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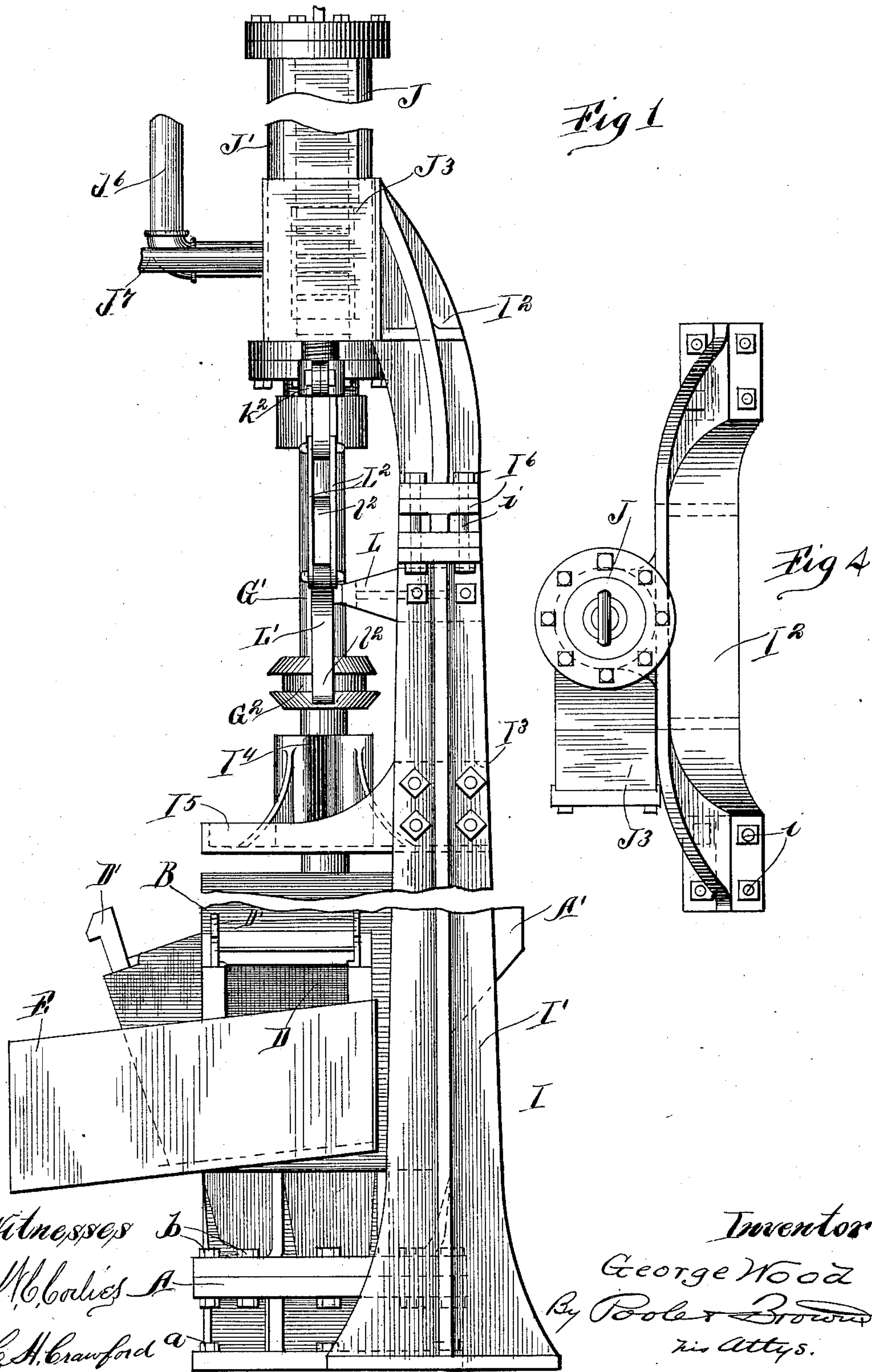
Patented Aug. 30, 1898.

G. WOOD.
STAMP MILL.

(Application filed June 19, 1897.)

(No Model.)

