

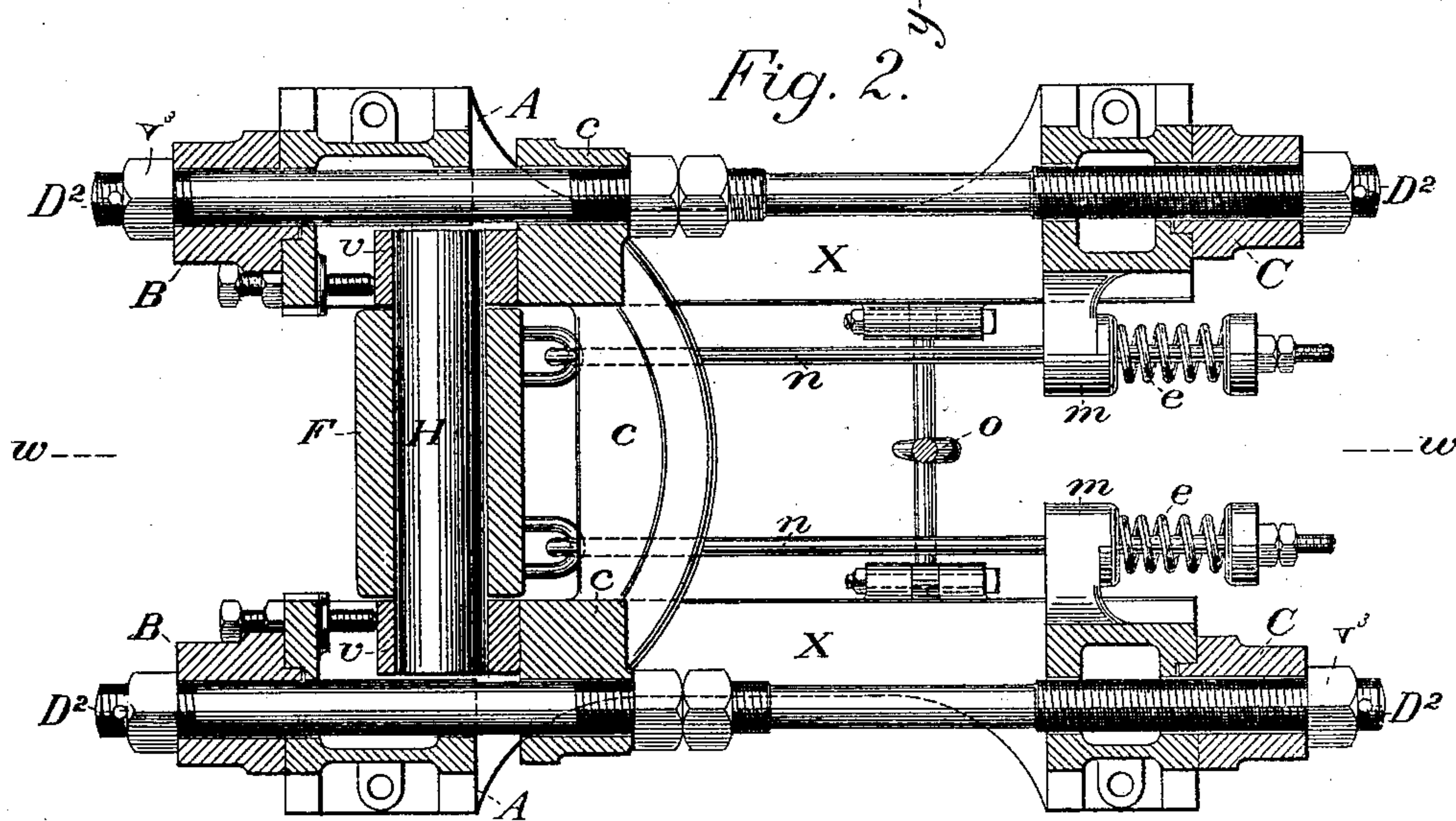
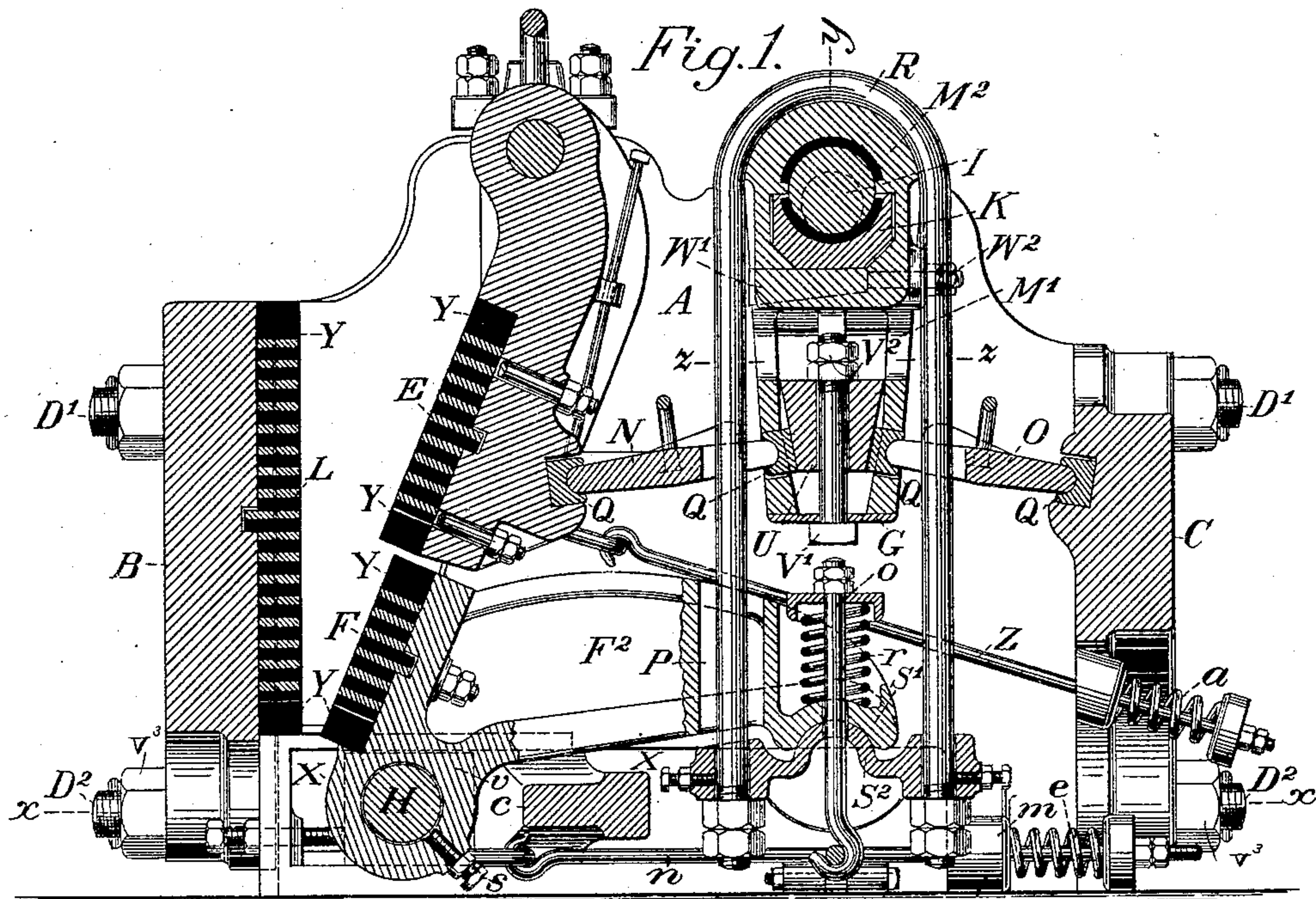
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3 Sheets—Sheet 1.

