

No. 675,369.

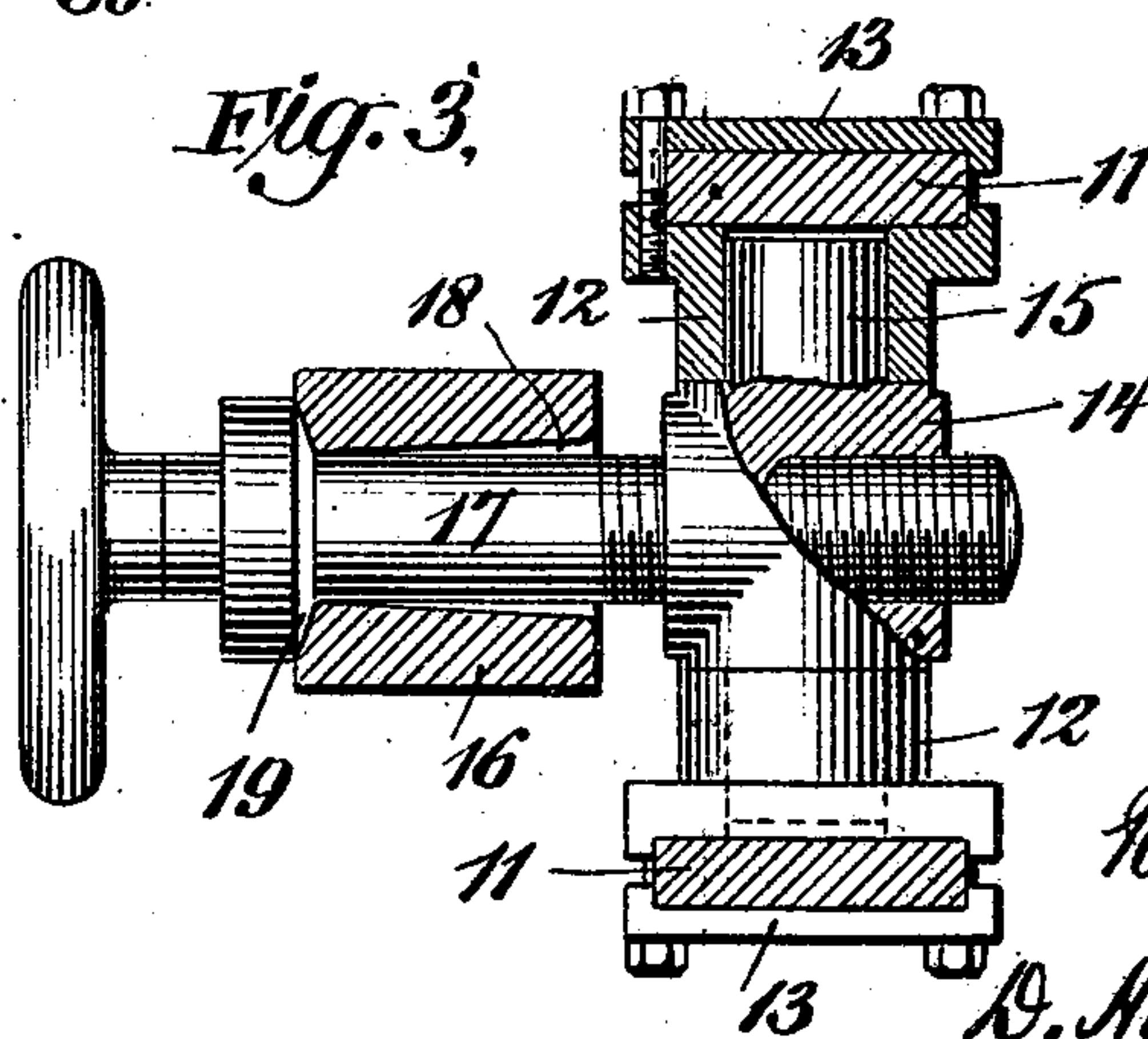
