

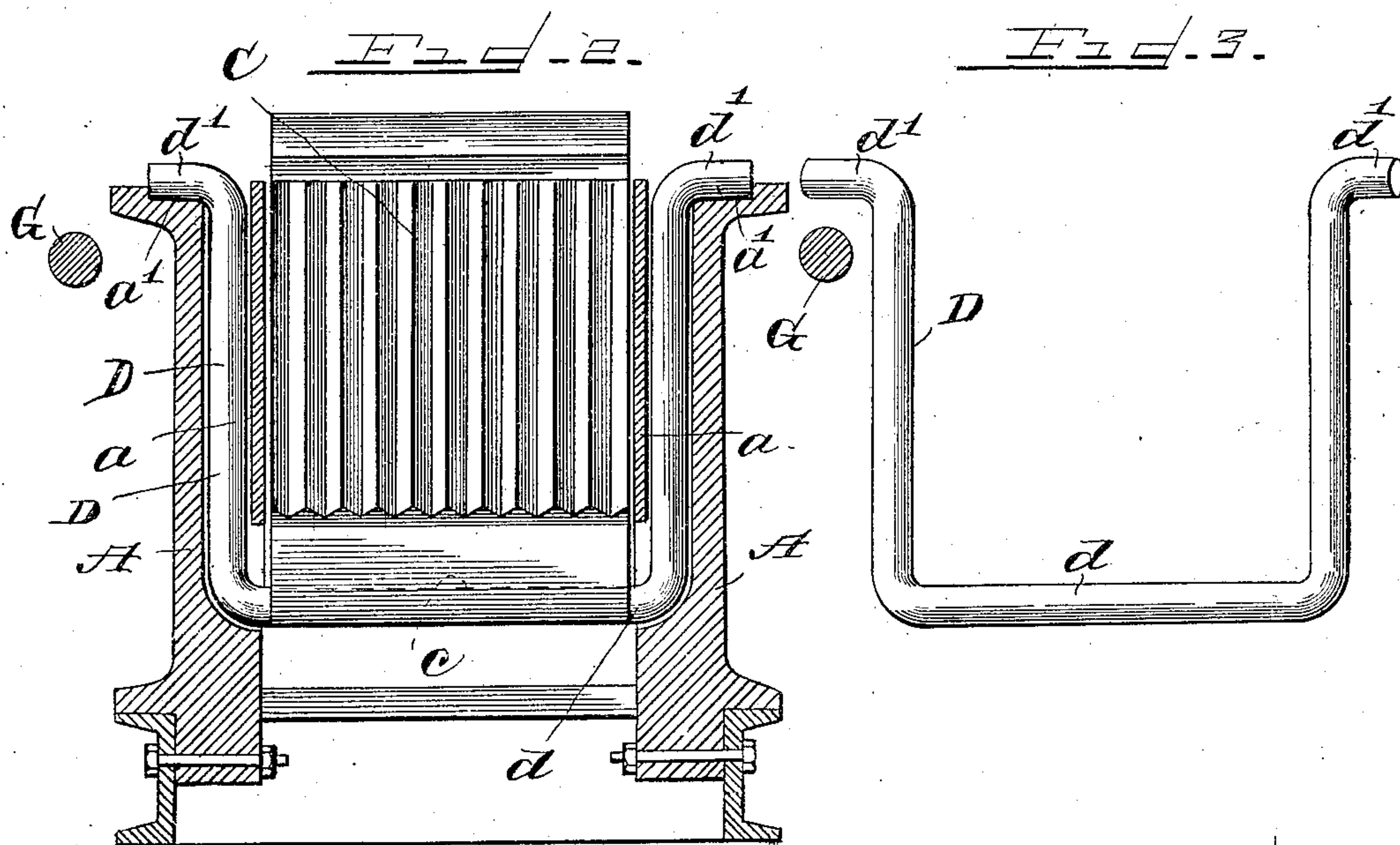