E. H. BOOTH.  
STONE AND ORE CRUSHING MACHINE.

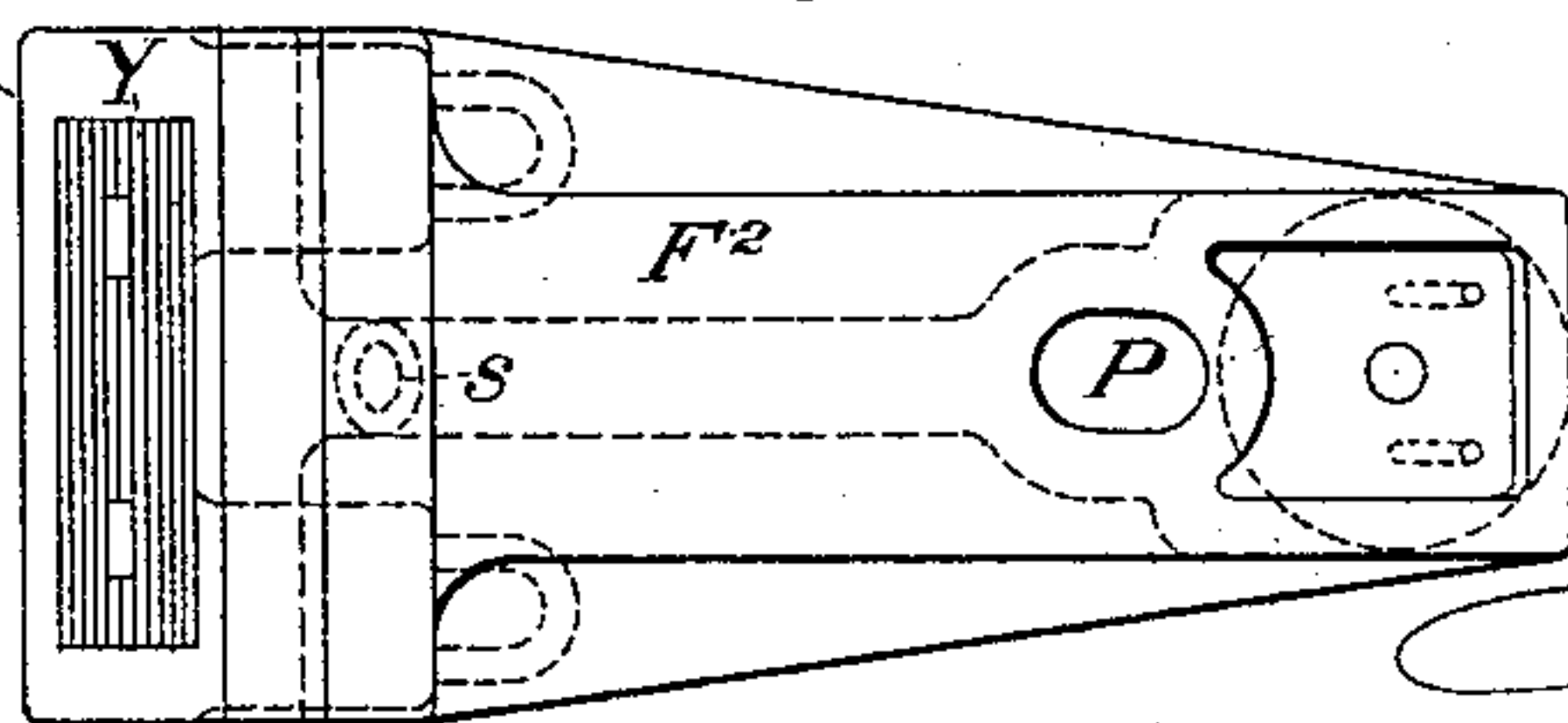
No. 480,761.

