

No. 702,889.

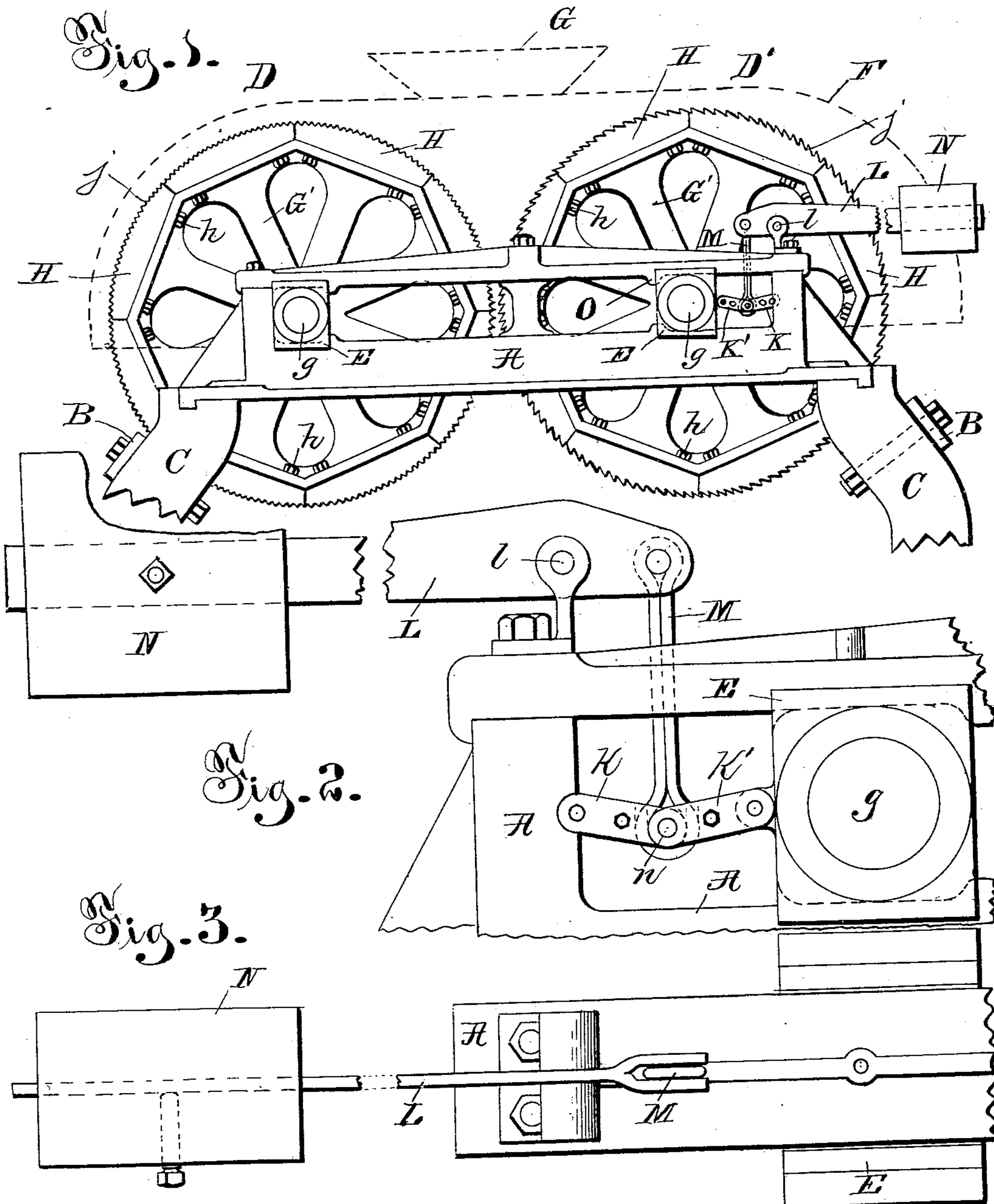
Patented June 17, 1902.

