M. PEDERSEN.

WHEEL CUTTING MACHINE.

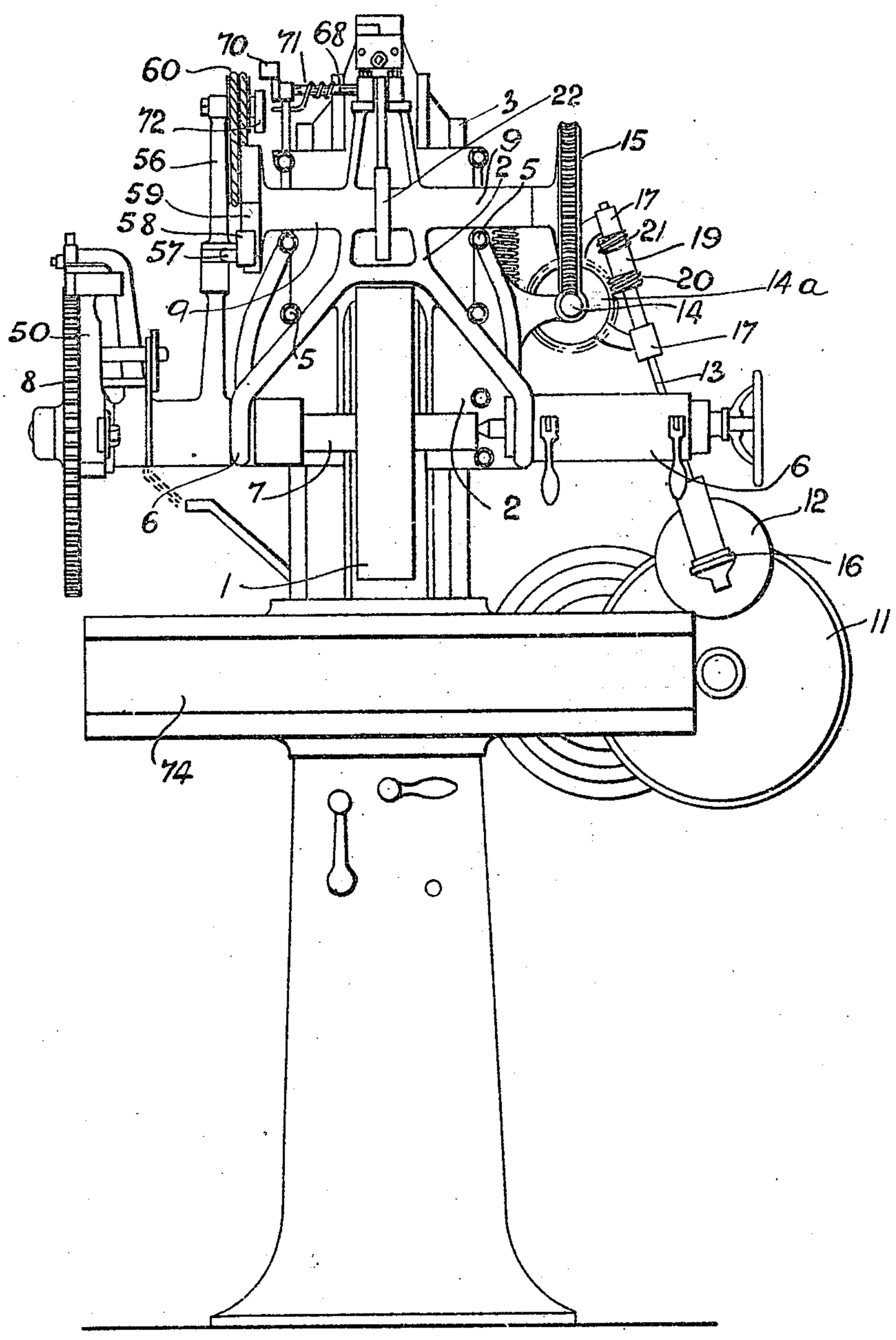
APPLICATION FILED MAR. 11, 1908.

959,588.

Patented May 31, 1910.

5 SHEETS—SHEET 1.

FIG. 1.



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5 SHEETS—SHEET 2.

FIG. 2.