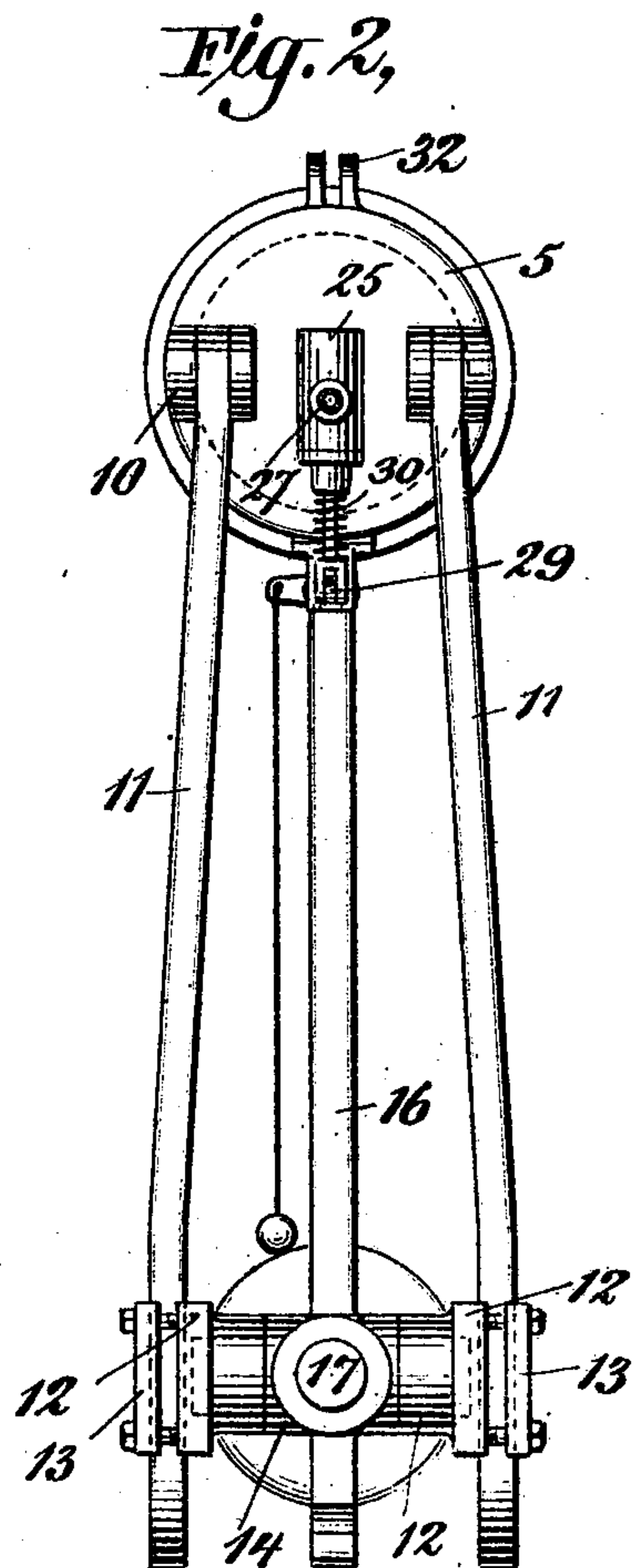
