocks engaging the convex surfaces of the jaws and slidably supported on the spacing-blocks, a hopper attached to the side plates and spacing-blocks, and means for operating the jaws.

6. In a stone-crusher, the combination of pivot-bolts, blocks on the respective ends of said bolts, connecting-rods extending through said block, said rods being provided with adjusting-nuts, opposing jaws pivoted on said bolts, and having adjacent and coacting surfaces concentric with the axis of said bolts, a driving-shaft extending through one of said jaws, an inner eccentric fixed on said shaft to operate said jaw, outer eccentrics adjustable on said shaft, a bolt extending through the other jaw, blocks on the respective ends of said bolt, straps surrounding the outer eccentrics, and rods adjustably connecting the straps to said last-named blocks.

7. In a stone-crusher, side plates, spacing-blocks between the side plates, bolts connecting said plates, jaws pivotally supported between said plates, said jaws having convex under surfaces concentric with the axis of the pivots means for operating said jaws, means for adjusting the pivots, adjustable blocks having concave surfaces engaging the convex surfaces of the jaws, and a hopper attached to the spacing-blocks and side plates.

8. In a stone-crusher, the combination of side plates spacing-blocks between the same, bolts connecting the side plates, pivoted jaws between the plates, pivot-bolts extending through said plates and jaws, rods connecting the pivot-bolts, a driving-shaft journaled in said plates, an inner eccentric on said shaft to operate one of the jaws, outer eccentrics on the shaft to operate the other jaw, and means for connecting the outer eccentrics to the said other jaw.

9. In a stone-crusher, the combination of side plates, spacing-blocks and bolts connect-

ing said plates, opposing jaws between said
plates, said jaws having convex under surfaces,
adjustable blocks having concave surfaces en-
gaging the same, a hopper attached to the side
5 plates and spacing-blocks, pivot-bolts extend-
ing through the plates and jaws, rods adjust-
ably connecting said pivot-plates, a driving-
shaft extending through one of said jaws, an
inner eccentric on the shaft, said eccentric also
10 engaging a slot in the jaw, outer eccentrics on

the shaft, a bolt in the other jaw, blocks on
the bolt, and means for connecting the outer
eccentrics and the bolt.

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

GEORGE S. KNAPP.

Witnesses:

LUTHER V. MOULTON,
GEORGIANA CHACE.