

No. 751,672.

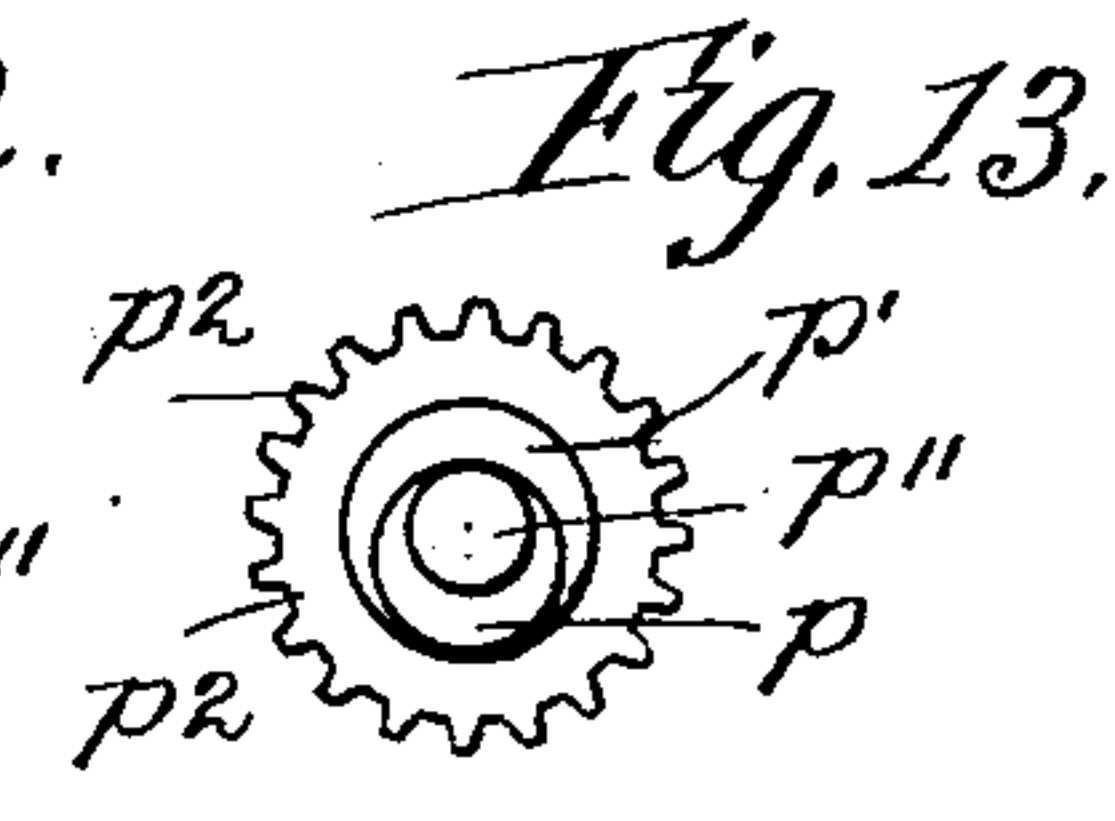
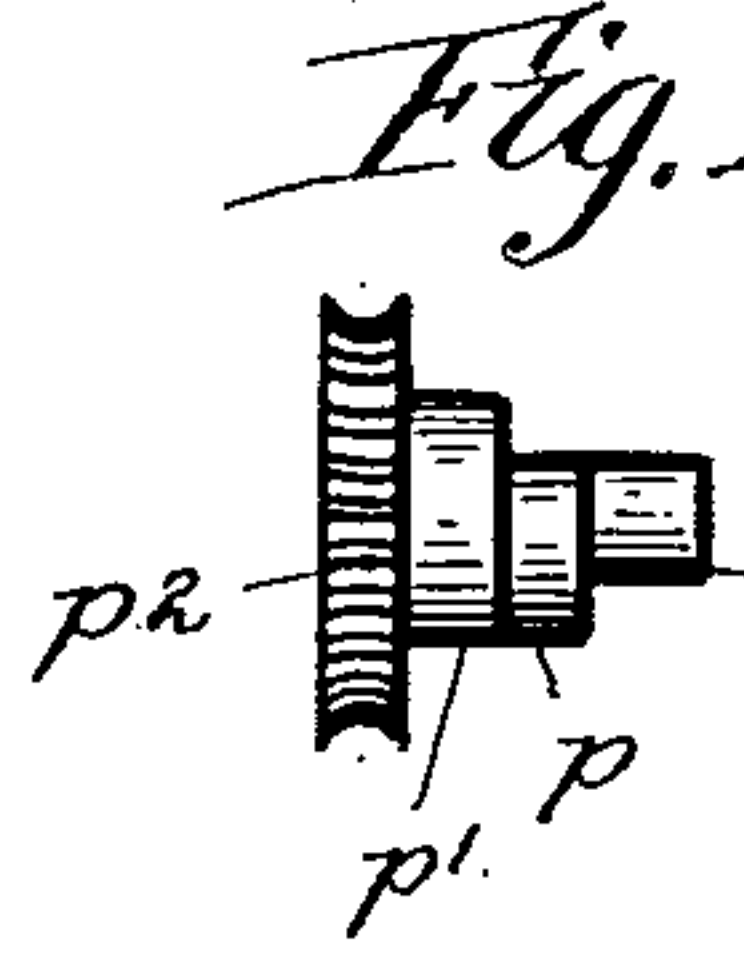
