

No. 670,837.

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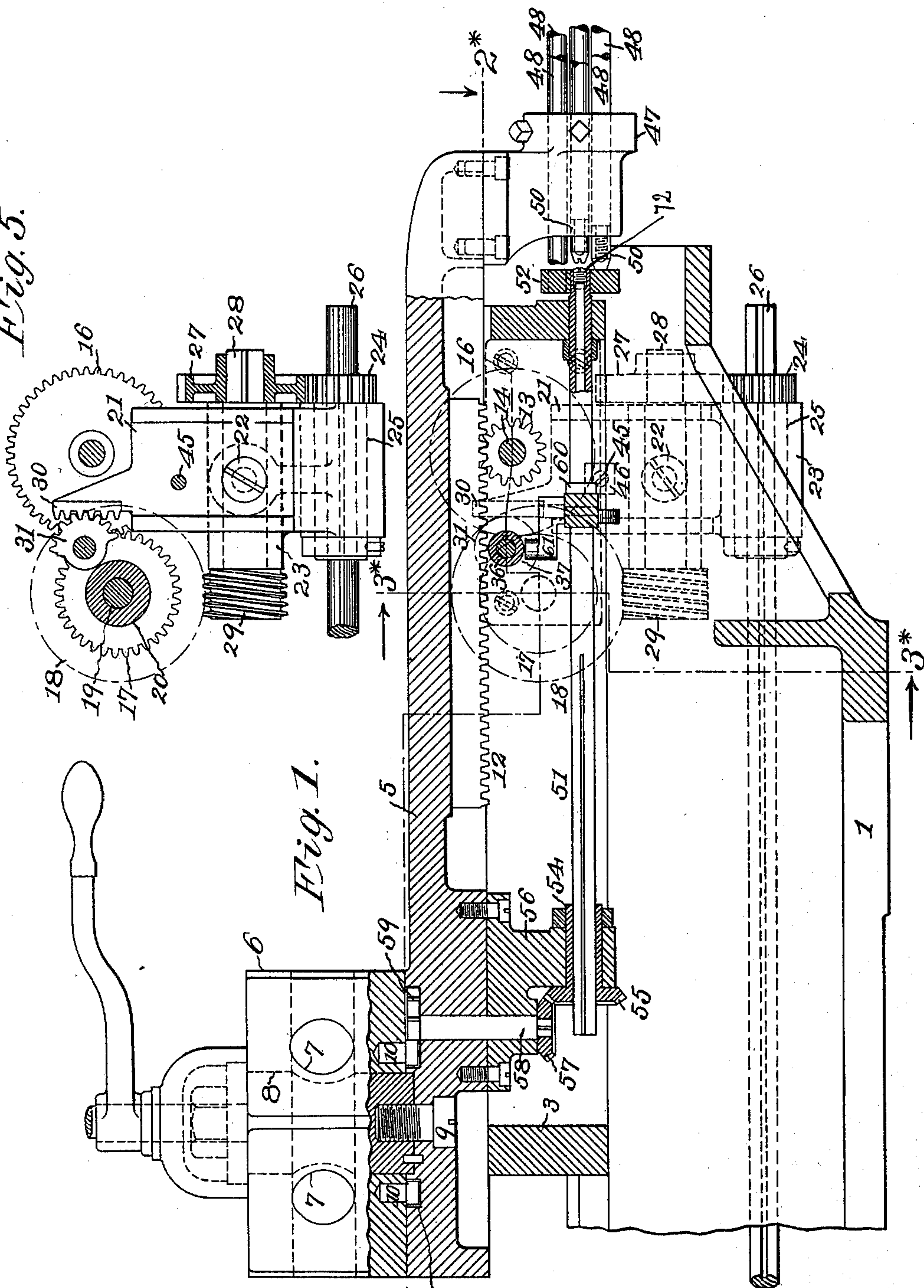
D. B. BULLARD.
TURRET LATHE.

(No Model.)

(Application filed May 10, 1898.)

3 Sheets—Sheet 1.

Fig. 5.



