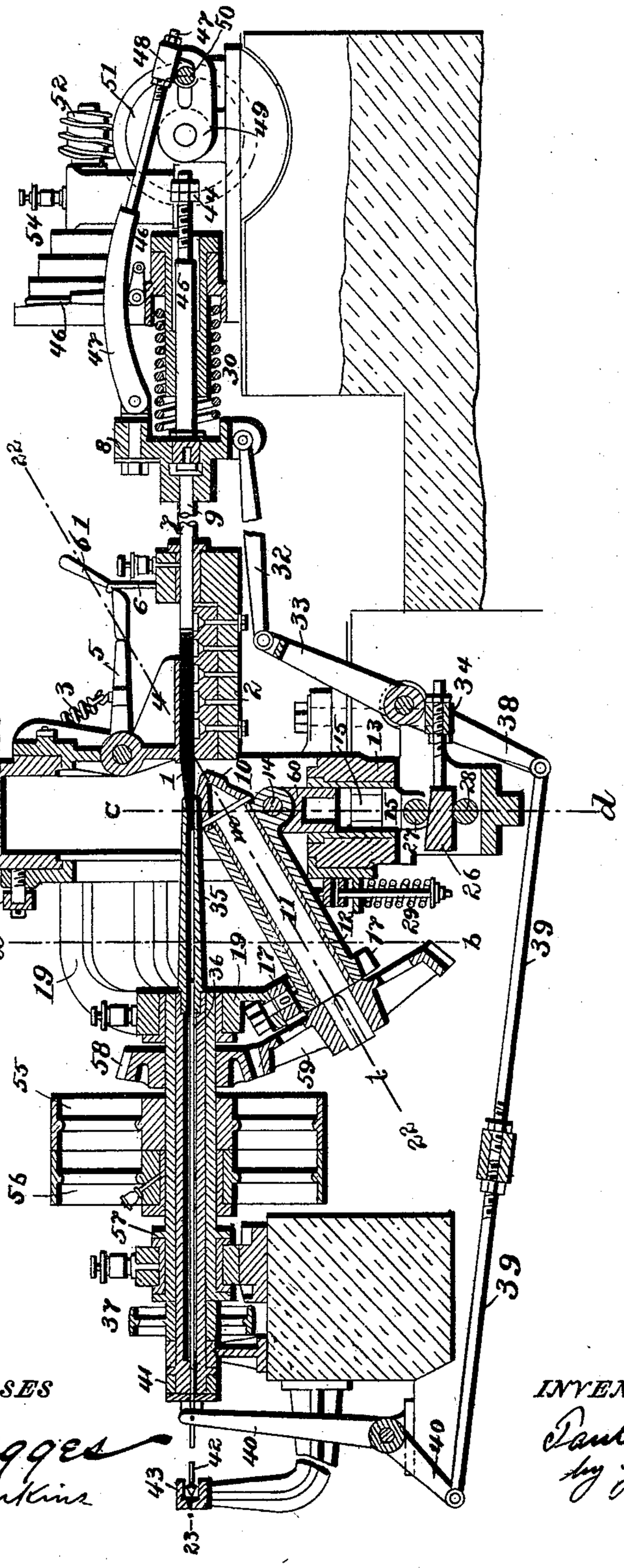
(No Model.) 3 Sheets—Sheet 1.

P. HESSE.

ROLLING MILL FOR PRODUCING BARRELS FOR RIFLES OR GUNS.