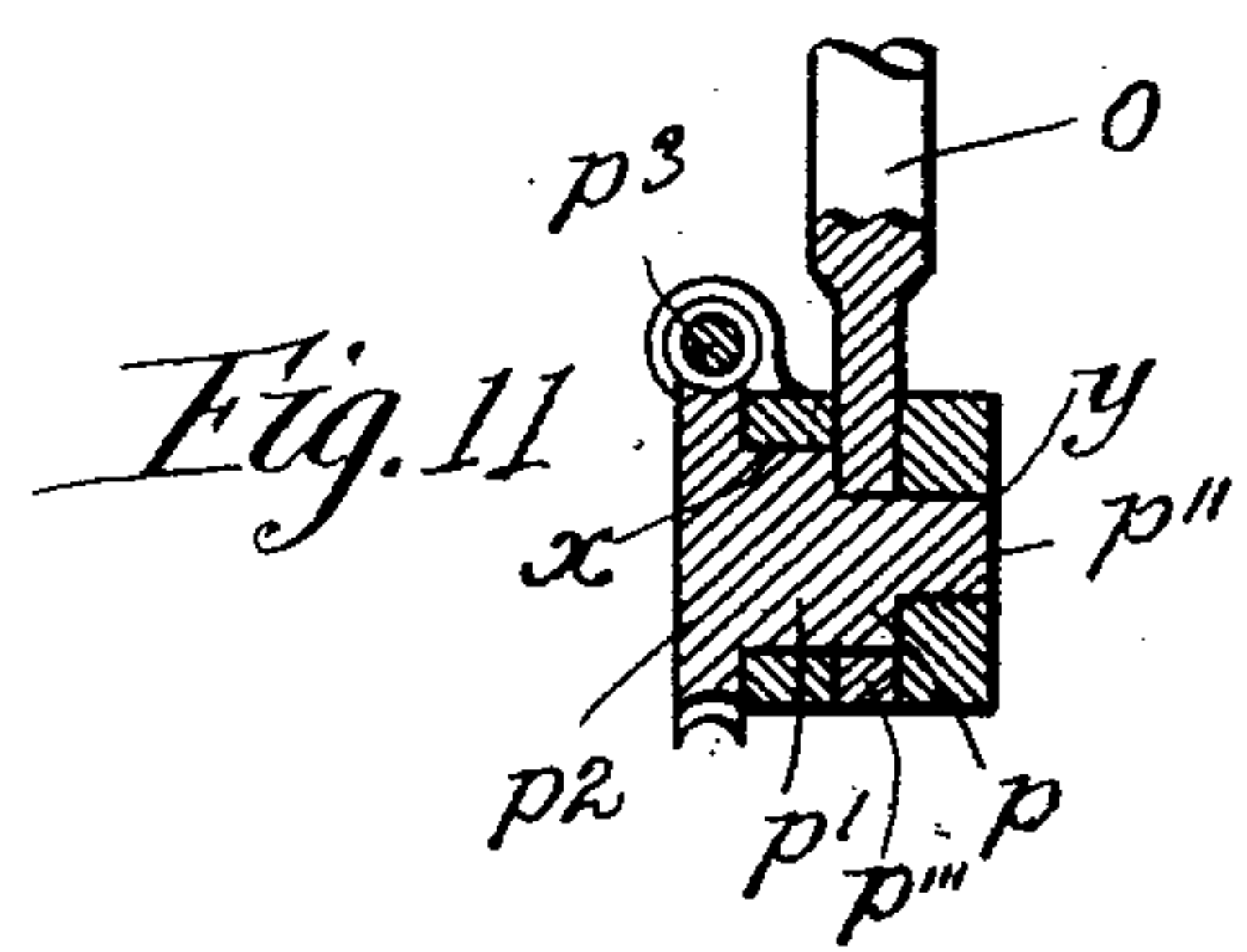
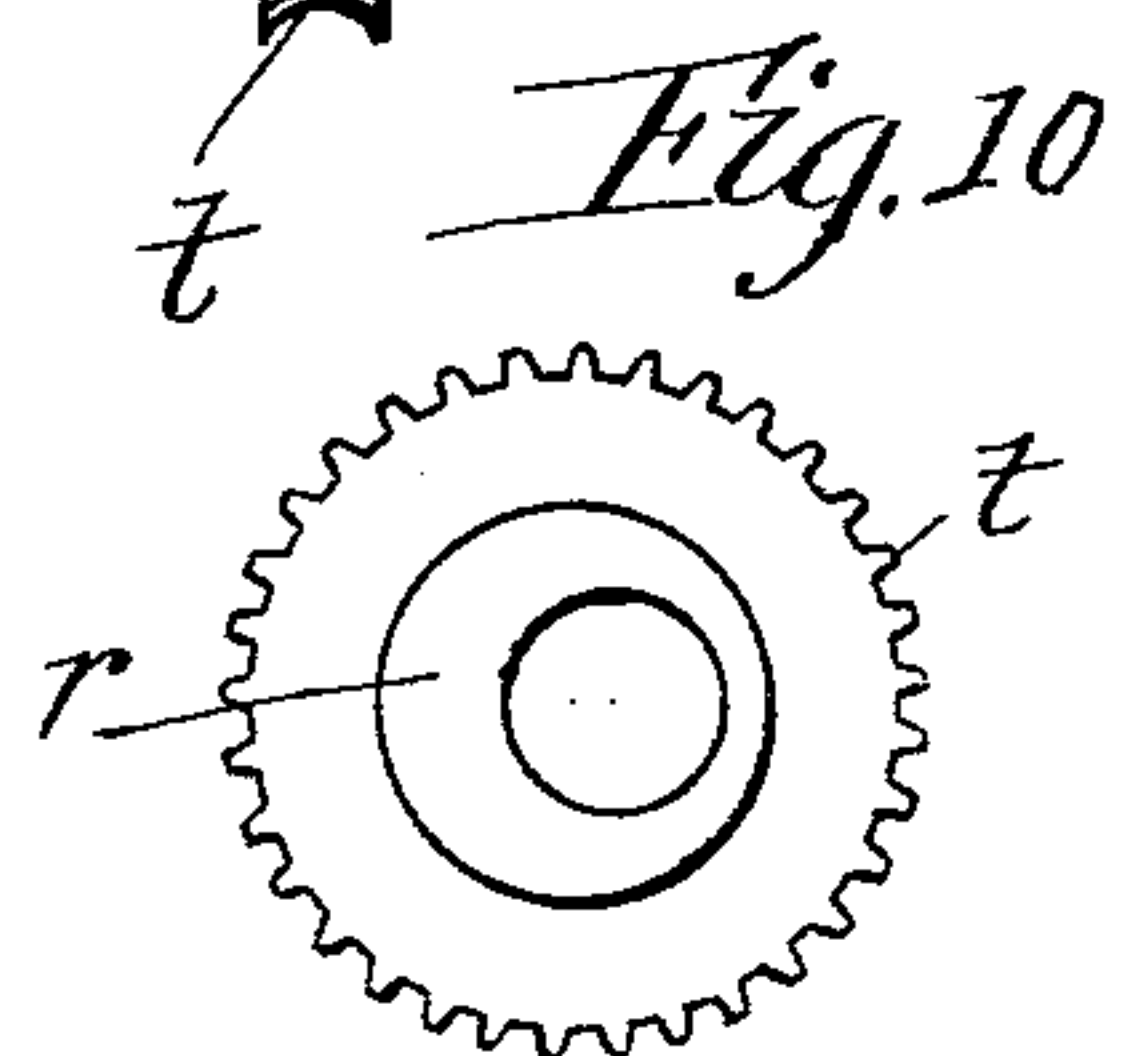
