

No. 697,802.

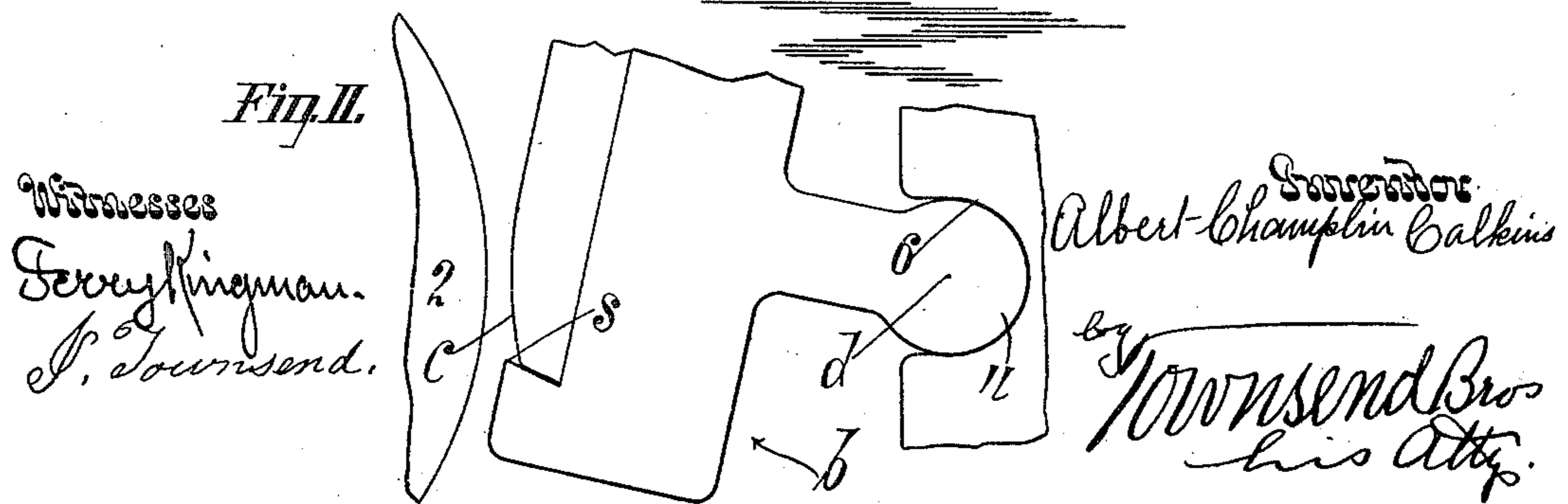
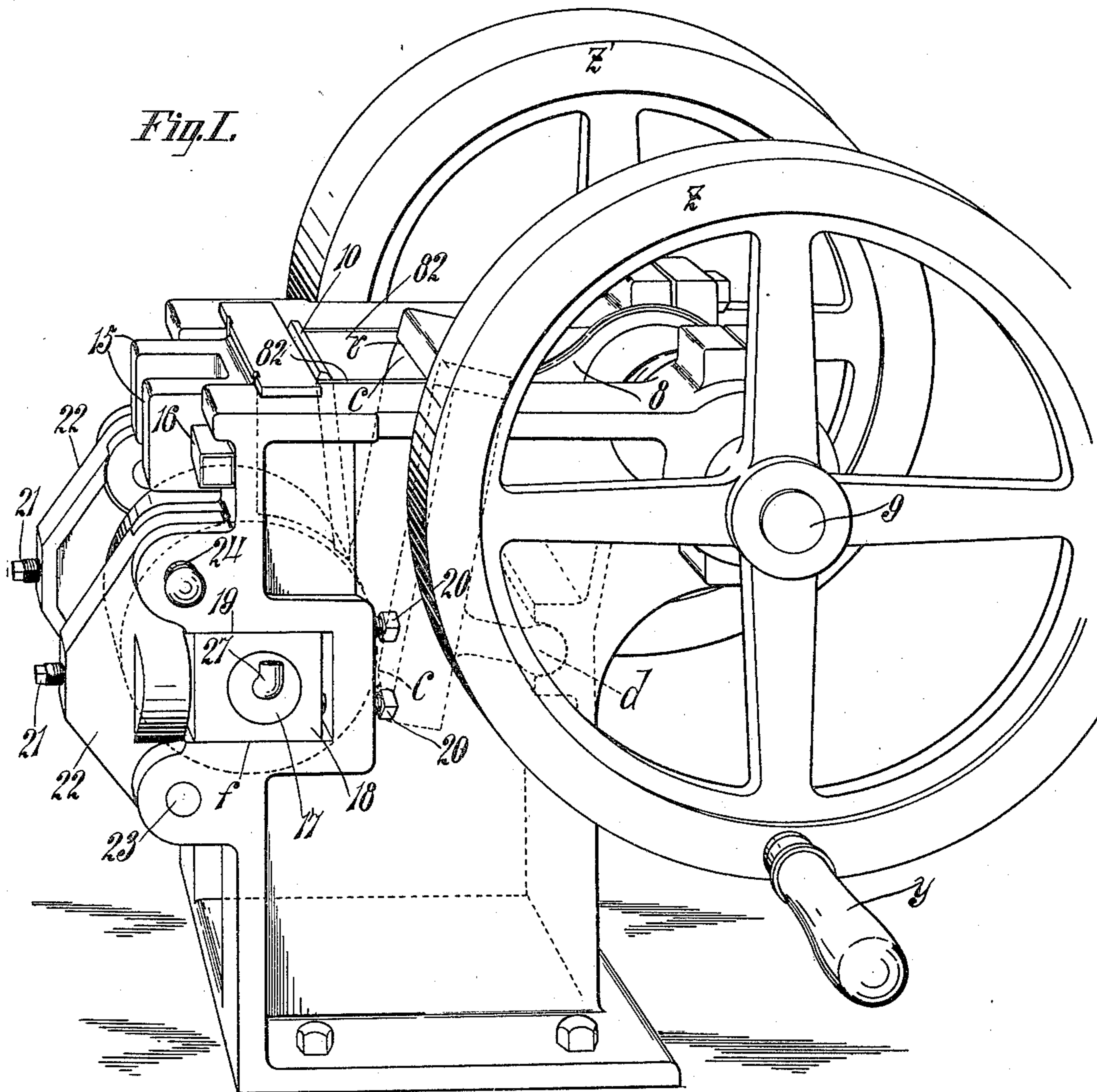
Patented Apr. 15, 1902.