No. 582,471. Patented May 11, 1897.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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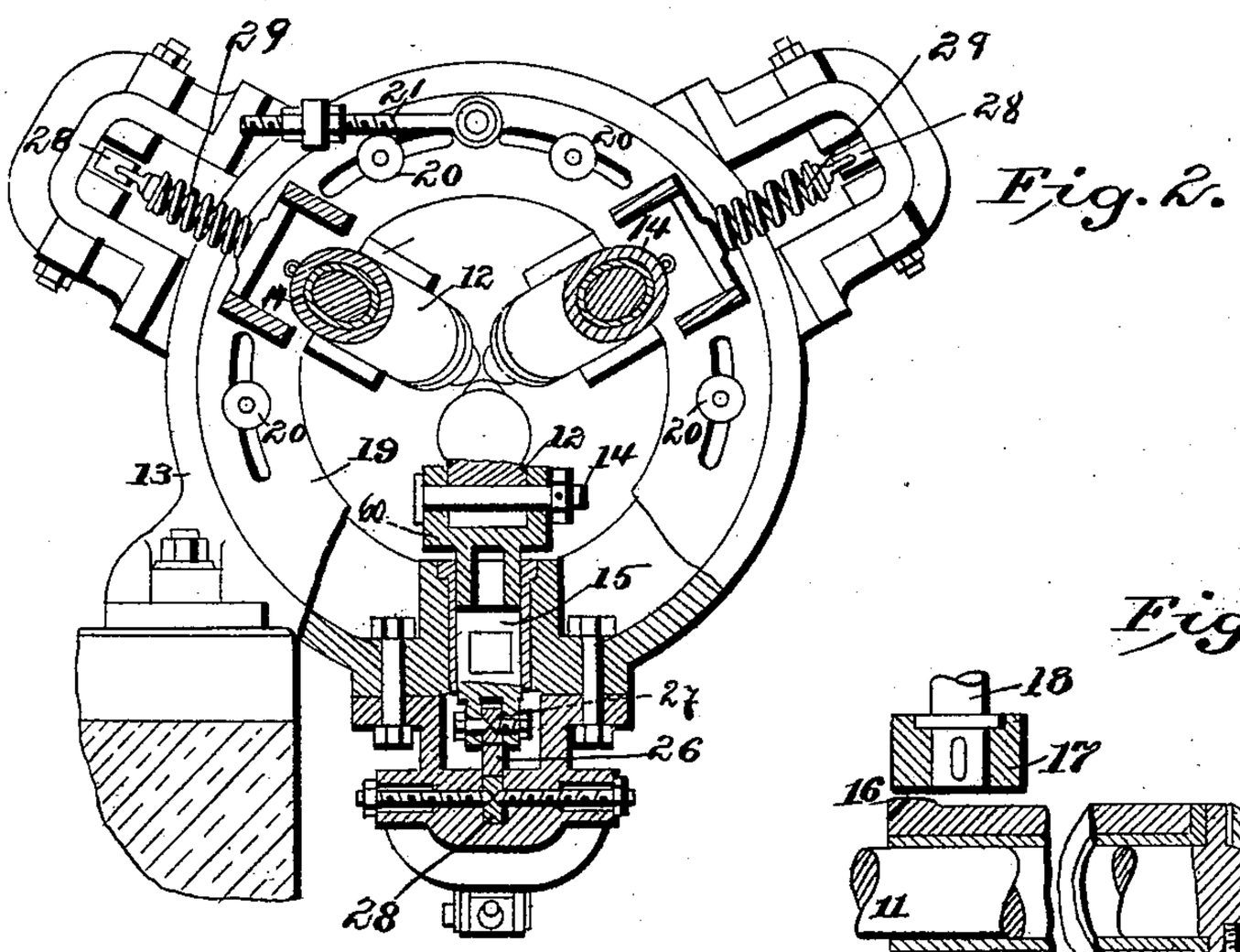


Fig. 2.

Fig 6.