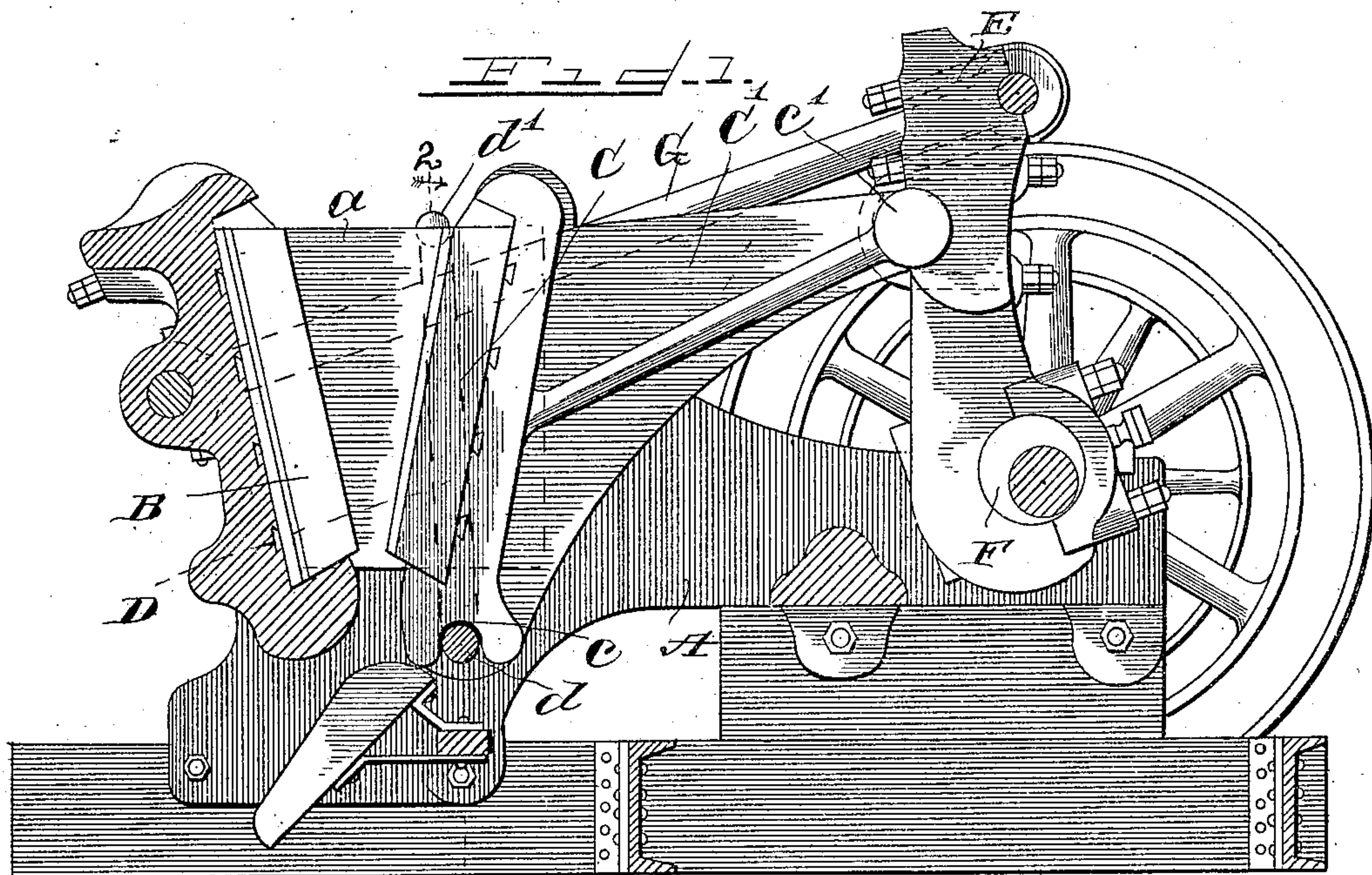
No. 845,028.