3 Sheets—Sheet 1.



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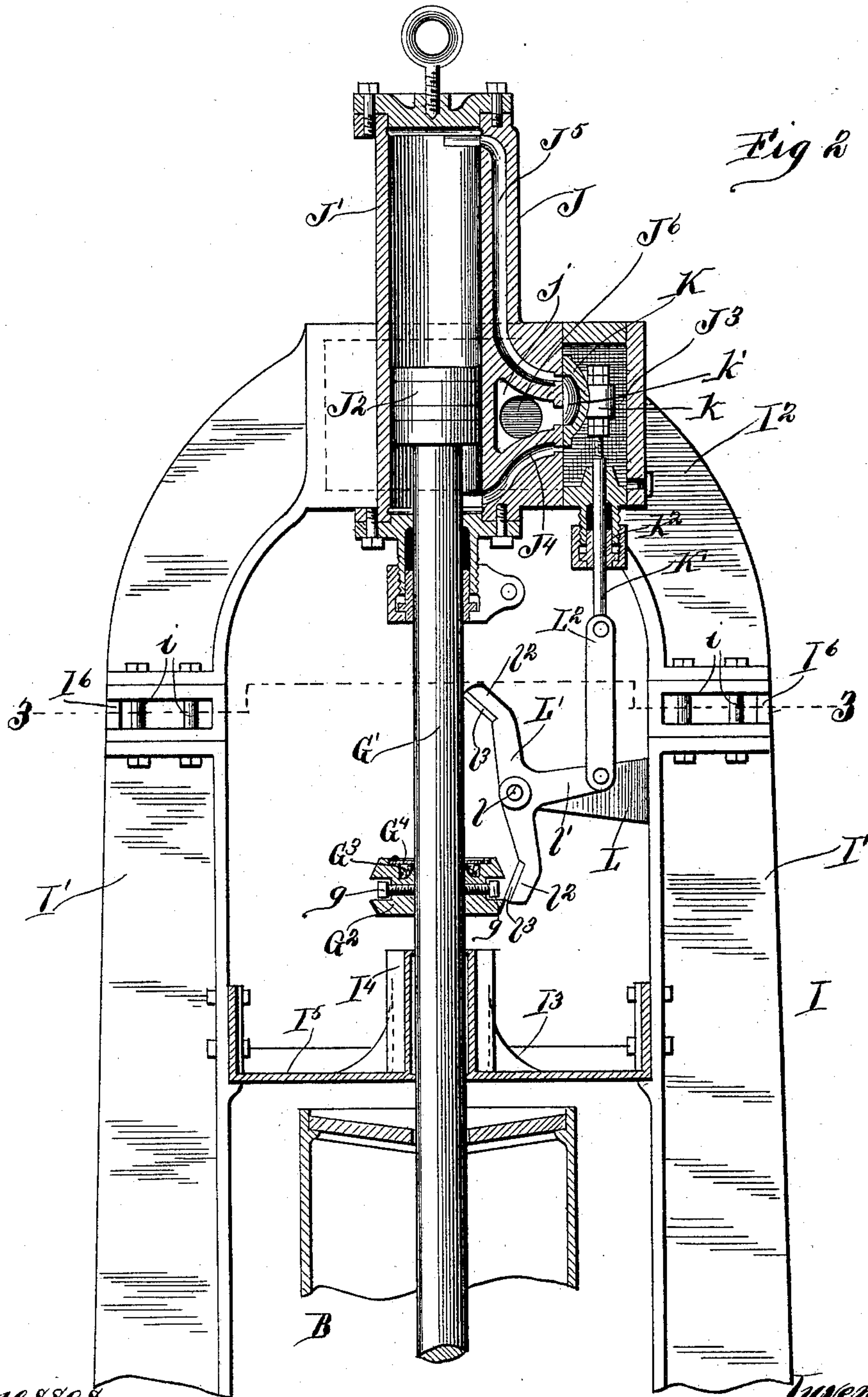
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3 Sheets—Sheet 2.



Witnesses
W. C. Corlies
C. A. Crawford

Inventor
George Wood
By *Robert Brown*
his Attorneys.