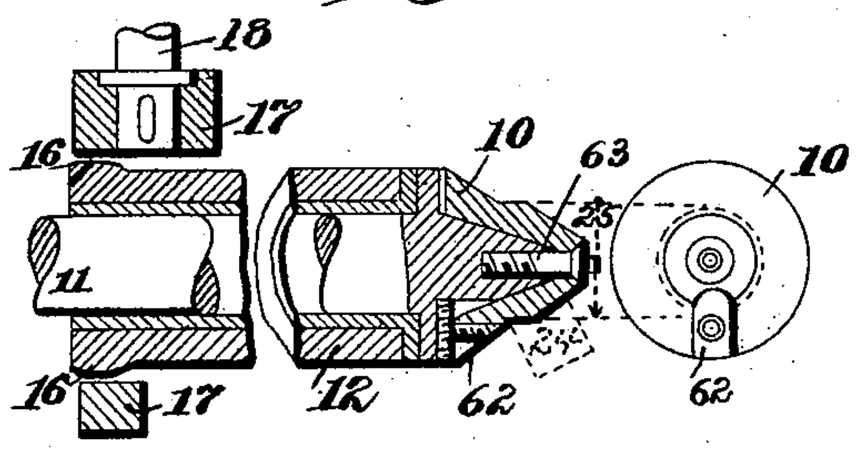
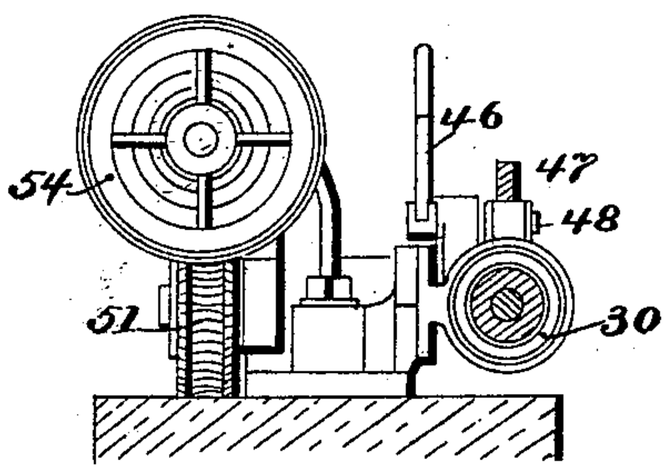


Fig. 4.

Fig. 5.



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ROLLING MILL FOR PRODUCING BARRELS FOR RIFLES OR GUNS.

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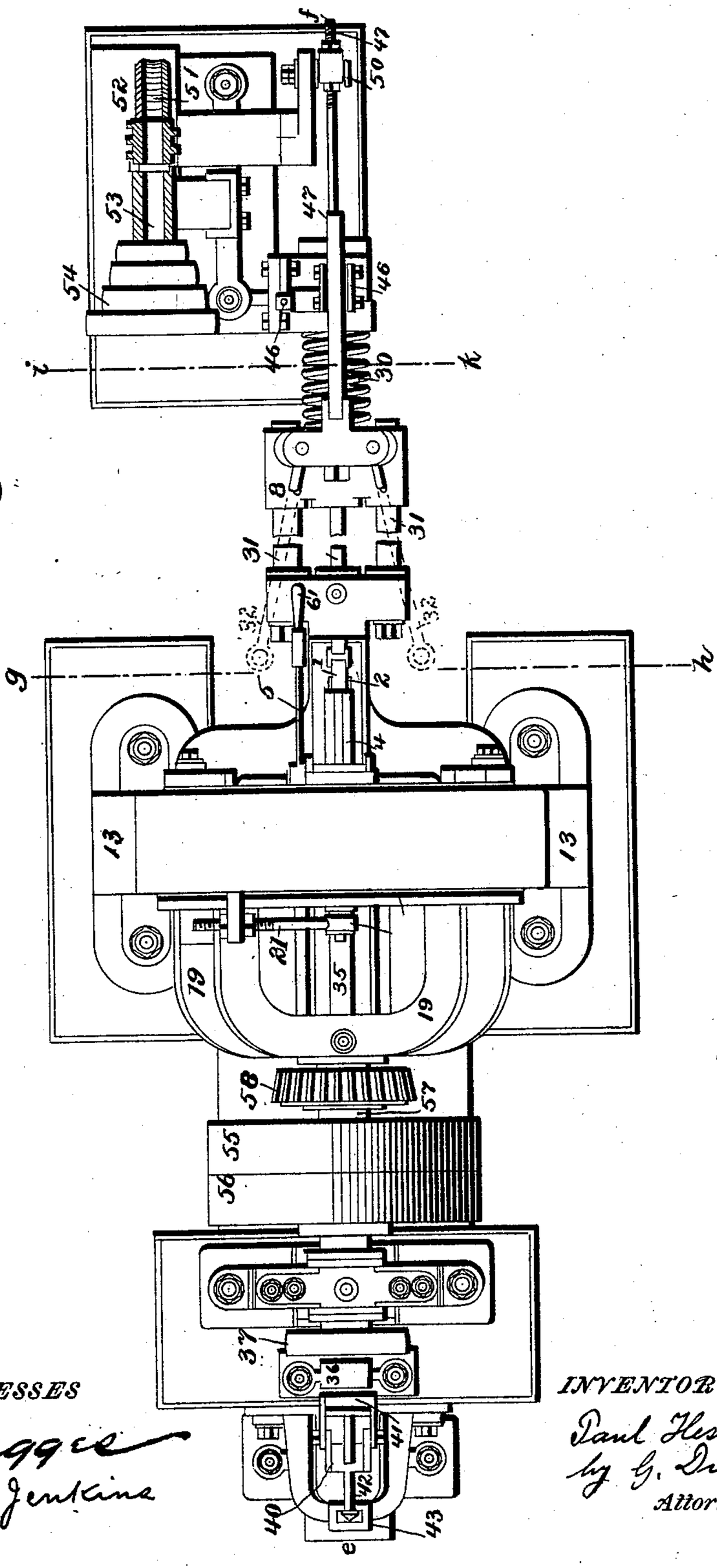
Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