A. W. F. STECKEL.
COAL CRUSHER.

(Application filed Apr. 6, 1898.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses
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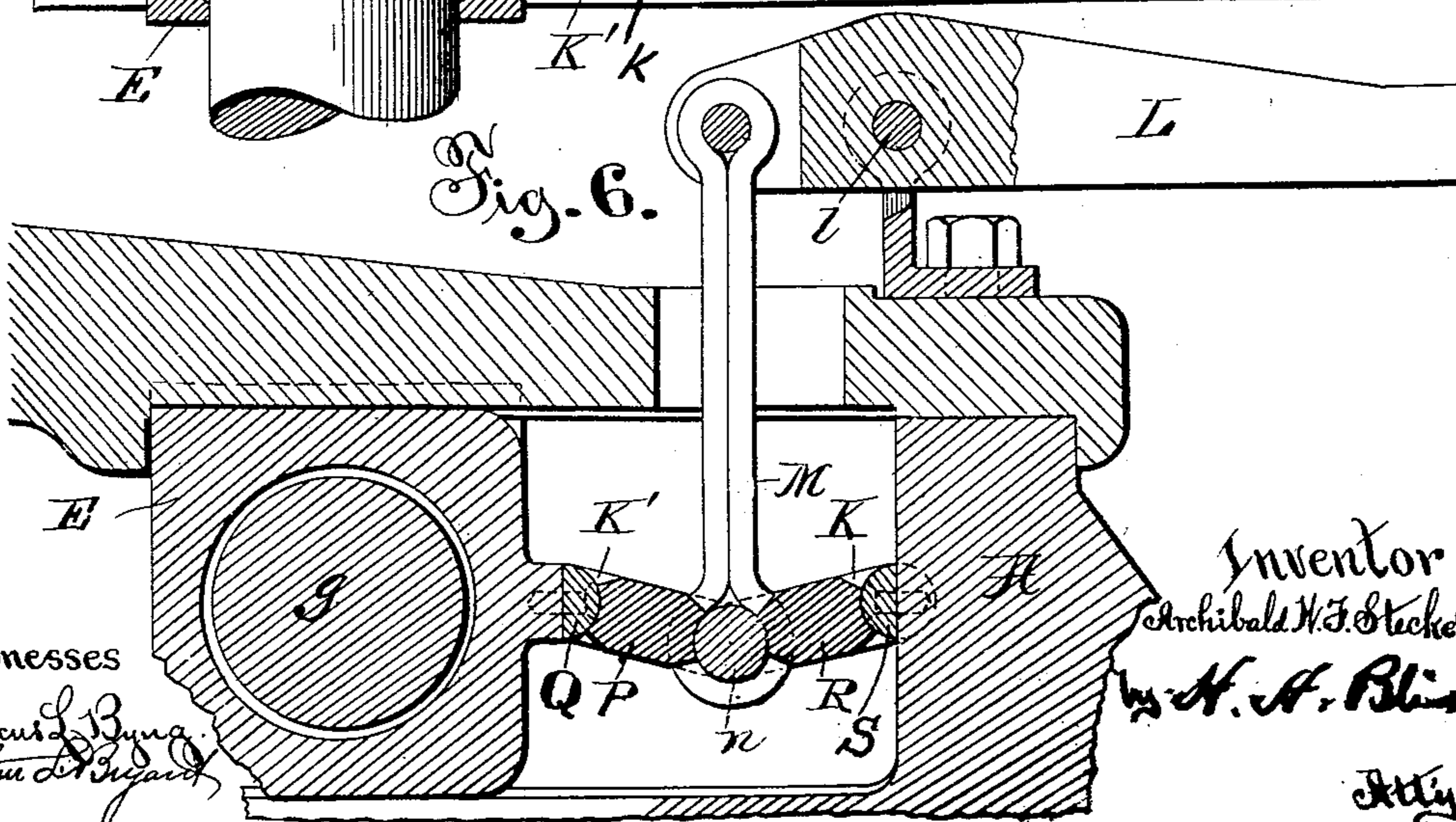
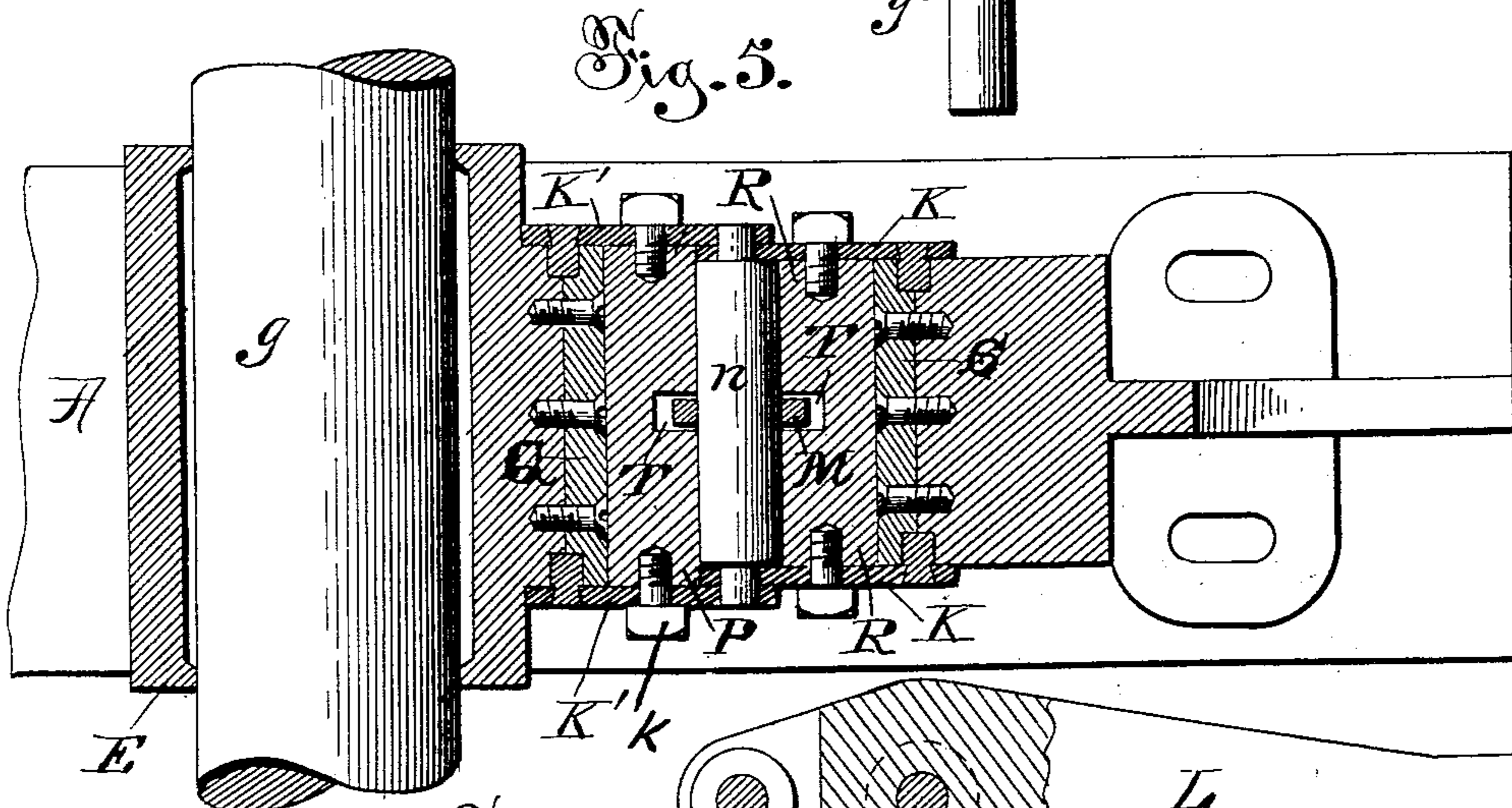