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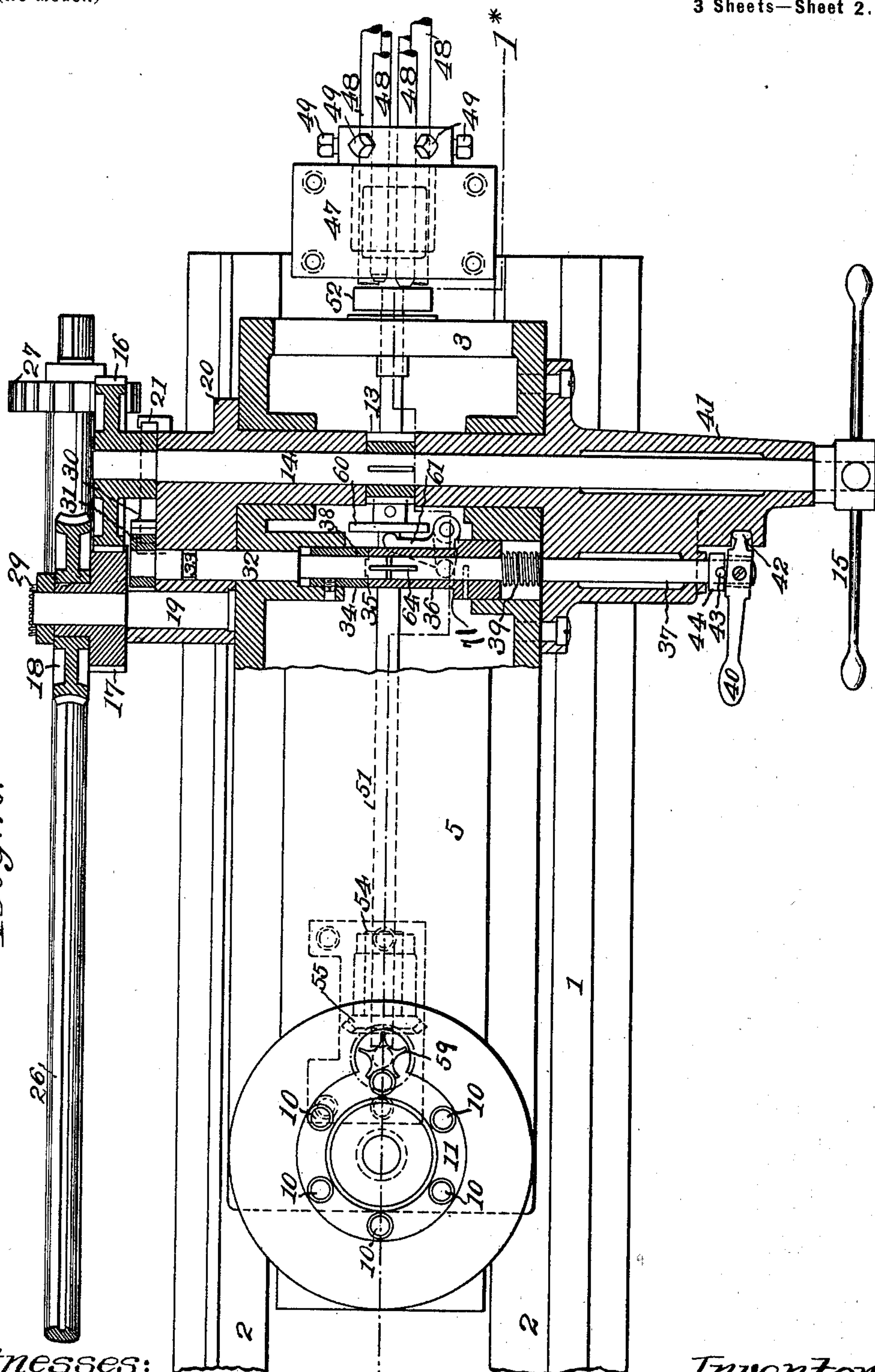
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Fig. 2.