PATENTED FEB. 19, 1907.

M. G. BUNNELL.

JAW CRUSHER.

APPLICATION FILED DEC. 23, 1901.



WITNESSES.

D. A. Pauberschnitt
J. H. Glendenning

INVENTOR.

Morton G. Bunnell
By Arthur F. Leonard

UNITED STATES PATENT OFFICE.

MORTON G. BUNNELL, OF CHICAGO, ILLINOIS, ASSIGNOR TO WESTERN
WHEELED SCRAPER CO., OF AURORA, ILLINOIS.

JAW-CRUSHER.

No. 845,028.

Specification of Letters Patent.

Patented Feb. 19, 1907.

Application filed December 23, 1901. Serial No. 86,913.

To all whom it may concern:

Be it known that I, MORTON G. BUNNELL, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Jaw-Crushers, of which the following is a specification.

This application is subordinate to my prior application, Serial No. 34,105, filed October 24, 1900, and covers an improvement on the subject-matter of said prior application.

My invention relates to what are commonly known as "jaw-crushers," and has for its object the provision of a simple and efficient construction and to provide certain features of improvement tending to facilitate the assembling of the various parts, a particular object being to provide a construction in which the jaw is supported for free and unhindered back-and-forth movement and in which the arrangement is such that the jaw will not tend to rise from its bearing.

To the foregoing and other useful ends the vibratory jaw is preferably supported by a swinging stirrup, and the power is applied in such manner that the resistance offered by the rock will not tend to raise the jaw from the stirrup. Preferably the jaw is actuated by a pitman, and, as stated, the motion of the pitman is communicated to the jaw in such manner that the resistance offered by the rock will hold the jaw down in place upon its bearing. This method of operation is preferably secured by arranging the toggle or pivotal connection of the jaw and pitman at a point on a level or substantially on a level with the top of the vibratory jaw. With this arrangement the resistance or back thrust of the rock in the hopper will at all times tend to force the jaw down rather than lift it. Thus arranged the jaw is supported for free and unhindered back-and-forth movement, and both the jaw and its swinging stirrup can be easily lifted out or removed from the crusher. The nature and advantages of my invention will, however, hereinafter more fully appear.

In the accompanying drawings, Figure 1 is a longitudinal section through a crusher constructed in accordance with my invention. Fig. 2 is a transverse section through the crusher-frame on line 2-2 of Fig. 1, showing the jaw and stirrup in elevation. Fig. 3 is a perspective of the swinging stirrup which is employed for supporting the vibratory jaw.

As thus illustrated, the crusher comprises a suitable frame or body A, having its forward portion constructed so as to provide a stationary jaw B. The movable or vibratory jaw C is arranged to oppose the face of said stationary jaw and is preferably supported for free and unhindered back-and-forth movement by the swinging stirrup D. This stirrup is preferably hung inside the crusher frame or body, as shown in Fig. 2, its vertical or side portions being arranged for a slight vibratory movement in recesses formed between the crusher frame or body and the check-plates *a*. It will be understood that these check-plates *a* are arranged to form side walls of the hopper provided by the stationary and movable jaws. Thus arranged the stirrup has its lower transverse portion D arranged in position to engage a groove or seat *c*, extending transversely across the bottom of the vibratory jaw C. The stirrup is also provided at its top with the laterally-extending portions *d'*. These portions *d'* are preferably arranged to seat in grooves *a'*, formed in the top of the crusher frame or body A. With this arrangement it will be seen that the movable jaw C can be readily lifted or removed from the stirrup and also that the latter can then be readily lifted or removed from the crusher-frame, it being understood that before lifting out the stirrup it will be necessary to first remove the cheek-plates *a* from their positions at each side of the hopper. The bearing thus provided for the vibratory jaw is of such character that it is free to rise—that is to say, the bearing is of such character that it does not hold the jaw down. In order, therefore, to prevent the rock in the hopper from forcing the jaw upward, the power is preferably applied in such manner that the resistance offered by the rock will tend to force and hold the jaw down. This is preferably accomplished by providing a vertically-reciprocating pitman E, which is preferably actuated at its lower end by an eccentric cam F and which has a pivotal or toggle-like connection with the rear end of the jaw-arm C'. The end portion of this arm is preferably tied to the pitman, and the pivotal or toggle-like joint or connection *c'* thereby provided is, it will be observed, arranged on a level or substantially on a level with the top of the movable jaw C.