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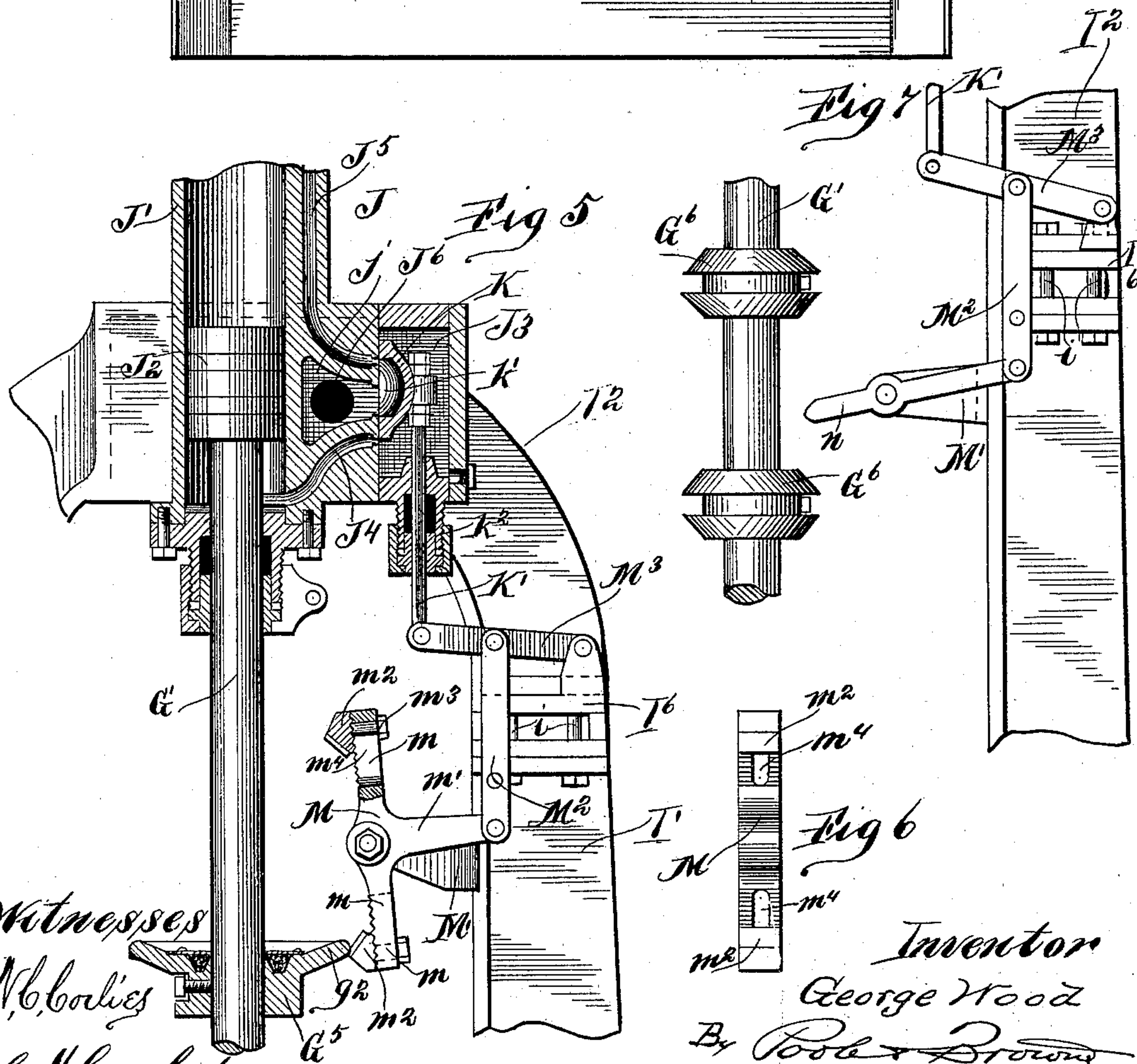