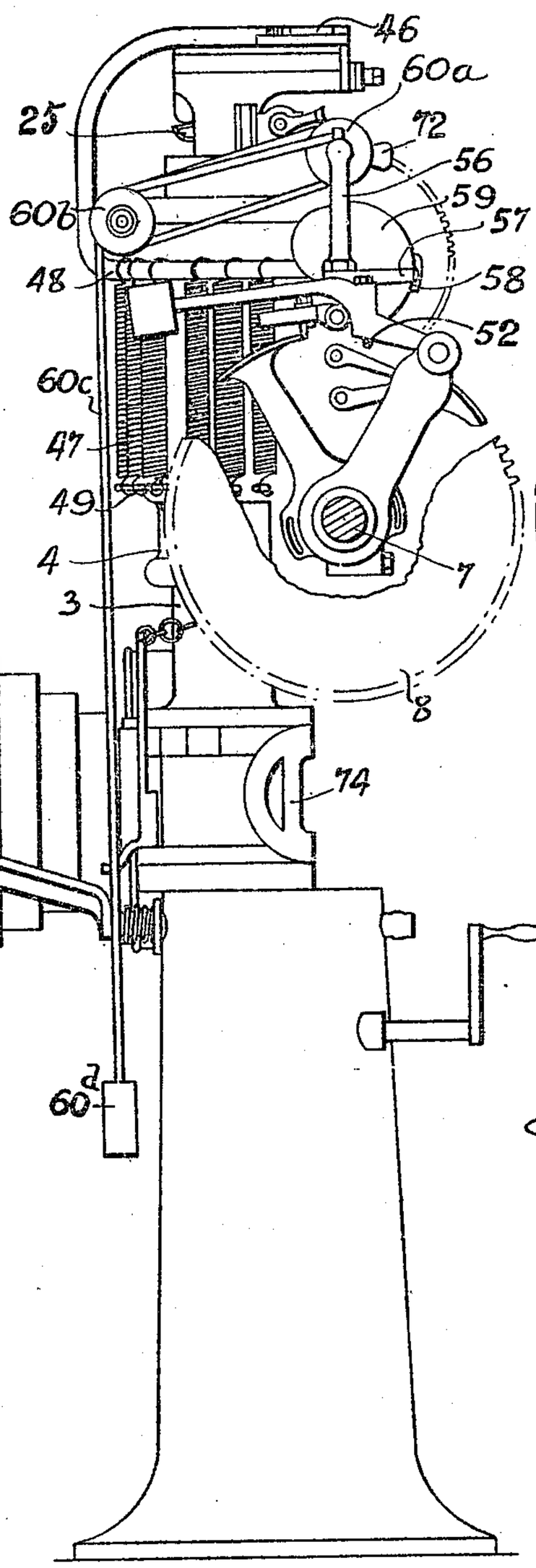
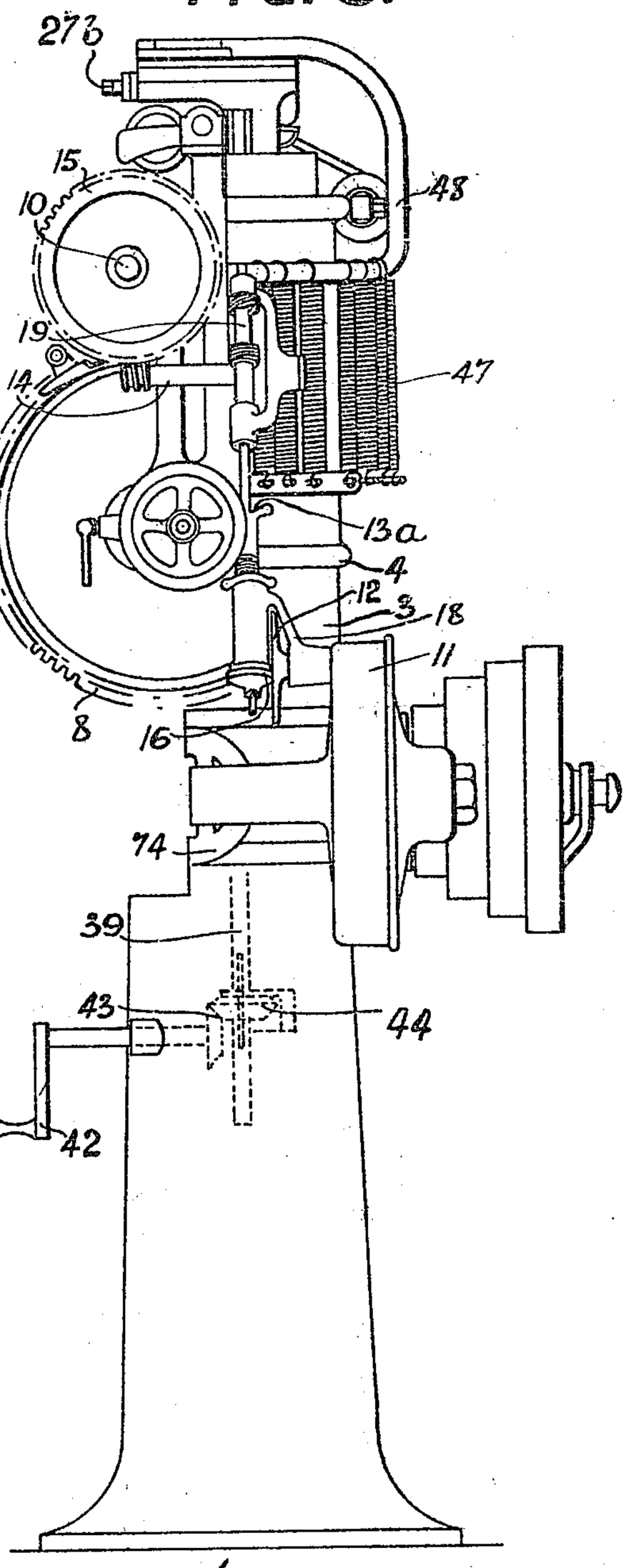


FIG. 3.



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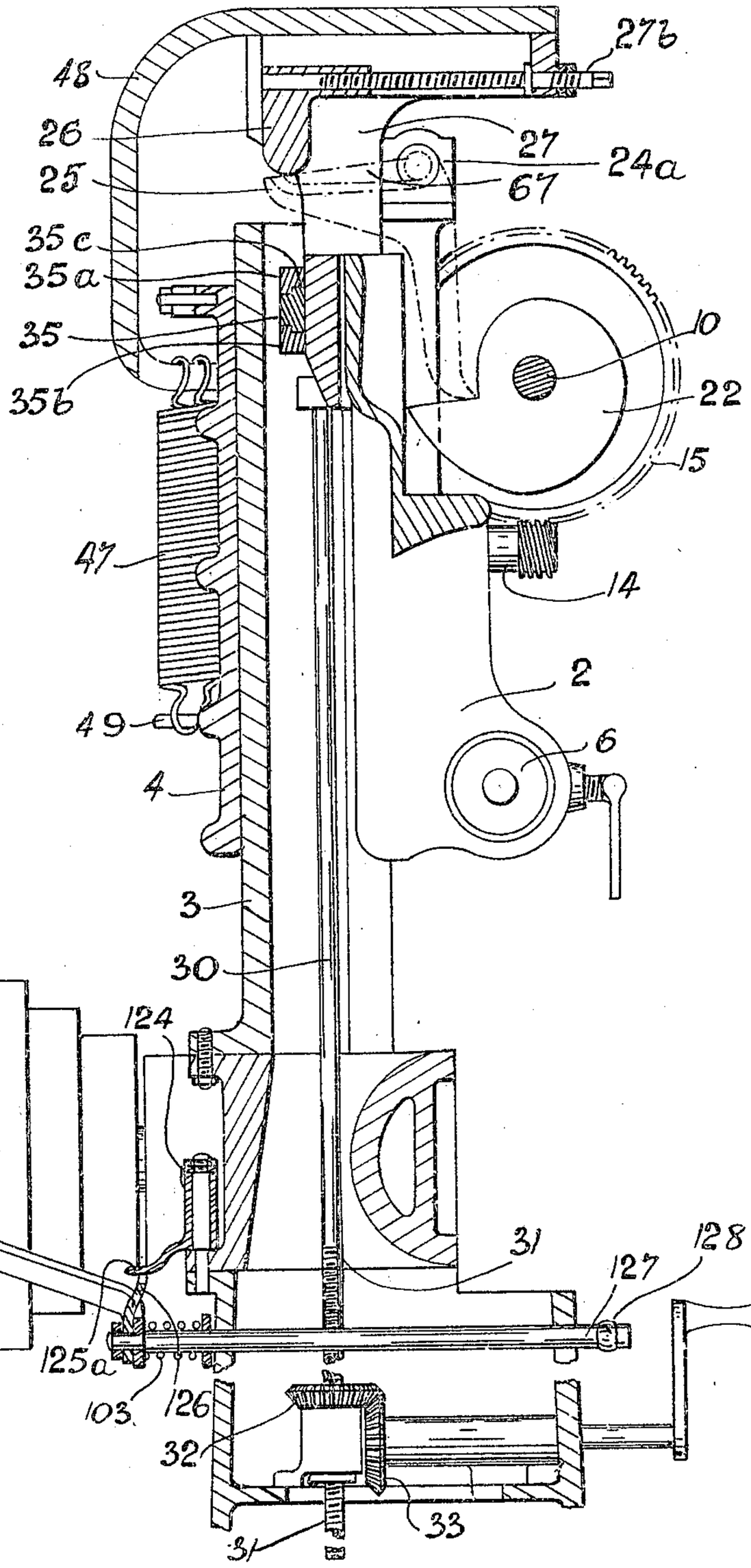
5 SHEETS—SHEET 3.