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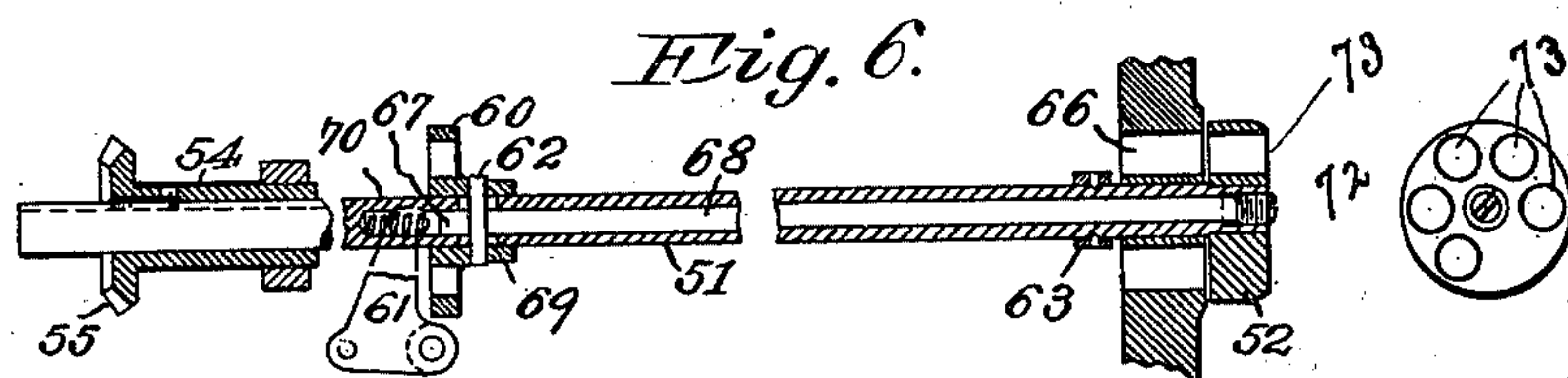
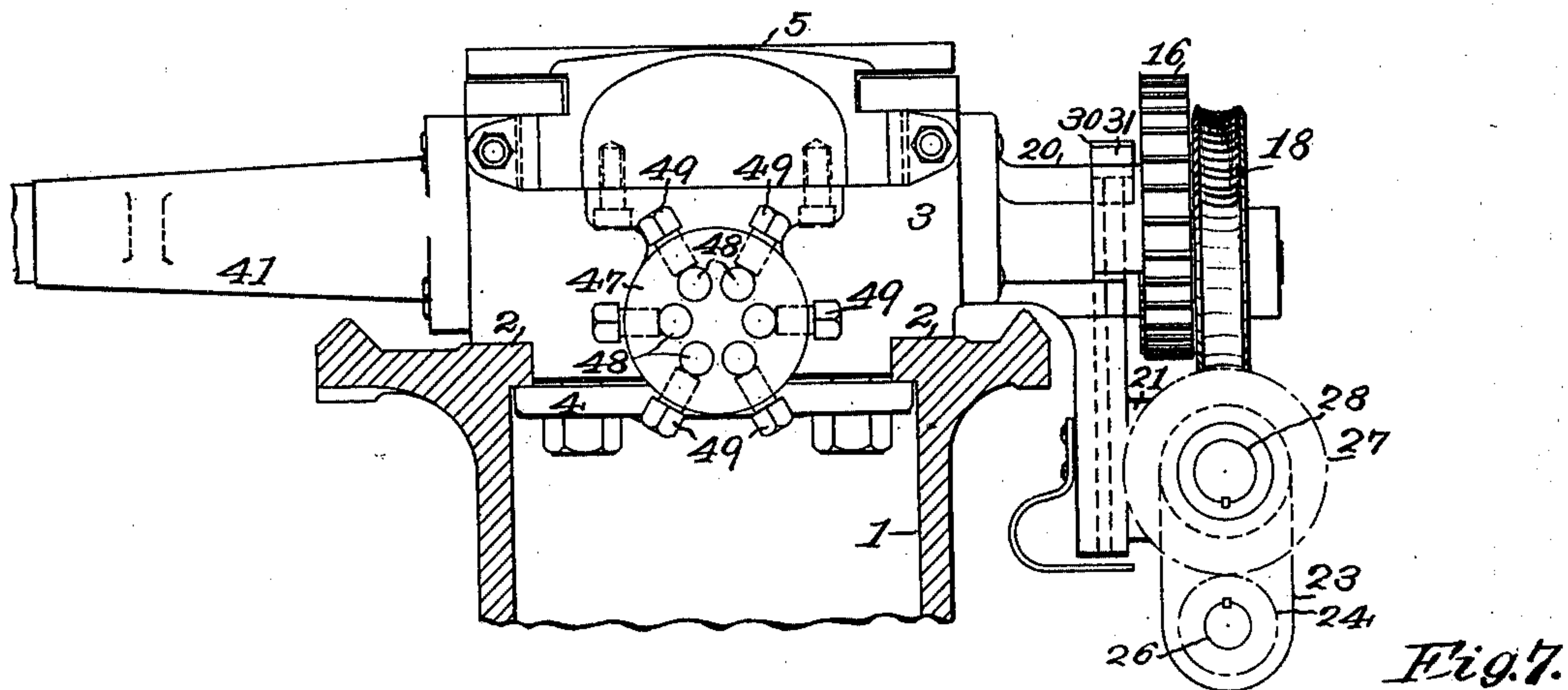