A. C. CALKINS.
ORE CRUSHER.

(Application filed Mar. 12, 1900.)

(No Model.)

2 Sheets—Sheet 1.



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2 Sheets—Sheet 2.

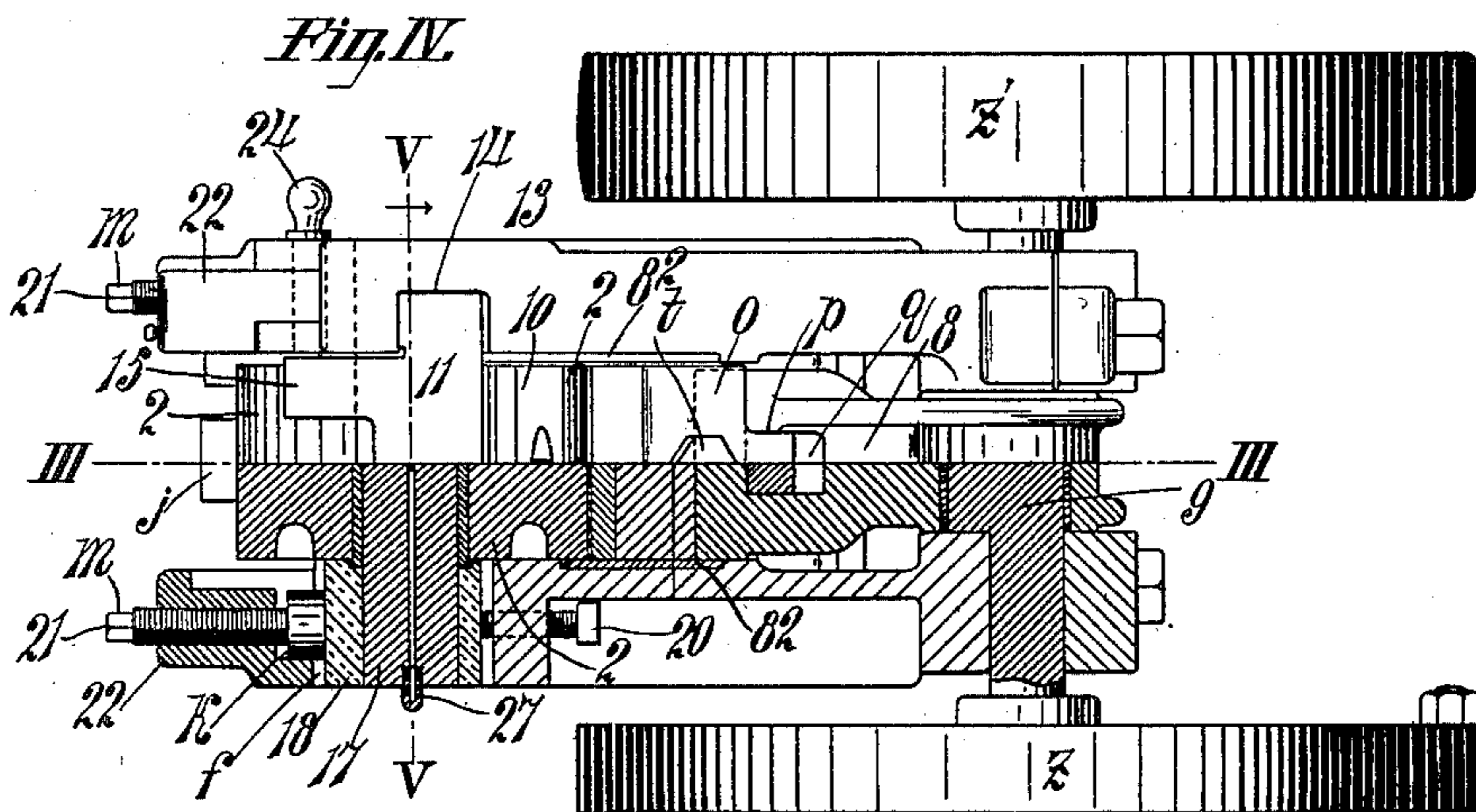