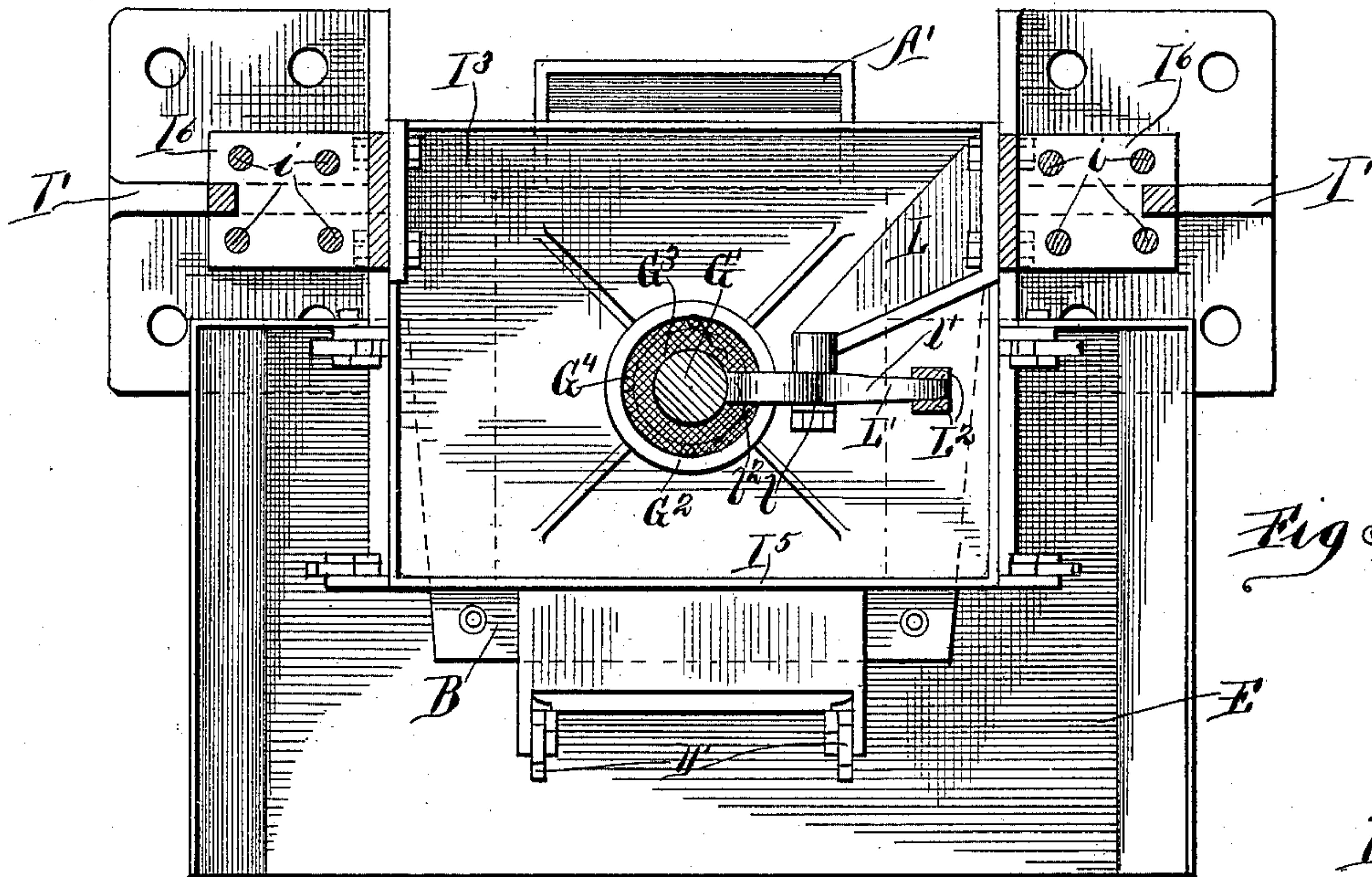
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3 Sheets—Sheet 3.