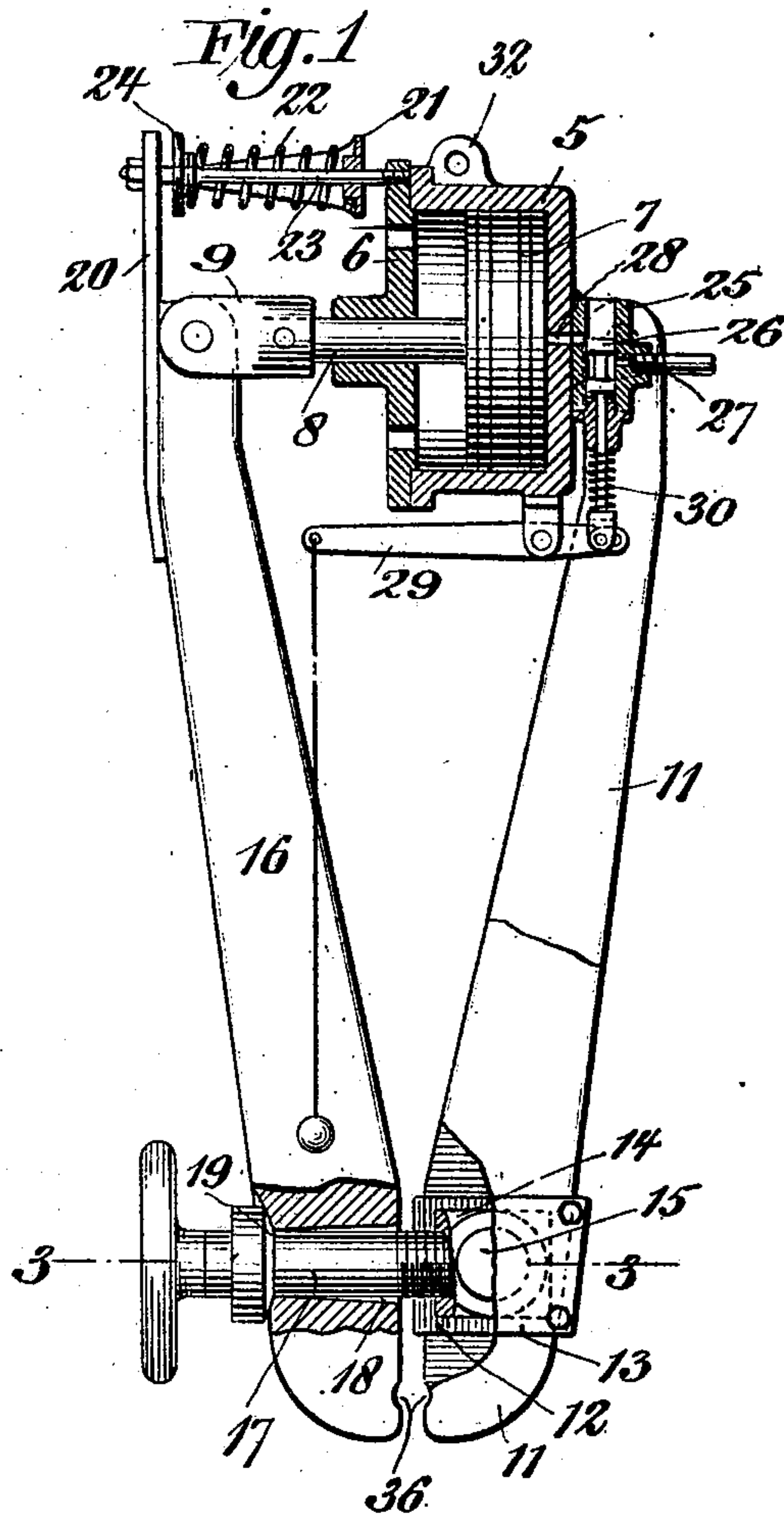
Patented June 4, 1901.