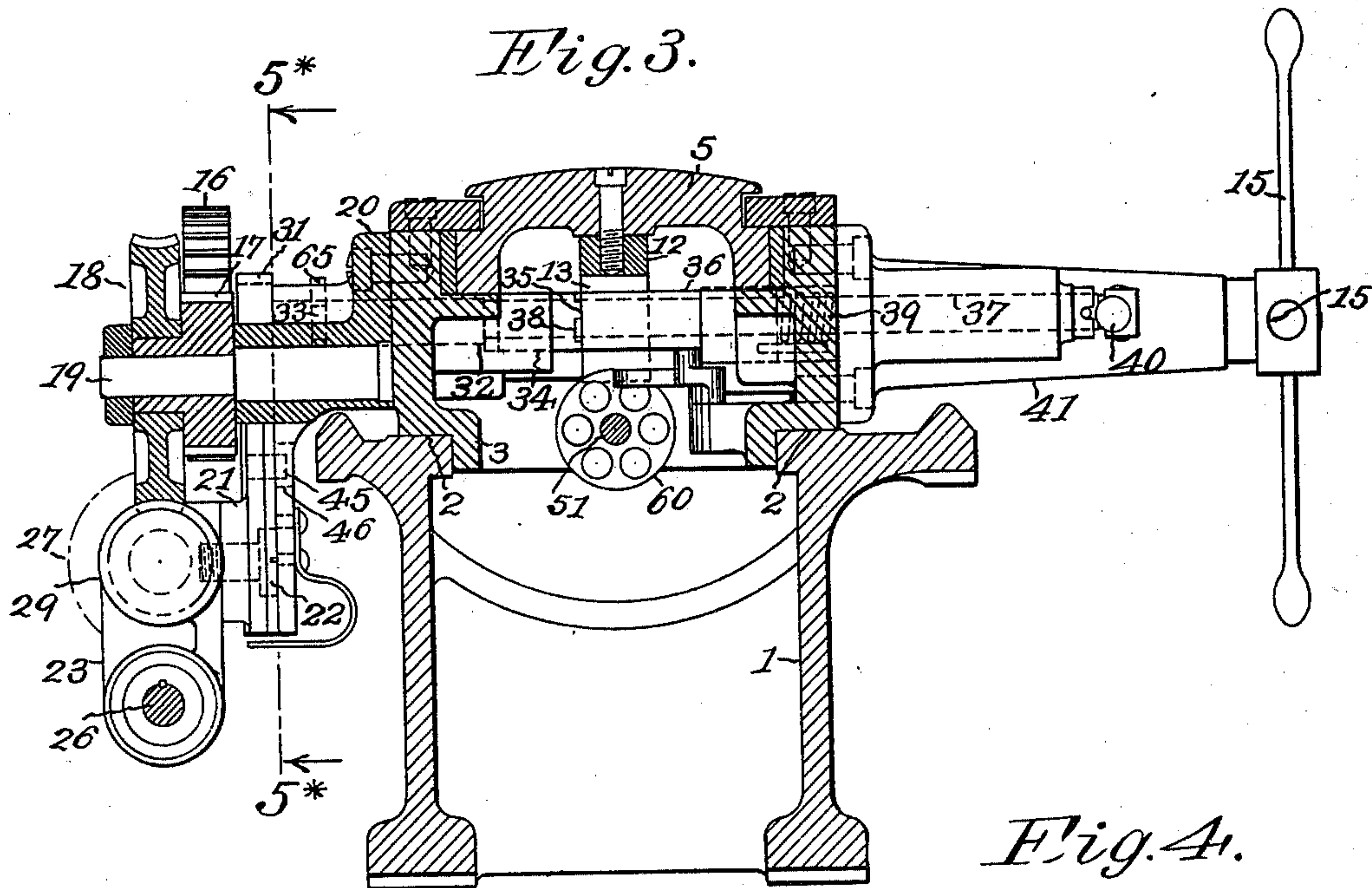
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UNITED STATES PATENT OFFICE.