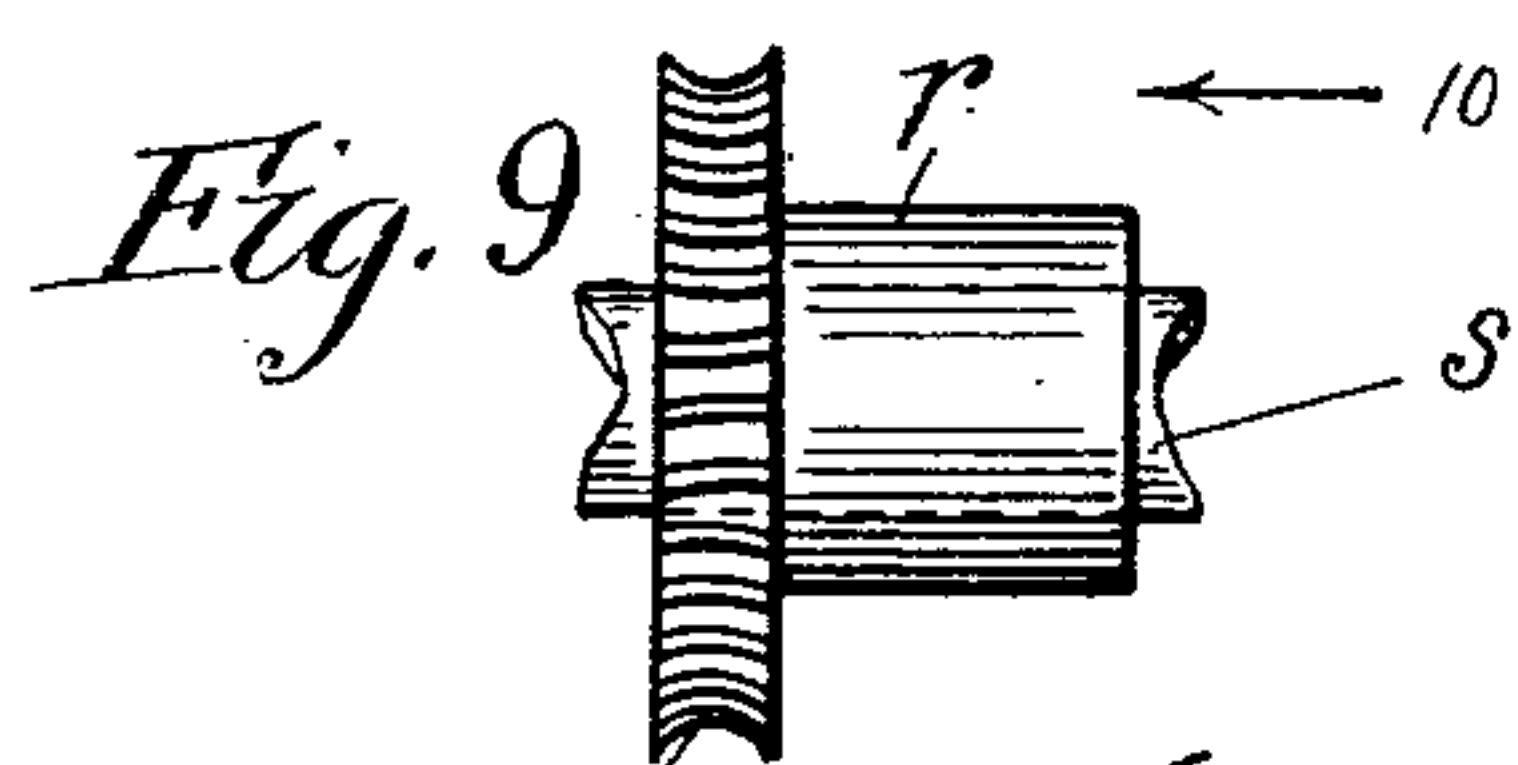
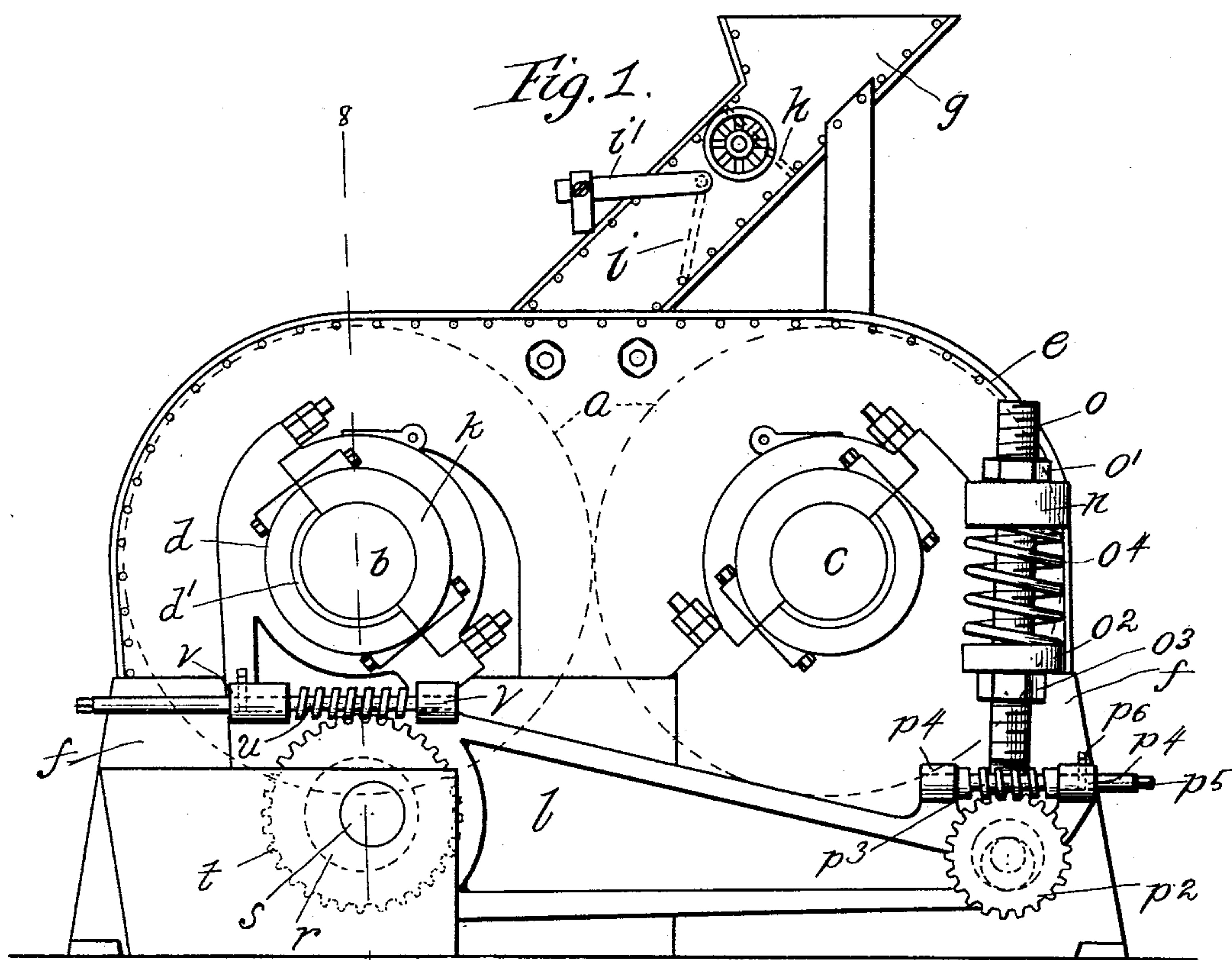
PATENTED FEB. 9, 1904.