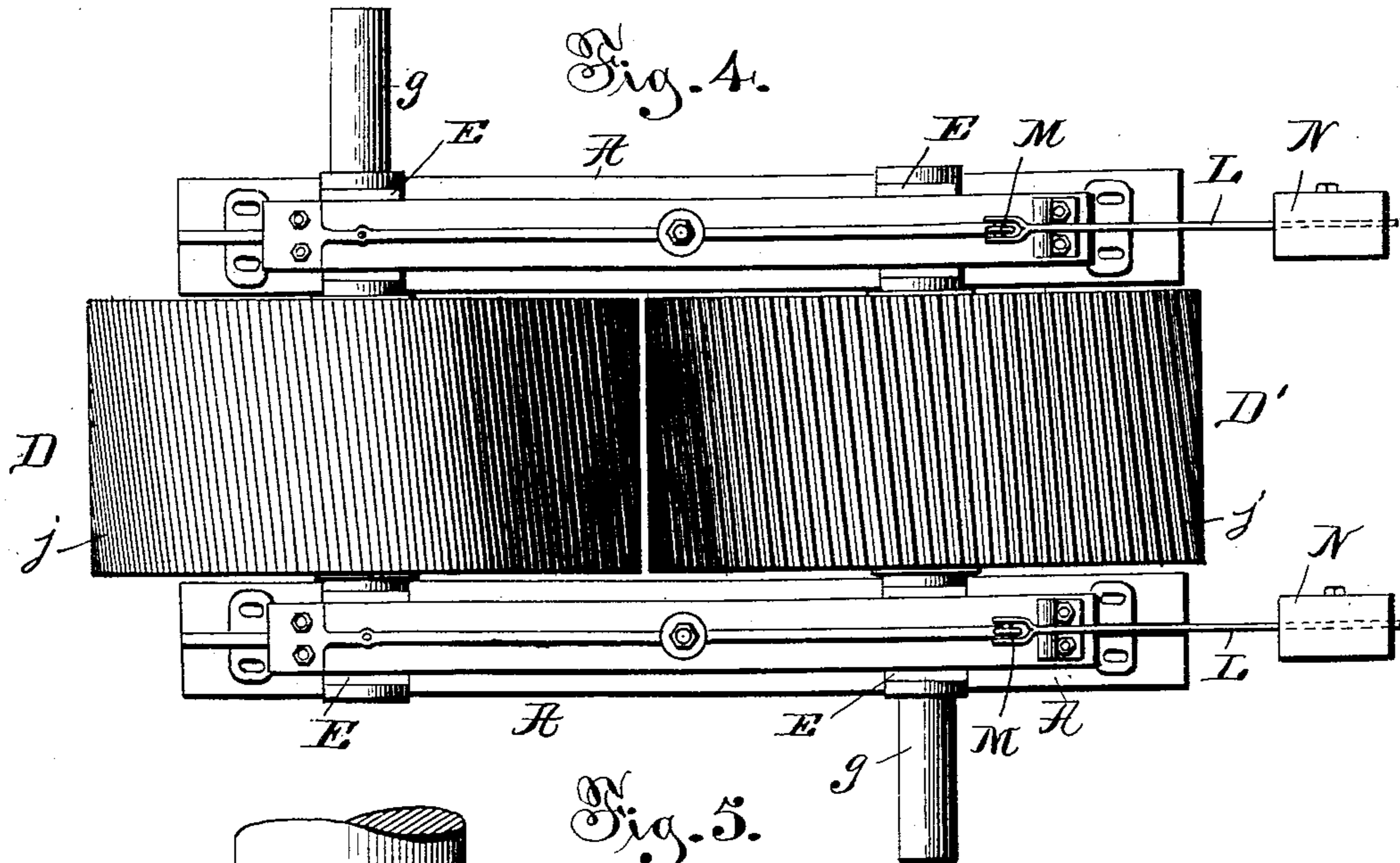
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UNITED STATES PATENT OFFICE.