In order to permit the pitman to communi-

cate forward-and-back movement to the movable jaw C, the upper portion of said pitman is preferably tied to the forward portion of the crusher frame or body by means of a suitable yoke, composed of a couple of parallel rods or bars G. The yoke thus formed by these swinging parallel rods or bars serves to provide the pitman with a shifting fulcrum, whereby the pitman is enabled to act as a lever for forcing the movable jaw back and forth relatively to the stationary jaw B. With this arrangement the rotation of the eccentric cam F causes the movable jaw to have a combined vibratory and bodily forward-and-back movement—that is to say, the jaw not only has a bodily forward-and-back movement, but also tilts about the bearing or fulcrum point provided by the lower transverse cross-piece d of the stirrup D. The movement of the jaw in this way causes the desired crushing action in the hopper. As the pitman engages the jaw-arm at a point on a line or substantially on a line with the top of the hopper, the resistance offered by the rock in the hopper will therefore have no tendency whatever to lift or raise the jaw from its bearing. In other words, the power or motion is so communicated to the jaw that the rock tends to force the latter down rather than to lift it. This will be readily understood by reference to Fig. 1, wherein it will be seen that the resistance offered by the rock in the hopper will be in such direction that it will have no tendency to swing the jaw upward about its pivotal connection with the pitman. In this way the power is applied in such manner as to permit the back thrust of the rock to be employed for holding the jaw down, and thus held down and prevented from rising the jaw is rendered free of all unnecessary friction, and, furthermore, with such method of operation the jaw can be readily and easily lifted out and removed from the crusher. It will also be seen at this juncture that such construction facilitates in assembling the various parts, it being necessary in putting the various parts of the crusher together to simply drop the stirrup D into place inside the frame and to then lower the movable jaw C into place upon the bottom portion of such stirrup.

It is therefore obvious that my improved construction and method of operation is not only simple and efficient, but that it is also of such character as to permit the parts to be readily and easily removed for the purpose of repair or substitution and as to facilitate the assembling of the parts, thereby reducing the cost of manufacture.

The stirrup D can be constructed in any suitable manner—as, for example, it can be formed in one piece, as shown in Figs. 2 and 3. It is obvious, however, that this swinging stirrup can be constructed in many dif-

ferent ways and also that it can be applied in various ways without departing from the spirit of my invention. For this reason I do not limit myself to the exact construction shown and described. Thus it will be seen that both the jaw and stirrup rest in place without means for positively holding them down, and it is therefore obvious that my invention contemplates, broadly, a swinging support and jaw merely resting in place and so actuated that the resistance of the material in the hopper tends to prevent both from rising.

In the following claims I have employed the term “resting,” and wherever this term is found I wish to be understood as meaning that no mechanical devices are employed for binding or tying down the jaw and that the elevated position of the toggle-joint taken in connection with the reaction of the material in the hopper constitute the only arrangement for preventing either the jaw or the swinging support from rising.

What I claim as my invention is—

1. A crushing-machine comprising a suitable frame or body, a stirrup made or formed in one piece and hung inside the crusher frame or body, said stirrup being left free to be raised from the frame or body; a movable jaw provided on its under side with a transverse groove adapted to receive the lower transverse portion of said stirrup, the jaw in this way resting upon the stirrup and the latter supporting the jaw for forward-and-back or vibratory movement, and the jaw being left free to be raised from its swinging support, cheek-plates arranged at each side of the hopper of which said jaw forms a part, the vertical portions of said stirrup being arranged to swing or vibrate in recesses formed between said cheek-plates and said frame or body, the upper laterally-projecting portions of said stirrup resting in grooves or concave seats formed on the upper surface of said frame or body, and a vertically-reciprocating pitman adapted and arranged for actuating said jaw, the pivotal connection between the jaw and pitman being arranged at a point on a level, or substantially on a level, with the top of the jaw-face, and the power and motion thus communicated to said jaw causing the latter to move back and forth and permitting the resistance offered by the rock to hold the jaw down in place and thereby prevent it from rising from the stirrup upon which it rests, substantially as described.

2. A crushing-machine comprising a movable crushing-jaw, actuated positively in all of the directions of its motion by the upper portion of a vertically-disposed pitman fulcrumed at its upper end and actuated at its lower end, and a swinging support for said jaw whereby the movable jaw has a combined oscillatory and bodily forward and back motion.

3. A crushing-machine comprising a movable jaw, a swinging U-shaped jaw-supporting member, a vertically-reciprocating pitman adapted and arranged for actuating said jaw in both directions, said jaw having a rigid arm swingingly connected at its end to said pitman, a swinging yoke having one end tied to said pitman and the other end tied to the crusher frame or body, so as to provide the pitman with a fulcrum at both forward and back strokes of the jaw, adjustable bearings for taking up wear between the pitman and the jaw and yoke, so as to prevent lost motion, and means for actuating said pitman, the side portions of the yoke thereby adapted to sustain both tensile and endwise compressive strains during the operation of the crushing-machine, and the means for maintaining the connection between the pitman and the said arm being applied to the pitman at a point above the said means for actuating the latter, the point of engagement between the said arm and pitman constituting an axis about which the movable jaw and the pitman have a relative swinging motion, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