FIG. 4.



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5 SHEETS—SHEET 4.

FIG. 5.

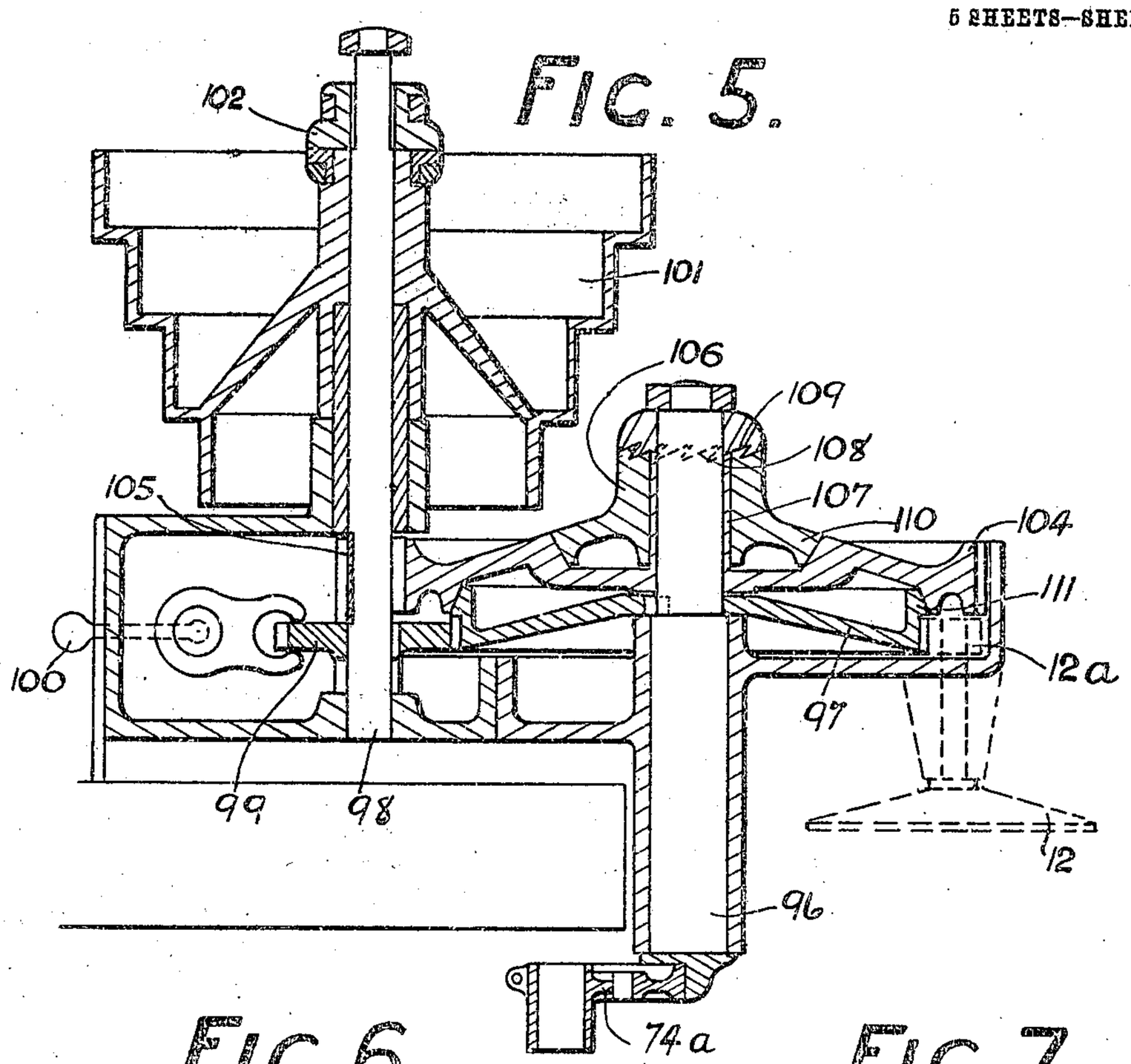


FIG. 6.

