

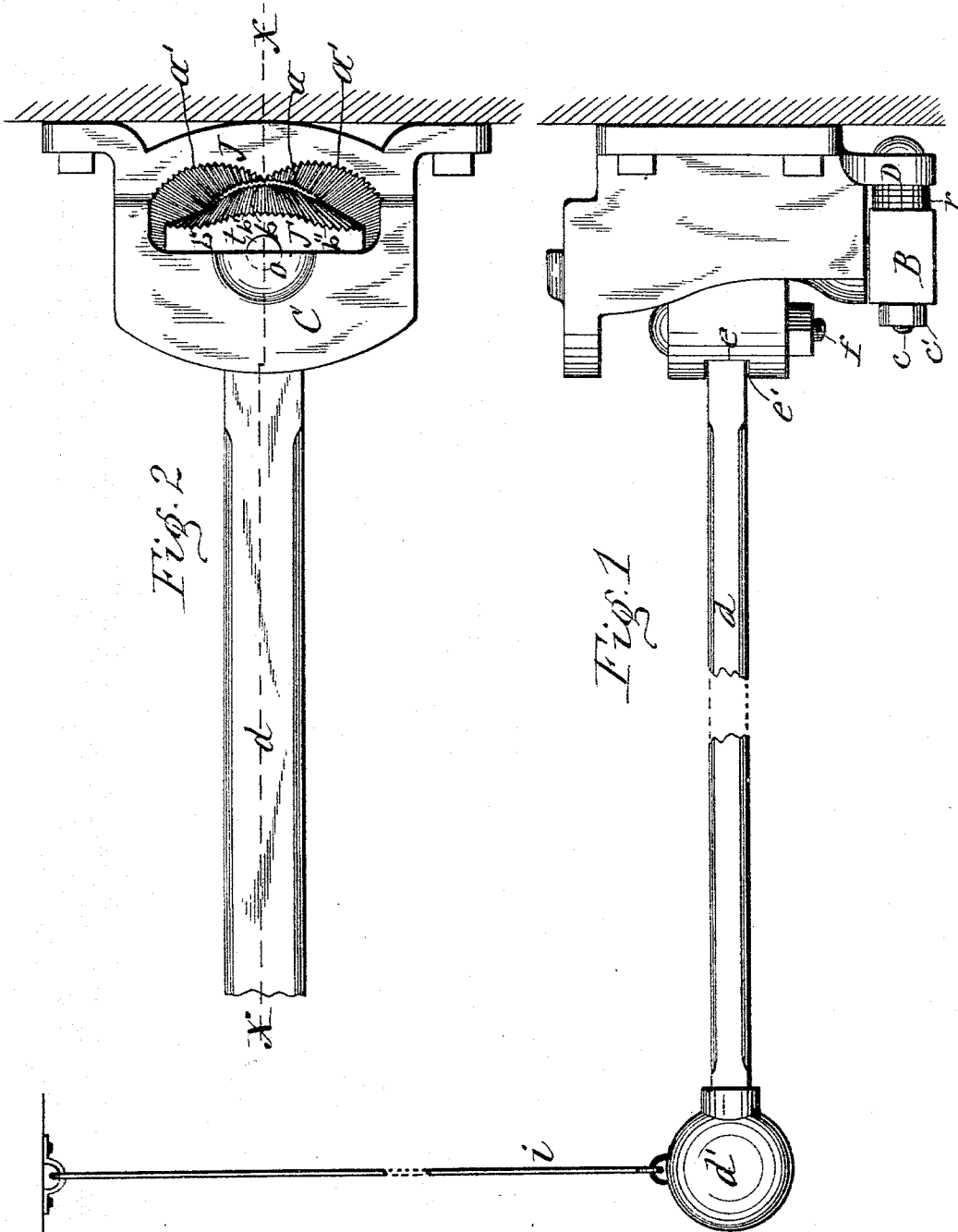
(No Model.)

3 Sheets—Sheet 1.

H. A. HANNUM.
CRUSHER.

No. 531,680.

Patented Jan. 1, 1895.