DUDLEY B. BULLARD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO THE
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TURRET-LATHE.

SPECIFICATION forming part of Letters Patent No. 670,837, dated March 26, 1901.

Application filed May 10, 1898. Serial No. 680,268. (No model.)

To all whom it may concern:

Be it known that I, DUDLEY B. BULLARD, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Turret-Lathes, of which the following is a specification.

This invention relates particularly to trip and stop mechanisms for hand and power fed turret-lathes; and the object of the invention is to provide a mechanism that will automatically determine and limit the forward stroke of each tool of the turret, and thereby permit each tool to have an independent stroke.

In the drawings accompanying and forming a part of this specification, Figure 1 is a vertical section on the line 1 1, Fig. 2, of a bed, base, turret-slide, and turret of a turret-machine fitted with my trip and stop mechanism. Fig. 2 is a plan and sectional view of the same parts as seen from above the line 2 2, Fig. 1. Fig. 3 is a transverse section through the bed, base, and slide as seen from the left of the line 3 3, Fig. 1. Fig. 4 is a rear end view of the base and slide with the turret left off. Fig. 5 is a view of the feed mechanism for the turret-slide as seen from the right of the line 5 5, Fig. 3. Fig. 6 is a detail sectional plan view of the revolving trip-rod journaled in the base. Fig. 7 is an end view of the same, showing the holes in the block on the trip-rod.

Similar reference-numbers designate like parts in all the figures of the drawings.

1 is the bed of the machine, which supports upon its left-hand end (not shown) a suitable head-stock and chuck and such other parts as are essential in a complete turret-lathe. Upon the right-hand end of the bed are flat ways 2, supporting a movable base 3, which may be clamped at any desired position by suitable straps 4, Fig. 4. Upon the base is mounted a turret-slide 5, having upon its forward end a revoluble hexagonal turret 6, provided with tool-holding apertures 7. Said turret is adapted to revolve upon a stud 8, recessed in the slide and clamped thereto by the screw 9. On the bottom of the turret are pins 10, corresponding in number to the tool-holding apertures of the turret and projecting downward into an annular recess 11 of

the turret-slide. The method of locking the turret rigidly to the slide while a tool is cutting and of unlocking and revolving it for the purpose of throwing a new tool into working position is fully shown and described in my concurrent application, Serial No. 680,269, filed May 10, 1898.

The turret-slide may be moved forward or backward on its base by means of a hand-wheel 15 on the end of a transverse shaft 14, journaled in the base, which carries a pinion 13, meshing with a rack 12, fastened on the lower side of the slide, or it may be fed forward automatically by means of power transmitted to the transverse shaft through the following-described train of gears, supported by a bracket 20 in the rear of the base.

26 is a splined shaft extending along the rear side of the bed, suitably connected by belting or gearing to the revolving spindle of the head-stock, which shaft travels through and imparts its motion to the gear 24, journaled by means of its sleeve 25 in a swivel-bracket 23. Meshing with gear 24 is a gear 27, keyed to a short worm-shaft 28, journaled in said swivel-bracket. The worm 29 engages a worm-wheel 18, pressed fast upon the sleeve of a pinion 17, revolving upon a stationary stud 19 in the bracket 20. Said pinion meshes with a gear 16, which is keyed to and transmits its power through the transverse pinion-shaft 14, operating the turret-slide.

The bracket 23, supporting the main driving-shaft and worm, is swiveled by means of a screw 22 to a slide 21, adapted to be moved vertically in bracket 20. By raising or lowering this slide the worm and worm-gear are connected or disconnected and the power-feed thrown on or off. The slide is raised and locked in the position shown in the drawings by the following means: Passing transversely through the bed is a two-part shaft 32 and 37, carrying on its rear end a segmental pinion 31, meshing with a rack 30 cut in the slide, and on its forward end a swiveled handle 40, fulcrumed in a vertical slot 42 cut in the sleeve-bracket 41. The shafts are rotatably connected together by means of their joint key 64 and a splined sleeve-clutch 36, which is pinned fast to the rod 37 and is adapted to slide lengthwise upon the rod 32. Said

clutch, forced forward by a coiled spring 39, has a series of teeth cut upon its rim 38, adapted to engage the teeth 35 of a corresponding non-revoluble clutch 34, pinned fast to the base, and to thereby lock the rod 32 and its segmental pinion 31, supporting the slide in working position against revolving.