Witnesses
N. C. Collier
C. H. Crawford


 Inventor
 George Wood
 By Robert Brown
 his Attys.

UNITED STATES PATENT OFFICE.

GEORGE WOOD, OF PRESCOTT, ARIZONA TERRITORY.

STAMP-MILL.

SPECIFICATION forming part of Letters Patent No. 609,863, dated August 30, 1898.

Application filed June 19, 1897. Serial No. 641,408. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WOOD, of Prescott, in the county of Yavapai and Territory of Arizona, have invented certain new and useful Improvements in Stamp-Mills; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in stamp-mills for comminuting ores and like hard substances, and refers more specifically to that class of stamp-mills provided with a single stamp which is connected with and is reciprocated by a suitable motor, so that the crushing blow is produced by the momentum of the stamp and the downward pressure of the motive agent on the moving part of said motor.

The invention relates to certain improvements in the motor, to an improved mechanism adapted to be operated from a moving part of the stamp-mill to regulate the action of the motive agent on said motor, and to means for compensating for the wear upon the stamp and die.

The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings illustrating two embodiments of my invention, Figure 1 is a side elevation, partly broken away, of a stamp-mill constructed in accordance with my invention. Fig. 2 is a view, partly in section and partly in elevation, of the same. Fig. 3 is a plan section taken on line 3 3 of Fig. 2. Fig. 4 is a plan view showing the manner of mounting the engine upon the stamp-mill frame. Fig. 5 is a front elevation of the stamp-mill, showing a slightly-modified form of valve-actuating mechanism. Fig. 6 is a detail thereof. Fig. 7 is a fragmentary view showing a further modification.

The stamp-mill shown in the drawings consists of the usual bed or mortar-block A, to which is fastened the mortar B in any preferred or convenient manner. Said mortar is shown as secured to the mortar-block by means of bolts *b*, passing through a flange at the lower end thereof and into said block. The block is secured to the floor or a suitable

foundation by means of bolts *a*, passing there-through and into said foundation. The casing B is provided with the usual openings, which serve as a means of egress for the pulp which has been reduced in said mill. Said openings are closed against the passage of particles of the substance being crushed larger than a determined size by means of screens D, which are held in place by suitable wedges D'. E designates an apron which is so mounted upon the mortar with relation to said openings of the mortar as to receive the pulp discharged therefrom and serves to deliver the latter from the mill to an amalgamable or other apparatus for further treating the same.

Within the mortar B and upon the mortar-block A will be mounted a die. (Not shown.) Said mortar will also be provided with a stamp (not shown) adapted to have vertical reciprocation therein. To said stamp is secured a stamp-stem G', which is attached to the motor and through which reciprocation is given to said stamp. Said stamp-mill may, however, be of any common or preferred construction and has not been herein shown in detail.

A' designates a hopper through which the ore may be fed to the mortar from any convenient source of supply.

I designates a frame upon which a motor for operating the stamp is supported. As herein shown, said frame consists of three parts—two vertical standards I' I', one on each side of the mortar, and a separate arched top portion I², secured at each end thereof upon the upper ends of the standards I' by means of bolts *i*, passing through suitable flanges in said parts. Said standards I' are secured in any suitable manner to the foundation independently of the mortar-block A.

I³ designates a cross-head secured to the opposite member I' of the frame, to which is integrally attached a guide-bearing I⁴, through which the stamp-stem G' passes. Said cross-head is flanged so as to form a large shallow tray I⁵ for the purpose of catching the drippings from the stuffing-boxes of the cylinder and steam-chest. Said frame I may, however, be made in one piece, and this would not be objectionable if the stamp were to be used at one place only. It is often neces-

sary, however, to move said mills from place to place and in mountainous countries, and it is therefore desirable that the frame be segregable, as shown.

5 In the present instance the operating-motor consists of a steam-engine J. Said engine J comprises a cylinder J' and a piston J², to the latter of which the upper end of the stamp-stem G' is rigidly attached and which forms the
 10 piston-rod of the engine as well as the stem of the stamp. Said part will hereinafter be referred to both as the engine "piston-rod" and "stamp-stem." In the present instance the cylinder is cast integral with the arched portion of the frame I, as shown more clearly in
 15 Fig. 4 of the drawings. Said cylinder J' is shown as provided in its side wall, adjacent to the lower end thereof, with a thickened portion which is provided with an interior
 20 recess j, into which the steam-exhaust pipe J² opens. The cylinder is provided with a steam-chest J³, which is secured to the enlarged lower end of the cylinder, which latter is provided with a steam-supply pipe J⁷, which
 25 leads from any suitable source of steam-supply. As herein shown, the wall of the cylinder adjacent to the steam-chest is thickened throughout the length thereof and is provided within said walls with steam-passages
 30 J⁴ J⁵, which extend from the opposite ends of the cylinder inwardly and open through said enlarged lower wall of the cylinder into the steam-chest J³. Said recess j also opens into the steam-chest J³ between the inner ends of
 35 the said passages J⁴ and J⁵. Said passages J⁴ and J⁵ each act alternately as steam inlet and exhaust passages, and the supply of steam therethrough is controlled by means of a suitable slide-valve, which is so formed
 40 that when one of the passages is in communication with the steam-chest the other passage will be in communication through the recess j with the exhaust-pipe J⁶. As herein shown, the admission of steam through said
 45 passages or ports is controlled by means of a slide-valve K. In order to alternately connect said passages J⁴ J⁵ with the said recess and the steam-chest J³, the slide-valve K is provided on its face adjacent to the said open-
 50 ings with a recess k', said recess being of such length as to extend from the outer margin of each of the steam-passages J⁴ J⁵ to the opposite margin of the opening of the recess j into the steam-chest. With this construction the
 55 steam-passage, which is uncovered by the valve, serves as a steam-inlet port, and the passage which is covered by said valve serves as an exhaust-port, the steam passing from said port through the recess k' in the slide-
 60 valve and through the recess j to the exhaust-pipe J⁶. Said slide-valve will be so actuated that it will be in its upper position in which the passage J⁴ will be in communication with the steam-chest J³ when the piston J² is at the
 65 limit of its inward movement, so that steam from the chest will be free to enter said cylinder through the passage J⁴ to move the