WITNESSES:

C. L. Burdison
J. J. Laaszy

INVENTOR:

Henry A. Hannum
By E. Laaszy
his ATTORNEY.

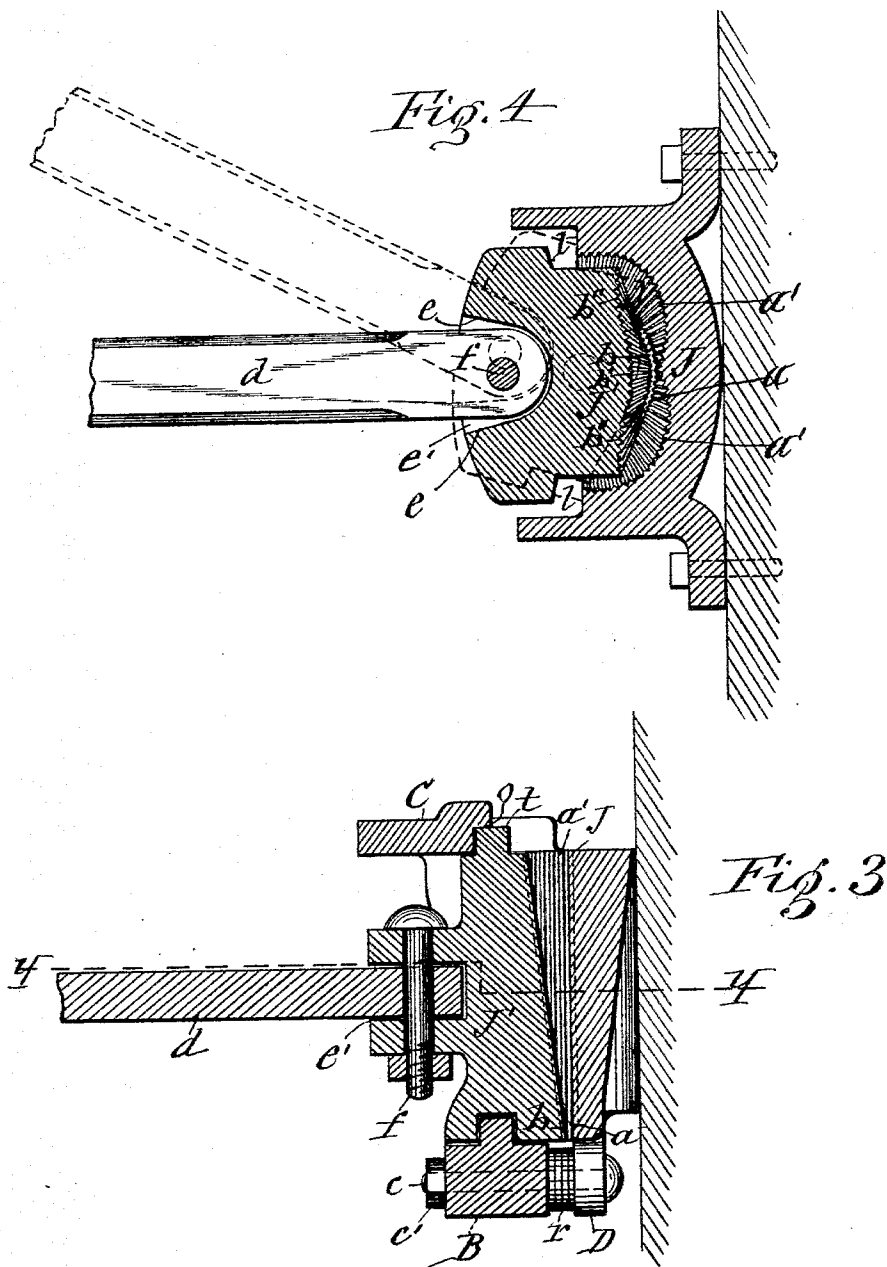
(No Model.)

3 Sheets—Sheet 2.

H. A. HANNUM.
CRUSHER.

No. 531,680.

Patented Jan. 1, 1895.