4. In a crushing-machine, the combination of a swinging U-shaped jaw-supporting member, a suitable body-frame, a jaw rigid with said body-frame, a movable jaw opposed to said stationary jaw and provided with a rigid rearwardly-extending toggle-arm, a vertically-reciprocating pitman actuated at its lower end by an eccentric device, said pitman being provided between its upper and lower ends with a bearing adapted to engage the rear end of said toggle-arm, means for tying the movable jaw and pitman together, said means having a pivotal connection with the toggle-arm and extending through and engaging the back of the pitman above the eccentric device, and a swinging yoke having one end tied to the upper end of said pitman and the other end tied to the body-frame, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

5. A crushing-machine comprising a stationary jaw and a movable jaw, a swinging U-shaped jaw-supporting member, a toggle-arm rigid with said movable jaw, a vertically-reciprocating pitman actuated by an eccentric device, said pitman having between its upper and lower ends a point of connection with the rear end of said toggle-arm, means for tying the movable jaw and pitman together and for taking up wear between the

pitman and the toggle-arm, said means having a pivotal connection with the toggle-arm and extending through and engaging the back of the pitman above the said eccentric device, a swinging yoke having one end tied to said pitman and the other end tied to the stationary jaw, and suitable devices for taking up wear at each end of said yoke, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

6. A crushing-machine comprising a body-frame, a vertically-disposed pitman, a stationary crushing-jaw, a movable jaw supported for bodily movement toward and away from the stationary jaw and provided with a rigid arm pivotally engaging said pitman, a swinging U-shaped jaw-supporting member, an eccentric device for actuating the lower end of said pitman, a swinging yoke having one end tied to the body-frame and the other end tied to the upper portion of said pitman, and means extending through the pitman above the eccentric device to bind the movable jaw and pitman together, whereby the movable jaw swings about its point of pivotal connection with the pitman and is moved bodily in both directions by the middle or intermediate portion of a pitman fulcrumed at its upper end, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

7. A crushing-machine comprising a body-frame, a stationary crushing-jaw, a movable crushing-jaw supported for bodily movement toward and away from the stationary jaw and provided with a rigid arm, a swinging U-shaped jaw-supporting member, a pitman fulcrumed at its upper end and actuated at its lower end by an eccentric device, and means extending through and engaging the back of said pitman above the eccentric device to keep the end of said arm in pivotal engagement with the face of the pitman, whereby the movable jaw swings relatively to said pitman and is actuated in all of the directions of its motion by the portion of the pitman having pivotal connection with the end of said arm, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

8. A crushing-machine comprising a body-frame, a stationary jaw, a movable crushing-jaw provided with a rigid arm, a swinging U-shaped jaw-supporting member, a pitman actuated at its lower end, means extending

through and engaging the back of said pitman between its upper and lower ends, and at a point above the means for actuating the pitman, to keep the end of said arm in pivotal engagement with the face of the pitman, a swinging yoke having one end tied to the body-frame, and U-bolts for tying the other end of the yoke to the upper end of the pitman, said bolts extending through the upper portion of the pitman, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

9. A crushing-machine comprising a body-frame, a stationary crushing-jaw, a movable crushing-jaw provided with a rigid arm, a swinging U-shaped jaw-supporting member, a swinging yoke, a pitman fulcrumed at its upper portion upon said yoke and actuated at its lower end, and U-bolts for keeping the end of said arm in pivotal engagement with the pitman, said bolts extending horizontally through the pitman above the point at which the latter is actuated, and said yoke having its opposite ends tied respectively to the body-frame and the upper end of the pitman, whereby the said movable crushing-jaw is actuated in all of the directions of its motion by that portion of the pitman which is tied by said U-bolts to the end of said arm, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

10. A crushing-machine comprising a swinging U-shaped jaw-supporting member, a movable crushing-jaw tied to and having a direct pivotal connection with, and actuated bodily in opposite directions by, a pitman fulcrumed above and actuated at a point below, the jaw thus actuated being adapted to swing relatively to the pitman during the operation of the machine, said pivotal connection or axis about which the jaw and pitman have a relative swinging motion being above the point at which the pitman is actuated, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

11. A crushing-machine comprising a swinging U-shaped jaw-supporting member, a movable jaw having a direct pivotal engagement with, and actuated in all of the directions of its motion by, a pitman fulcrumed at or near its upper end and actuated at its lower end, the jaw thus actuated being adapted to swing relatively to the pitman during the operation of the machine, said

pivotal engagement or axis about which the jaw and pitman have a relative swinging motion being above the point at which the pitman is actuated, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