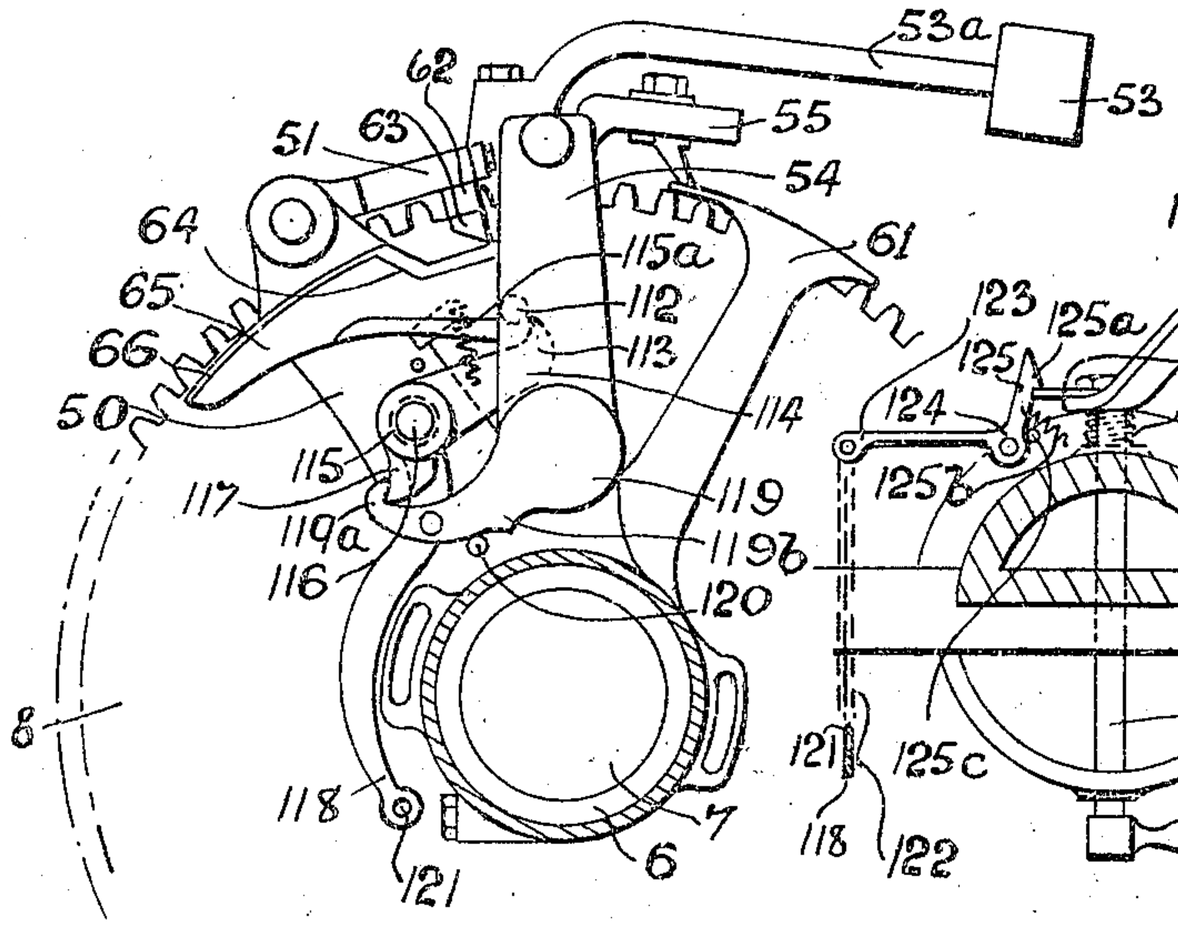
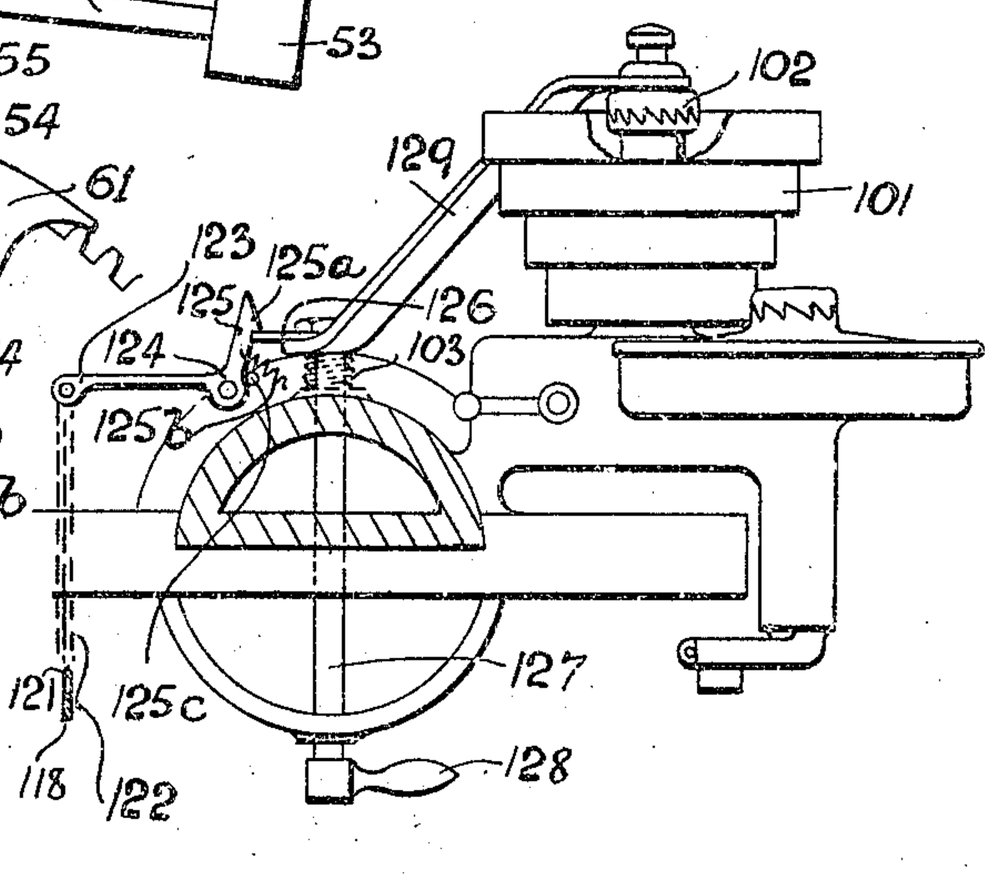


FIG. 7.



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APPLICATION FILED MAR. 11, 1908.

959,588.

Patented May 31, 1910.

5 SHEETS—SHEET 5.

FIG. 11.

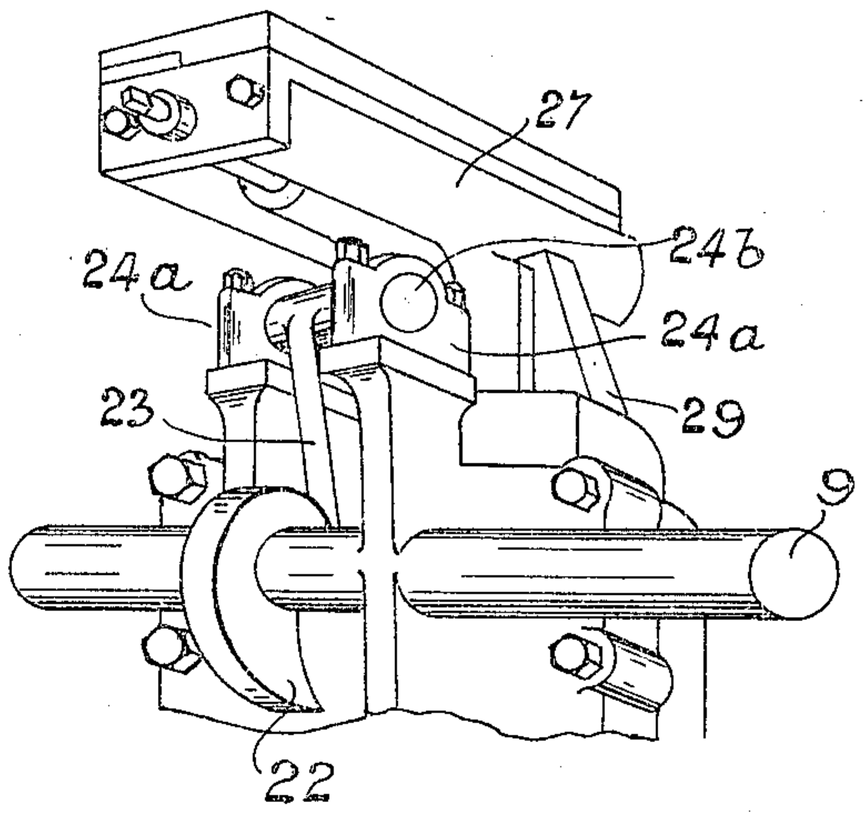


FIG. 10.

