

No. 714,894.

Patented Dec. 2, 1902.

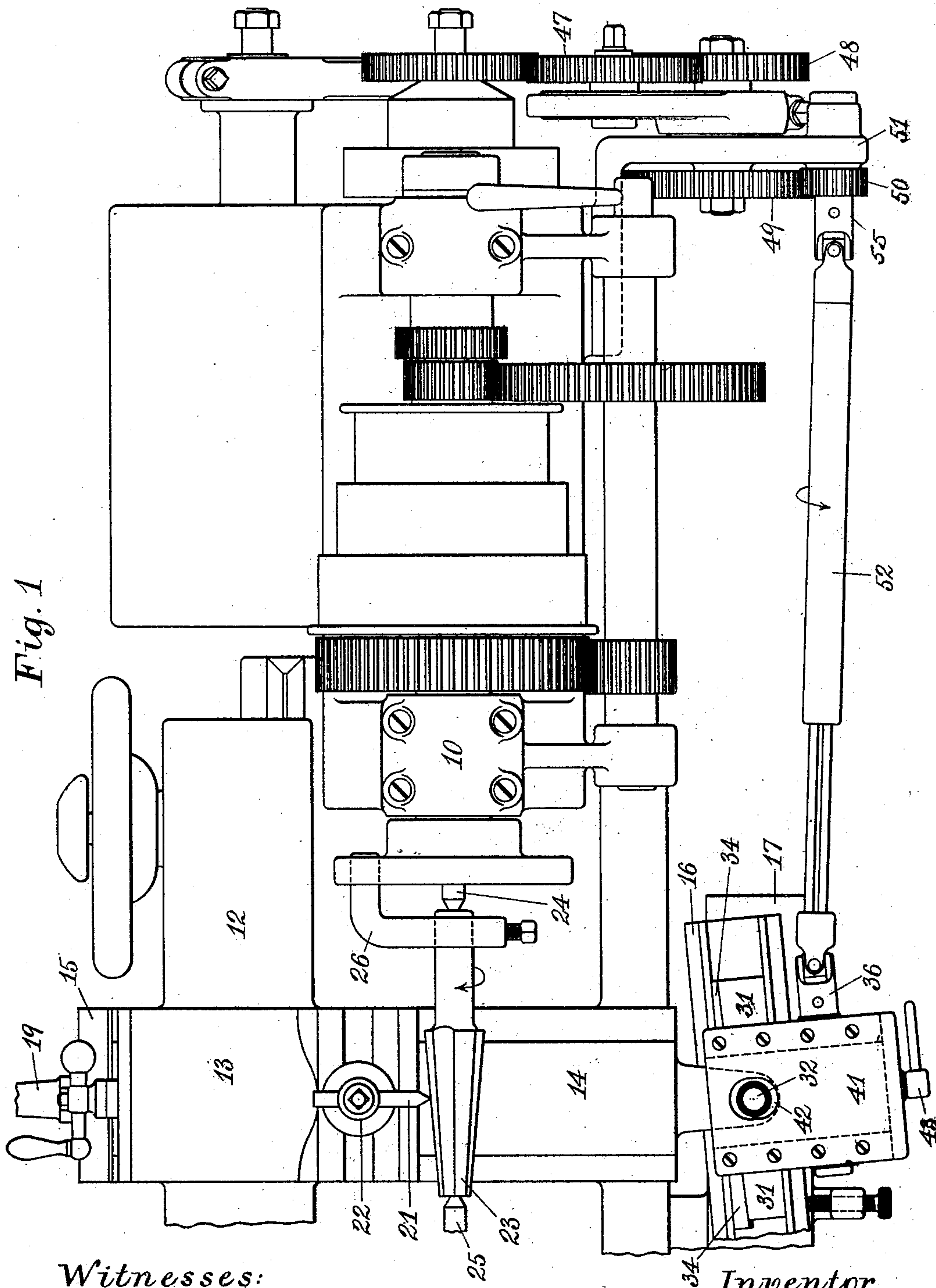
B. M. W. HANSON.  
RELIEVING ATTACHMENT FOR LATHES.

(Application filed Jan. 15, 1902.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1