12. A crushing-machine comprising a suitable body-frame, a jaw rigid with said body-frame, a movable jaw opposed to said stationary jaw and provided with a rigid rearwardly-extending toggle-arm, a swinging U-shaped jaw-supporting member, a vertically-reciprocating pitman actuated at its lower end by an eccentric device, said pitman being provided between its upper and lower ends with a bearing adapted to engage the rear end of said toggle-arm, means for tying the movable jaw and pitman together, said means having a pivotal connection with the movable crushing-jaw and extending through and engaging the back of the pitman above the eccentric device, and a swinging yoke having one end tied to the upper end of said pitman and the other end tied to the body-frame, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

13. A crushing-machine comprising a movable jaw provided with a rigid rearwardly-extending toggle-arm, a swinging U-shaped jaw-supporting member, a vertically-reciprocating pitman, a suitably-mounted swinging yoke having one end tied to the upper end of said pitman, an eccentric actuating the lower end of said pitman, the said pitman being thereby subject to the endwise compressive strain imposed upon it by the weight of said yoke, the upper portion of the pitman having a pivotal engagement or connection with the rear end of said toggle-arm, and means for tying the movable jaw and pitman together, said means being removably secured to the portion of the pitman above the eccentric device, whereby the said movable jaw swings relatively to the pitman and is actuated in all of the directions of its motion by that portion of the pitman above the said eccentric device, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

14. A crushing-machine comprising a movable jaw provided with a rigid rearwardly-extending toggle-arm, the rear end of said arm being suitably rounded, a swinging U-shaped jaw-supporting member, a vertically-reciprocating pitman fulcrumed at its upper

end and actuated at its lower end by an eccentric device, said pitman being provided with a bearing or seat adapted to engage the rounded rear end portion of said toggle-arm, and means secured to said pitman above the eccentric device to keep the end of said toggle-arm in engagement with said bearing on the pitman, whereby the said jaw swings relatively to the pitman and is actuated in all of the directions of its motion by that portion of the pitman above the said eccentric device, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

15. A crushing-machine comprising a suitably-supported movable jaw provided with a rigid arm, a swinging U-shaped jaw-supporting member, a swinging yoke, a pitman having its upper end fulcrumed upon the swinging end portion of said yoke, an eccentric device actuating the lower end of said pitman, and means for tying the jaw and pitman together, the end of said arm being held in pivotal engagement or connection with the pitman at a point substantially on a level with the top of the crushing-face of said jaw, whereby, in the main, the crushing action does not tend to lift the jaw, and whereby the said jaw swings relatively to the pitman and is actuated in all of the directions of its motion by that portion of the pitman above the said eccentric device, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

16. A crushing-machine comprising a suitably-supported movable jaw provided with a rigid arm, a swinging U-shaped jaw-supporting member, a pitman actuated at its lower end by an eccentric device, and a swinging yoke upon which the upper end of the pitman is fulcrumed, the end of said arm having a pivotal engagement or connection with the

pitman at a point nearer the latter's upper end than its lower end, and at a point substantially on a level with the top of the crushing-face of said jaw, whereby the said jaw is substantially free from any tendency to rise or swing upwardly about its axis or point of pivotal connection with the pitman during the operation of the machine, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

17. In a crushing-machine, the combination of crushing means including a pair of jaws, swinging U-shaped jaw-supporting member, and operating means for producing relative movement between said jaws, said operating means including a pitman, an eccentric for actuating the lower end of said pitman, means including a swinging toggle-arm for directly tying and connecting the upper portion of the pitman to the other jaw, the said pitman being adapted to tilt relatively to both of said jaws, and that portion of the pitman above the said eccentric constituting a power-transmitting connection through which all power necessary for producing said relative movement, in all of its directions, is communicated from the eccentric to the crushing means, the movable jaw being supported upon the horizontal lower portion of said swinging U-shaped member, and vertically removable therefrom, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

18. In a crusher, a vibratory or swinging U-shaped member upon which the movable jaw is fulcrumed, substantially as shown and described, whereby the movable jaw has a combined oscillatory and bodily forward-and-back motion.

MORTON G. BUNNELL.

Witnesses:

ARTHUR F. DURAND,

HARRY P. BAUMGARTNER.