WITNESSES:

C. L. Bindix on
J. J. Laasy

INVENTOR:

Henry A. Hannum
By C. Laasy
his ATTORNEY

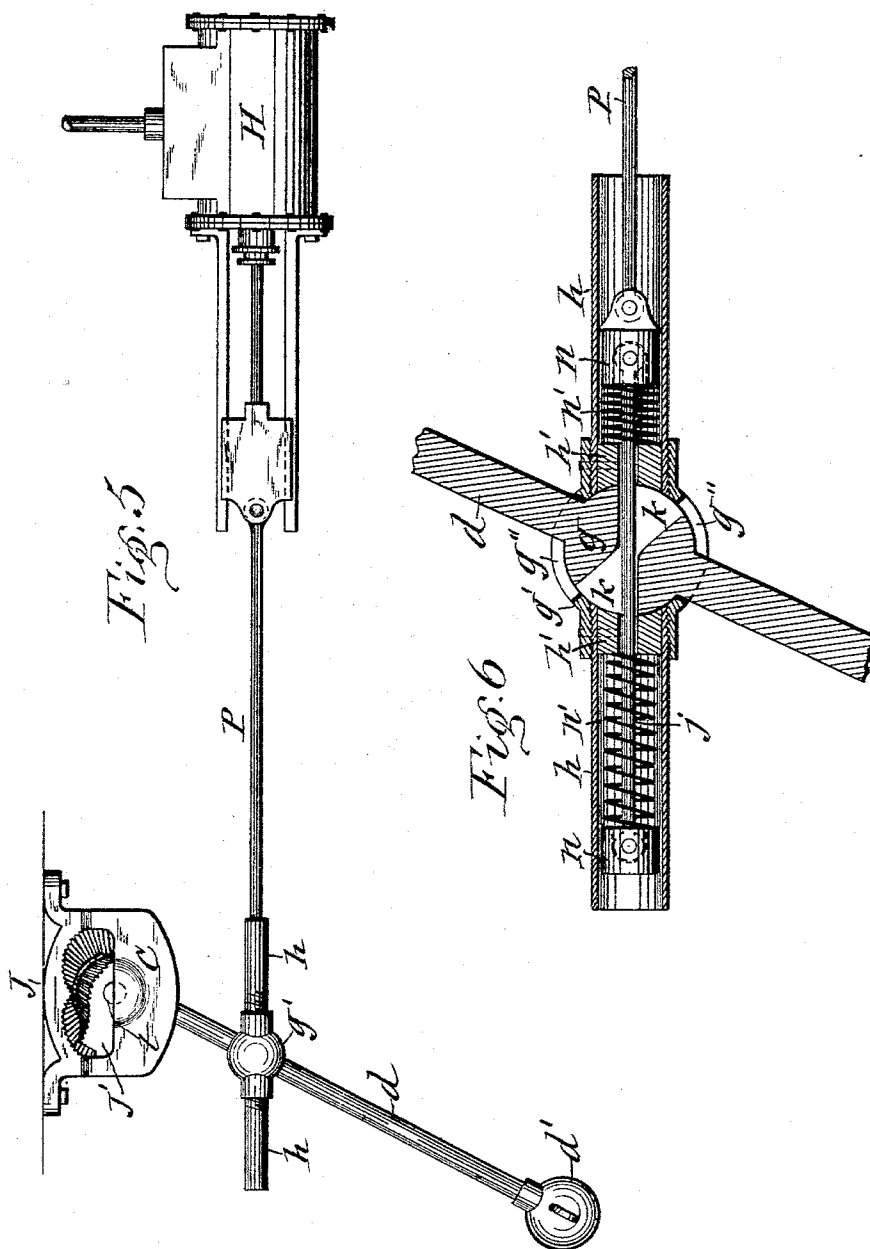
(No Model.)

3 Sheets—Sheet 3.

H. A. HANNUM.
CRUSHER.

No. 531,680.

Patented Jan. 1, 1895.



WITNESSES:

C. L. Bendixon
J. J. Saasz

INVENTOR:

Henry A. Hanna
By E. Laas
his ATTORNEY

UNITED STATES PATENT OFFICE.