ARCHIBALD W. F. STECKEL, OF COLUMBUS, OHIO, ASSIGNOR TO JOSEPH A. JEFFREY, OF COLUMBUS, OHIO.

COAL-CRUSHER.

SPECIFICATION forming part of Letters Patent No. 702,889, dated June 17, 1902.

Application filed April 6, 1898. Serial No. 676,673. (No model.)

To all whom it may concern:

Be it known that I, ARCHIBALD W. F. STECKEL, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Coal-Crushers; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

Figure 1 is a side elevation of a crushing mechanism embodying my improvements. Fig. 2 is a side elevation of some of the parts on a larger scale. Fig. 3 is a top plan view of the parts in Fig. 2. Fig. 4 is a plan view of the entire crusher. Figs. 5 and 6 are respectively a horizontal and vertical section of the roll-adjusting devices.

In the drawings I have shown a framework for supporting the operative parts, having the side bed-bars A A, the end bars B B, and downwardly-extending supports C. The crushing-rolls D D' are supported upon this bed by means of adjustable bearing-boxes E E, in which are mounted the journal portions of their shafts. These boxes are fitted in a guideway, a slot, or suitable apertures in the bars A of the frame. The rolls may be inclosed in a chamber or casing, as shown at F, provided at the top with a hopper G, through which the coal or other material is fed to the space between the rolls. Each roll is built up of a series of two or more spiders G' G', the peripheries of which are polygonal, these spiders being suitably arranged on and rigidly secured to a shaft g, which, as above stated, has its ends mounted in the boxes E, and by means of which rotary motion is imparted to the rolls. The active portions of each roll are formed of a series of sections H H, the outer face of each of which is a segment of a cylinder concentric with the axis of the shaft and the inner face of which is flat and adapted to be fitted to one of the peripheral edges or sides of each spider, it being permanently fastened thereto by bolts at h. When the proper number of the sections H are put in place, they make a complete cy-

lindrical surface, although it is not smooth, but is ribbed and grooved for the purpose of efficiently engaging with and operating upon the material which passes between them. The ribs j and grooves are not parallel to the axis of the roll, but are inclined thereto, each being the section of a spiral, and those upon the roll D running, respectively, in the same direction as those of the roll D'. The roll D is held stationary in the frame, though adjustable by means of the sliding box or boxes, as above described, the latter being preferably fastened in place by bolts after adjustment; but the roll D' is so arranged and mounted that it can be moved back and forth when in operation. Such movements become necessary when certain materials are being treated. For instance, it is well known that bituminous coal as ordinarily obtained from the mine is not in the condition desired for some purposes—as, for example, in producing some sorts of coke—and it becomes requisite to crush and more or less pulverize it. It is also well-known that this material as found in its natural state contains foreign and undesirable materials—such as sulfur in flakes, laminae, or balls—and that this substance is exceedingly refractory. When the coal containing such particles or pieces is passed between the crushing-rolls, the latter are apt to be broken or marred, and it is necessary that provision be made to permit said hard materials to pass freely and easily between the rolls. Heretofore several devices have been employed for this purpose. Generally use has been made of a frangible abutment—that is to say, one capable of breakage when the stress or pressure passes beyond a certain point; but trouble and inconvenience have been incident to mechanisms having parts of this character. I accomplish this purpose in a superior manner by means of the devices which I have shown and being as follows: Behind each of the bearing boxes or blocks E of the roll D', I place a yielding abutment or holder formed of two toggle-joint links or bars K K'. The link K' is pivoted to or bears against the journal block or box E, and that at K is pivoted to or bears against a suitable part of the bed-frame, and with these I combine the means having a tendency to normally keep the toggle-joint distended. As

shown, the latter consists of a lever L, a link M, and a weight N. The link M is connected to the pivot *n*, which joins the links K and K', and extends upward therefrom to the lever L, which in its turn is pivoted at *l* to the bed-frame or to a suitable standard. The weight N is adjustable along the lever and can be put at such place as to exert the desired amount of retaining force upon the links K and K'. As it is desirable to have the ends of the roll more or less independent of each other, I prefer to apply a separate retaining device at each end.