PAUL HESSE, OF ISERLOHN, GERMANY.

ROLLING-MILL FOR PRODUCING BARRELS FOR RIFLES OR GUNS.

SPECIFICATION forming part of Letters Patent No. 582,471, dated May 11, 1897.

Application filed May 7, 1896. Serial No. 590,548. (No model.) Patented in France October 15, 1895, No. 251,112; in Belgium October 15, 1895, No. 117,884; in Austria November 15, 1895, No. 45/4,691; in Hungary November 23, 1895, No. 4,603, and in Italy April 28, 1896, No. 41,394/485.

To all whom it may concern:

Be it known that I, PAUL HESSE, a subject of the Emperor of Germany, residing at Iserlohn, Germany, have invented a new and useful Improvement in Mills for Rolling Rifle or Gun Barrels, which improvement is fully set forth in the following specification and accompanying drawings, and for which invention I have obtained patents in the following countries, as follows: France, No. 251,112, dated October 15, 1895; Belgium, No. 117,884, dated October 15, 1895; Austria, No. 45/4,691, dated November 15, 1895; Hungary, No. 4,603, dated November 23, 1895, and Italy, No. 41,394/485, dated April 28, 1896.

The present invention consists of a rolling-mill for producing the barrels of rifles and guns of all descriptions, as hereinafter set forth; and in order to render the present specification more easily intelligible reference is had to the accompanying drawings, in which similar figures of reference denote similar parts through the several views.

Figure 1 is a longitudinal section of the machine, taken along the line *e f* of Fig. 3; Fig. 2, a transverse section on the line *a b c d* of Fig. 1; Fig. 3, a plan of the machine; Fig. 4, a transverse section on the line *g h* of Fig. 3; Fig. 5, a transverse section on the line *i k* of Fig. 3, and Fig. 6 a section through the rolls on the line *l m* of Fig. 1.

The bar 1 from which the barrel is to be formed is placed in the guide 2 in a hot state. The cover 4 of the said guide or throat-piece 2, which is normally kept up by the spring 3, is then closed by the lever 5 and the latter retained by means of the spring-catch 6. Thus the bar 1 is properly inclosed on all sides, but is at the same time free to turn and to slide in the said inclosure. The pusher 9 is revolubly mounted in the cross-head 8 and adapted to move in the direction of the arrow 7 and pushes the bar 1 between the three rolls 10, which are mounted equidistant from each other around said bar. Each roll 10 is mounted on a driving-shaft 11, Fig. 6, supported in a sleeve 12. The sleeves 12 are supported at one end in the circular machine-frame 13 and are radially adjustable in the same and at the same time revolubly mounted on the pivots 14 and 15. At the opposite end the sleeves 12 are provided with exteriorly-rounded collars 16, mounted in rings 17, having stems 18, revolubly mounted in a common frame 19. The frame 19 is adjustable on the housing 13 by loosening the screws 20, Fig. 2, and turning the nuts on the screw-spindle 21, which is pivotally mounted on the frame 19 and engages in a lug of the housing 13, being adjustable thereon by means of suitable nuts. Thus the center lines of the rolls, normally crossing the geometrical axis of the machine, may be adjusted to pass to the right or to the left, so that the center lines of the rolls pass more or less aside of the geometrical axis or the main center line of the machine without intersecting with the same.