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STRAIGHTENING OR BENDING APPARATUS.

(Application filed Apr. 19, 1900.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

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INVENTOR

Robert L. Ambrose

BY *D. Howard Hayworth*
HIS ATTORNEY

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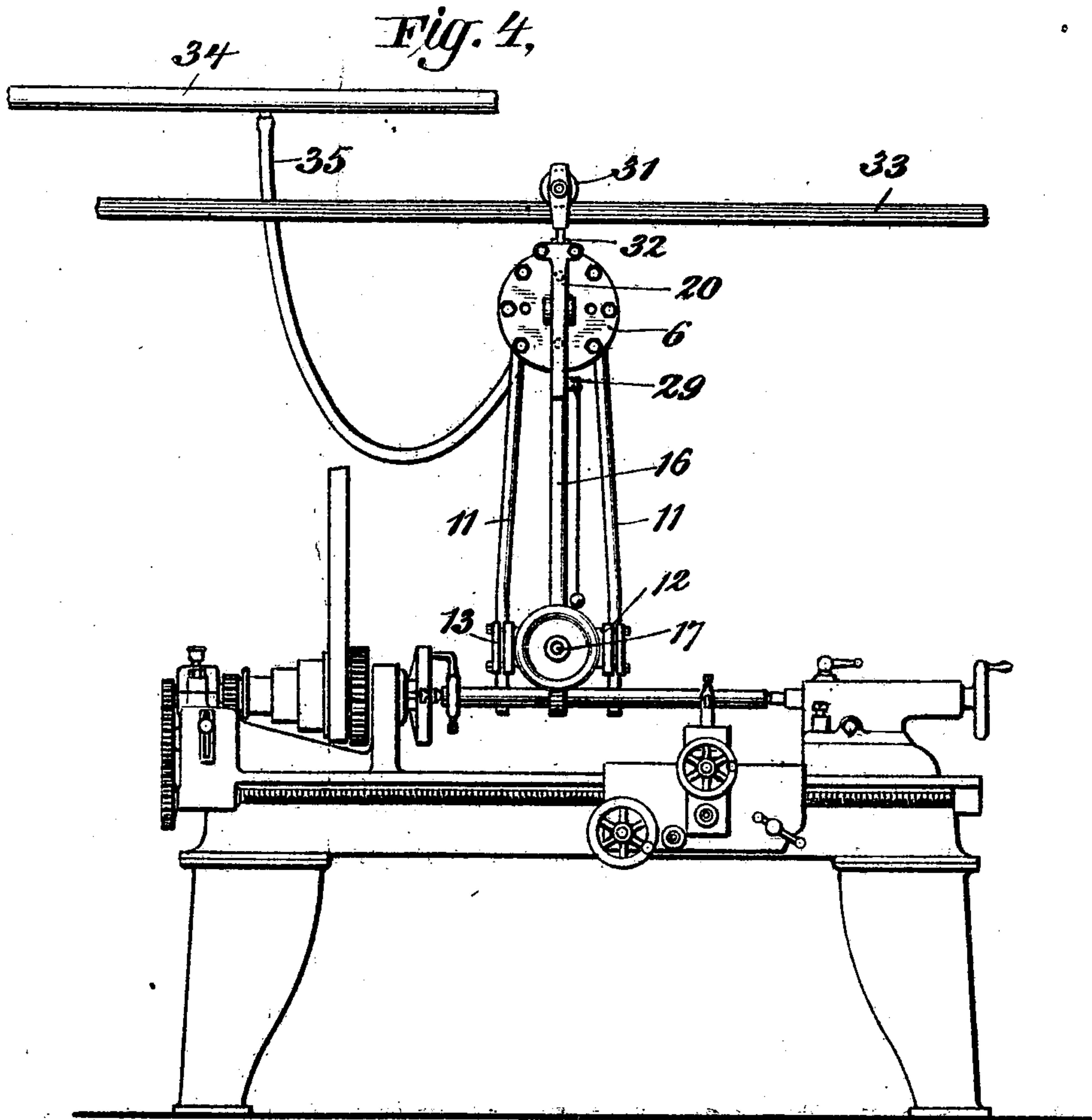
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STRAIGHTENING OR BENDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 675,369, dated June 4, 1901.

Application filed April 19, 1900. Serial No. 13,445. (No model.)

To all whom it may concern:

Be it known that I, ROBERT L. AMBROSE, a citizen of the United States of America, and a resident of Tarrytown, county of Westchester, State of New York, have invented a new and useful Improvement in Straightening or Bending Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to improvements in straightening or bending apparatus, and particularly to improvements in power devices for straightening or bending metal bars.