HENRY A. HANNUM, OF CAZENOVIA, NEW YORK.

CRUSHER.

SPECIFICATION forming part of Letters Patent No. 531,680, dated January 1, 1895.

Application filed February 12, 1894. Serial No. 499,867. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. HANNUM, of Cazenovia, in the county of Madison, in the State of New York, have invented new and useful Improvements in Crushers, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

The purpose of this invention is to crush or reduce in an effectual and expeditious manner stones, bones, oystershells, and other hard substances into small polyhedral or angular particles suitable for various purposes, including their use as feed for fowls; and to that end the invention consists primarily in the employment of a vibrating or swinging mechanical arm impelling the member of the machine or apparatus impinging the material under treatment and weighted at its free end to increase its momentum and resultant force; and the invention also consists in certain novel features of the details of the crushing or comminuting machine as hereinafter fully described and specifically set forth in the claims.

In the annexed drawings Figure 1 is a side view of a crushing or comminuting machine embodying my invention. Fig. 2 is a top plan view of the same. Fig. 3 is a vertical transverse section on line —X—X— in Fig. 2. Fig. 4 is a horizontal transverse section on line —Y—Y— in Fig. 3. Fig. 5 is a plan view of said machine in connection with a motor for primarily actuating the weighted vibrating arm which operates the machine or apparatus, and Fig. 6 is an enlarged longitudinal section of the connection of said motor to the vibrating arm.

Similar letters of reference indicate corresponding parts.

—J— and —J'— designate the two jaws between which the stone or other material to be crushed is introduced. The jaw —J— is secured stationary in its position, and the opposed jaw —J'— is pivoted on vertical axes so as to allow it to be rocked laterally. For this purpose I preferably form the top of the stationary jaw —J— with a yoke —C— which is provided with a socket or recessed bearing —o— for the trunnion —t— which pro-

jects from the top of the jaw —J'— as shown in Fig. 3 of the drawings.

The bottom of the jaw —J'— is pivoted to a bar —B— which is connected to the ears —D— on the base of the stationary jaw, by screw-bolts —c— passing through said ears and end portions of the bar and provided with nuts —c'— by means of which the bar —B— can be retained different distances from the ears and thus the base of the jaw —J'— can be adjusted to a greater or less distance from the stationary jaw according to the size of the particles to which the material is to be reduced.

—r—r— denote washers which are interposed between the ears —D— and bar —B— to take up the space and steady the said bar in the operation of the machine.

In order to cause the machine to crush the material in an effectual and expeditious manner and without undue rubbing or abrading actions which tend to produce rounded particles of the material under treatment, I employ a suitable mechanical driver which applies to the rocking jaw —J'— concussive blows forcing said jaw toward the stationary jaw and causing the same to act upon the material to be crushed similar to the blows of a hammer applied to said material. This action of the member of the machine impinging the material under treatment, constitutes the most important feature of this invention. The aforesaid driver I prefer to form of a vibrating or swinging arm or lever —d— impelling the rocking jaw or impinging member —J'— and weighted at its free end as shown at —d'— to increase the momentum of said arm and the resultant force thereof. I do not limit myself to the use of this vibrating arm weighted at its free end solely in connection with the specific construction of the crushing-jaws or members of the machine, as it is obvious that said arm may be employed with equal efficiency on other machines, its salient feature being the increased energy caused to be exerted by said arm by the weight carried on its free end.

In the machine constructed as herein shown, I prefer to pivot the arm —d— in such a manner as to allow it to swing in a horizontal plane or in a plane at right angles to the axes

of the pivoted jaw —J'— and independently of said jaw and provide the latter with suitable bearings or stops —e—e— in the path of the arm to receive the thrusts thereof near the ends of its strokes.