J. H. McCORMICK.
CRUSHING MACHINE.

APPLICATION FILED JAN. 28, 1901.

NO MODEL.

4 SHEETS—SHEET 1.



Witnesses:
Milton M. Alexander.
May M. Label.

Inventor:
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by Charles A. Brown & Co. Attys.

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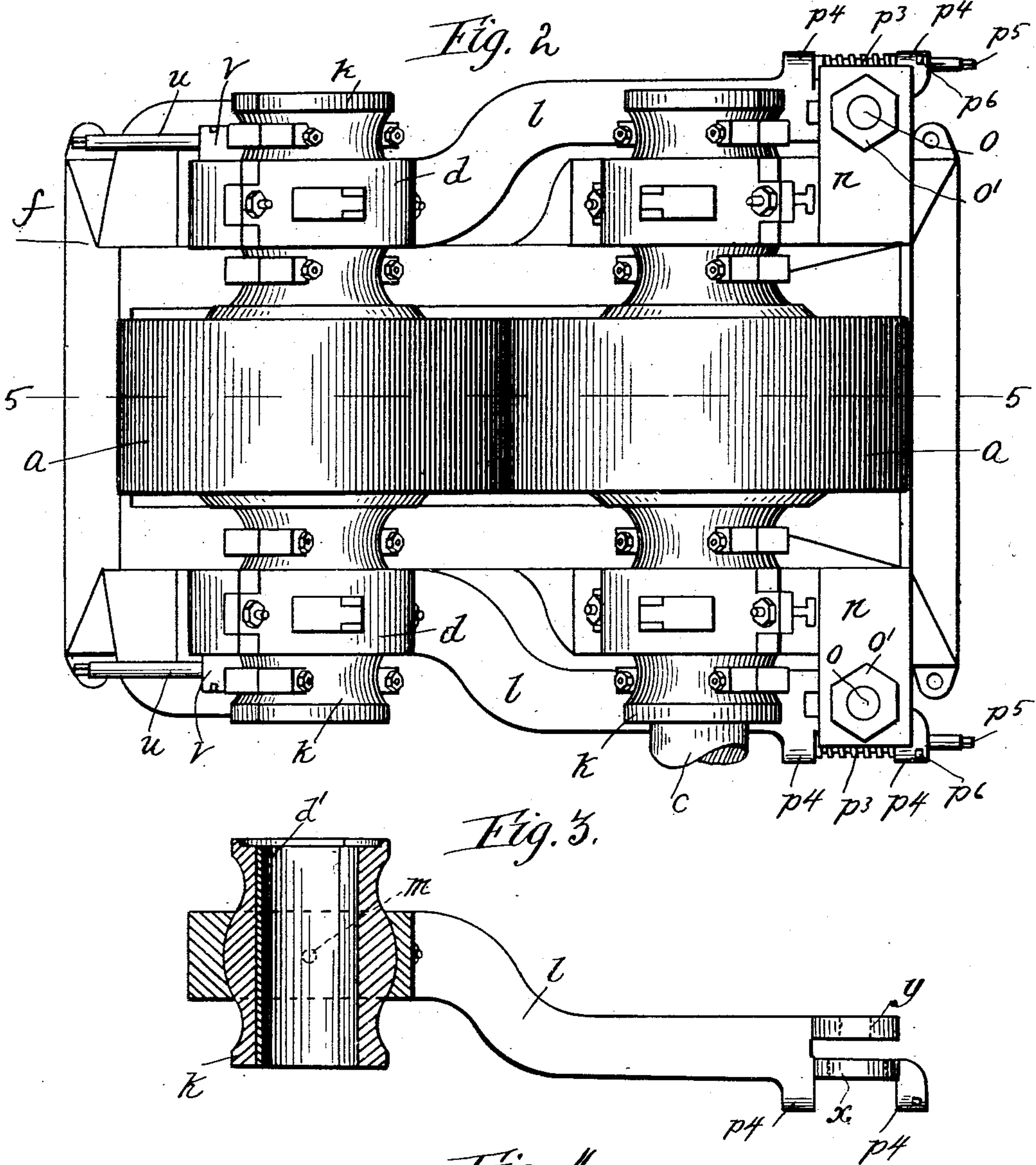
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4 SHEETS—SHEET 2.