The rolls 10 rotate all in the same direction and will by means of their conical or hemispherical operative surface 24, Fig. 6, either tend to pull the bar 1 in between them if the center lines 22 of the rolls lie to the left of the main center line 23 of the machine or push the bar 1 outward if the center lines lie to the right of the main center line of the machine, the direction of rotation being the same. Thus it is possible to reverse the direction of motion of the metal bar under treatment without reversing the direction of rotation of the rolls. On the other hand, the direction of motion of the bar may be reversed by reversing the direction of rotation of the inclined rolls. As a rule, and particularly in the present case, the bar 1 is drawn in by the rolls 10 and rolled out to a diameter corresponding to the most approximate position of the working ends of the rolls. In this rolling process the said bar will be rotated at a speed higher than the speed of rotation of the rolls, the proportion of the speed variation being in the ratio of the diameter of the metal bar to that of the rolls. Thus if the diameter of the rolls is one hundred and fifty millimeters and that of the bar thirty millimeters the latter will be rotated five times as quickly as the rolls.

The diameter of the blanks for the small bore (eight millimeters) modern rifles is seventeen millimeters, and in order to bring the rolls 10 sufficiently close together to enable a bar of such diameter to be treated their di-

ameter at the operative surface 25 in Fig. 6 must not exceed one hundred and ten millimeters. The most advantageous form for the roll-heads is the semispherical form.

On the inner end of each roll are secured the heads, which are most advantageous in a semispherical form. These heads are secured at their rear so as to present an unbroken face to the metal by the wedges 62, while a screw 63 holds the head against the conical head of the shaft 11.

The radial adjustment of the rolls is effected by means of the hardened wedges 26. The ends of the roll-sleeves are pivoted at 14 in the cap 60, revolubly mounted on the supporting-pin 15, adapted to slide in the housing 13 and carrying at its end a roll 27, which is pressed against the wedge 26 by means of the spring 29. The rear of the wedge is supported against the roll 28, which is mounted to run between the points of two set-screws, Fig. 2, as is also the roll 27. As the bar is drawn into the rolls and reduced in the first place to seventeen millimeters diameter the rod 9 will advance simultaneously with the bar under the action of the spring 30, which pushes the cross-head 8 forward, said cross-head sliding on the guide-bars 31, Fig. 3. Thus the rod 9 and the bar 1 are kept in continual contact. The contact is of importance in order to produce an exact copy of the templet or wedge 26. Three connecting-rods 32 are pivoted to the cross-head 8 and connected at their opposite ends to double-arm levers 33, which support at their lower ends in a pivotal joint 34 the templet 26 by means of the screw-stem of the same. Thus when the bar 1 is pushed into the rolls the templets 26 will be withdrawn, and vice versa. These templets are shaped either at one or both of their operative surfaces to correspond to the form it is desired to give the bar under treatment. Thus if the rolls are moved together the diameter will be reduced, and vice versa. Thus by means of templets of varying form or by varying the position of the templets 26 the diameter of the metal under treatment may be varied at will in the most convenient manner. The metal bar passes through the roll and enters with its end into the sleeve 35, by which it is guided and retained in its proper straight position. The sleeve 35 is mounted on the hollow shaft 36 and rotated at a greater, less, or equal speed to that of the bar 1 by means of the pulley 37 or other suitable gearing. The lever 33 is extended downward at 38 and connected by means of the rod 39 to the lower end of a double-arm lever 40, mounted in suitable bearings and having its upper end attached by means of a fork to a collar 41 on the end of the hollow shaft 36, so that the latter is free to rotate. The rod 42 projects through the shaft 36 and has its rear end supported free to rotate in the head of a bracket-arm 43.