Patented Aug. 16, 1892.



*Fig. 3.*

Witnesses:  
E. A. Brandau.  
W. D. Bent.



Inventor:  
Edgar H. Booth.  
By his atty  
John Richards



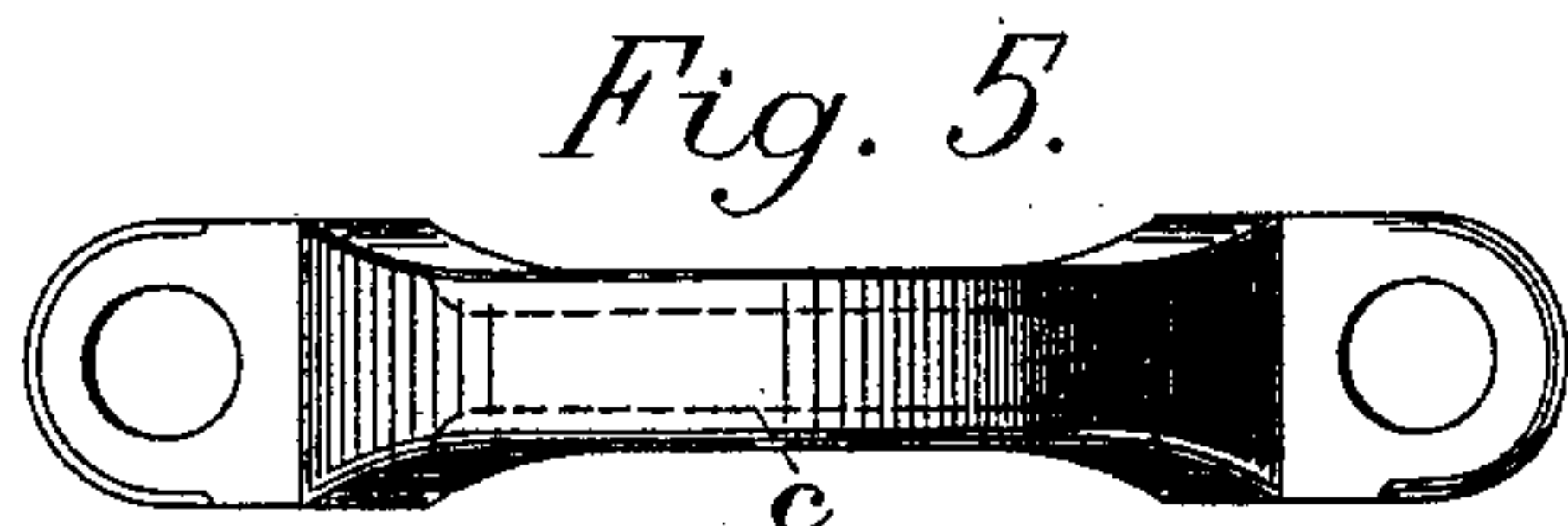
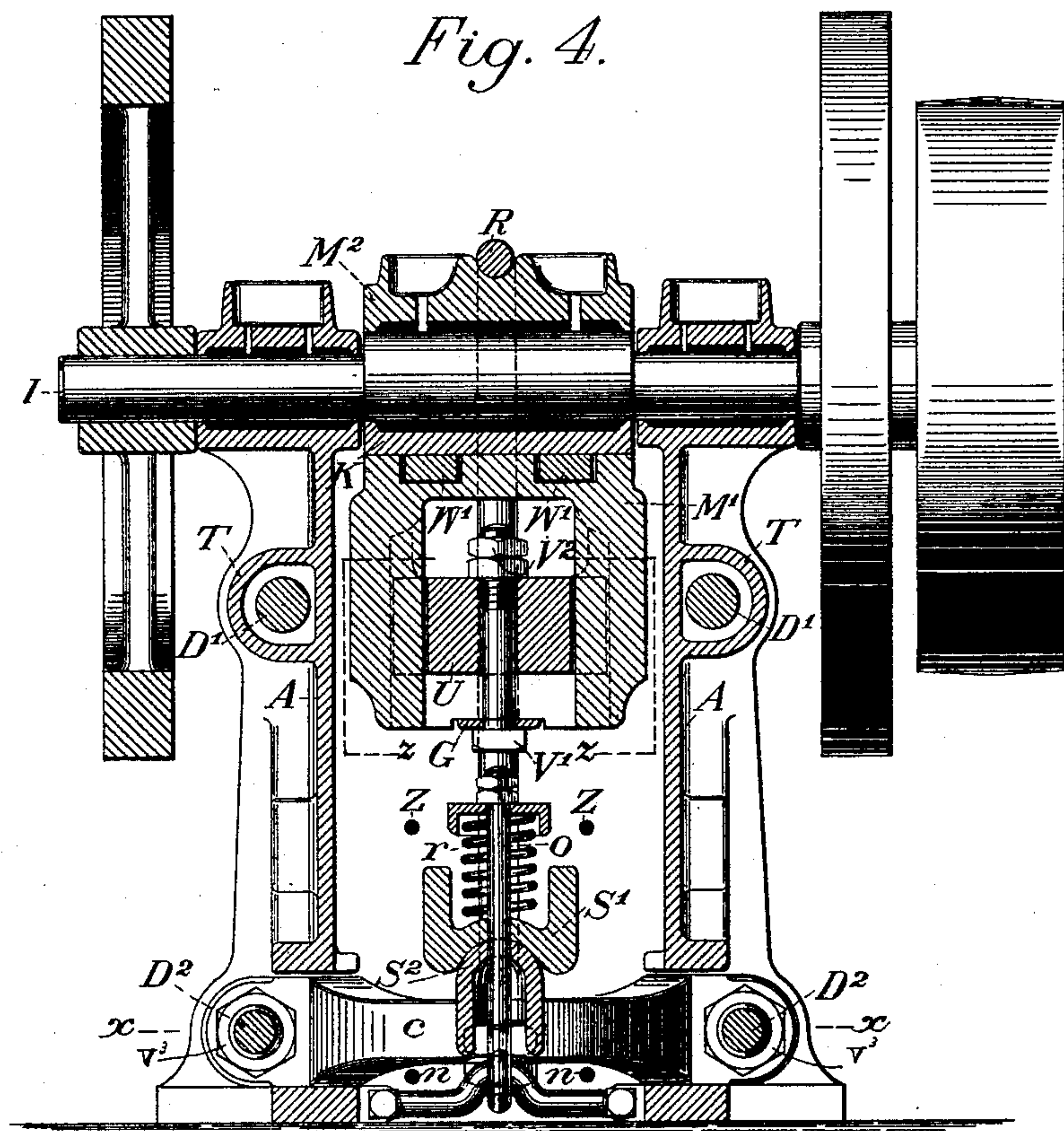