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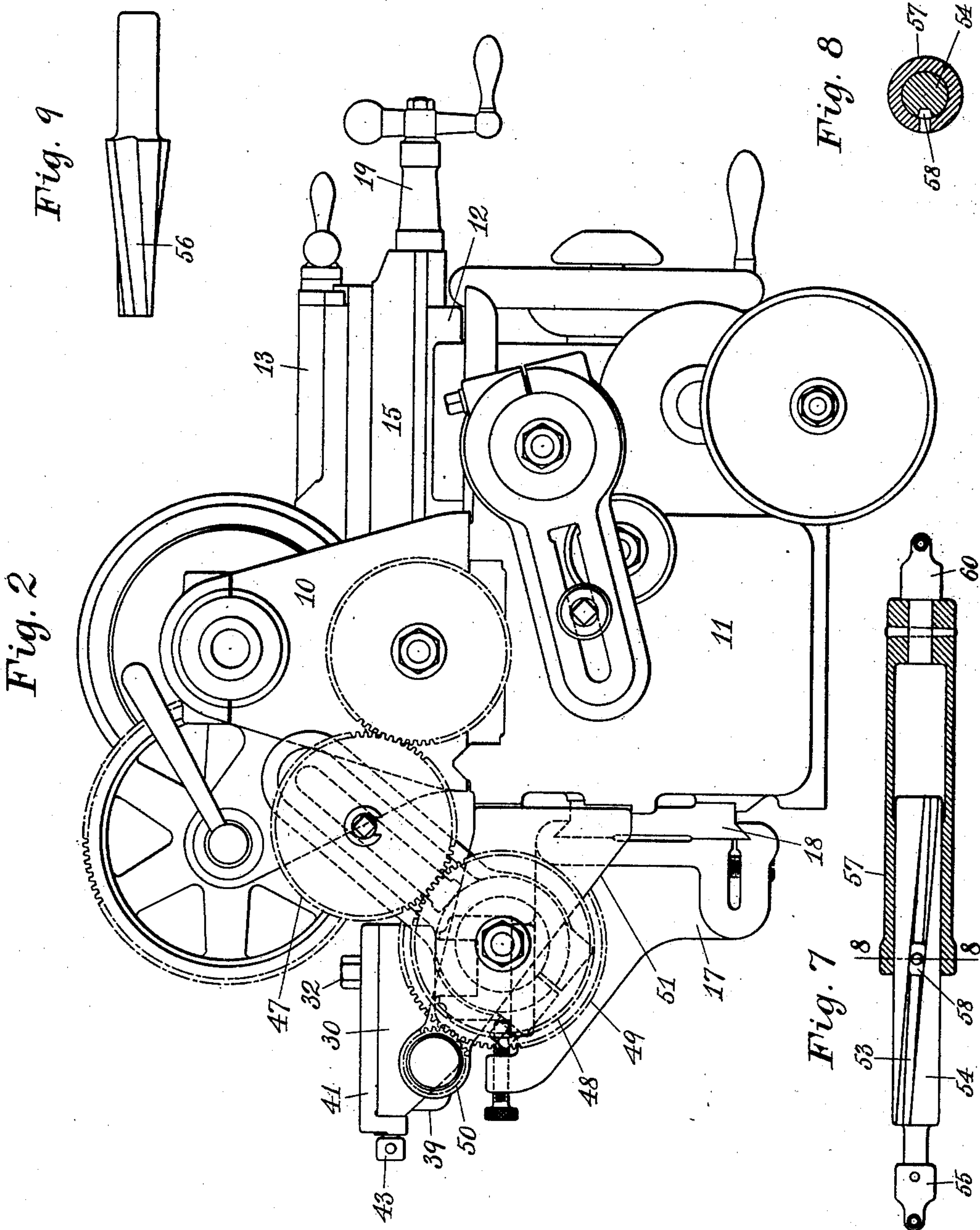
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3 Sheets—Sheet 2.