From the above it will be clear that by means of the lever system 38, 39, 40, and 41 the hollow shaft 36, and with it the sleeve 35, will be moved in exactly the same measure as the bar 1 passes the rolls. When the bar 1 has been properly rolled—*i. e.*, when it has entirely passed the rolls—it will be pushed out of the sleeves 35 by the end of the bar or rod 42, which can, if necessary, be pushed forward by hand. The bar 1 will then fall down under the machine, or may be caused to fall onto an inclined guide-plate and pass on for further treatment. In the meantime the rod 9 has been advanced close to the rolls 10, the distance of the said rod end from the rolls in its extreme position being regulated by the nuts 44 on the spindle 45.

To the cross-head 8 is pivoted a curved rod 47, having at its rear end a hook 48, which is longitudinally adjustable on the said rod, said hook being outwardly rounded off and adapted to engage over the crank-pin 50 of a crank 49, which is rotated by means of a worm-wheel 51 and worm 52, shaft 53, and a graduated pulley 54. The curved rod 47 may be raised and kept out of contact with the crank-pin 50 by means of a pivoted hand-lever 46, which engages under the said rod 47 by means of its pin, as will be clearly seen from Figs. 1 and 3.

As soon as the rolling process is finished this lever 46 is turned down, so that the hook 48 can engage with the pin 50 when it comes around. The crank-pin 50 is in about the opposite position to that shown in Fig. 1 when the bar 1 has been rolled, and in turning further engages under the hook 48 and pulls the cross-head back, compressing the spring 30.

The cross-head by means of the connections 32 throws the lever 33 to the right, thereby driving the templet-wedges 26 to the left, between the rolls 27 and 28, thus permitting the springs 29 to adjust the working rolls to their positions farthest apart preparatory for the placing of another bar in the guide 2. The spring-catch 6 is withdrawn from the arm 5 by the handle 61 and the next bar laid in the guide. In the meantime the crank-pin 50 has attained its rear position and commences to go forward, but very slowly, owing to the slow lineal movement of the said pin at this point of its revolution. The spring 30 will at this point exercise the most pressure on the bar 1, being highly compressed, so that the barrel will be slowly but powerfully pushed between the rolls at this part of its movement. The second bar, and so on, will now be rolled out in the manner previously described.

The crank-pin 50 should have a somewhat quicker motion than the speed at which the rolls are capable of drawing the bar 1 in between them. Consequently the pin 50 will disengage itself from the hook 48 at the beginning of its stroke, so that the latter may be raised by the lever 46 previous to its being again let down to engage the said pin to subsequently compress the spring 30, as described. The speed of the crank 49 can, if desired, be regulated to correspond to that of

the forward motion of the bar 1, so that the lever 46 would be unnecessary, which would save one manipulation in working the machine. The pin 50 is adjustably mounted in the crank 49.

The rolling-mill is driven by means of the fast and loose pulleys 55 and 56, mounted on the hollow shaft 57, carrying the bevel-wheel 58, which engages all the bevels 59 of the rolls 10. If the take-in capacity of the rolls—*i. e.*, the conicity of the operating-surface of the rolls—is reduced to such an extent as to be less than the speed of the bar through the rolls caused by the inclined position of the latter during one revolution of a roll, the metal (steel, bronze, or alloy,) will be very highly compressed, which is of particular importance in making rifle and gun barrels.

If the inclined position of each of the rolls 10 is varied with regard to the other rolls, so as to cause each roll to effect a varying transport of the bar, the fibers of the metal can be caused to take a great variety of positions and either to run parallel to or to cross each other.

The following means for treating the metal bar in a variety of ways may be employed in connection with the present machine:

First. The shape of the rolls.

Second. The inclined position of the rolls to the bar under treatment.

Third. The combination of the first two manipulations to attain a variety of results.

Fourth. One roll only may be inclined—*i. e.*, may serve as a transport-roll—while the other may be straight and run loosely with the first to form counter-pressure for the metal bar and smooth the same. Two of the rolls may be inclined, and, if desired, at different angles.