For simplicity of construction, I provide the back of the pivoted or rocking jaw —J'— with a rearwardly flaring recess —e'— into which is inserted the attaching end of the arm —d—, which is pivoted to the jaw by a pin —f— passing vertically through the recessed portion of the jaw and through the arm. The flare of the recess —e'— allows the arm a limited swinging movement independent of the jaw, the vertical end walls of the recess constituting the aforesaid stops or shoulders —e—e— which receive the thrusts of the arm and thereby impart concussive blows to the back of the jaw alternately at opposite sides of the axis thereof; the concussion being materially increased by the increased momentum imparted to the arm by the weight on the free end thereof. Said arm may be operated primarily either by hand or by means of an engine or suitable motor hereinafter referred to and in order to facilitate the operation of said arm, I suspend the free end thereof from a suitable overhead support by means of a rod —i— as shown in Fig. 1 of the drawings, or other suitable vibrating suspender, thus relieving the pivot of the arm of the greater portion of the weight of the arm and allowing said arm to be swung more freely on its pivot.

Both jaws are formed with downwardly grooved or serrated operative faces and to increase the efficiency of these jaws in their operation of crushing or comminuting the material under treatment, I form the operative face of the stationary jaw —J— with a segmental concave bottom portion —a— and two concave top portions —a'—a'— respectively at opposite sides of the center of its width, and the operative face of the opposed rocking jaw —J'—, I form with a convex bottom portion —b— terminating with a convex central portion —b'— and reverse curved side portions —b''—b''— at the top. The bottom portions —a— and —b— are concentric to the axis of the rocking jaw —J'—. By this construction, I obtain at opposite sides of the axis of the rocking jaw, two principal pockets in which to alternately crush the material under treatment by the blows applied to the rocking jaw —J'— by the action of the driver or arm —d—. The material thus broken up, descends to the concentric bottom portions —a— and —b— of the jaws where the crushed material is further reduced by a grinding action of the jaws.

—l—l— are shoulders formed respectively on the stationary jaw and rocking jaw, the contact of which shoulders limits the movement of the rocking jaw —J'—.

The arm —d— may be operated primarily by an engine or suitable motor as hereinbe-

fore stated. An exemplification of this is illustrated in Figs. 5 and 6 of the drawings, in which —H— denotes a suitable engine, which by a pitman —P—, is connected to the arm —d— near the fulcrum thereof. The connection of said pitman to the arm is made elastic or yielding lengthwise of the pitman in order to utilize the momentum of said arm obtained by the weight on the free end thereof when in motion. One form of this yielding connection is illustrated in Fig. 6 of the drawings, and consists of a ball-bearing —g— secured to the arm —d— and a corresponding socket —g'— embracing said ball and having slots —g''— in the sides for the play of the arm. To said socket in front and rear of the arm are fastened the sleeves —h—h— and the blocks —h'—h'— which are inside of the sleeves and bear on the ball —g—. Through flaring slots —k—k— extending through the ball passes the rod —j— to each end of which is fastened a follower —n— fitted to slide longitudinally in the sleeve. Between each follower and adjacent block —h— is a suitable elastic cushion —n'— preferably formed of a spiral spring. To the follower —n— which extends toward the motor —H— is connected the pitman —P—.

In the operation of the engine or motor —H—, the arm —d— is primarily moved and its inertia overcome by the action of the pitman, the quantity of motion being subsequently multiplied by the weight on the free end of the arm, the momentum of which causes said arm to impart a concussive blow on the back of the rocking jaw —J'— at one side of the axis thereof. Said jaw is thus suddenly turned on its axis and caused to impinge the material under treatment between the concave portions of the two jaws at one side of the axis thereof.

The arresting of the movement of the arm swung with the momentum increased by the weighted end thereof, causes the rocking jaw to strike the material with a force similar to that exerted by a hammer.

The crushed material descends and is subjected to a partial grinding action by the lower portions of the jaws during the reverse movement of the rocking jaw —J'—.

I claim—

1. The improved crushing machine comprising a stationary crushing jaw, an opposed rocking jaw, a swinging arm striking concussive blows on said rocking jaw toward the stationary jaw, and a weight on the free end of said arm to increase the momentum thereof as set forth.