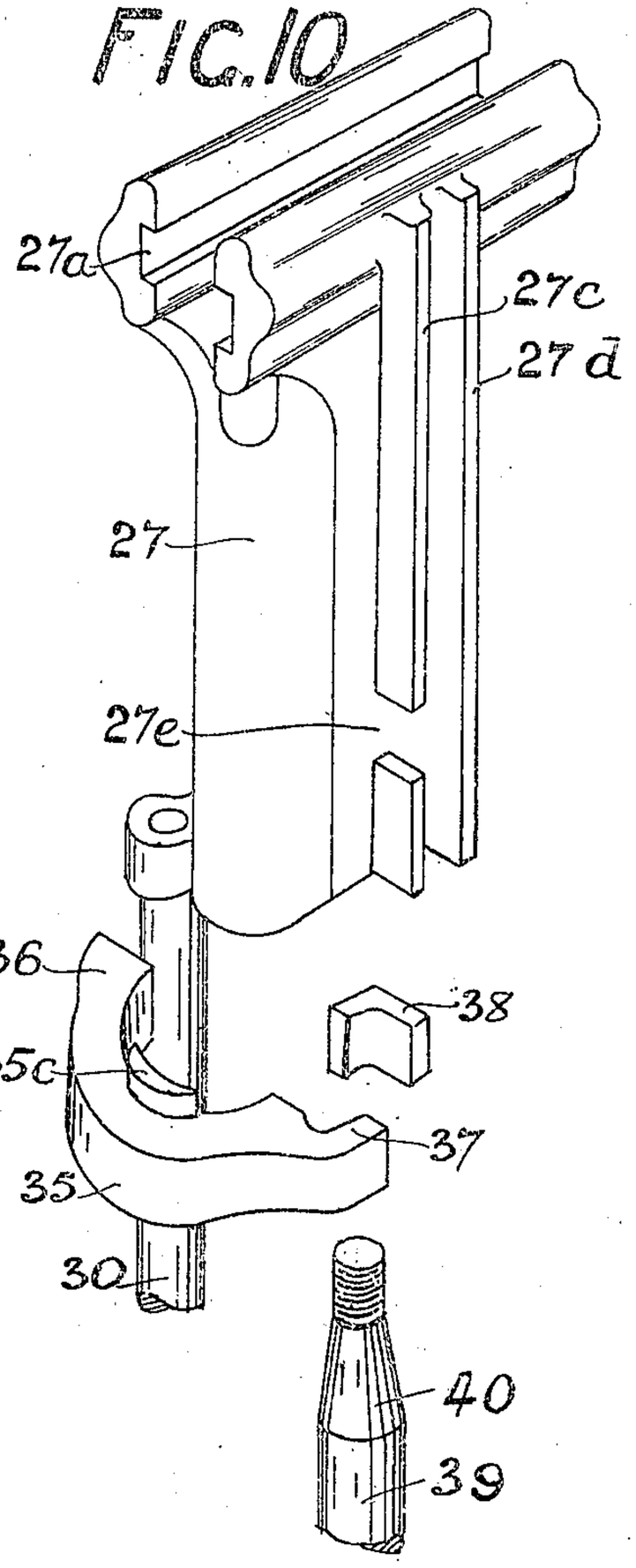


FIG. 9.

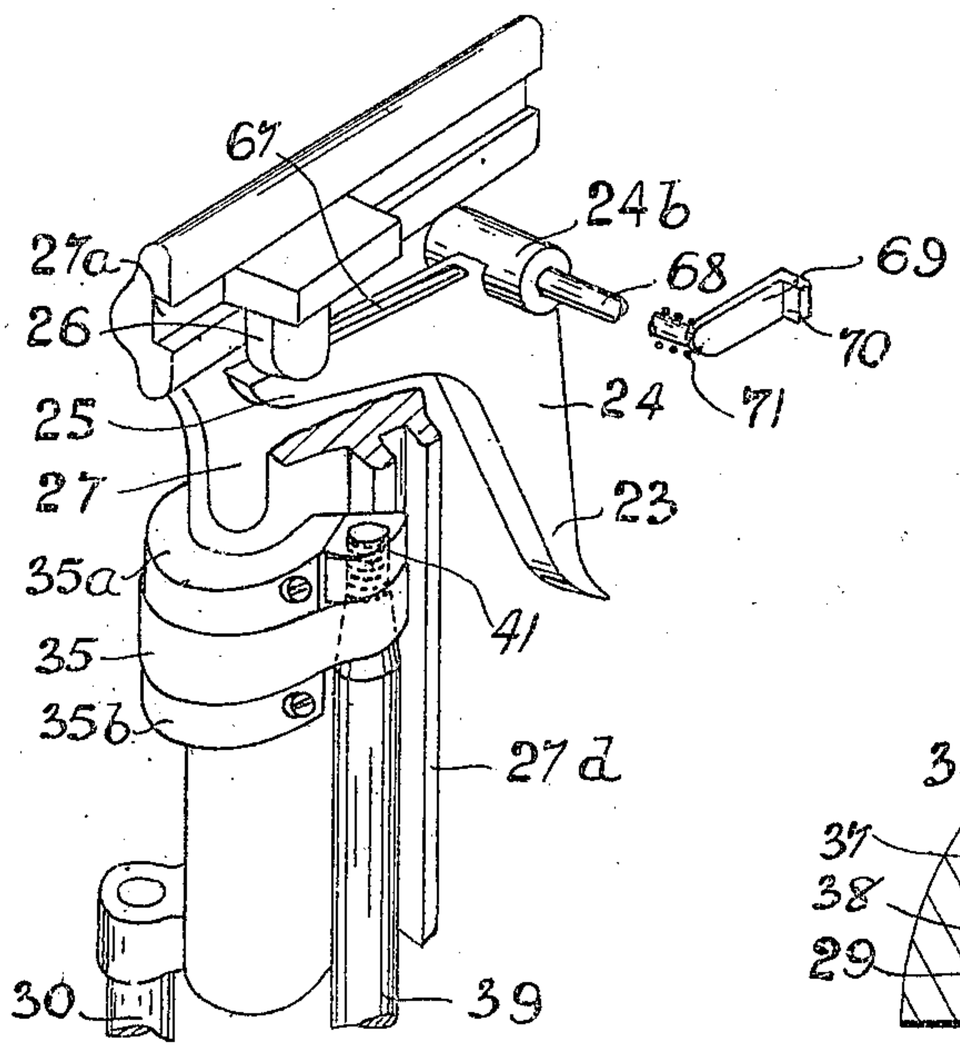
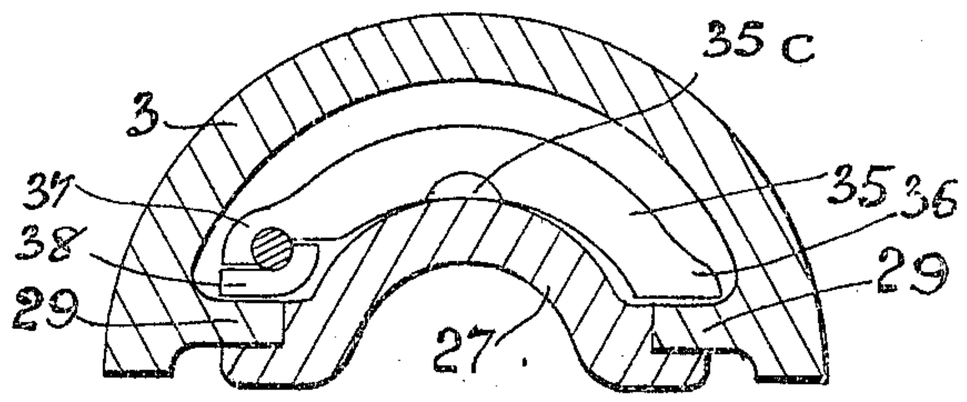


FIG. 8.