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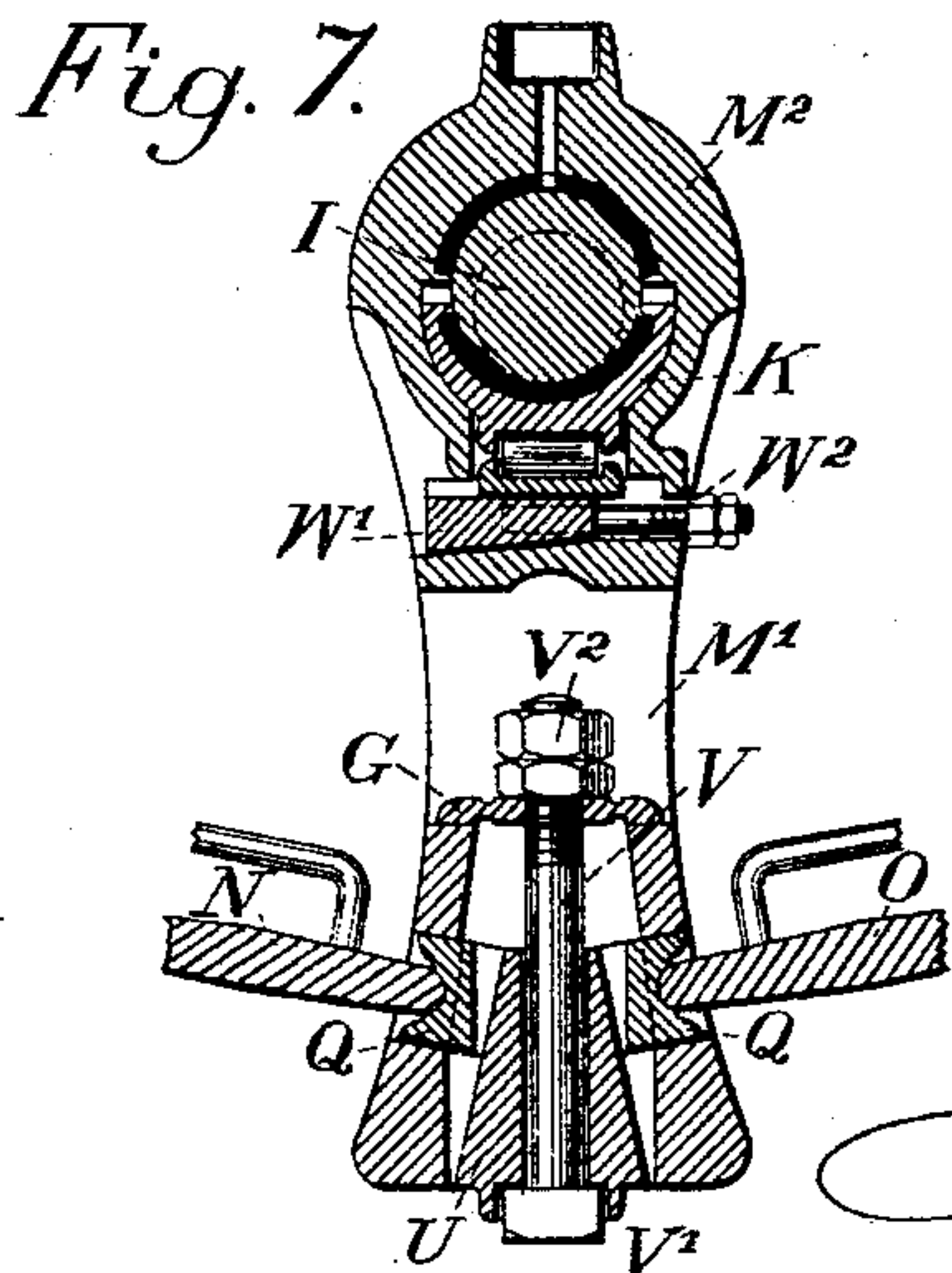
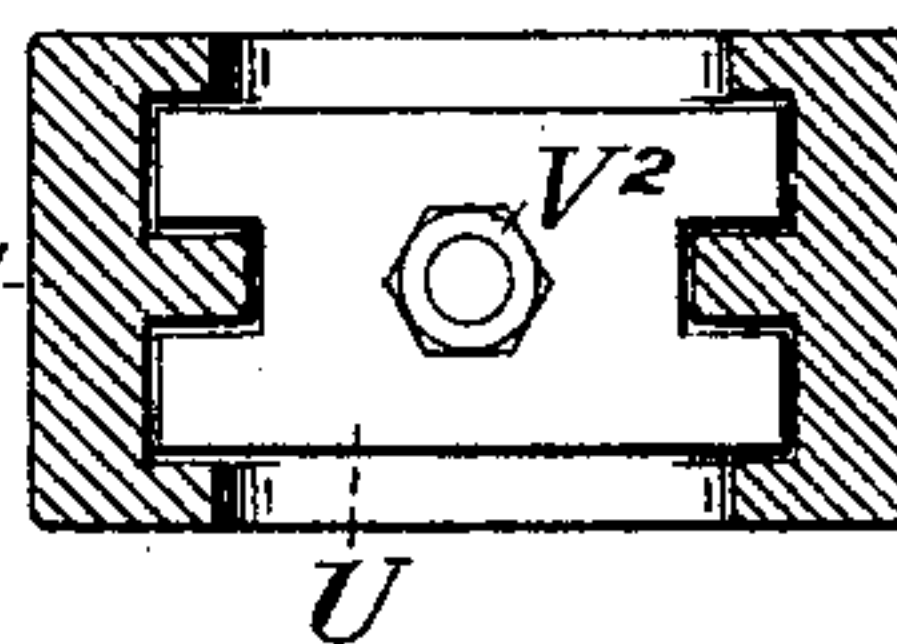
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*Fig. 6.*