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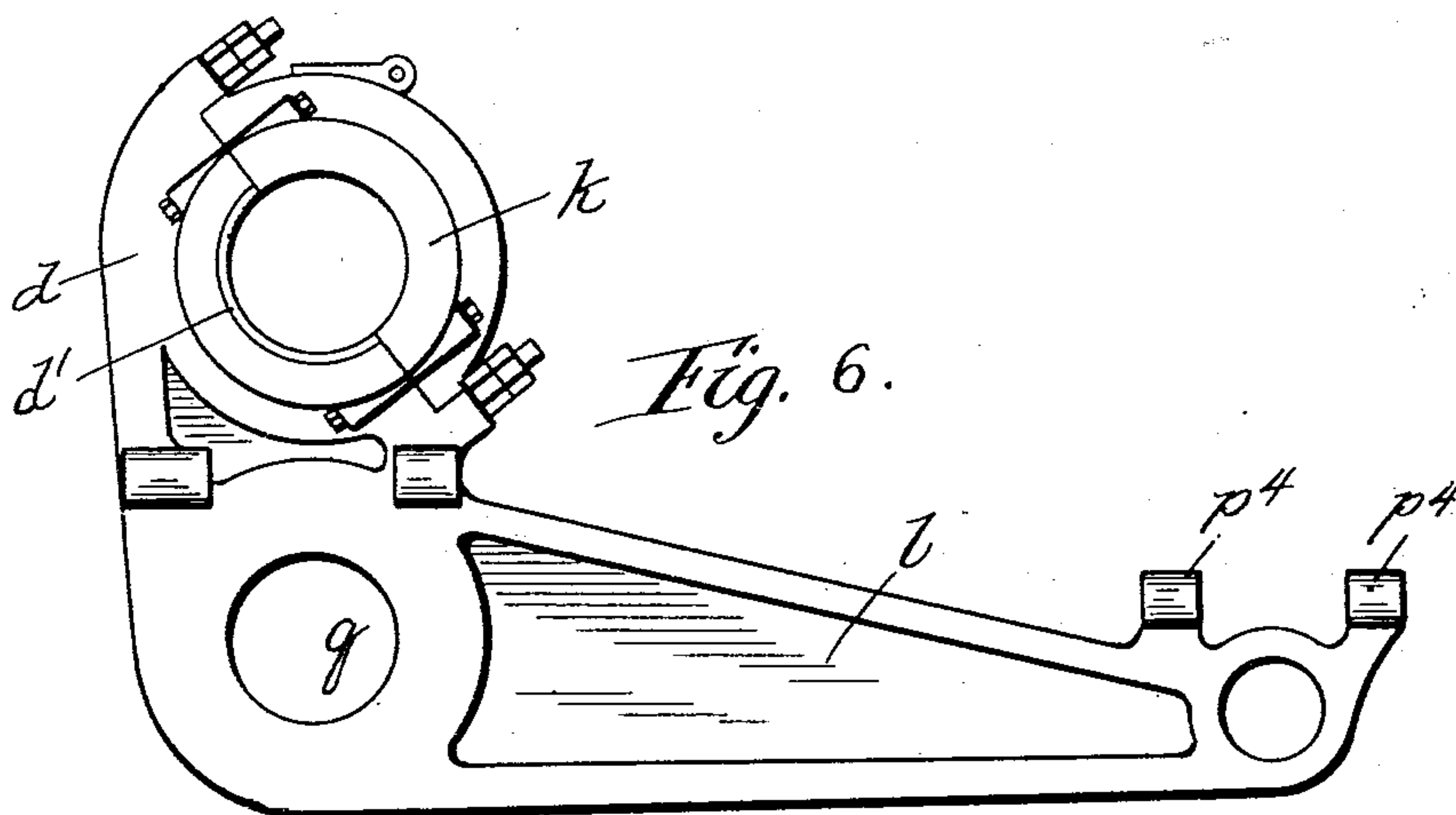
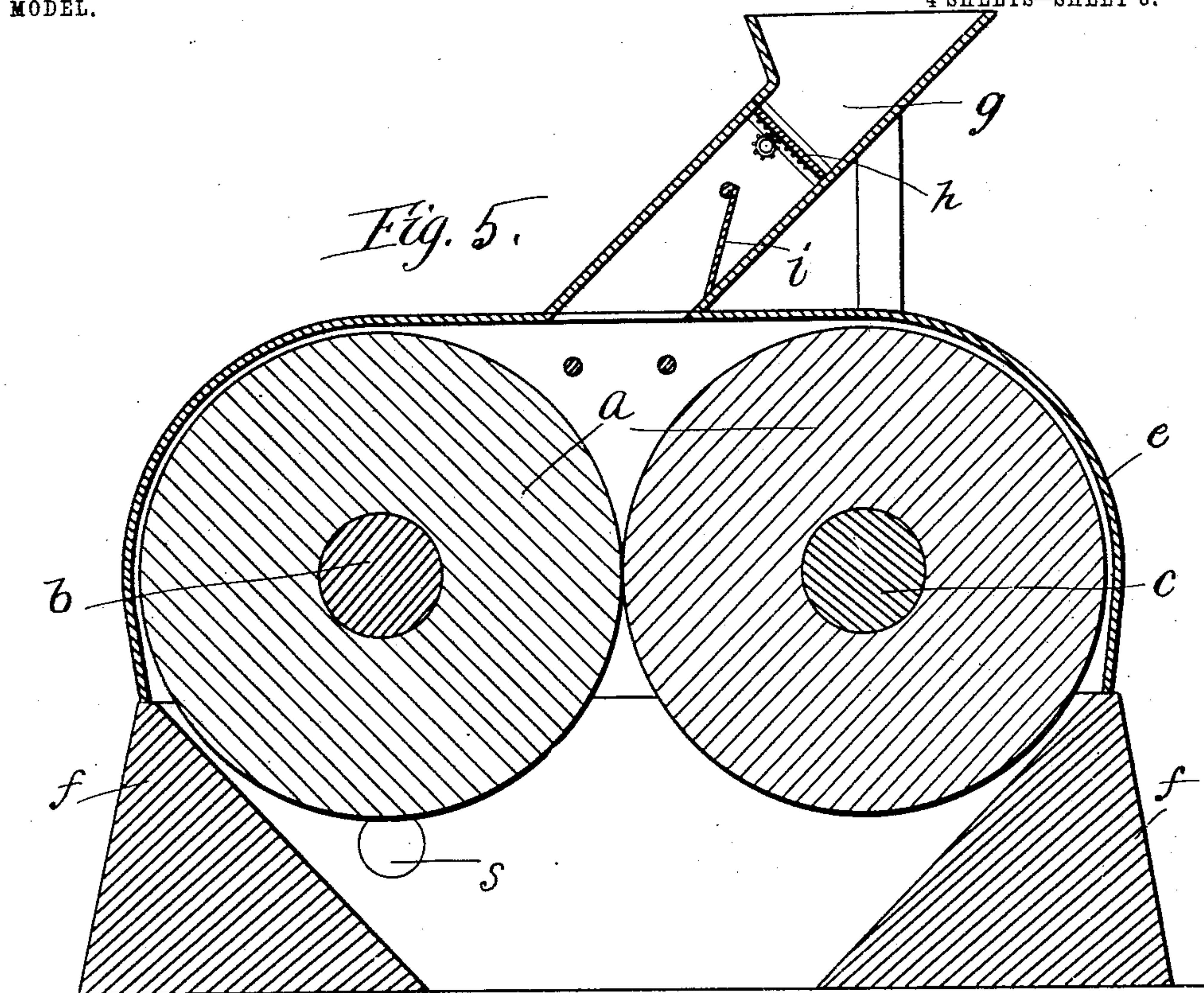
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