piston outwardly, while the other passage J⁵ will be in communication with the exhaust-pipe J⁶, through which the steam will exhaust
 70 as said piston moves outwardly. Said slide-valve K is provided with a valve-stem K', which has engagement with an integral apertured lug k on said block. Said stem K' passes through the lower wall of the steam-
 75 chest and through a suitable stuffing-box k² and is operatively connected with a valve-actuating mechanism hereinafter to be described and which is shown as actuated from the piston-rod or stamp-stem G'. As shown
 80 in Figs. 1, 2, and 3, said valve-actuating mechanism is constructed as follows:

L designates a bracket which is mounted upon one of the standards I' of the frame I and extends inwardly toward the stamp-stem
 85 G'. Said bracket L carries at its inner end a bifurcated lever L', said lever being pivotally mounted upon the bracket by means of a short bearing-stud l. The single arm l' of the lever is directed outwardly toward the standard I'
 90 and is operatively connected at its outer end with the valve-stem K' by means of a connecting-link L². The opposite or bifurcated end of said lever constitutes tappet-arms l², which are adapted to have alternate and intermit-
 95 tent engagement with a part of the moving stamp-stem and by means of which the lever will be rocked on the stud l at each reciprocation of the piston and the position of the slide-valve K, operatively connected with said
 100 lever, changed accordingly. As herein shown, the stamp-stem G' is provided with an adjustable tappet-collar G², which is shown as secured to said stem by means of set-screws g. Said collar G² is so mounted upon the stem G'
 105 that when the stem and the connected piston are in the lower limit of their movement, as shown in Fig. 1, the collar will engage the adjacent or lower tappet-arm l² of the lever L' and act to oscillate the outer end of said lever
 110 upwardly and to thereby move the slide-valve K to uncover the passage J⁴ and allow the steam to pass to the inner side of said piston to move the same outwardly. It will be noted that the tappet-arms of the lever are
 115 arranged to normally stand in an inclined position with relation to the axis of the stem, so that when one of said arms is moved away from the stem by engagement thereof with the tappet-collar G² the opposite arm will be
 120 moved toward the stem and in position to be engaged by said collar in the next reciprocation thereof. When the piston is moved upwardly, the tappet-collar G², carried by the stem G', will engage the upper tappet-arm to
 125 oscillate the lever and move the slide-valve, so as to uncover the steam-passage J⁵ and to connect the passage J⁴ with the exhaust-passage J⁶ in an obvious manner. The parts of the tappet-arms engaging the tappet-collar
 130 G² will preferably be lined with hard-steel plates l³ to reduce to a minimum the wear upon said parts. Said contacting-surfaces will also preferably be arranged at an out-

ward inclination from the horizontal, and the collar will be correspondingly shaped to provide a smooth contact between the same. The form of the collar G^2 herein shown is not essential for the purpose described. The special form shown, however, has been provided to serve as a tappet-surface and at the same time prevent oil from the cylinder working down the stem G' into the inside of the stamp-mill. Said collar is for this purpose provided on its upper surface with an annular groove G^3 , the inner side of which is worked out to a feather-edge. Said groove will be filled with cotton or other absorbent material and will be covered by a circular screen G^4 , secured to said collar in any convenient manner.