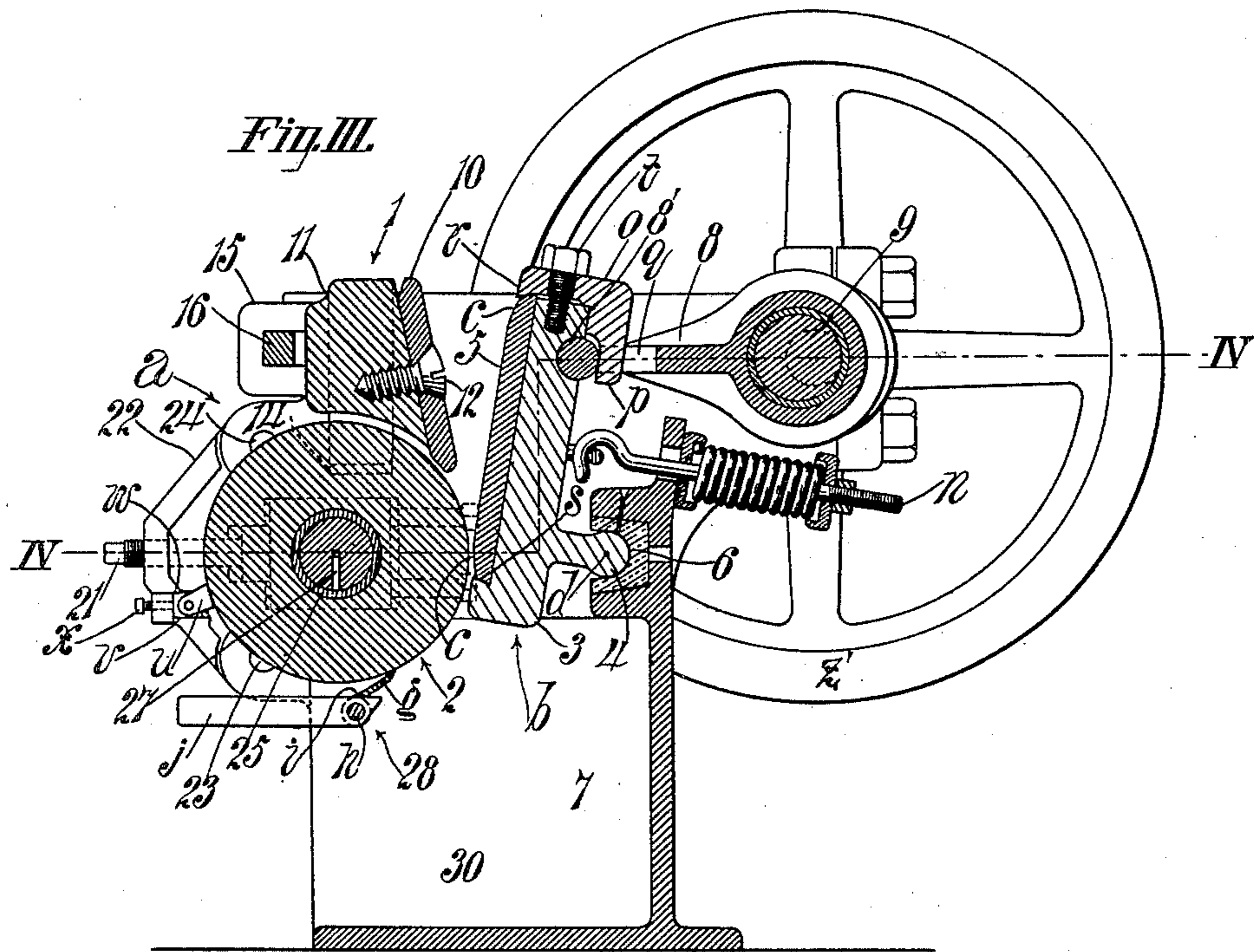
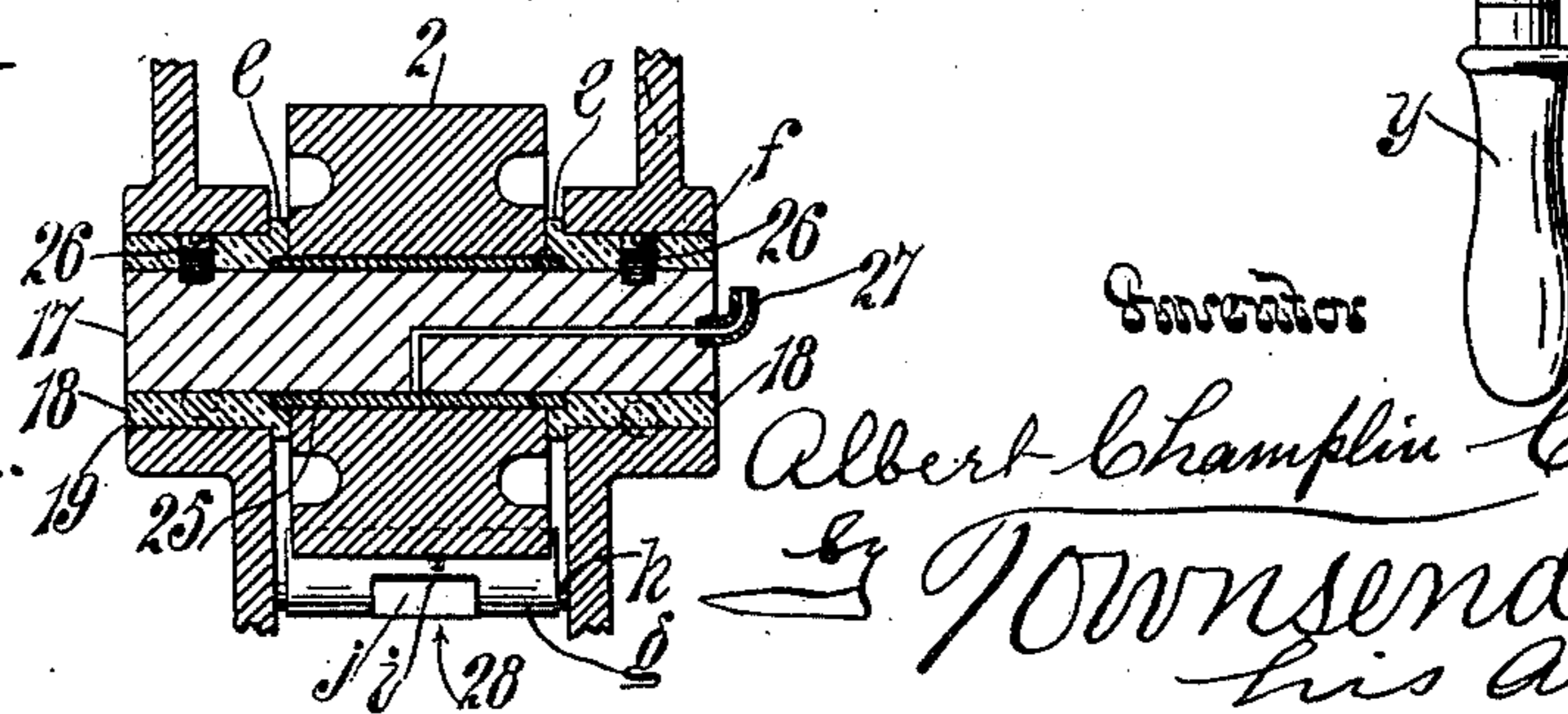