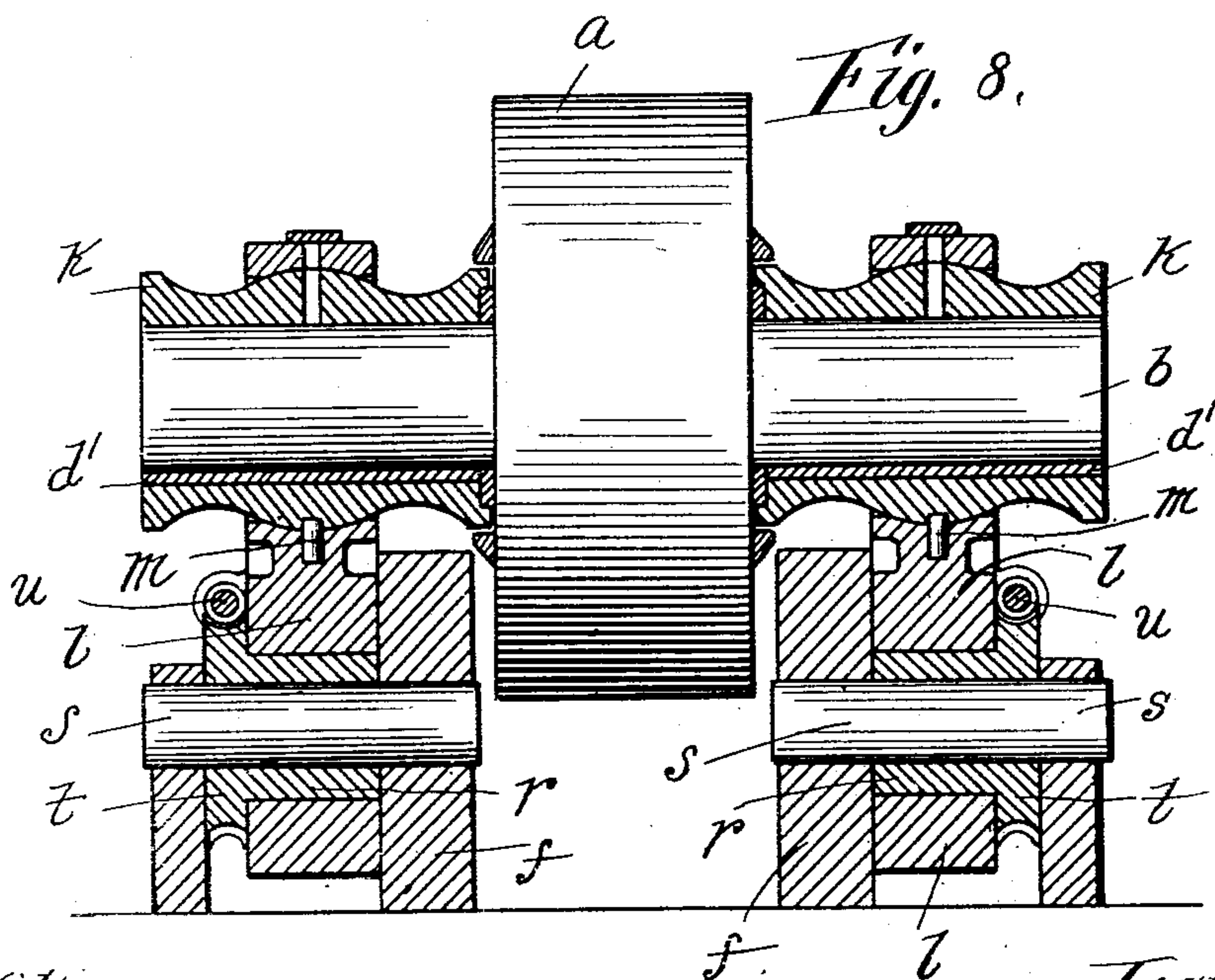
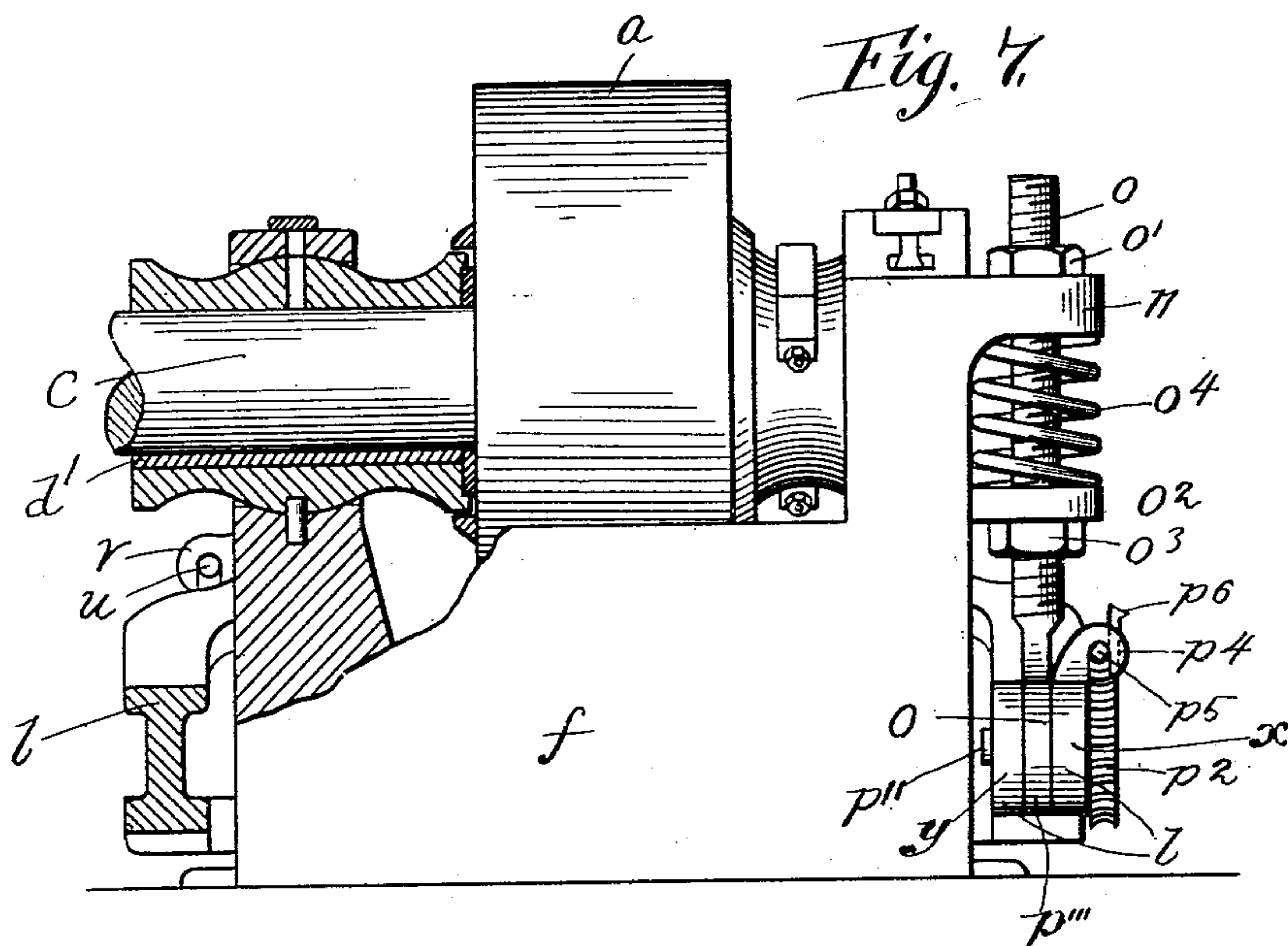
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UNITED STATES PATENT OFFICE.