The operation of these devices will be readily understood. As the coal is passing between the rolls, the latter being actuated by any usual or preferred means—for instance, by suitable power mechanism connected with the shaft *g* of the roll D—it is acted thereon, being crushed, broken, and reduced to the desired size of particles; but should any foreign hard particles—such as stones, sulfur balls, and the like—attempt to pass through they will resist the breaking action and will cause the roll D' to be thrust backward. This backward thrust causes one or both of the toggle-joints to yield sufficiently to let the foreign body pass, thus avoiding injury to the mechanism. Immediately after it passes the weighted lever forces the toggle-links and the roll back to their normal position. At O there are stops which prevent the roll D' from being advanced toward the roll D beyond a predetermined line.

As shown in Figs. 5 and 6, abutment-pieces P are preferably secured to the links K', as by screws *k*, and extend from the pivot-roller *n* to the stationary abutment Q, secured to the journal block or box E, a corresponding spacing-piece R being arranged between said roller *n* and the abutment S on the bed-frame, the ends of this piece R being secured to the links K, as by screws *k'*. Suitable slots T are formed in the blocks P R for the passage of the link M. By employing rocking abutment-pieces like those at P and R, I am enabled to transmit a powerful pressure from the roll to the frame without depending upon the pintles or hinged devices to sustain this pressure. The said hinges or pintles may be small and serve merely to hold the several parts together, being relieved of thrust, as aforesaid, by the rocking abutments, and this part of the mechanism can be arranged compactly in small compass.

The toggle parts are peculiar in that the wearing-surfaces are provided by elongated hard-metal bars or plates, which distribute the strains over extended lines and enable the use of a pivot or hinge piece *n*, which can be made of large diameter, as shown, and directly transmit the thrust from one toggle-piece to the other.

With respect to the holding of the movable roll to its working position I am aware of the fact that the toggle mechanism has been heretofore used or proposed; but I believe myself

to be the first to have combined with a movable crushing-roll a toggle-like abutment or holding device of the character of that herein, together with a lever and link so arranged and related to the toggle that a powerful force shall always be instantly ready to move the roll forward and at the same time the roll be capable of quickly yielding backward, for the weight *n* being relatively light, because of the multiplying action of the lever and the frame itself furnishing through the toggle a great part of the roll-holding force, the latter component is lost almost instantly upon the first receding impulse of the roll. As soon as the obstruction has passed the multiplied force of the weight becomes efficient to instantly slide the roll back to its working position and to bring the toggles to their position of approximate lock.

What I claim is—

1. In a crushing mechanism, the combination of a frame, a relatively stationary roll, an opposing bodily-movable roll, means for rotating the rolls, a toggle mechanism acting on the movable roll to force the latter toward the stationary roll, said toggle mechanism comprising elongated abutment-pieces arranged parallel with the movable roll and having their sides which are parallel with said roll connected pivotally with each other, a lever connected with said abutment-pieces and a weight connected with said lever for moving the said sides of the abutment-pieces vertically, substantially as set forth.

2. In a crushing mechanism, the combination of a frame, a relatively stationary roll, an opposing bodily-movable roll, means for rotating the rolls, a toggle mechanism acting on the movable roll to force the latter toward the stationary roll, said toggle mechanism comprising abutment-pieces inclined downwardly toward each other and connected pivotally, a link connected with said abutment-pieces and extending upward therefrom, a lever connected with said link, and a weight acting on the lever for moving the connected ends of said abutment-pieces vertically, substantially as set forth.

3. In a crushing mechanism, the combination of the frame, the crushing-roll thereon, the opposing crushing-roll mounted in a yielding bearing, the links, K, K', pivoted respectively to the frame, and to the yielding roll, and pivotally connected with each other, the abutment-pieces, P and R, secured to the said links and respectively rocking against surfaces carried by the roll and the frame respectively, said links and abutment-pieces forming a toggle, the weighted lever, L, and the link connecting said lever to the toggle, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ARCHIBALD W. F. STECKEL.

Witnesses:

WM. E. RICH,

A. RUPPERSBERG.