By revolving the handle 40 in a horizontal plane about its fulcrum 42 the clutch 36 is withdrawn from the locking-clutch 34 and the slide supporting the worm in working contact with the worm-gear is permitted to drop until the pin 45 of the slide rests on the bottom of the slot 46 in the bracket 20. To re-connect the worm and worm-gear, the slide is raised by revolving the handle 40 in a vertical plane on the axis of the rod 37 until the clutch 36 is rotated sufficiently far for its teeth to engage the teeth of the non-revolving clutch 34, when the spring 39 will automatically force and lock the clutches together. When the power-feed is not required, the clutches may be locked apart by revolving a knurled ring 43 on the rod 37 sufficiently far to cause a pin 43, fastened in the rod and shown recessed in a groove of the ring, to rest upon its edge. For the purpose of throwing the feed out automatically, the clutch 36 is provided with a shoulder 71, against which rests one arm of a bell-crank 61, swiveled upon a lug of the bed, the other arm of which is operated by a mechanism which is one form of embodiment of my invention and which I will now describe.

On the rear end of the turret-slide is a bracket 47, which carries a circular series of bars 48, corresponding in number to the tool-holding apertures in the turret, which may be adjusted lengthwise therein and firmly clamped by the set-screws 49. For the purpose of more delicate adjustment the bars are fitted with screw-caps 50. The rear end of the base is perforated with a series of holes 66, corresponding in number to and in line with the bars and of sufficient diameter to admit of their passage. Journaled in the base in the center of said series of holes and adapted to move a limited distance lengthwise is a revoluble trip-shaft 51, the left-hand end of which is keyed to and adapted to slide through a bevel-gear revolubly mounted in a bracket 56, suspended from the turret-slide. Keyed to its right-hand end, which projects through the base, is a block 52, perforated with the same number of holes 73, less one, as there are holes in the base, and within the base, in contact with one arm of the bell-crank 61, is keyed a disk 60, perforated with the same number of holes as the base. This shaft is indirectly geared to and revolved by the turret by means of a short shaft 58, journaled perpendicularly in the turret-slide, which has keyed to its upper end a star-wheel 59, recessed in the upper surface of the slide, with its arms projecting into the annular groove 11, and thus in the line of travel of the turret-pins 10, and which has

keyed to its lower end a bevel-gear 57, meshing with the bevel-gear 55 in the bracket 56. The gearing is so proportioned that a complete revolution of the turret causes a complete revolution of the trip-shaft. The best method of uniting the turret and trip-shaft revolubly will depend in each case upon the construction of the surrounding parts, and I do not intend by the foregoing description to limit my invention to the particular means illustrated. When the slide is traveling forward, the holes of the block 52, the disk 60, and base 3 are in perfect alinement with each other, and the adjustable bars 48, with one exception, enter and project into the base. The excepted bar impinges upon the non-perforated part of the block 52 and forces the trip-shaft 51 forward until the disk 60, striking upon one arm of the bell-crank 61, revolves it sufficiently far for its other arm to release the clutches 34 36 and throw out the power-feed.

To prevent the block 52 from striking the base before the power-feed is released, and thereby binding and breaking the feed-gearing, the distance between the left-hand faces of the disks 60 and the block 52 can be adjusted in the following manner, as shown fully in Fig. 6: The disk 60 is fastened non-rotatably to the trip-shaft by a pin 62, which passes through a slot 69, cut lengthwise therein and of same width as the diameter of the pin. A two-part rod 68 67, separated by the disk-pin 62, is inserted in the trip-shaft between a spring 70 and screw 72. By turning the screw in the proper direction the disk and the block may be separated or brought together.

The operation of the trip and stop mechanism is as follows: The tools are first arranged serially in the turret in the order in which they are to be used. Then the adjustable bars 48 of the slide are so clamped that the relative projection of each serially, beginning with the bar opposite the non-perforated section of the block, will correspond to the length of travel required of each turret-tool serially. The operator then throws in the power-feed by means of the clutch-handle 40 and the turret travels forward. When the turret-tool has all but traveled its predetermined distance, the bar 48 at the end of the slide corresponding to that tool impinges upon the block 52 of the trip-rod, all bars projecting beyond the operative bar having passed through the perforations of the block 52, the disk 60, and the base. The movement of the turret-slide is imparted by the impinging bar to the trip-shaft, which thereupon travels forward with the slide and causes the bell-crank 61, by means of the disk 60, to revolve and unlock the clutches 34 36 and to thus release the power-feed. The operator completes the remainder of the tool's stroke by pressing on the hand-wheel 15 until the block 52 strikes the base. By reversing the revolution of the hand-wheel the turret-slide