JAMES HOMER McCORMICK, OF BEARTOWN, MONTANA.

CRUSHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 751,672, dated February 9, 1904.

Application filed January 28, 1901. Serial No. 45,061. (No model.)

To all whom it may concern:

Be it known that I, JAMES HOMER McCORMICK, a citizen of the United States, residing at Beartown, in the county of Granite and State of Montana, have invented a certain new and useful Improvement in Crushing-Machines, (Case No. 1,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to mechanism for adjusting the alinement and relative tensions of shafts and to the bearing-supports for shafts, the invention having particular utility in connection with crushing-machines used for crushing and pulverizing ores, although I do not wish to be limited to such machines in all embodiments of the different features of my invention.

My invention has for its further object the provision of improved means whereby the material may be uniformly distributed when fed to the pulverizing-rolls to equalize the feeding of the ore, so that irregular discharges of ore into the machine may be equalized before the ore reaches the rolls.

My invention as applied to crushing-machines comprises in its preferred embodiment a pair of crushing-rolls, between which adjustment is to be effected, and a swinging arm, one being preferably provided for each bearing of the shaft, the said swinging arm having its pivotal or swinging support removed from the shaft and having mechanism whereby it may be shifted with reference to its pivotal point, so that the alinement of the shaft may be adjusted. In the preferred embodiment of the invention the arm is in the form of a bell-crank lever normally fixed with relation to a sleeve provided at its elbow, this sleeve being mounted upon a shaft in suitable bearings, the exterior of the sleeve being eccentric with respect to the center of the shaft, so that when the sleeve is rotated the position of the arm with reference to its fulcrum is changed. One end of the bell-crank lever carries a shaft-bearing, while the other end is in engagement with adjusting means, whereby the said lever may be rotated about its ful-

crum to effect accurate adjustment of the pressure between the rolls and preferably to permit the rolls to separate upon the passage of an excessive charge between the same.

The means that I employ for evenly grading the charges of ore admitted to the machine consists in a weighted flight which will prevent the ore from passing to the hopper until the flight is subjected to the requisite pressure of ore, when the flight will permit the access of ore to the rolls.

I will explain my invention more fully by reference to the accompanying drawings, in which—

Figure 1 illustrates a side view of a crushing-machine constructed in accordance with my invention; Fig. 2, a plan view of the apparatus illustrated in Fig. 1 with the housing removed to clearly reveal details of construction; Fig. 3, a plan view of one of the bell-crank levers, with a bearing supported thereby; Fig. 4, an elevation of a two-part bearing adapted for support by the bell-crank lever; Fig. 5, a sectional view on line 5 5 of Fig. 2; Fig. 6, a side elevation of the bell-crank lever having a bearing in place; Fig. 7, a rear view of the machine, parts being broken away to reveal the features of construction; Fig. 8, a sectional view looking toward the front of the machine on line 8 8 of Fig. 1; Fig. 9, a side elevation of the sleeve having eccentric outer and inner peripheries adapted to form the mounting for the bell-crank lever, the shaft upon which the sleeve is mounted being indicated; Fig. 10, a view of the structure shown in Fig. 9 in the direction indicated by the arrow 10; Fig. 11, a detail showing the adjusting means in engagement with the free end of the bell-crank lever; Fig. 12, a side elevation of a pinion with its eccentric and concentric hubs entering into the construction illustrated in Fig. 11; Fig. 13, an end elevation of the construction illustrated in Fig. 12.

Like parts are indicated by similar characters of reference throughout the different figures.

The invention is shown as being applied to a crushing-machine having two crushing-rolls *a a*, mounted upon shafts *b* and *c*, power

being preferably applied to both shafts to effect the operation of the rolls. The shaft *c* and the roll carried thereby may be mounted in any suitable manner upon shaft-bearings, this shaft being preferably non-adjustable. The shaft *b* is mounted upon bearings *d*, both of which are preferably mounted in the manner hereinafter to be set forth. The rolls are inclosed by a casing *e*, that rests at its lower margin upon the base *f*, the casing being interposed between the bearings and the rolls. A hopper *g* is preferably employed for conveying the material to be crushed to the rolls, a suitable form of gate *h* being illustrated for shutting off the supply of ore when desired. A pivotally-supported flight *i* is mounted in the hopper and has a weighted arm *j* rigidly secured thereto, which serves to press the flight toward the lower oblique wall of the hopper. When the ore is fed into the hopper, a sufficient quantity of the ore by its weight will remove the flight *i* from its normal position, as indicated in Fig. 1, and permit the passage of ore beneath the flight to the rolls. This flight will not be moved from its normal position until the requisite quantity of ore is placed in the hopper, so that an even feeding of the ore to the rolls is secured.