The die and stamp of the stamp-mill will be subjected to constant wear in the use of the mill, and the position of the piston within the cylinder, which has a constant relation to said stamp, will be correspondingly changed. In order to avoid the necessity of resetting the cylinder as such parts are worn away and the plane of reciprocation of the stamp lowered, said cylinder is made of greater length than the entire travel of the piston. When said die and stamp are of their maximum vertical length, the travel of the piston will be between the position of the piston shown in Fig. 1 and the outer end wall of the cylinder. As the die and shoe wear away the limits of said travel will gradually move downwardly until it will be exactly reversed. In other words, the travel of said piston will occupy the space between the inner end wall of the cylinder and a point below the outer end wall thereof equal to the distance between the piston and the said inner end wall of the cylinder, as shown in Fig. 1. It will be understood, of course, that the position of the tappet-collar G^2 will be changed to correspond with the change of the piston within the cylinder, so that the points of cutting off and admitting steam to the cylinder will not be changed with relation to the operation of the die and stamp within the mortar. As shown in said Fig. 1, the length of the cylinder with relation to the travel of the piston is such as to compensate for one half of the wear of said stamp and die. In order to compensate for the remaining half of the wear between said parts, distance-blocks I^6 are interposed between the standards I' and the upper arched portion I^2 of the frame. With this construction when the coacting surfaces of the die and shoe have worn so that the travel of the piston is changed to the lower end of the cylinder said blocks I^6 will be removed, when the travel of the piston will be changed to the upper part of the cylinder, as shown in Fig. 1. The tappet-collar G^2 will again be adjusted to the changed position of said parts. The travel of the piston within the cylinder will again be gradually lowered as the stamp and die are worn away; but the amount of adjustment permitted in the cylinder will be sufficient to

allow the die and stamp to be completely worn away, when a new die and shoe will be substituted and the parts adjusted as before.

The tappet-surfaces of the lever L' , just described, are fixed immovably with relation to each other, so that the length of the stroke of the stamp will remain constant and cannot be changed without the substitution of a lever of different size.

In Fig. 5 is shown a modification of the valve-actuating mechanism in which the tappet surfaces or blocks in the actuating-lever are made adjustable. In said figure, M designates a three-arm lever corresponding in function to the lever L' of the previously-described figures. Said lever is pivotally mounted upon an inwardly-extending bracket M' , secured to the frame I , as in the construction before described. The tappet-collar G^5 is provided with an outwardly-flaring rim g^2 , the object of which is to more perfectly insure the catching of the drip from the cylinder. The tappet-arms m of the lever are shown as arranged at right angles to the outwardly-extending arm m' thereof and, as in the previously-described construction, normally at a slight inclination to the axis of the stem G . Said tappet-arms m are provided with adjustable tappet-blocks m^2 , and said blocks are adjustably secured upon the arms m by means of set-screws m^3 , which have engagement with slots m^4 in said arms. The adjacent faces of said blocks and arms are provided with interfitting recesses and projections in order to form a positive adjustment of said blocks on the arms. The enlargement of the rim of said tappet-collar G^5 necessitates the shifting of the tappet-lever M away from the stem G , which brings the center line of the connecting-link M^2 out of line with the axis of the valve-stem K' . Said link is herein shown as operatively connected with the stem by means of a horizontally-arranged lever M^3 , which is pivotally engaged at one end to the frame, has pivotal connection at its opposite end with the valve-stem, and is engaged between its ends by the connecting-link M^2 . The oscillation of the tappet-lever M serves through the medium of the connecting-link M^2 and lever M^3 to reciprocate the valve-stem and block attached thereto in the same manner as described in connection with the preceding figures. With the adjustable construction of the tappet-blocks it will be seen that the length of the stroke of the piston and stamp thereto attached may be varied as desired. If the tappet-blocks are moved inwardly upon the arms m , they will act to shorten the stroke of the piston by reversing the valve mechanism earlier in the stroke of the piston, and vice versa.