Fig. V



Witnesses
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UNITED STATES PATENT OFFICE.

ALBERT CHAMPLIN CALKINS, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO
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ORE-CRUSHER.

SPECIFICATION forming part of Letters Patent No. 697,802, dated April 15, 1902.

Application filed March 12, 1900. Serial No. 8,374. (No model.)

To all whom it may concern:

Be it known that I, ALBERT CHAMPLIN CALKINS, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Crusher for Ores and other Materials, of which the following is a specification.

An object of my invention is to provide a crusher adapted to crush coarse frangible material to produce a product of more uniform fineness than has heretofore been obtained by other types of crushers.

Another object of my invention is to increase the life of the machine with a minimum expenditure for replacing worn parts.

Another object is to provide for readily cleaning the interior of the machine of all material. Provision is made for readily cleaning the whole interior by removing the mechanism and a part of the frame at the front end of the machine. This is especially desirable in laboratory work of assayers and chemists, inasmuch as it obviates the liability of salting specimen samples by contamination with any former crushings which may have remained in the machine.

Another object is to afford more ready and accurate adjustment of the size of the discharge-opening of the machine, thus to regulate the maximum size of the product crushed.

The accompanying drawings illustrate my invention.

Figure I is a perspective view of the machine ready for operation. Fig. II is a fragmental diagram, in side elevation, of the rotary and vibratory sections. Fig. III is a vertical mid-section of the machine on line III III, Fig. IV. Fig. IV is a plan, partly in section, on line IV IV, Fig. III. Fig. V is an enlarged detail, in axial section, of the rotary member of the fixed jaw on line V V, Figs. III and IV.

α indicates the non-vibrating jaw, composed of an upper plain fixed section 1, where the heavy crushing takes place, and the lower rotary section 2, which is in the form of a heavy smooth-faced cylindrical roll and which rotates downwardly inwardly toward the vibratory jaw b , which is composed of a heavy body 3, provided with a heel extension

4 and with a reversible replaceable wearing-face 5. The heel portion 4 is seated in a socket 6, held by the main frame 7 of the machine. The body 3 of the vibratory jaw is operated by a connecting-rod 8, driven by the eccentric shaft 9 in the ordinary way. The upper end of the body of the vibratory jaw vibrates in an approximately horizontal arc.

10 indicates a reversible replaceable wearing face-plate, which forms the wearing-face of the fixed part 1 of the non-vibrating jaw α . The wearing-face at the lower edge of the replaceable face-plate 5 of the vibratory jaw is formed in the segment of the outer face of a cylinder, as at c , described from the axis d of rotation of the heel 4, and extends through the arc of vibration contiguous to the roll portion of the non-vibrating jaw, the said segment being of such an extent relative to the amplitude of vibration of the vibratory jaw that the nearest tangential points of the two jaws will always be equidistant. The wearing-face at the upper edge of the wearing face-plate 5 is curved to the same radius, so that the face-plate 5 is reversible.

The upper fixed section 1 of the non-vibrating jaw α is composed of a block 11, with the face-plate 10 secured thereto by a screw 12. The block 11 is provided with lateral extensions 13 to fit in gains 14 in the frame.

15 indicates eyes or staples projecting forward from the block 11 to receive a wedge 16, which wedges against the outer external face of the frame and holds the block firmly at any desired height in relation to the lower rotary section 2 of the non-vibrating jaw. By driving the wedge 16 into place after the block has been dropped into the frame the block is positively secured in place and prevented from slipping downward or becoming loose. The gains 14 extend down in the frame of the machine to a greater depth than the ordinary adjustment of the jaw will require, so that the jaw may be adjusted as to height and held in place by the wedge 16. The block can be readily removed by driving out the wedge, and the face-plate can be taken off and turned with upper edge downward, to thus restore this section of the jaw to perfect working condition after the lower edge has been worn away.