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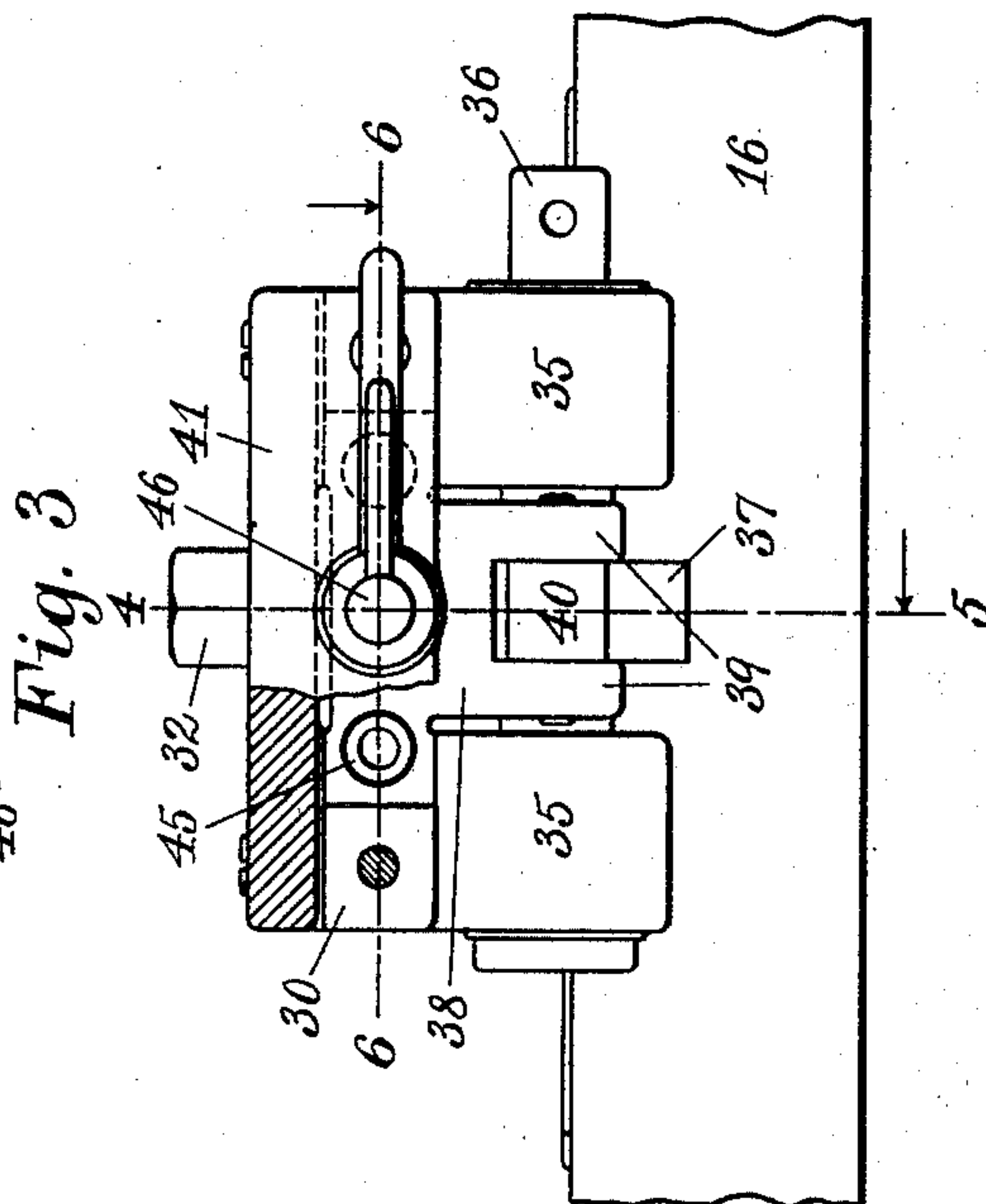