Witnesses:

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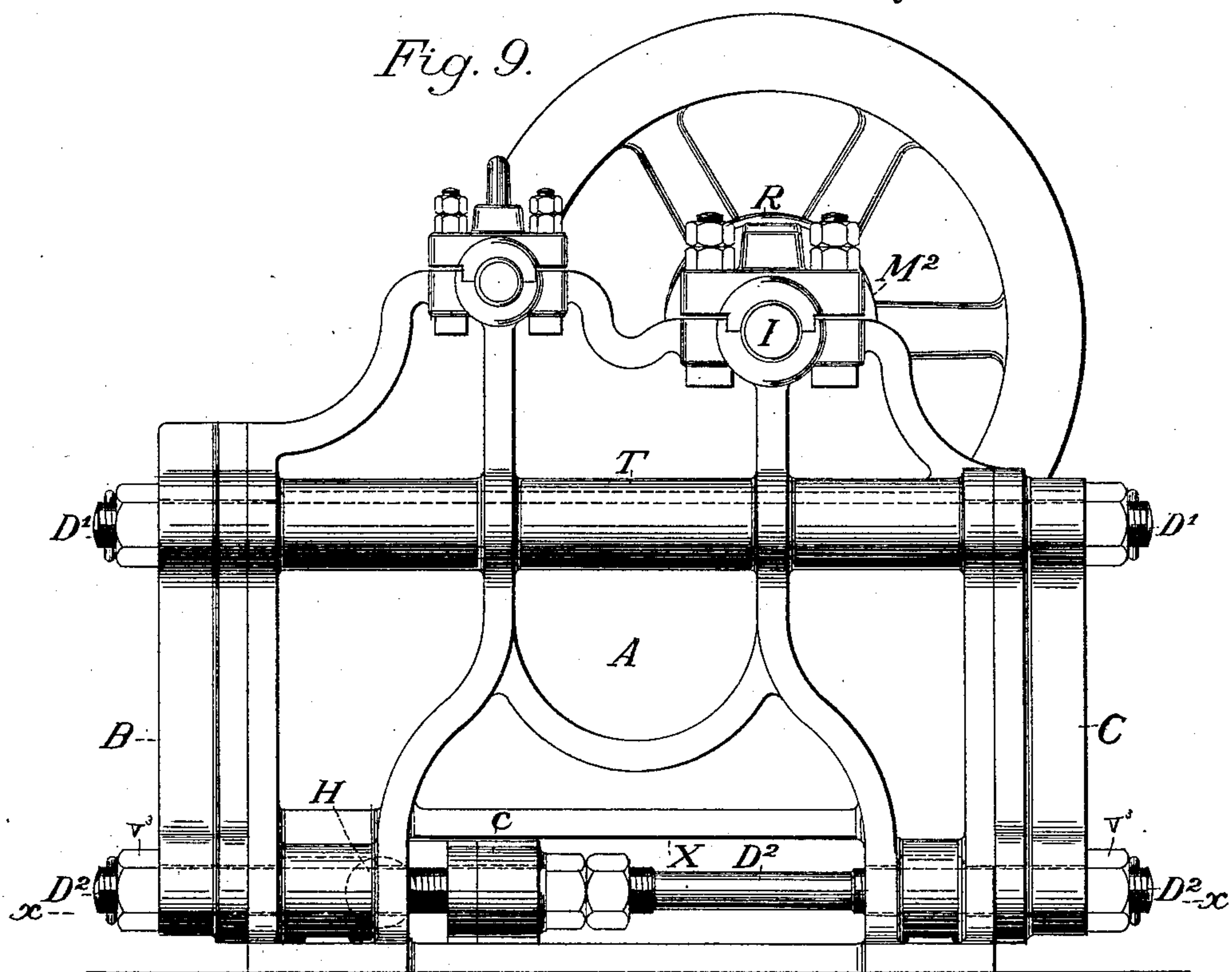
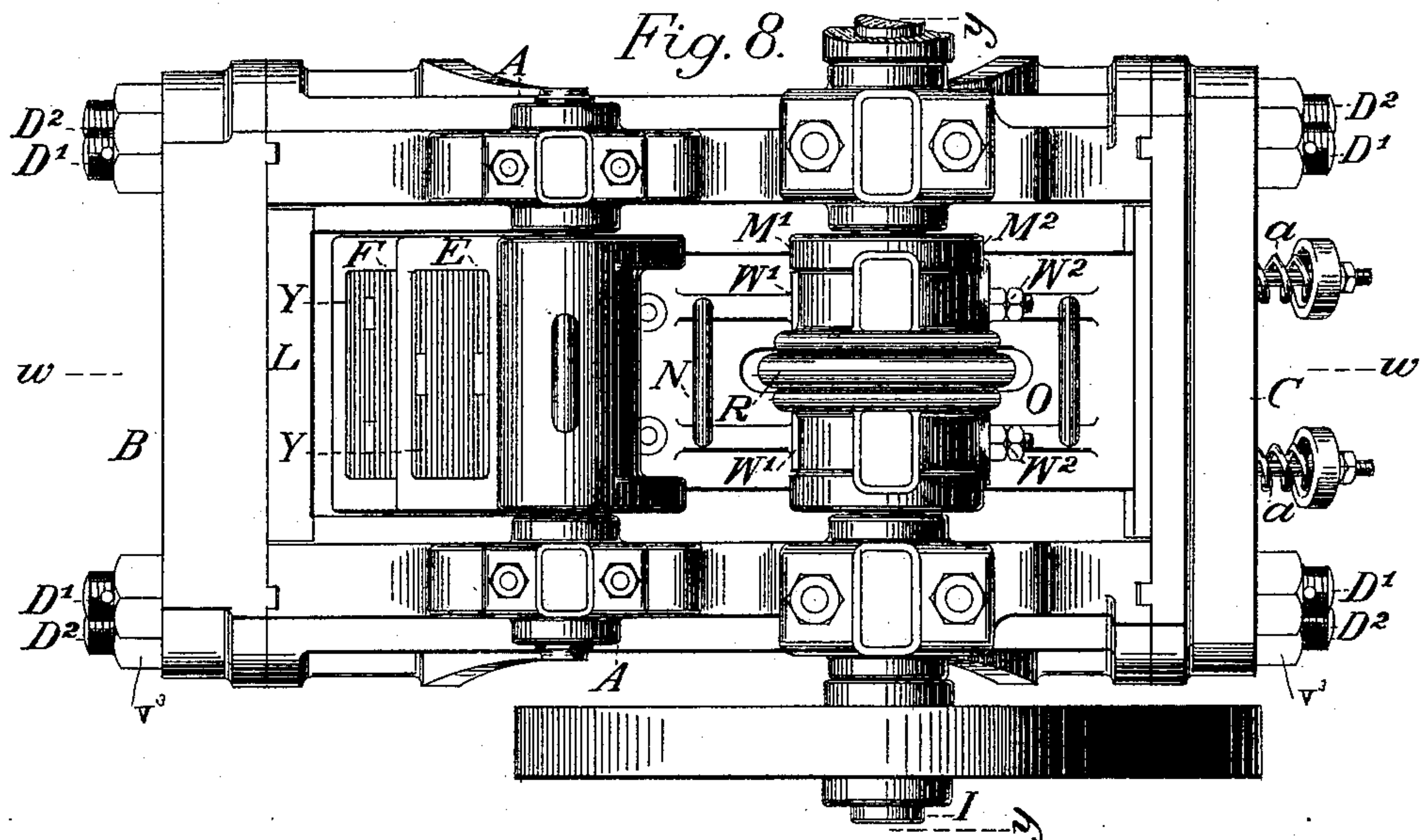
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3 Sheets—Sheet 3.

E. H. BOOTH.  
STONE AND ORE CRUSHING MACHINE.

No. 480,761.

Patented Aug. 16, 1892.



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# UNITED STATES PATENT OFFICE.

EDGAR H. BOOTH, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO THE  
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## STONE AND ORE CRUSHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 480,761, dated August 16, 1892.

Application filed October 21, 1891. Serial No. 409,357. (No model.)

*To all whom it may concern:*

Be it known that I, EDGAR H. BOOTH, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Stone and Ore Crushing Machines; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

The improvements about to be described are specially applicable to the kind of stone and ore crushing machines for which my application for Letters Patent was filed June 20, 1891, bearing Serial No. 396,925; but they will also be found useful in connection with other machines of the kind differing in some respects from these.

My invention consists in the employment of a wedge adjusted by a bolt and placed between the toggle-plate seats in the center of the actuating link or pitman, so that by moving the nuts upon the bolt the wedge will force the toggle-seats farther apart or allow them to come closer together, and by this means regulate the size of the product of the crushing jaws or faces. This arrangement enables the adjustment of the jaws to be more quickly made, owing to the wedge tapering on each side, and also materially shortens the machine as compared with those having a wedge and wedge-block placed at the back of the machine, also in placing a cast or wrought iron plate under the head of the bolt, which supports and adjusts the wedge in such a manner as to permit the plate to be broken or bent should any undue strain be thrown upon the wedge through the toggle-seats by reason of foreign matter—such as drill-points, sledges, &c.—accidentally falling between the jaws, and thus prevents serious damage to the machine.