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UNITED STATES PATENT OFFICE.

MIKAEL PEDERSEN, OF DURSLEY, ENGLAND.

WHEEL-CUTTING MACHINE.

959,588. Specification of Letters Patent. Patented May 31, 1910.

Original application filed September 10, 1906, Serial No. 333,930. Divided and this application filed March 11, 1908. Serial No. 420,385.

To all whom it may concern:

Be it known that I, MIKAEL PEDERSEN, of Raglan House, Dursley, in the county of Gloucester, England, engineer, have invented certain new and useful Improvements in Wheel-Cutting Machines; and I hereby declare that the following is a full, clear, and exact description of the same, and that this application is a division or continuation of my application for Letters Patent of the United States for the same invention filed September 10, 1906, Serial No. 333,930.

This invention relates to improvements in machinery for cutting toothed wheels for gearing and the like, and has for its object to increase the working capacity of the machine consistent with simplification of the mechanism and accuracy of the work produced.

In order that this invention may be clearly understood and more easily carried into practice, I have appended hereunto five sheets of drawings upon which I have illustrated the nature of my said improvements.

Figure 1 is a front elevation of the machine with the blank in position for cutting. Fig. 2 is a side elevation of the machine illustrated in Fig. 1 parts being broken away to show hidden mechanism. Fig. 3 is an elevation of the opposite side of the machine to that illustrated in Fig. 2. Fig. 4 is an enlarged part vertical section through the machine corresponding to the elevation illustrated in Fig. 2. Fig. 5 is a sectional plan of the variable gearing mechanism which is preferably used in conjunction with the present machine. Fig. 6 is an inside elevation of the dividing wheel and mechanism hereinafter described, showing also a means for throwing the machine out of gear when the cutting of a wheel is complete. Fig. 7 is a sectional plan of the machine with parts removed showing the means whereby the driving pulley is automatically disconnected when the cutting of a wheel is completed. Fig. 8 is a horizontal section of the machine showing more particularly the means whereby the block slide is fixed in the required position the section being immediately above the hereinafter mentioned lever 35. Fig. 9 is a perspective view of the block slide showing the means for fixing same in position in accordance with the diameter of the blank under operation. The figure also shows the hereinafter described double lever and part of the safety attachment. Fig. 10 illustrates the block slide and affixing devices. Fig. 11 is a perspective view of the upper part of the machine with parts omitted.

In carrying this invention into effect the blank 1 to be cut is carried in a main slide or saddle 2 which is capable of movement in a vertical direction for the purposes of feed and regulation. The main bed or body 3 upon which the slide 2 travels is preferably of semi-cylindrical section and the main slide is so arranged that it takes its bearing, on the flat side in which position it is kept by a part 4 which fits the cylindrical side and is bolted to the front part 2 by bolts 5, the semi-cylindrical bed 3 leaving room for the blank 1 in its front hollow side. The main slide 2 carries the boss 6 or bearing for supporting the spindle 7 which holds the blank 1 by any suitable means and also carries the dividing wheel 8. The main slide 2 has also one or more bearings 9 for the automatic spindle 10 which latter may be driven by any convenient means such as a cam and ratchet arrangement but is preferably driven from the gear box 11 through the medium of worm gearing as illustrated in the drawings. In this arrangement the friction disk 12 is driven from the gear box 11 through the medium of the pinion 12^a which gears with the hereinafter mentioned spur wheel 97 shown in Fig. 5 and the motion is transmitted through the medium of shafts 13 and 14 to the worm wheel 15 which is mounted upon the automatic spindle 10. The friction transmission 16 allows of variation of the gear the shaft 13 being telescopic at 13^a while it is mounted on bearings 17, 18 which allows of the variation of angle which is necessary to provide for the vertical movement of the main slide 2. Further variation of the gear may be obtained by the provision of the longitudinally adjustable sleeve 19 which has the single thread worm 20 at one end for a slow drive and the faster driving worm 21 at the other. The one worm wheel 14^a has its teeth so designed as to be capable of adapting itself to either the single thread or the triple thread worm.

The mechanism for feeding the blank is shown particularly in Figs. 4, 9 and 11. The adjustable block slide 27 as fixed upon or within the main bed 3 of the machine and carries a horizontally sliding block 26 which

may be adjusted in grooves 27ª by a rotatable screw 27ᵇ which is incapable of longitudinal displacement. A cam 22 is fixed upon the automatic spindle 10, which cam engages with and actuates the one arm 23 of a double lever 24 which is pivoted in journals 24ª upon the slide 2 and the other arm 25 of which bears against the block 26. In operation the rotation of the cam 22 depresses the arm 23 of the lever 24 which action in conjunction with the fixed block 26 effects the downward displacement of the slide 2 through the medium of the pivot 24ᵇ of the lever 24, against the action of springs 47 which when the cam 22 has released the arm 23 of the double lever 24, draw the main slide 2 upward to its original position, thus giving a reciprocating motion in a vertical direction to the main slide 2. The block 26 is adjustable radially to the lever 24 so that although the throw of the cam 22 is always the same the amount of feed of the main slide 2 will be according to the position of the adjustable block 26. For the purpose of adjusting the block 26 in a vertical direction, which adjustment is necessary for the various diameters of blanks which may be cut, the block 26 is mounted on the block slide 27, the latter having longitudinal side ridges 27ᶜ 27ᵈ. The block slide 27 is slidable vertically in the main bed 3, which is provided with guide projections 29, Fig. 8 engaging in the slots between the side ridges 27ᶜ 27ᵈ. The adjustment is effected through the medium of the rod 30 which is attached to the one side of the block slide 27 by any suitable means and is screwed at 31 (see Fig. 4) in such a manner as to be vertically operable by the rotation of the bevel wheel 32 which is fixed as regards vertical movement and is only capable of rotation through the medium of the bevel wheel 33 which is adapted to be turned by the handle 34. Collars 35ª and 35ᵇ are fixed to the block slide 27 between which collars the lever 35 is pivoted the pivots 35ᶜ being formed integrally with the lever. Slots 27ᵉ are formed through the ridges 27ᶜ at points opposite the ends 36 and 37 of the double lever 35. The end 36 of the lever 35 is of such length as to extend into the slot 27ᵉ and nearly engage with the guide projection 29. The end 37 of the lever 35 is situated at some distance from the projection 29 and between it and the said projection in the slot 27ᵉ, is placed a clutch block 38. A rod 39, similar to the rod 30, is used, having a wedge shaped end 40 engaging between the clutch block 38 and the end 37 of the double lever 35. When the rod 39, the upper end of which is screw threaded, is revolved through the medium of the handle 42 Fig. 3 and bevel wheels 43 and 44, the upper part of the wedge shaped end 40 screws into the nut 41 which cannot rotate, forcing the clutch block 38 away from the lever end 37 whereby the clutch block 38 and the end 26 of the lever 35 are each forced against the projection 29, by which means the slide 27 is fixed in position relative to the main bed 3. The bevel wheel 44 is keyed to the rod 39 to allow of the vertical displacement of the latter during the adjustment of the block slide through the medium of the rod 30 operable by the second handle 34, the bevel wheel revolving with the rod 39 to impart a vertical movement to the wedge 40 by causing it to screw into the nut 41. The adjustable block 26 slides horizontally in guideways 27ª in the block slide 27 and is adjustable by the screw 27ᵇ aforesaid. A scale 46 showing the right place for the depth of teeth to be cut may be arranged either on the block slide as shown in Fig. 2 or on the adjusting block and any suitable locking arrangement such as a screw or screws may be provided to keep the block 26 in position. To retain the double lever 24 in continual contact with both cam 22 and block 26 one or more spiral springs 47 are connected to the main slide 2 by projections 49 and an attachment 48 which is screwed to the main bed or body 3 through the medium of the block slide 27, the springs thus expanding as the cam 22 feeds the main slide 2 and blank 1 toward the cutters and contracting when the cam 22 relieves the double lever 24 thus bringing the main slide back to the required position for starting a new tooth.