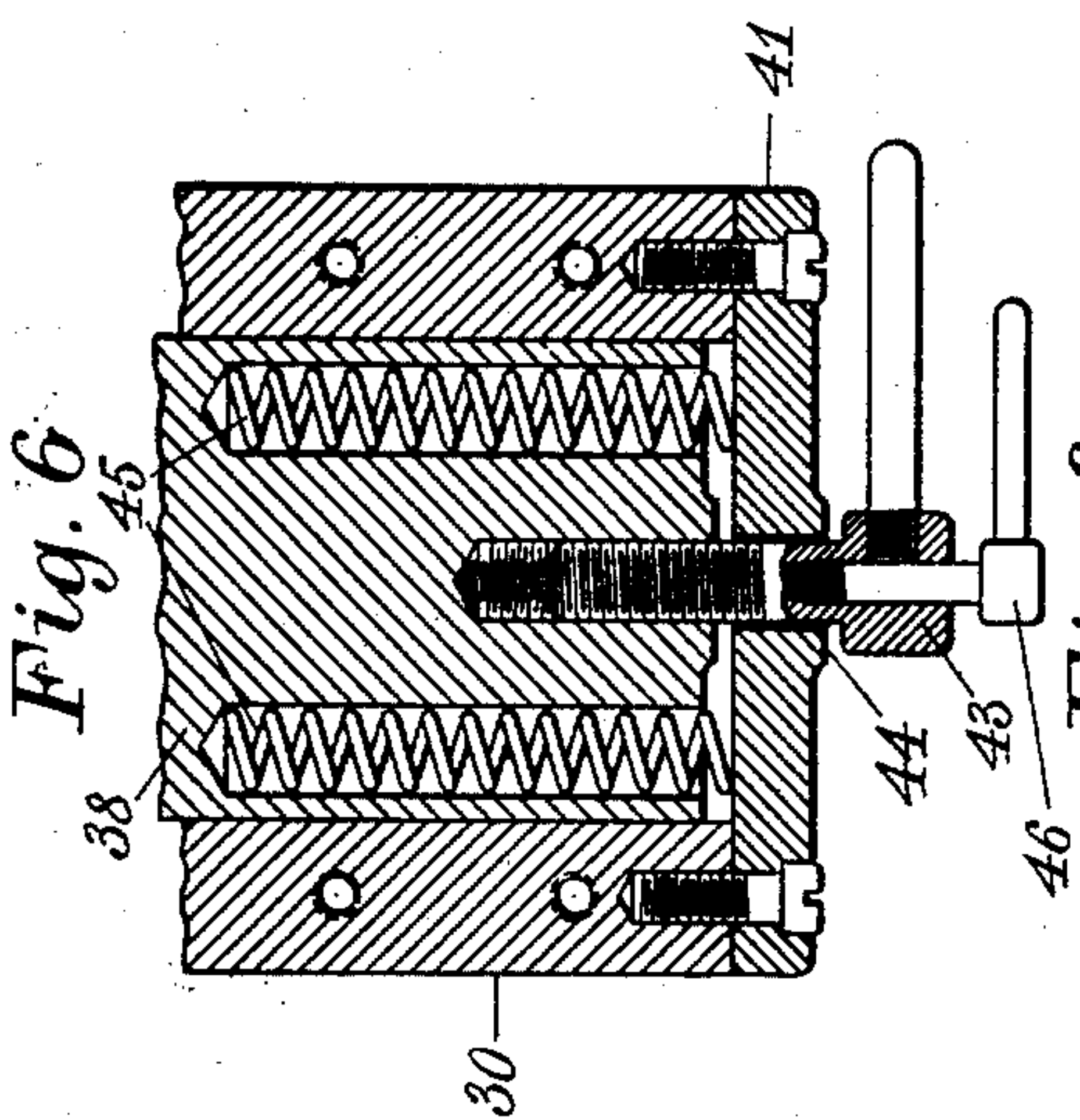
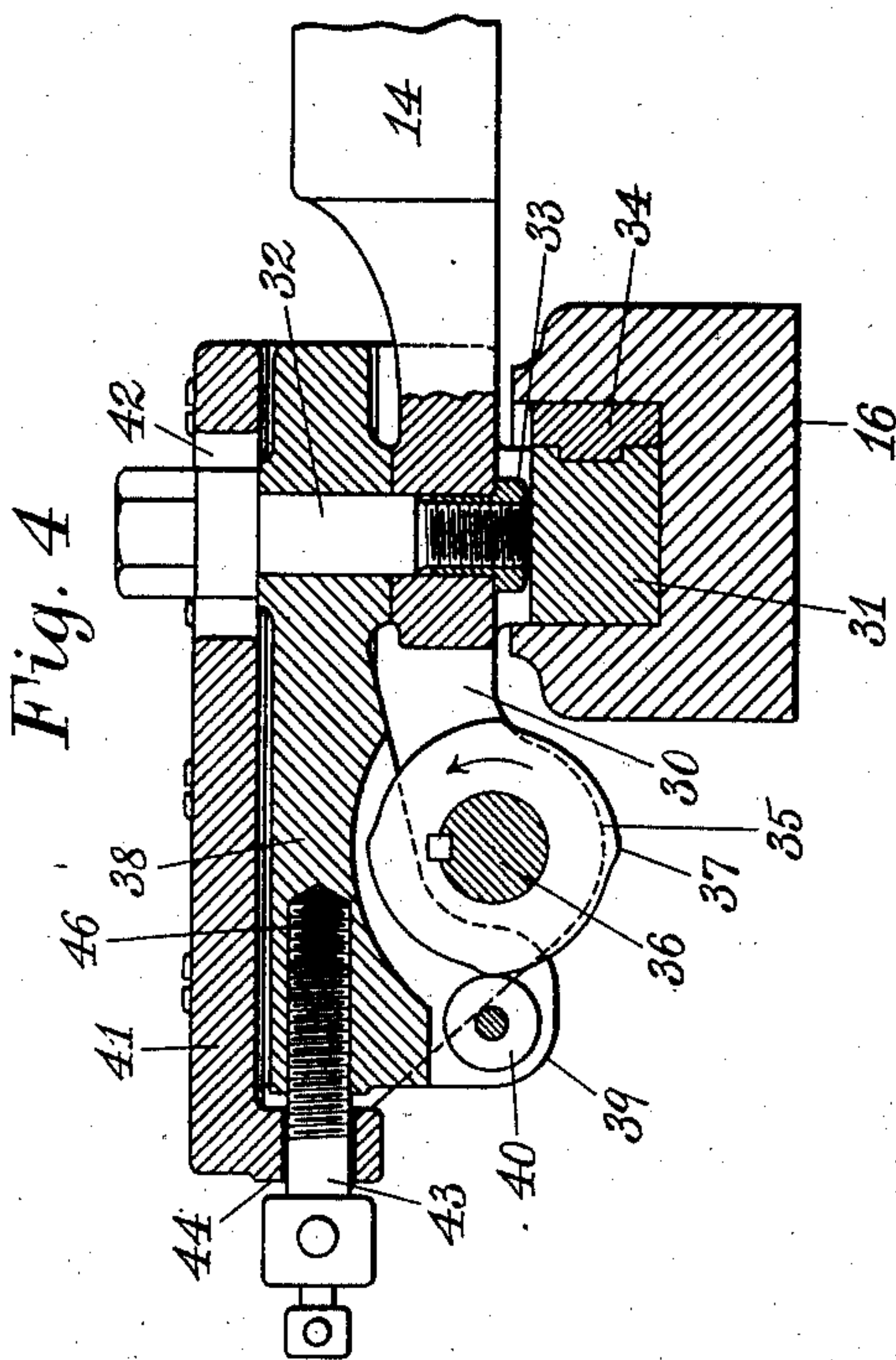
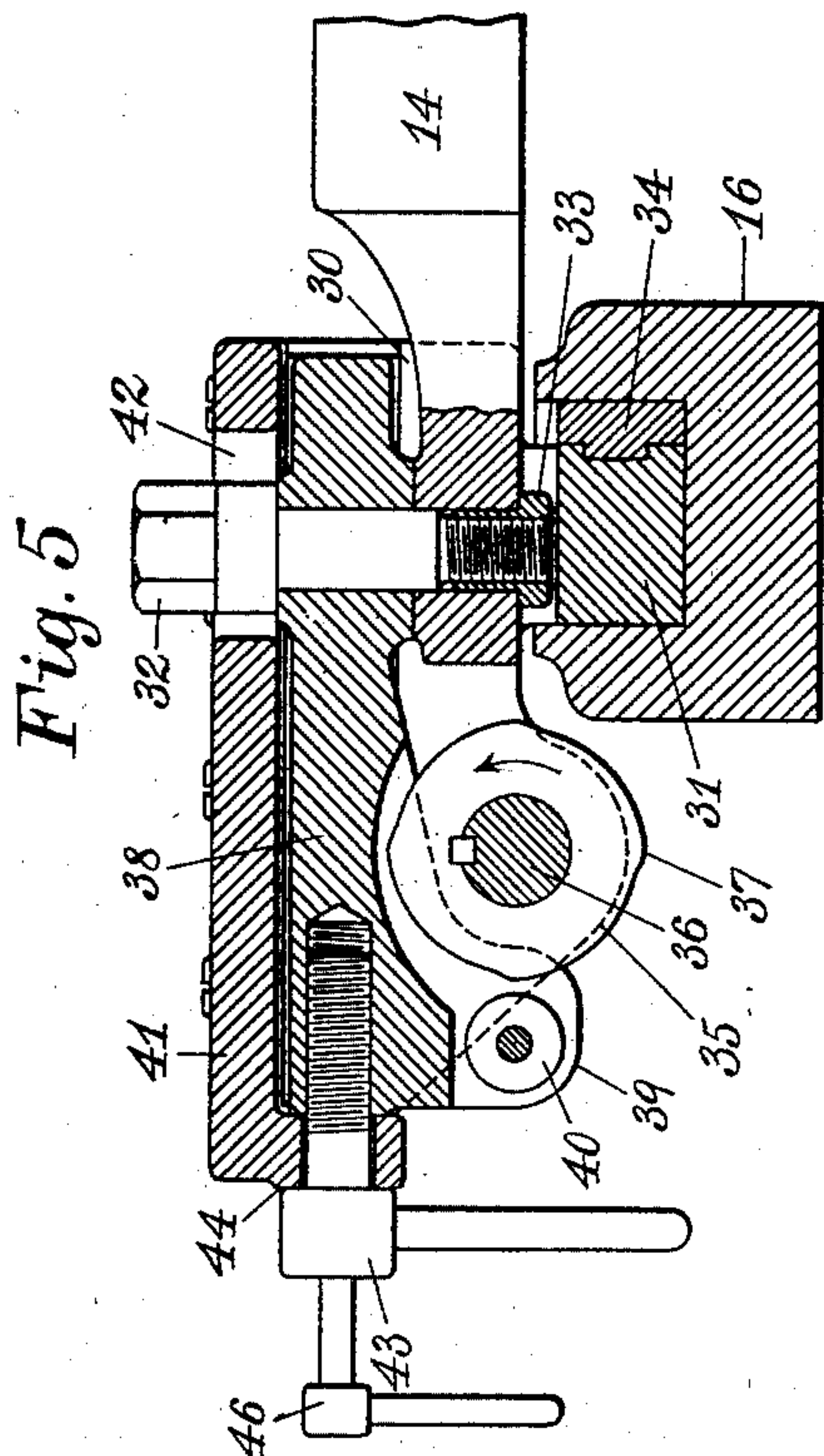
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(Application filed Jan. 15, 1902.)