My invention further consists in providing two wrought-iron or steel bolts near the bottom of the machine in the same plane and at a right angle to the pivot shaft or pin of the moving jaw, which is pivoted below its crushing-face for the purpose of taking the crushing strains, which are thus mainly thrown upon wrought iron or steel and not entirely

taken up by massive cast-iron frames, as is usual in machines having their moving jaws pivoted below their crushing-face, also by having threads cut upon these bolts between their ends in the proper place to provide an adjustment for the size of the crushed product by means of nuts working upon these threads and bearing upon a cross-bar, against which the journal-boxes of the pivot-shaft rest. This adjustment for determining the size of the crushed product is more quickly made and accessible than by the devices hitherto employed for this purpose, such as placing filling in plates behind the journal-boxes.

My invention also consists in a novel manner of transmitting the motion from the eccentric-shaft to the lower moving jaw by means of a bent rod or U-bolt, whereby the actuating mechanism of the upper and lower moving jaws are made less dependent upon each other and oblique strains avoided.

Another object of my invention is to provide an arrangement of springs whereby the lost motion due to wear in the different journals and moving joints is taken up, and also to provide suitable springs for bringing the moving jaws back after each forward crushing movement, also to provide means for taking up the lost motion in the eccentric bearing of the actuating pitman by means of a key or keys and a loose gib-piece bearing against the shaft.

My invention also consists in improvements of the crushing-faces of the removable shoes and dies for the purpose of insuring longer wear and securing a better crushing effect.

Another object of my invention is to increase the strength and stiffness of the two side frames of the machine without greatly increasing the weight by casting hollow shells or sleeves on the sides of the frames and extending approximately the whole length thereof, and through which the side rods or bolts that take the heavy crushing strains pass.

Figure 1 is a longitudinal vertical section through the center of a machine having my improvements. Fig. 2 is a section on the line  $x x$  of Figs. 1 and 4. Fig. 3 is a plan view of the lower jaw. Fig. 4 is a transverse section on the line  $y y$  of Figs. 1 and 8. Fig. 5 is a



rear elevation of the sliding cross-bar or abutment of the lower jaw. Fig. 6 is a plan on the line  $z z$  of Figs. 1 and 4, showing the wedge for the toggle-plates. Fig. 7 is a longitudinal section showing an inverted position of the wedge. Fig. 8 is a plan view of a complete machine. Fig. 9 is a side elevation of the same.

Similar letters of reference on the different figures indicate corresponding parts.

10 In notation the following letters are employed to designate the principal parts of the machine and of my improvements: A A, side frames; B C, end frames; D' D<sup>2</sup>, side bolts; E, upper jaw; F, lower jaw; F<sup>2</sup>, lever for lower jaw; G, breaking plate; H, pivot-pin of lower jaw; I, eccentric-shaft; K, loose gib; L, stationary die; M', pitman; M<sup>2</sup>, pitman-head; N O, toggle-plates; P, hole in lever of lower jaw; Q, toggle-seats; R, U-bolt for pitman; S' S<sup>2</sup>, ball-and-socket joint for lower jaw; T, shell or sleeves on sides of main frame; U, adjusting-wedge for toggle-joint; V', wedge-bolt for toggle-joint; V<sup>2</sup>, nuts on toggle-bolt; W', keys in the top of the pitman; W<sup>2</sup>, bolts and nuts for keys; X, guides in main side frames; Y, frames for shoes and dies; Z, pull-back rods for upper jaw;  $a$ , spring for upper pull-back rods;  $c$ , sliding cross-bar for lower jaw;  $e$ , springs on pull-back rods for lower jaw;  $m$ , lugs on side frames for springs;  $n$ , pull-back rods for lower jaw;  $o$ , spring-rods for ball-and-socket joint;  $r$ , spring for ball-and-socket joint;  $v$ , journal-boxes for fulcrum-pin of lower jaw.

35 The main frame of the machine and its driving-shaft, together with the arrangement of the upper and lower moving-jaws, is substantially the same as in my aforesaid application for Letters Patent, or may be constructed in any other approved manner.

40 To this machine or any other operated on the same general principles I apply my invention as follows: The pitman M' has an opening in its center, with ribs running between its sides, within which is placed the wedge U, bearing against the toggle-seats Q Q, which rest on and are guided by the ribs between the sides. The bolt V' passes through the center of wedge U, with nuts V<sup>2</sup> resting upon its upper surface, the head of bolt V' resting upon the plate G, which forms a bridge across the ribs at bottom of pitman M<sup>2</sup>. Upon turning the nuts the wedge U is either forced down between the toggles N O, forcing them apart and causing the shoe E to approach the die L, or the reverse if the nuts are turned in the opposite direction. There are two pull-back rods Z and springs  $a$  provided, attached to the lower part of upper jaw E, and taking their bearing against lugs attached to back frame C, as shown in Fig. 1. These springs keep the moving parts actuating the upper jaw E in their proper position in the usual manner. The plate G is of wrought or cast iron, made sufficiently strong to hold the wedge U in its proper place for ordinary crushing-strains; but will break or bend and allow the wedge to rise and the toggle-seats Q Q to approach