For the purpose of dividing up the blank and rotating it to the required extent when a new tooth is to be started the main spindle 7 as aforestated has fixed on its outer end the division wheel 8, the latter having its periphery toothed. An arm 50 (Fig. 6) projecting radially outward is fixed on the main boss 6 and has pivoted to its outer end a ratchet formed stopper 51 having on its underside near the end thereof, a projection 52 (shown in Fig. 2) which can engage the notches in the dividing wheel, in which position it is firmly held either by a weight 53 or spring. When a weight is used it is usually applied to an extension 53ª on the end of the stopper 51, projecting outward therefrom so that the weight acting in a downward direction will hold the said projection 52 in engagement with the notches in the dividing wheel. For automatically operating the dividing wheel 8 a lever 54 having a spring or weighted ratchet 55 on its outer end for pushing the dividing wheel 8 forward, is loosely mounted on or pivoted to the main boss 6. This lever 54 has fixed to it and projecting from the same center in such a manner as to be operative with it, another lever 56 (shown in Figs. 1 and 2) which has a projection 57 carrying a part 58 having a radial face which rests on a

cam 59 upon the automatic spindle 10, so that when the cam 59 releases the lever 56 the latter is drawn backward by a spring or weight and pulley arrangement 60, the movement operating the lever 54 and shifting the dividing wheel 8 through the medium of the ratchet 55. The weight and pulley arrangement 60 is particularly shown in Fig. 2 and comprises sheaves of pulleys 60^a, 60^b, respectively upon the lever 56 and slide 2, the rope 60^c being fastened at its one end to the lever 56 and having the weight 60^d at its other end such weight having for its purpose to draw the lever 56 toward the pulleys 60^b immediately upon its release.

In order to make the ratchet 55 (Fig. 6) shift the dividing wheel 8 to the required degree for a new tooth, a quadrant or shield 61 is provided upon the main boss 6 or fixed arm 50 concentric therewith, which is adjustable round the boss by hand, such shield or quadrant 61 projecting over a certain portion of the periphery of the driving wheel in such a manner as to cause the ratchet 55 to slide upon it for part of the stroke and only engage and shift the dividing wheel for the remainder of the stroke thereby providing the means whereby the required amount of teeth to be cut is regulated. To bring the projection 52 (shown in Fig. 2) on the stopper 51 out of the notch in the dividing-wheel 8 for the purpose of allowing of the shifting of the latter the stopper 52 carries a lifter 62 which is pivoted to the stopper crosswise to the main spindle 7. This lifter 62 has a beveled end 63 which is adapted to engage an inclined face 64 on a quadrant 65 which is carried by and operates with the lever 54 so that on engagement the inclined face 64 lifts the projection 52 on the stopper 51 out of the notch in the dividing wheel 8, the projection 63 of the lifter 62 sliding on the periphery of the quadrant 65 until the end of the stroke of the ratchet lever 56 is reached which is caused by the quadrant 65 allowing the projection 63 on the lifter 62 to fall over its end remote from the inclined face 64, the projection 52 on the stopper 51 holding the dividing wheel by remaining in the notch for the period of cutting the next tooth. The quadrant 65 has on its side near its periphery an inclined face 66 so that when it passes back by the action of the cam 59, through the medium of the levers 56 and 54, it engages the projection 63 on the pivoted lifter 62 and pushes it out of the way against the action of a spring, without lifting or bringing the projection 52 on the stopper 51 out of the notch, the projection 63 sliding against the inclined face 66 of the quadrant 65 and swinging back to its normal position in which it is ready to again lift the stopper.

A safety arrangement is preferably provided in connection with the dividing mechanism and has for its purpose to prevent the dividing wheel from being shifted unless the main slide has been brought completely back for the commencement of a new tooth by the action of the coiled springs 47, such safety arrangement consisting of a lever 67 which is concentric to the lever 24 (see Fig. 9) the arm 25 of which lever bears against the adjustable block 26. The lever 67 preferably projects from one end of a spindle 68 which extends outward through the pivot 24^b of the double lever 24 and has on its outer end a lever 69 preferably with an endwise projection or quadrant 70 which will engage an attachment upon the ratchet lever 56 (shown in Figs. 1 and 2) and prevent it from shifting in the direction for feeding the dividing wheel except when the main slide is up, the lever 67 being always in contact with the adjustable block 26 by the weight of the quadrant 70 or preferably by the action of the coiled spring 71. The attachment, upon the ratchet lever 56 (see Figs. 1 and 2) consists of a part 72 which is pivoted and supported normally in such a manner that it just misses engagement with the quadrant 70 when the slide 2 is raised to the required extent and it is so positioned that it stops the ratchet lever 56 and prevents the dividing wheel from being shifted if the slide 2 should fail to be brought back by the springs 47. The part 72 is so pivoted as to allow of its change of position by engagement with the quadrant 70 for the passage of the ratchet lever 56 on its return movement. If so desired the quadrant 70 may be formed in one with the double lever 24 upon an extension of its pivot 24^b, the arm 25 of the lever 24 being retained against the adjustable block 26 by an efficient spring.