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3 Sheets—Sheet 3.



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# UNITED STATES PATENT OFFICE.

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## RELIEVING ATTACHMENT FOR LATHES.

SPECIFICATION forming part of Letters Patent No. 714,894, dated December 2, 1902.

Application filed January 15, 1902. Serial No. 89,873. (No model.)

*To all whom it may concern:*

Be it known that I, BENGT M. W. HANSON, a citizen of Sweden, and a resident of Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Relieving Attachments for Lathes, of which the following is a specification.

This invention relates to improved apparatus for turning or forming contours, and particularly for "backing off" or relieving the cutting edges of various forms of tools—such as taps, dies, formers, and other forms of toothed cutting-tools—the object being to provide a simple, compact, efficient, and inexpensive apparatus which may readily be attached to and removed from the well-known leading types of engine-lathes, of which this apparatus is thus made a valuable adjunct and auxiliary.

The invention is herein shown as applied and adapted to the relieving of tapering taps like those commonly employed for cutting pipe-threads.

Figure 1 of the drawings is a plan view of my apparatus, including also the relevant portions of an engine-lathe to which it is applied. Fig. 2 is an end view looking from the right-hand end of Fig. 1. Fig. 3 is a view, on an enlarged scale, of my relieving apparatus looking from the front side of Fig. 1, which is the rearward side of the lathe. Fig. 4 is an end view of the apparatus in section, taken on the line 4 5 of Fig. 3. Fig. 5 is a view similar to Fig. 6, showing the relieving apparatus thrown out of operation. Fig. 6 is a plan view in section, taken on the line 6 6 of Fig. 3. Fig. 7 is a plan view showing a modified construction of a telescoping joint of this apparatus. Fig. 8 is an end view in section, taken on the line 8 8 of Fig. 7. Fig. 9 is a side view of a spirally-fluted tapering reamer, illustrating the form of reamer which can be relieved by this apparatus when employing the coupling shown in Figs. 7 and 8.

The lathe-head 10, with its spindle, pulleys, and gears, the bed 11, the carriage, with its tool-slides mounted thereon and connected with the guide-bar, or "taper bar," as it is commonly termed, are or may be all of well-

known types and need only be briefly described. The taper bar 16 is mounted upon one or more brackets 17, which are secured to the bed 11, in some cases upon ways 18 thereof, so that the bar may be moved to any desired portion of the length of the bed. The taper bar as commonly used is provided with a closely-fitting block which slides lengthwise of the bar and is pivotally connected with the cross-slide 14, which slides transversely of the bed and is usually connected with the tool-slide 15 by means of a cross-feed screw 19 to enable the tool to be adjusted to and from the work. The tool-slide is usually provided with a superimposed tool-rest 13, carrying the tool-post 22, in which is clamped the tool 21. In the customary operation of turning a tapering piece of work the taper bar 16 is adjusted to the desired angle, and as the carriage moves longitudinally of the bed the sliding block, moving in its divergent path on the inclined taper bar, pushes or draws the cross-slide 14 and its attached tool transversely of the bed, thereby producing the desired taper upon the work.

Having thus briefly described the general features of such an engine-lathe, I will now describe more in detail the function, construction, and mode of operation of my present invention.

The intended function of this apparatus is to impart to the tool 21 a reciprocating movement transversely of the work in accordance with the desired contour, in the present instance in proper relation to the series of teeth of the tap or other work to be made, so that the tool is drawn toward and from the axis of the work as the latter rotates in order to relieve the teeth backwardly from their cutting edges and to do this while guiding the tool in its proper relation to the axis of the work whether parallel or inclined, so as to operate upon either a tapering or a parallel piece of work.

The work 23, which is herein shown to be a blank for a pipe-tap, is mounted upon the centers 24 and 25 and is rotated by means of the dog 26, engaging with the face-plate 27 of the lathe-spindle in the customary way.

The parts constituting my improved apparatus



ratus are supported in a frame 30, the lower portion 31 of which is fitted to slide in the taper bar 16 in place of the usual sliding block to which the cross-slide 14 is attached, that block being removed and the slide being now connected to this apparatus by means of the center pin 32, which passes through a vertical hole in the cam-slide 38 and is screwed into a bushing 33, seated in the end of the cross-slide 14, whereby that slide and the cam-slide 38 may be clamped together in any angular relation, according to the taper for which the taper bar 16 may be set. The block or slide portion 31 is provided with a suitable gib 34, by means of which a close sliding fit may be maintained in the taper bar. The frame 30 extends rearwardly of the taper bar and is provided with the bearings 35, in which is journaled the cam-shaft 36, to which is secured the relieving-cam 37. The cam-slide 38 is seated in its slideway of the frame 30, so as to move substantially at right angles to the axis of the shaft 36, and engages with the cam 37, preferably by means of a pin or roller 40, which is supported by the downwardly-extending lugs 39 and bears against the periphery of the cam 37, as shown in Fig. 4, that periphery being provided with a suitable contour for imparting the required movements to the tool through the medium of the cam-slide 38 and its attached cross-slide 14.

For convenience in constructing and assembling the parts the frame 30 is made with a removable cover 41, which forms a top bearing for the slide 38, and is slotted at 42 to permit of the lateral movement of the center pin 32. When employing an open cam, as herein shown, the slide 38 is provided with springs 45 or equivalent devices, which bear against the abutment 44 or some other suitable portion of the framing and holds the roll 40 into contact with the cam 37. Obviously these springs must be strong enough to move the slides 38, 13, and 14 backwardly.

It is sometimes desirable to throw the relieving device out of operation temporarily without removing it from the lathe in order to do some other operation upon the work, either with or without the use of the taper turning device. For this purpose the cam-slide 38 is provided with means, as the screw 43, which abuts against a downwardly-projecting portion 44 of the cover 41. By means of this screw the cam-slide 38 may be drawn backwardly, as shown in Fig. 5, so as to carry the roll 40 away from the action of the cam 37, thereby stopping the lateral reciprocations of the tool-slide and leaving the lathe free to perform all its customary functions, including the use of the taper turning adjunct, since the device when in the condition shown in Fig. 5 may be utilized to perform, in conjunction with the cross-slide 14 and the guide-bar 16, the functions of the ordinary sliding block which it displaces.