My invention consists in the novel construction and combination of parts, as will be hereinafter more fully set forth.

I will now proceed to describe a straightening or bending apparatus embodying my invention and will then point out the novel features in claims.

In the drawings, Figure 1 represents a view, partially in side elevation and partially in central vertical section, of a straightening or bending apparatus embodying my invention. Fig. 2 is a rear view of the same. Fig. 3 is a horizontal section taken on the plane of the line 3 3 of Fig. 1. Fig. 4 is a view illustrating a straightening or bending apparatus embodying my invention applied for use.

Similar reference characters designate corresponding parts in all the figures.

Reference character 5 designates a cylinder having a head or cover 6 suitably secured thereto, as by bolting. Within the cylinder 5 is arranged a piston 7, which piston is adapted to have a limited reciprocating movement therein. Secured to the piston 7 is a piston-rod 8, which passes out through a suitable orifice arranged in a projecting hub of the cylinder-cover 6. A head 9 is secured to the end of the piston-rod 8.

Pivoted to lugs 10, projecting from the rear end of the cylinder 5, is a lever constituting a bending-jaw 11. This bending-jaw 11 in the particular form or construction in which it is herein illustrated comprises two members. The members may, if desired, be connected together in any suitable manner. As shown in the drawings, they are connected together near their lower ends, and hence act as one lever or bending-jaw having two bend-

ing-faces. The bending-jaw 11 at its lower end supports bearing-boxes 12. The bearing-boxes 12 are secured to the bending-jaw 11 by being fitted one to each member thereof and partially embracing same and by means of clamping-bolts which pass through plates 13, fitted to the outside of said members and which are tapped into the said bearing-boxes. A nut 14, having trunnions 15, is journaled in the said bearings, the trunnions 15 fitting the said bearings and arranged to have an axial movement therein.

A bending-jaw 16 is pivotally secured to the head 9 upon the piston-rod 8 and is suspended therefrom opposite to the bending-jaw 11. The lower end of the bending-jaw 16 is located between the two ends of the two members of the said bending-jaw 11, and the said bending-jaws 11 and 16 are arranged to face each other and to move toward and away from each other.

An adjusting-bolt 17 is mounted in an orifice 18 in the lower end of the bending-jaw 16, the said orifice 18 being preferably somewhat tapered, as shown, the diameter thereof being larger at the inside of the bending-jaw than at the outside. The adjusting-bolt 17 is screw-threaded at its inner end, and such screw-threaded portion engages with the nut 14, as will be seen more clearly by reference to Fig. 3. A hand-wheel is secured to the outer end of the bolt to permit the ready turning of same. A washer is also provided near the front end of the adjusting-bolt 17, the rear face of the washer having a convex portion. The convex face of the washer engages with a concave surface 19, which is arranged in the outer face of the bending-jaw 16. The coaction of these convex and concave surfaces permits such relative movement of the parts as is desirable.

Secured to the upper end of the bending-jaw 16 and extending beyond the opposite side of its pivotal connection with the head 9 is an arm 20. A yoke 21 is bolted to the said arm 20 and supports one end of a compression-spring 22. A rod 23, secured to the cylinder-cover 6, passes through the end of the said yoke and is provided with a head 24, against which the opposite end of the spring 22 bears. The spring is coiled around the

rod 23. This compression-spring 22 exerts its force to press the arm 20 toward the cylinder 5, and hence to swing the end of the bending-jaw 16 forwardly or outwardly.

5 Upon the rear or opposite side of the cylinder 5 is arranged a valve-casing 25, and mounted in the valve-casing 25 is a distributing-valve 26. A suitable inlet 27 is provided for a supply of the motive fluid.

10 I preferably employ air under pressure as the motive fluid, but may employ other motive fluids, such as steam, if desired.

A port 28 leads from the interior of the valve-casing to the interior of the cylinder 5.