each other, and thus widen the opening at the bottom of the jaw E should foreign matter not capable of being crushed by an ordinary effort fall between the jaws. The loose gib K is fitted in the upper part of pitman M' and held against the bottom of the eccentric-shaft I by means of a key W', set up by a bolt and nuts W<sup>2</sup> for the purpose of taking up any lost motion of the shaft in the pitman-head M<sup>2</sup>. The bent rod or U-bolt R is curved to conform to the circle of the pitman-head M<sup>2</sup>. The ends thereof pass down on each side of the pitman M' and engage the ball-bearing connection S', which fits into the socket S<sup>2</sup>, cast on the end lever F<sup>2</sup>. The motion of the eccentric is thus transmitted through the lever F<sup>2</sup> to the crushing-face F. A hole P is made in the lever F<sup>2</sup> to allow the passage of the rod on that side. The ball-and-socket joint S' S<sup>2</sup> is self-adjusting, and thus compensates for any inequality in alignment due to construction or wear. The spring  $r$  is held by the rod  $o$  and, bearing on top of ball-and-socket joint S' S<sup>2</sup>, acts as a pull-back spring for jaw F and also takes up any lost motion between the U-bolt R and the pitman-head M<sup>2</sup>, as well as between the ball-bearing connection S<sup>2</sup> and the nuts on the ends of U-bolt R. The shaft or pivot-pin H, on which the jaw F is fulcrumed, is held rigidly in the lower part of the jaw F by means of the set-screw S. The projecting bearings of the pin H rest in the journal-boxes  $v v$ , which may be made to slide back and forth in guides X X, cast on the inside of side frames A A. These boxes  $v v$  rest against the cast-iron cross-bar  $c$ , which extends across the machine and through which pass the bolts D<sup>2</sup>. These bolts are threaded at the ends and provided with nuts V<sup>3</sup>, so the cross-bar  $c$  can be moved forward or allowed to come back, moving in and held in place by the slides X in the lower part of side frames A. Said bolts are also threaded near the middle portions thereof and provided with other nuts thereon, which operate against the cross-bar  $c$ , as shown in Fig. 2. By this adjustment the size of the crushed product falling from bottom of jaw F is determined and the heavy crushing strains are taken up by the bolts D<sup>2</sup> in tension. These bolts pass outside of the boxes  $v$  and through the end frames B C and hold them in place, in addition to taking crushing strains from jaw F.

The rods  $n$ , attached to bottom of jaw F and between the bearings  $v$ , are held in tension by means of springs  $e$ , acting against lugs  $m$ , cast on the side frames. These springs hold the boxes  $v$  firmly against the sliding piece  $c$ , and also prevent lost motion of the pin H in the boxes  $v$ . As there are two of these springs situated between the boxes  $v$ , should one break the other is capable alone of performing their duty.

Upon the faces of the stationary and movable jaws are fitted removable crushing-faces E, F, and L. These consist of alternate layers of wrought iron and steel bars placed on



edge and held within rectangular wrought iron or steel frames Y. The steel bars are hardened, and the wear being greater upon the wrought-iron bars than upon the steel, the latter will be slightly elevated above the surface of the wrought iron, forming a corrugated surface and giving a better crushing effect.

In Figs. 3, 4, and 9 will be seen the hollow iron shell or sleeve T, cast upon the side frames A A, and through which pass the bolts D'. These hollow sleeves add greatly to the strength and stiffness of the side frame and give the machine a heavy massive appearance without materially increasing its weight.

It will be understood that the wedge U, bolt V', and connected members can be inverted in any case when required, as shown in Fig. 7, without in anywise altering their functions or manner of operating.

Having thus explained the nature and objects of my invention and the manner of applying and constructing the same, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of an abutment, a moving crushing-jaw, a central oscillating pitman, toggle-jointed plates between the abutment, the pitman, and the crushing-jaw, a wedge fitted within said pitman between the toggle-seats therein, and adjusting means for said wedge, substantially as set forth.

2. In a stone or ore crushing-machine, a breaking or safety plate resting upon the pitman and connected to a wedge within the pitman, so as to receive the strain coming upon the wedge, substantially as and for the purpose herein described.

3. In a stone or ore crushing-machine, having two movable jaws, both driven from the

same shaft, a connecting-rod or U-bolt passing over the pitman-head on the shaft and connected to the lower jaw by means of a ball-and-socket joint, substantially as and for the purposes herein described.

4. In a stone and ore crushing-machine, the combination, with the moving crushing-jaw F, pivoted below its crushing-face, of side bolts D<sup>2</sup>, passing outside of the ends of the pivot-shaft or pin H, and the nuts upon the bolts D<sup>2</sup>, between the end frames B C, for receiving the thrust of the pivot shaft-bearings v v, through the sliding bar c, substantially as and for the purpose herein described.

5. In a stone or ore crushing-machine, the combination, with the moving crushing-jaw, pivoted below its crushing-face, with side bolts having adjusting-nuts, the sliding bar, and pivot shaft-bearings, substantially as and for the purposes herein described.

6. In a stone or ore crushing-machine, the combination, with the moving crushing-jaw F, pivoted below its crushing-face, the ball-and-socket joint S' S<sup>2</sup>, bolt R, and pitman-head M<sup>2</sup>, of the spring r, a rod o, secured at one end to side frames A A of the machine, and at the other bearing upon the spring r, so as to be held in tension for the purpose of preventing lost motion between the bolt R and the head M<sup>2</sup> as well as between the ball-bearing connection and the end of bolt R, all substantially as and for the purpose herein described.

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

EDGAR H. BOOTH

Witnesses:

ALFRED A. ENQUIST,  
WILSON D. BENT, Jr.