In Fig. 7 is shown still another modification of the tappet arm or lever and means for actuating the same wherein the arrangement heretofore shown and described is reversed. In said figure the stamp-stem G' is provided with two tappet-collars G^6 , similar to the collar G^2 .

(Shown in Fig. 1.) N designates a horizontally-arranged arm or lever, which is pivoted between its ends upon the outer end of a bracket M', like that shown in Fig. 5. Said collar is operatively connected at its rear ends with the valve-stem K', as described in connection with Fig. 5, and the forward end thereof is directed toward the stamp-stem G', in position to be engaged by the tappet-collars G⁶. Said collars are spaced at such distance apart upon the stamp-stem G' as to engage the lever end at the limit of each reciprocation thereof to rock said arm upon its pivot and to thereby actuate the slide-valve K. The operative connections between said valve-stem K' and tappet-arm N, being similar to the connection shown in Fig. 5, are designated by the same letters as in said Fig. 5 and need not be further described.

The steam-chest J³ is shown in the figures of the drawings as located adjacent to the lower end of the cylinder J', the result being that the steam-passage J⁴, leading to said lower end, is of less length than the other.

This arrangement of the steam-chest and steam-passages is deemed to be advantageous by reason of the fact that the passage between the steam-chest and the lower end of the cylinder being greatly reduced in length the steam will act more quickly to raise the stamp than if the passage were the usual length.

I claim as my invention—

1. The combination with the reciprocating stem of a stamp-mill and an engine comprising a cylinder provided with steam inlet and exhaust ports, a piston therein which is connected with said stamp-stem, and a slide-valve for controlling the admission of steam to said cylinder, of a valve-actuating mechanism comprising a pivoted lever operatively connected at one end with said valve and formed at its opposite end with two oppositely-directed tappet-arms, detachable contact-plates which have slotted connection with the opposite ends of said arms, and a tappet-collar on said stamp-stem adapted to alternately engage said contact-plates of the lever-arms in the reciprocation of the stem.

2. In combination with the reciprocating stem of a stamp-mill and an engine comprising a cylinder provided with steam inlet and exhaust ports, a piston therein which is connected with said stamp-stem and a slide-valve for controlling the admission of steam to said cylinder, of a valve-actuating mechanism comprising a pivoted lever operatively connected at one end with said valve and formed at its opposite end adjacent to the stamp-stem with two separated arms, detachable contact-plates mounted on opposite ends

of said arms, interfitting projections and recesses on the adjacent faces of the plates and arms, a bolt having screw-threaded engagement with each of said plates and having slotted connection with the arms and a tappet-collar on said stamp-stem for alternately engaging said contact-plates of the tappet-arms in the reciprocation of the stem.

3. The combination of the reciprocating stem of a stamp-mill, a frame comprising two upright extensible standards connected by an upper arched portion, an engine mounted on said arched portion of the frame comprising a cylinder provided with steam inlet and exhaust ports, a piston therein connected with said stamp-stem, a valve for controlling the passage of steam through said ports and means for varying the vertical length of said standards.

4. The combination of the reciprocating stem of a stamp-mill, a frame comprising two upright standards, and a separate arched portion mounted on said standards, an engine mounted on said arched portion of the frame comprising a cylinder provided with steam inlet and exhaust ports, a piston therein connected with said stamp-stem and a slide-valve for controlling the passage of steam through said ports, and detachable distance-blocks inserted between the upper ends of said standards and the arched portion of the frame.

5. In a stamp-mill, the combination of a mortar, a stamp adapted to reciprocate therein and provided with a stamp-stem, a supporting-frame comprising two upright standards secured at one side of the mortar independently of the foundation which supports the mortar and overhanging at their upper ends said mortar, a steam-engine supported upon said overhanging portion of the standards and connected with said stamp-stem, and a cross-piece extending between said standards and formed outside of the same in a wide shallow tray which overhangs said mortar, said tray being provided centrally with a vertically-extended guide-bearing through which the stamp-stem passes.

6. In combination with a stamp-stem G' of the collar G² provided in its upper surface adjacent the stem with a groove G³ adapted to receive a mass of absorbent material and a screen attached to the collar to retain said absorbent material in place.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 12th day of June, A. D. 1897.

GEORGE WOOD.

Witnesses:

F. A. FRITH, Jr.,
J. M. WATTS.