The rotary member or roll 2 is made adjustable toward and from the vibratory jaw *b*, thus to increase and decrease the discharge-opening to regulate the maximum size of the product. The roll is mounted to rotate on the fixed shaft 17, mounted in blocks 18, which are held in position in ways 19 by screws 20 21. The outer screws 21 are carried by two frame members 22, which are pivoted to the frame by pivots 23 at the lower end and are fastened to the frame at the upper end by loose pins 24. When in working position, the frame members 22 constitute rigid portions of the frame, and by adjusting the screws 20 and 21 the blocks 18 may be adjusted toward or from the vibratory jaw to decrease or increase the size of the discharge-opening. When the rotary member 2 is thus brought nearer to or farther from the vibratory jaw, the relations of the fixed and rotary portions of the non-vibrating jaw may be maintained by driving out the wedge 16 and raising or lowering the block 11, as the case may require, and then retightening the wedge to hold the block in the desired position. The roll 2 is preferably provided with a phosphor-bronze bushing 25, which is driven tightly into the roll 2, so as to rotate therewith on the shaft 17, which is fixed to the blocks 18 by means of a set-screw 26. The phosphor-bronze bushing 25 is somewhat longer than the roll 2 and is housed in the blocks 18, thus to prevent any dust from penetrating to the wearing-face of the shaft. The blocks 18 are provided with shoulders *e* to engage the inside of the slideways 19 of the frame in which the blocks are adjustably mounted to prevent thrust.

27 indicates an oil-inlet leading from one end of the shaft into the interior of the roll to lubricate between the roll and the shaft 17.

28 indicates a scraper, which is formed of a plate *g*, bent around and thereby pivoted on a shaft *h*, carried by the frame 7.

i indicates a slot in the plate, through which extends a counterweight rod or bar *j*, which holds the plate *g* in engagement with the roll 2.

In order to provide a larger supporting-face for the screws 21 to engage the blocks 18, which carry the shaft, the screws are each provided on their inner ends with an enlarged head *k*, and the screws are inserted outward from the inner portion of the frame members 22. The outer end of each of the screws 21 is provided with an angular reduced portion *m*, to be turned by a wrench.

In the drawings, *n* indicates a spring-actuated draw-rod for holding the vibratory jaw *b* firmly against the socket 6 and the connecting-rod 8 to take up any lost motion and to prevent any looseness of the parts. This is a common expedient and is not claimed as a part of my invention.

o indicates a clamp for serving the double purpose of a box for the connecting-rod and a retainer for the face-plate 5 of the vibra-

tory jaw. The clamp *o* is provided at its rear with a downwardly-projecting finger *p*, which passes through a slot *q* in the connecting-rod 8 to hold the end of the connecting-rod in the socket 8'. The front edge of the clamp *o* is provided with a downwardly-extending lip *r* to fit onto the upper edge of the wearing face-plate 5, and the body 3 of the vibratory jaw *b* is provided with a corresponding lip *s* at its lower extremity to seat the lower edge of the face-plate 5.

t indicates a lag-screw which passes through the clamp *o* and screws into the upper end of the body 3 of the vibratory jaw to hold the clamp in place.

u, Fig. III, indicates a friction-dog pivoted to a block *v*, which slides in a gain *w* in one of the frame members 22.

x indicates an adjusting-screw for holding the dog in proper relation to the roll-section 2 of the stationary jaw. This prevents the roll from rotating backward.

y indicates a crank, and *z z'* indicate the fly-wheels of the machine. The crank *y* is detachable, and the fly-wheel *z'* is arranged to be used as a pulley, so that the machine may be driven by power, if desired.