The bearings *d* are preferably of the form indicated each bearing being provided with a lining *d'* of suitable antifriction metal. The lining preferably extends but half-way around the shaft and is provided within the lower half of the box *k*. The plumber-block is carried by the upper end of the bell-crank lever *l* and is preferably integrally formed therewith. The bearing *k* preferably has that portion that engages the bearing in the upper end of the bell-crank of spherical contour, constituting, with the plumber-block portion of the bell-crank lever, a ball-and-socket joint, a pin *m* being employed for preventing displacement of the bearing in its supporting-block. Both bearings of the shaft *b* are preferably supported similarly, and like characters of reference are employed to designate similar parts in these bearings.

Each arm *l* is pivoted at its elbow in a manner to be hereinafter more particularly set forth and is provided with a novel means for effecting its rotation to secure adjustment of the shaft *b*.

I prefer to provide a lug *n* upon the casing *e*, through which lug a threaded bolt *o* is freely adapted to pass, this bolt having connection at its lower end with the free end of the bell-crank lever. A nut *o'* is screwed upon the bolt *o* and serves to limit the downward vertical movement of the said bolt. A pocketed washer *o²* is rested upon a hexagonal nut *o³*, that is screwed upon the bolt *o*, a coil-spring *o⁴* being interposed between the stationary lug *n* and the pocketed washer *o²*, whereby the

said spring exerts a rotative tendency upon the bell-crank lever to yieldingly and normally maintain the crushing-roll mounted upon the bell-crank levers in its closed position toward the non-adjustable crushing-roll, the spring yielding when material of sufficient hardness is passed between the rolls so as to permit of a separation of the rolls to prevent breakage of the machine. I prefer to secure an approximate adjustment of the bell-crank lever through the agency of the nuts *o'* *o³*, but prefer to provide in addition to this adjusting means an intermediate adjusting device interposed between the free end of the bell-crank lever and the lower end of the bolt *o*. This intermediate adjusting means preferably comprises an eccentric portion *p*, disposed between the two shaft portions *p'* and *p''*. The free ends of the bell-crank levers are bifurcated, the limbs of the bifurcated ends forming bearings *x* and *y*, in which shaft portions *p'* and *p''* are respectively journaled. The end of bolt *o* is preferably formed into an eye *p'''* to engage the eccentric portion *p*, and shaft portion *p''* is of reduced diameter to allow passage thereover of said eye portion for engagement with the eccentric portion *p*. By a rotation of the shaft portions vertical movement of the lever-arms is accomplished, and I preferably provide a worm-wheel *p²*, that is concentric and integral with the shaft portions *p'* and *p''*, and a worm-shaft *p³* is adapted to mesh with the said worm-wheel, upon rotation of which the bell-crank arm is either raised or lowered. The worm-shaft *p³* is preferably disposed within lined bearings *p⁴* *p⁴*, carried by the free end of the bell-crank lever, the worm-shaft being provided with an extension *p⁵* of polygonal cross-section, adapted to be engaged by a crank to effect a rotation of the worm-shaft, and thereby the worm-wheel *p²*, with its hubs *p'* *p''*. The relative adjustment of the crushing-rolls by this means may readily be effected and modified while the machine is in operation. The bearings *p⁴* *p⁴* are preferably constructed, as illustrated most clearly in Fig. 7, which shows the bearings as provided with vertical slots open at their lower ends. By this construction the worm-shaft may be put in place, after which the worm-wheel *p²* may be mounted in position, so that the worm and the extensions thereof that are journaled in the bearings *p⁴* may be formed in one integral structure. Gibs *p⁶* serve to maintain the worm-shaft in adjustment.

In adjusting the machine the lobe of the eccentric *p* preferably extends downwardly, and the nut *o'* is unscrewed until the rolls may be placed, say, one-fourth of an inch apart, after which the desired tension may be secured by the nut *o³*. When the machine is started, the rolls may be brought close together and into contact, if desired. After the machine has

been brought to speed a further approach of the adjustable roll toward its companion may be effected by the rotation of the worm-wheel p^2 .

5 The elbow of the bell-crank is preferably provided with an aperture q , that receives the sleeve r , the bore of the sleeve being eccentric with reference to the sleeve's outer periphery. The sleeve is mounted upon its shaft s . By
10 rotating the sleeve the position of the bell-crank lever with reference to its fulcrum, the center of the shaft s , may be changed, so that the adjustment of the corresponding bearing may be effected in securing the desired aline-
15 ment of the shaft. The rotation of the sleeve r is preferably effected by means of a worm-wheel t , fixed with relation to the sleeve and which is actuated by the rotation of the worm-shaft u , which is secured in place in bearings
20 v v , carried by the bell-crank in a manner similar to that in which the worm-shaft p^3 is secured. The worm-wheels after adjustment are maintained in fixed relation to the bell-crank lever by the worm-shafts. When the
25 roll becomes worn, the lobes of the eccentrics r may be turned toward the rear, or if the rolls are running out of line, so that one roll will crowd the bearing on one side in an end-wise direction, causing that bearing to heat,
30 this crowding action may be overcome by raising the side toward which it is crowding a little higher than the other side by means of the worm-shaft v .

While I have herein shown and particularly

described the preferred embodiment of my 35 invention, I do not wish to be limited to the precise disclosure herein set forth; but,

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

In a crushing-machine, the combination 40 with the crushing-rolls thereof, of a pair of bell-crank levers on opposite sides of the machine in similar positions, tiltable bearings on corresponding arms of said bell-crank levers adapted to carry one of said rolls, a shaft for 45 each of said bell-cranks journaled in the framework of the machine, an eccentric on each of said shafts rotatably mounted thereon, said bell-cranks engaging said eccentrics at their elbows, means for revolving said eccentrics 50 independently of each other whereby either end of said roll may be given combined vertical and horizontal adjustment, eccentrics engaged by the other arms of said bell-cranks at their ends, and means for rotating said eccen- 55 trics independently of each other whereby said arms of the bell-cranks engaged thereby may be given vertical adjustment independently of each other whereby either end of said roll may be given horizontal adjustment with 60 respect to a stationary roll, substantially as described.

In witness whereof I hereunto subscribe my name this 17th day of December, A. D. 1900.

JAMES HOMER McCORMICK.

Witnesses:

A. MILLER BELFIELD,

HARVEY L. HANSON.