2. A crushing machine comprising a stationary jaw, an opposed jaw rocking on a central vertical axis, a swinging arm movable independent of the latter jaw and striking the same alternately at opposite sides of its axis, and a weight on the free end of the arm to increase the momentum thereof as set forth.

3. In a crusher for stone or similar hard ma-

materials, the combination with the stationary jaw, of a rocking jaw sustained with its operative face convergent toward the discharge end of the stationary jaw, and a driver striking the rocking jaw alternately at opposite sides of its axis and imparting thereto an intermittent rocking motion impelled by concussive blows.

4. In a crusher for stone or similar hard materials, the combination with the stationary jaw, of a rocking jaw sustained with its operative face convergent toward the discharge end of the stationary jaw, and a lever weighted at one end and pivoted at the opposite end to the rocking jaw to move independently thereof, and stops on said jaw receiving the thrusts of said lever and transmitting concussive blows to the rocking jaw alternately at opposite sides of its axis as set forth.

5. In combination with the stationary jaw, an opposed jaw rocking laterally upon an axis in front of the longitudinal center of the stationary jaw, a lever pivoted at one end to swing in a plane at right angles to the axis of the rocking jaw, stops on the said jaw in the path of the lever and disposed with a lateral play between the lever and catches to receive the force of said lever at the extremes of its thrusts as set forth.

6. The combination of the stationary jaw formed with a downwardly extending operative face recessed transversely and with shoulders at opposite sides of said face, a jaw rocking upon a central vertical axis in front of the stationary jaw and provided at opposite sides with stops adapted to engage the shoulders of the stationary jaw, a lever pivoted to swing in a plane at right angles to the axis of the rocking jaw, and stops on said jaw disposed a distance apart to receive the extreme thrusts of the lever as set forth.

7. The combination of the jaw —J— having its operative face formed with the segmental concave bottom portion —a— and double concave top portion —a'—, the jaw —J'— rocking laterally upon a central vertical axis and having its operative face formed with the convex bottom portion —b— terminating with the convex central portion —b'— and reverse curved side portions —b''—b''— at the top, a lever pivoted to swing laterally independent of the rocking jaw, and stops receiving the force of the lever at the extremes of its thrusts and transmitting concussive blows to

the rocking jaw alternately at opposite sides of its axis as set forth.

8. In combination with the stationary jaw —J— having a downwardly extending operative face, and provided with a pivot bearing in front of its top, the bar —B— connected to the base of said jaw adjustably in its distance from the front thereof, and the rocking jaw —J'— pivoted to said adjustable bar and aforesaid top bearing as set forth.

9. The combination of the jaw —J— formed with the segmental concave bottom portion —a—, double concave top portion —a'—, and with the pivot-bearing —o—, the bar —B— connected to the base of said jaw adjustably in its distance from the front thereof, the jaw —J'— pivoted to the aforesaid bearing and bar and formed with the convex bottom portion —b— terminating with the convex central portion —b'— and reverse curved side portions —b''—b''— at the top, the lever —d— pivoted to swing laterally independent of the pivoted jaw and weighted at its free end, and shoulder —e—e— on the pivoted jaw receiving the force of the lever at the extremes of its thrusts and thereby transmitting concussive blows to said jaw alternately at opposite sides of the axis thereof as set forth.

10. In a machine for crushing stone, and similar hard materials, the combination of a stationary jaw, an opposed rocking jaw, a lever swinging independently of said jaw and imparting thereto concussive blows alternately at opposite sides of the axis of the jaw, a weight on the free end of the lever to increase the momentum thereof, a pitman yieldingly connected to said lever to primarily actuate the same, and a motor actuating said pitman as set forth.

11. In combination with the stationary jaw, the opposed jaw rocking on a central vertical axis, a horizontally swinging arm pivoted at one end to the rocking jaw and actuating the same at the ends of the strokes of the arm, a weight on the free end of said arm, and a vibrating suspender connecting said end of the arm to an overhead support as set forth and shown.

In testimony whereof I have hereunto signed my name this 3d day of February, 1894.

HENRY A. HANNUM. [L. s.]

Witnesses:

JOHN J. LAASS,
C. L. BENDIXON.