In practical operation motion is imparted to the vibratory jaw by rotating the fly-wheels *z z'*, and the material is fed between the jaws in the ordinary manner. The material on entering the machine is first cracked between the upper crushing-surfaces and falls down between the roll 2 and the lower portion of the vibratory jaw and is further crushed, and when reduced to a fineness sufficient to pass through the aperture between the segmental portion *c* of the vibratory jaw and the segment of the roll contiguous thereto the material will fall through into the chamber 30 of the frame. The maximum size of the product may be readily adjusted by adjusting the screws 20 and 21. The adjusting-screw *x* of the dog will also be turned to maintain proper relation of the dog when under new adjustment. Under the vibratory action the friction of the material being crushed will cause a rotation of the roll 2, thus permitting and forcing the discharge, but maintaining a uniform size of outlet-opening and constantly offering a new wearing-surface in opposition to the vibratory jaw. The edge of the scraper 28 is held by the weight of bar *j* against the rotating roll, thus removing from the surface of the roll any material which adheres thereto. When the desired charge has been crushed, the machine is readily opened for perfect cleaning by withdrawing the pins 24 and the wedge 16, so that the roll 2 and the block 11 may be entirely removed from the frame, thus allowing perfect access to all of the parts to which any of the material might adhere.

82 indicates steel wear-plates at the opposite faces of the open space, which extends from front to rear at the top of the frame and in which space the non-vibrating and vibratory jaws are mounted.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. A crusher comprising a vibratory jaw which vibrates in an approximately horizontal arc; and a non-vibrating jaw, the lower section of which non-vibrating jaw is formed of a roll; the portion of the vibratory jaw which is contiguous to the roll being formed in a segment of the outer face of a cylinder, substantially as set forth.

2. In a crusher, the combination of a non-vibrating jaw composed of a fixed section and a roll journaled in the frame to constitute the lower section of said jaw; and a vibratory jaw which vibrates in an approximately horizontal arc, provided with a face having the portion contiguous to the roll formed in the segment of the outer face of a cylinder described from the axis of vibration of the vibratory jaw.

3. A crusher comprising a vibratory jaw and a non-vibrating jaw, the lower section of which non-vibrating jaw is formed of a roll which is free to be propelled in the direction of the discharge-outlet by the crushed material; and means to prevent rotation in the opposite direction; the portion of the vibratory jaw which is contiguous to the roll being formed in a segment of the outer face of a cylinder.

4. In a crusher, the combination of the frame of the crusher provided with vertical gains and with horizontal ways; a non-vibrating jaw comprising a block with extensions to fit in said ways; means for fastening the block in said gains; blocks to move in said horizontal ways; a shaft journaled in said blocks; a roller mounted to turn on said shaft and to form the lower sections of the non-vibrating jaw; and means for holding the blocks in the adjusted position.

5. A crusher comprising a frame provided at the top with an open space extending from the front rearward to receive the vibratory and non-vibrating jaws and provided in its side walls with vertical gains and horizontal ways beneath said gains; a vibratory jaw mounted to vibrate in said space; means for vibrating the jaw; a block to form a section of the fixed jaw provided with lateral extensions to fit in said gains; means for fastening

the said block in the gains; blocks to slide in said ways; a shaft fastened at its ends to the blocks; a roll mounted to rotate on said shaft; and means for holding the blocks in said ways to bring the roll into position beneath the fixed section of the non-vibrating jaw to form the lower section of the non-vibrating jaw.

6. In a crusher, the combination of a frame provided with an open space extending from the front rearward to receive the vibratory and non-vibrating jaws and provided in its side walls with vertical gains and horizontal ways beneath said gains; a vibratory jaw mounted to vibrate in said space; means for vibrating the jaw; a block to form a section of the fixed jaw provided with lateral extensions to fit in said gains; means for fastening the said block in the gains; blocks to slide in said ways; a shaft fastened at its ends to the blocks; a roll mounted to rotate on said shaft; frame members extending in front of the horizontal ways; and means in said frame and frame members to adjust the blocks in said ways.

7. In a crusher, the combination of the frame; an eccentric shaft mounted in said frame; a vibratory jaw provided with a seat for a face-plate and having at its lower end a lip to retain the face-plate in said seat and being provided at the upper rear side with a socket for a connecting-rod; a wearing face-plate seated in said seat; a connecting-rod mounted on the eccentric of the shaft and socketing in the said socket and provided with an opening, rearward of its socket; and a clamp-piece for the top of the body of the vibratory jaw and provided at its front with a lip to extend in front of the face-plate and provided at the rear with a finger to extend through said opening in the connecting-rod to hold the end of the connecting-rod in the socket; and means for fastening the clamp member to the upper end of said body.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, at Los Angeles, California, this 5th day of March, 1900.

ALBERT CHAMPLIN CALKINS.

Witnesses:

JAMES R. TOWNSEND,
JULIA TOWNSEND.