The shaft 36 is driven in suitable relation

to the rotations of the work by means of a universal coupling or other jointed connection with the gearing 47 of the lathe-head. As herein shown, the gears 48, 49, and 50 are journaled in the bracket 51, which may be bolted to the side of the lathe-bed, the connection between the gear 50 and the shaft 36 being made by means of a telescoping universal coupling 52, which permits the shaft 36 to conform to the adjustments of the guide-bar and to travel longitudinally thereof with the movements of the carriage 12.

This apparatus may be employed for turning or milling or grinding non-cylindrical contours in many ways and for various purposes. A milling-cutter or a grinding-wheel may be substituted for the tool 21, according to the character of the material to be worked, and the forming-cams 37 may be varied in shape to produce an infinite variety of contours. A series of these cams may be employed for various kinds of work, the cams being readily removable from the spindle to enable others to be substituted. In the example herein illustrated the relieving-cam 37 is intended to make one rotation for each rotation of the four-fluted reamer shown in Fig. 1. Hence that cam is four-lobed and symmetrical, due to the repetition of the same contour for each of the four teeth of the reamer; but it is obvious that any non-symmetrical contour can be produced in the same way, or when, as in the present case, the same contour is to be repeated around the work the cam instead of having its contour repeated may have the required contour extended entirely around its periphery and be geared so as to make a complete rotation for each repetition of the contour upon the work. In fact, this is the preferable way where it is desirable to accurately repeat the same contour. In the case of reamers and other cutting-tools of the same class it is desirable to space the cutting-teeth unequally around the periphery of the tool. In such cases it may be preferable, as here shown, to gear the work and the cam to rotate evenly together and to arrange the relieving-cam as here shown. The effect of the same cam may be varied to a considerable extent by the use of the screw 43, by means of which the cam-slide 38 may not only be drawn backwardly, as above explained, to carry the roll 40 entirely out of engagement with the cam 37, but may be employed as a stop-screw at any intermediate position, thereby preventing the roller 40 and its connected cross-slide 14 from following to the bottom of the contour of the cam. In this way different effects and varying amounts of relief may be produced by the use of a single one of these cams. This use of the stop-screw 43 is of great value, particularly upon internal work, such as dies, where the intervals between the rows of teeth are narrow and deep, since in that case the stop-screw may be adjusted to prevent the tool from dropping too far into the interval, and thus



enables it to be retracted more quickly and with absence of shock for the succeeding tooth or row of teeth. The use of the stop-screw also enables the device to form contours, portions of which are cylindrical, without providing a cylindrical contour upon the cam 37. For example, with a cam of the contour represented in Fig. 4 the roller reproduces the contour of the cam so far as it is allowed to follow in contact therewith; but when the stop-screw 43 is adjusted forwardly toward the right far enough to prevent the roller from following to the bottom of the contour the tool will produce a cylindrical contour upon the work during the time that the cross-slide is thus sustained by the head of the screw 43, with the roller 40 out of contact with the cam. The stop-screw is fixed in any desired position by the set-screw 46, which is threaded into the stop-screw 43 in an axial relation thereto, as best shown in Fig. 6, and is screwed against the bottom of the tapped hole for the latter to set that screw in any desired position. When operating upon internal contours, such as those of dies or analogous tools or objects, the die may be carried in a chuck mounted upon the spindle or upon the face-plate 27 in the usual way.

In order to employ this apparatus to operate upon contours which advance in a spiral relation, as in the case of the spirally-fluted tapering reamer 56, (shown in Fig. 9,) I provide a device for accelerating or retarding the rotations of the relieving-cam, which device is substituted for the universal coupling 52 of Fig. 1. That device is shown in Figs. 7 and 8 and performs the ordinary functions of the universal coupling 52, besides its additional particular function of accelerating or retarding the relieving-cam. This device, as herein shown, consists of the sleeve 57, which is attached to or integral with the coupling member 60, and of a shaft 54, which is attached to or integral with the coupling member 55. The sleeve and shaft are preferably fitted to slide one within the other, as in the case of the coupling 52, and are connected by means of a key 58 and a keyway 53, which is inclined to the axis of the shaft instead of being parallel therewith, as in Fig. 1. The direction and degree of inclination of the keyway are in accordance with the work to be done. A number of these keyways may be cut at different peripheral portions of the shaft and may be regular or irregular in path, according to the work required. Where the groove is not a regular spiral, the portion of the key which travels in the groove should be cylindrical or conical, according to the form of the groove; but where, as shown in Fig. 7, the groove 53 is a regular spiral the key may be extended longitudinally to increase its bearing-surface in the groove, and where different master contour shafts 54 are employed the key should swivel in the sleeve 57, as shown in Figs. 7 and 8, in order to enable it