15 As shown in Fig. 2, in which figure the parts are in their "out of operation" position, the port 28 will at such times be in communication with the atmosphere through the open end of the valve-casing 25. By depressing
20 the front end of the lever 29 the valve 26 may be raised and the port 28 placed in communication with the inlet for the motive fluid. A release of the valve 29 will cause the parts to resume their normal position—that is to
25 say, the valve 25 will be moved downwardly by the return action of the spring 30 and the front end of the lever 29 again lifted.

I have shown the cylinder-cover as having
30 orifices in order to permit the escape to atmosphere of air which may have passed by the piston and which otherwise might tend to balance the same by exerting pressure on both sides thereof.

In using the device I preferably suspend
35 the same from an overhead beam, a suitable suspension-wheel 31 being secured to lugs 32 upon the upper end of the cylinder 5 and the said suspension-wheel being arranged to engage with said beam to permit the ready move-
40 ment bodily of the straightening or bending apparatus. An illustration of such arrangement is shown in Fig. 4, in which 33 designates the beam upon which the straightening or bending apparatus is suspended. A
45 main inlet-pipe for the motive fluid is shown at 34, and a flexible hose connection 35 may be used to permit the movement of the device.

The operation of the device is as follows:
It being desired to bend or straighten a bar
50 of metal, the said bar may be placed transversely of the device or the device may be located transversely of the bar to be bent, as the case may be, with the lower end of the bending-jaws 11 and 16 upon opposite sides
55 of the said bar. I have shown notches in the bending-faces at the lower end of the said bending-jaws 11 and 16, as at 36, which constitute supports for the said bar, in order to correctly locate the same and to prevent accidental displacement thereof during the operation of straightening or bending it. The bar
60 having been correctly located, the adjusting-bolt 17 may be adjusted as required by means of the hand-wheel provided therefor and motive fluid may be admitted to the cylinder 5
65 behind the piston 7. The piston 7 will now be driven forward with great power and the

upper ends of the bending-jaws 11 and 16 will be forced apart. This will force the lower ends together, rocking the bending-jaw 11 70 upon the nut-trunnions 15 and the bending-jaw 16 upon the universal joint 19. The bending-jaws 11 and 16 are thus levers of the first order, the power being applied at 10 and 9, the fulcrum being at 14 and 19, and the work at 36. By reason of the large area of the piston 7 and the great leverage of the bending-jaws 11 and 16 an enormous force will be exerted to bend the bar supported in the notches 36. The extent that this bar may be bent at each stroke is a matter of very easy calculation. In practice I make the stroke of the piston 7 about two inches. The purchase of the bending-jaws 11 and 16, figuring the leverage in a straight line between the centers of the notches 36 and the point at which the power is applied, is about as eight is to one. Hence the full movement of two inches of the piston 7 will give a movement of about a quarter of an inch to the bending-faces opposite the notches 36. Assuming the pitch of the thread of the adjusting-screw to be one-half of an inch, it will readily be seen that to so adjust the device as to bend the bar one-quarter of an inch it would merely be necessary to screw 9 the adjusting-bolt 17 until the notches 36 firmly grasp the bar and then to turn the adjusting-bolt back one-quarter of a revolution.

The particular use to which I have thus far applied my invention is to that of straightening the piston of power rock-drills. For this purpose I preferably mount the piston between the centers of a lathe and suspend the straightening device over it so that the centers of the bending-faces opposite the notches 36 come in a line with the lathe-centers. This is shown more clearly in Fig. 4. By revolving the piston I am enabled to tell exactly how much it is necessary to bend same in order to straighten it, which I can then do by properly adjusting the straightening device and operating it as just described. After the piston has been acted upon I may again rotate it, and I may then again apply the straightening device, and so on until the said piston has been completely straightened.

When not in use, I can readily remove the device out of the way by reason of the manner in which it is suspended from the overhead beam.