The transverse bed 74 may have a reciprocating slide which is adapted to carry the cutting mechanism but as this forms no feature of the present invention its description is omitted from this specification. A suitable mechanism for effecting the cutting of the blank is described in the specification of my concurrent application Serial Number 333,930, but it is obvious that the present invention is not restricted to any particular form of cutting mechanism.

The gearing which is preferably used in connection with the present machine is of the type in which the power is transmitted for one of two gears through a concentric friction clutch actuated by a crown ratchet wheel and it is particularly illustrated by Fig. 5.

The crank 74^a or other device for operating the cutting mechanism is carried upon the spindle 96 to which the spur wheel 97 is fixed and it receives its motion from an adjacent shaft 98 through the medium of a pinion 99 which can be brought into and out

of engagement with the spur wheel 97 by a pivoted hand lever 100 or equivalent arrangement, necessary when changing the speed, the shaft 98 being driven by the cone of belt pulleys 101 which are mounted loosely and may be locked to the shaft 98 by a sliding ratchet clutch 102 which is keyed to the shaft 98, and is kept in engagement in the manner hereinafter described. A lower gear is provided for, and in this case the spindle 96 receives its motion through the medium of a larger spur wheel 104 which is driven from a smaller pinion 105 fixed to the shaft 98, when the pinion 99 is out of engagement with the spur wheel 97, the power being transmitted from the spur wheel 104 to the spindle 96 through the medium of a clutch 106 which is mounted upon an extension or sleeve 107 upon the said spur wheel 104. The clutch 106 has ratchet teeth 108 at its outer end which bear against similar teeth upon the sleeve 109 which is fixed to the spindle 96, the wedging so produced causing the spur wheel 104 to be locked between the friction faces 110, 111 and thereby locked to the shaft. In the high speed the spur wheel 97 rotates with the spindle 96 and clutch 106 at a greater speed than the spur wheel 104 the latter running free in this case by which arrangement no wedging action takes place the friction faces 110, 111 being in loose contact.

For engaging and disengaging the sliding clutch 102 with the driving belt pulley 101, a longitudinally sliding rod 127 is provided and mounted in bearings in the body of the machine to be operated by a handle 128 (see Figs. 4 and 7). A suitable coupling part or arm 129 is provided upon the rod 127 and so connected to the clutch 102 that it permits of the rotation of the latter but provides for its displacement by the longitudinal movement of the hand operated rod 127 for the purpose of connecting and disconnecting the clutch and driving belt pulley. A coiled spring 103 is provided upon the rod 127 intermediate to the projection 129 and the body of the machine to normally retain the clutch 102 out of engagement and such clutch 102 is held in engagement against the action of the spring 103 during the working of the machine by a ratchet hook 125^a upon the one arm 125 of a double lever 124, such hook engaging with a suitable projection 126 which is mounted upon the rod 127 and may be formed in one with the aforementioned coupling part or projection 129. The double lever 124 is suitably pivoted upon the body of the machine and a coiled or other spring 125^b is provided and adapted to normally retain it in the required position against a stop 125^c, whereby the starting of the machine may be effected by bringing the projection 126 into engagement with the ratchet hook 125^a through the medium of the handle 128.

For the purpose of automatically stopping the machine when the cutting of the last tooth of a wheel has been completed means are provided whereby the clutch 102 is disconnected from the belt pulley 101 by the dividing wheel 8 when it has traveled once around and this is preferably effected by providing a stud or projection 112 in the required position upon the dividing wheel (see Fig. 6) such stud 112 being adapted to make a complete circuit during the cutting of the wheel. On the completion of the cutting of the last tooth the shifting of the dividing wheel 8 causes the stud 112 to engage with the hook or projection 113 upon the one arm 114 of a double lever 115 which is pivoted upon the aforementioned fixed arm 50 of the machine at 116, its passage thereby pressing the arm 114 downward out of the way against the action of a spring 115^a. A second lever 118 is mounted upon the same pivot 116 as the lever 115 and such lever 118 carries a weighted pivoted catch or connection 119 which is provided with a ratchet hook 119^a and so arranged that it is engaged by the other arm 117 of the double lever 115 whereby the latter is coupled with and caused to actuate the lever 118. A stud or projection 120 is provided and mounted upon the fixed arm 50 and so positioned that it normally supports the weighted catch 119, and a projection or cam part 119^b is provided upon the catch 119 in such a manner that it is ultimately engaged by the stud or projection 120 when the lever 118 is actuated and displaced to the required extent, with the resultant release of the hook engagement between the arm 117 of the lever 115 and the catch 119. The lever 118 is displaced to the required extent for its hereinafter described purpose before it is disconnected from the lever 115 by the projection 120, the object of the weighted catch 119 being to insure the immediate release of the lever 118 after it has been operated. The arm 117 of the lever 115 may itself be arranged to form the lever 118. The end 121 of the lever 118 is connected by means of a chain 122 or the like to the other arm 123 of the aforementioned double lever 124 whereby, by the displacement of the lever 118, the clutch 102 is released, and the provision of the catch 119 insures the immediate return of the levers 118 and 124 to their normal positions by the spring 125^b, the lever 124 being then in the required position for restarting.

Having now described my invention, I declare that what I claim is—

1. In a wheel cutting machine a main bed, a block slide adjustably mounted thereon, an adjustable block mounted on the block slide, a main slide reciprocally movable upon the main bed, tension springs connecting the main slide and block slide, a double lever

pivoted on the main slide and having one of its arms engaging the adjustable block on the block slide, a cam mounted on the main slide and bearing against the other arm of the double lever, and driving mechanism for the cam.

2. In a wheel cutting machine, a main bed, a block slide adjustably mounted thereon, an adjustable block mounted on the block side, a main slide of semi-cylindrical cross section reciprocally movable upon the main bed, a double lever pivoted on the main slide and having one of its arms engaging the adjustable block on the block slide, a cam mounted on the main slide and bearing against the other arm of the double lever, a variable driving gear for the cam, and tension springs connecting the main slide and block slide.

3. In a wheel cutting machine, a main bed, a block slide adjustably mounted thereon, an adjustable block mounted on the block slide, a main slide reciprocally movable upon the main bed, a double lever pivoted on the main slide and having one of its arms engaging the adjustable block on the block slide, a cam mounted on the main slide and bearing against the other arm of the double lever, driving mechanism for the cam, springs connecting the main slide and the block slide, and manually operable means for raising and lowering the block slide.

4. In a wheel cutting machine, a main bed, a block slide adjustably mounted thereon, an adjustable block mounted on the block slide, a main slide reciprocally movable upon the main bed, a double lever pivoted on the main slide and having one of its arms engaging the adjustable block on the block slide, a cam mounted on the main slide and bearing against the other arm of the double lever, driving mechanism for the cam, tension springs connecting the main slide and block slide, manually operable means for raising and lowering the block slide, and manually operable means for locking the block slide in any desired position.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

MIKAEL PEDERSEN.

Witnesses:
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EILER MELLEREY.