to adjust itself to the different degrees of spiral of the several master-shafts employed therewith. This construction also enables the key to be easily removed and replaced by merely separating the sleeve and shaft. Inasmuch as one of the members of this telescoping connection travels with the relieving-slide while the other is held against longitudinal movement by its connection with its driving devices, an acceleration or retardation of the rotary movement of the relieving-cam 37 is imparted, in accordance with the movement of the tool longitudinally of the work. Where, as here shown, the direction of rotation of the cam, as indicated by the arrow in Figs. 4 and 5, is opposite to that of the work, the direction of the spiral of the groove 53 must be opposite to the spiral upon the work, as shown by a comparison of Figs. 7 and 9, a right-handed master-spiral being employed for a left-handed spiral upon the work, and vice versa. Where the work and the master cam or shaft 54 rotate in the same direction, the direction of the spirals should be the same on both. The relative position of the sleeve 57 and the shaft 54 may be reversed, so that the sleeve travels with the relieving-slide, and the shaft 54 be driven by the gear 50. Under some conditions, and especially where the machine is to be employed in the presence of flying dirt or grit, it may be advisable to make the spiral groove upon the inner surface of the sleeve and to seat the key 58 in the shaft. Either the sleeve or the shaft, or both, as the case may be, may be provided with a number of different guiding-grooves or keyways of different inclinations arranged around its periphery. In that case the same key may be employed in connection with its appropriate groove or keyway suitable for the work to be done. In many other ways, which will be obvious to those familiar with this art, the various features of the invention herein shown may be modified and its applications extended.

An important advantage of this apparatus is that it may not only be applied to new lathes at the time of making them, but may also be sent out and applied to existing lathes of the same pattern that may be already in use.

I claim as my invention—

1. A relieving attachment for lathes, comprising a frame adapted to slide on and longitudinally of the taper bar, a rotating cam journaled thereon to swing with the taper bar, and a cam-slide mounted on the said frame for transmitting the movements of the cam to the tool cross-slide of the lathe.

2. A relieving attachment for lathes, comprising a frame adapted to slide on and longitudinally of the taper bar, a rotatable cam journaled thereon, a universal telescoping coupling for maintaining the cam in operative connection and time relation with the spindle-gearing of the lathe, and a cam-slide



mounted upon the frame for engagement with the cam, and pivotally connected with the tool cross-slide of the lathe.

3. A relieving attachment for lathes, comprising a frame adapted to slide on and longitudinally of the taper bar, a relieving-cam rotatably mounted thereon, a cam-slide pivotally connected with the tool cross-slide of the lathe, and bearing against the relieving-cam, and means for applying spring-pressure to hold the cam-slide into operative engagement with the relieving-cam.

4. A removable relieving attachment for lathes, comprising a frame adapted to slide on and longitudinally of the taper bar, a cam rotatably mounted on the frame, a cam-slide pivotally connected with the tool cross-slide of the lathe, and bearing against the cam, means for applying spring-pressure to hold the cam-slide into engagement with the cam, and a screw for withdrawing and retaining the cam-slide out of engagement with the cam.

5. The combination of a traveling tool-carrier, a rotatable member for operating the tool-carrier, a rotating driving member therefor, held against longitudinal movement, and means, intermediate the two members for accelerating or retarding the movement of the driven member, by its longitudinal movement.

6. The combination of a traveling tool-carrier, a longitudinally-extensible driving device for operating the carrier, comprising a rotatable driven member, a rotatable driving member, and means for varying the rotative movement of the driven member with relation to the driving member, by the relative longitudinal movement of the two members.

7. In a relieving apparatus, the combination of a rotatable shaft, a rotating driving member for operating the apparatus, held against longitudinal movement, and means intermediate the driving member and the shaft for retarding or accelerating the rotations of the driven member by its longitudinal movement, relative to the driving member.

8. In combination with the taper bar and tool cross-slide of a lathe, a relieving attachment mounted to slide longitudinally of the taper bar, a rotatable driving device for moving the tool cross-slide, and an extensible driving connection therefor comprising a shaft, a sleeve sliding thereon, and engaging with the shaft by means of a key, and an inclined keyway.

9. In combination with the taper bar and tool cross-slide of a lathe, a relieving attachment mounted to slide longitudinally of the taper bar, a rotatable operating device for the cross movement of the slide, and an extensible speed-varying driving connection, comprising a shaft, a sleeve sliding thereon, and engaging with the shaft, by means of a key, and an inclined keyway.

10. In combination with the taper bar and tool cross-slide of a lathe, a relieving attachment mounted to slide longitudinally of the taper bar, a rotatable relieving-shaft mounted thereon, and a flexible, extensible driving connection, comprising a shaft, a sleeve slidable thereon, and a key carried by one of the sliding members and engaging with an inclined groove in the other member.

11. In combination with the swiveling taper bar and cross-slide of a lathe, a relieving attachment mounted to slide longitudinally of the taper bar, a rotatable driving device for the cross movement of the slide, and an extensible speed-varying universal connection, comprising a shaft, a sleeve sliding thereon, and engaging with the shaft by means of a key and an inclined keyway, the shaft and the sleeve being flexibly coupled with the driving devices of the lathe and with the cooperating devices of the cross-slide.

Signed at Hartford, Connecticut, this 11th day of January, 1902.

BENGT M. W. HANSON.

Witnesses:

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WM. H. HONISS.