I have for purposes of this specification described the bending-jaw 11 as being a single lever having two members, the said members being connected together. Various modifications in the form and construction of this bending-jaw may of course be resorted to within the scope of my invention, as will be obvious to those skilled in the art to which this invention appertains. It is also of course obvious that the arrangement of the bending-jaws 11 and 16 may be transposed and that the bending-jaw 11 may be supported from the head 9 and the bending-jaw 16 from the lugs 10. An essential feature

the arrangement of the bending-jaws 11 and 16 is, however, that at their lower ends one shall be provided with a single bending-face adapted to engage with the said bar of metal or otherwise to be acted upon and the other with two of such bending-faces adapted to engage with the said bar of metal upon the opposite side thereof, the former bending-face being located between the latter.

10 My improved apparatus is capable of many modifications, and I do not, therefore, desire to be limited to the exact form or construction as described and shown herein. Variations of same within wide limits may be made 15 without departing from the spirit and scope of my invention.

What I do claim, and desire to secure by United States Letters Patent, is—

1. In a straightening or bending apparatus 20 the combination with a cylinder and a piston mounted therein, of two fulcrumed bending-jaws, the one connected to the cylinder and the other to the piston.

2. In a straightening or bending apparatus 25 the combination with a cylinder and a piston mounted therein, of two fulcrumed bending-jaws, the one connected to the cylinder and the other to the piston, one of the said jaws having two bending-faces, and the other having a single bending-face arranged between 30 the two bending-faces of the other jaw.

3. In a straightening or bending apparatus the combination with a cylinder and a piston 35 mounted therein, of two fulcrumed bending-jaws, the one connected to the cylinder and the other to the piston, and an independent adjustment for one of the said jaws toward and away from the other of said jaws.

4. In a straightening or bending apparatus 40 the combination with a cylinder and a piston mounted therein, of two fulcrumed bending-jaws having bending-faces, one of said jaws connected to the cylinder and the other to the piston, and means for adjusting the bending-faces of said jaws toward and away from 45 each other, independently of the movement of said piston in said cylinder.

5. In a straightening or bending apparatus 50 the combination with a cylinder and a piston mounted therein, of two bending-jaws, the one connected to the cylinder and the other to the piston, a fulcrum for each of said bend-

ing-jaws upon which the said jaws are adapted to rock, and means for adjusting the said ful- 55 era toward and away from each other.

6. In a straightening or bending apparatus the combination with a cylinder and a piston 60 mounted therein, of two fulcrumed bending-jaws, the one connected to the cylinder and the other to the piston, an adjusting-bolt carried by one of said jaws and a nut with which the said bolt is adapted to engage, carried by 65 the other of said jaws.

7. In a straightening or bending apparatus the combination with a cylinder and a piston 70 mounted therein, of two bending-jaws, the one connected to the cylinder, and the other to the piston, an adjusting-bolt carried by one of said jaws, the said jaw being fulcrumed thereon, and a nut with which the said ad- 75 justing-bolt is adapted to engage, and upon which the other of said jaws is fulcrumed.

8. In a straightening or bending apparatus the combination with a cylinder and a piston, 80 of two bending-jaws, the one connected to the cylinder and the other to the piston, bearing-boxes carried by one of said jaws, a threaded nut having trunnions supported in said bear- 85 ings, and an adjusting-bolt carried by the other of said jaws, said bolt having a yielding connection with the jaw by which it is car- 90 ried and adapted to engage with the said threaded nut.

9. In a straightening or bending apparatus the combination with a cylinder and a piston, 85 of two bending-jaws, one of the said jaws comprising two members, each member having a bending-face, and the other of said jaws comprising a single member having a single bend- 90 ing-face, one of said jaws connected to the cylinder and the other to the piston, bearing-boxes carried, one each by the two members of the said first-mentioned jaw, a threaded 95 nut having trunnions supported in said bearings, and an adjusting-bolt carried by the other of said jaws, said bolt having a yielding connection with the jaw by which it is carried and adapted to engage with the said threaded nut.

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Witnesses:

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