Fifth. If bars of very small diameter are to be treated, one or two of the rolls may have a larger diameter and one or two counter-pressure rolls of small diameter be employed. The said latter rolls may either be positively driven or run loosely with the ones driven. In the former case they will help to work the metal, in the latter they will merely smooth it.

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

1. In a rolling-mill for producing gun-barrels, a guide, a cover to said guide, a spring for the support thereof, a lever having a spring-catch, a casing inclosing the parts aforesaid, rolls mounted on shafts in said casing and means for adjusting said rolls both radially and revolubly all of said parts being combined substantially as described.

2. A rolling-mill for producing gun-barrels having a casing, radially and revolubly adjustable rolls in cases, means for suitably conducting the blank between said rolls, a pusher adapted to engage said blank and arms automatically connected with said pusher for extracting the barrels, said parts being combined substantially as described.

3. In a rolling-mill for producing gun-barrels, a casing, rolls mounted on shafts therein, and sleeves supporting said shafts and having at their outer ends exteriorly-mounted collars, a frame in said casing, stems on said collars revolubly mounted in said frame, a circular frame having a pivot suitably secured thereto and having the inner end of said rolls fastened thereto, means for suitably adjusting both frames, a guide in said casing, a pusher automatically engaging said guide all of said parts being combined substantially as and for the purposes described.

4. In a rolling-mill for producing gun-barrels, a casing having rolls mounted on shafts therein and means for adjusting the same both radially and revolubly, a cross-head having a pusher revolubly mounted therein, guides adapted to engage said pusher, a curved rod having at its rear end a longitudinally-adjustable hook, a worm, a worm-wheel having a crank provided with a crank-pin adapted to engage said hook and a pulley adapted to operate said worm and worm-wheel a lever for disengaging said hook and means connecting said casing and pusher, all of said parts being combined substantially as described.

5. In a rolling-mill having a casing, suitably-adjustable rolls mounted on shafts therein, a guide in said casing, a pusher adapted to engage said guide, a cross-head having said pusher revolubly mounted therein, an adjustable spring suitably secured and bearing against the rear of said cross-head, a curved arm secured to said cross-head at one end and having at its other end a hook, a worm, a worm-wheel having a crank provided with a crank-pin adapted to engage said hook, a pulley adapted to operate said worm, connecting-rods secured to said cross-head, levers engaging said connecting-rods, a hollow shaft, a sleeve mounted on said shaft, a rod snugly fitting in said hollow shaft, and a collar loosely mounted on said shaft and engaging aforesaid levers, all of said parts being combined substantially as described.

6. A rolling-mill having a casing, rolls radially and revolubly mounted on shafts therein, adjustable frames in said casing, means for securing said rolls to said frames, a cross-head means for operating the same, connecting-rods secured thereto double-arm levers secured to said connecting-rods, rolls 27 and 28, a wedge engaging the same, a screw-stem secured to said wedge and engaging said levers, a spring-actuated supporting-pin in said casing, a sleeve mounted on a hollow shaft, pulley-wheels suitably mounted on said sleeve, bevels on the aforesaid rolls, and a bevel-wheel engaging said pulleys and bevels, all of said parts being combined substantially as described.

7. A rolling-mill having rolls mounted on shafts therein, means for operating said shafts and adjusting said rolls both radially and revolubly, the inner end of each of said rolls being semispherically ground, wedges near

the end thereof and heads formed similarly to said roll ends and adapted to engage said wedges, a screw passing through said head and engaging said rolls, all of said parts being combined substantially as described.

8. A rolling-mill having a casing, radially and revolubly adjustable rolls having separate head-pieces suitably mounted therein, means for operating the same, a cross-head having a pusher adjustably connected therewith, means for operating said pusher, connecting-rods and levers secured at one end thereto, a hollow shaft having a rod therein, said rod engaging the other end of said levers, a sleeve mounted on said rod and pulleys mounted on said sleeve, all of said parts being combined substantially as described.

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

PAUL HESSE.

Witnesses:
SOPHIE NAGEL,
W. H. MADDEN.