is caused to travel backward until the cutting-tool is released from its work and the stop-bars withdrawn from the perforations of the block 52. The turret is then unlocked and a new tool revolved into position by hand or automatically by the mechanism shown and described in my concurrent application, Serial No. 680,269, filed May 10, 1898. As the turret revolves the pins 10, projecting from its lower surface, strike the arms of the star-wheel 59 and cause the trip-shaft 51 to revolve a corresponding part of a revolution and to bring the non-perforated part of the disk 52 opposite the bar corresponding to the new tool thrown into working position. The turret is then relocked, the worm 29 again brought into mesh with the worm-gear 18, and the forward travel of the new tool continued until the worm is automatically released by the impingement of the bar corresponding to the cutting-tool upon the block of the trip-rod, as previously described.

In the drawings and foregoing description the block 52 is shown and described as automatically revolved by the turret. While automatic means for revolving the block are preferable, they are not at all necessary. My invention will perform its function as a trip and stop mechanism if the connections between the trip-shaft and turret—viz., the star-wheel 59, the shaft 58, and the bevel-gears 57 55—are wholly discarded, provided the trip-shaft is journaled directly in the bracket 56 and the block 52 is revolved by hand as each new turret-tool is thrown into working position.

My invention may also be applied to hand-fed lathes and used simply as a stop mechanism by discarding the disk 60 and revolving the block 52, either automatically, as shown, or by hand, the aforesaid star-wheel and bevel-gear being discarded.

Having thus described my invention, what I claim is—

1. In a turret-machine in combination, a base, a slide movable longitudinally on the base, a turret revolubly mounted on and movable with said slide, a non-revoluble series of bars adjustably supported by the slide, and a rotatable block adapted to be moved into position to oppose the travel of either bar of said series, substantially as specified.

2. In a turret-machine in combination, a base, a slide movable longitudinally thereon, a turret revolubly mounted on and movable with the slide, a non-revoluble series of bars adjustably supported by the slide, a rotatable shaft journaled in the base, a block secured to the outer end of the shaft and adapted to be moved into the path of either bar of the series, and means connecting the shaft with the turret whereby the shaft is rotated as the turret is revolved, substantially as specified.

3. In a turret-machine in combination, a base, a slide movable longitudinally thereon, a turret revolubly mounted on and movable with said slide, a non-revoluble series of bars

adjustably supported by the slide, a shaft journaled in the base, a connection between the shaft and the turret whereby the shaft is rotated by the rotation of the turret, and a perforated block mounted on the end of the shaft and arranged to successively oppose the forward passage of each bar of the series as the slide moves forward, substantially as specified.

4. In a turret-machine in combination, a base, a slide movable upon the base and having an annular recess, a turret revolubly mounted on the slide, pins projecting from the turret into the annular recess, a series of bars adjustably supported by the slide, a shaft journaled in the base and adapted to be moved therein longitudinally, a shaft journaled in the slide, a star-wheel attached to the upper end of the slide-shaft and arranged to be engaged by pins projecting from the turret, gearing between the slide-shaft and the base-shaft, and a perforated block fastened to the outer end of the base-shaft, said block having a less number of holes than there are stop-bars supported by the slide, substantially as specified.

5. In a turret-machine in combination, a base, a slide movable on the base, a turret mounted on the slide, a non-revoluble series of bars adjustably supported by the slide, a revoluble block, susceptible of longitudinal movement, mounted in the base in line with said bars, a feed mechanism for moving the slide, and means connecting the revoluble block with the feed mechanism whereby the feed mechanism is thrown out of action by a slight longitudinal movement of the block arising from the impingement of one of the bars upon said block, substantially as specified.

6. In a turret-machine in combination, a base, a slide movable on the base, a turret mounted on the slide, a non-revoluble series of bars adjustably supported by the slide, a revoluble trip-shaft mounted in the base and susceptible of a limited longitudinal movement therein, a perforated block mounted on the trip-shaft in line with said bars, a feed mechanism for moving the slide, and means connecting the shaft bearing the block with the feed mechanism, whereby the feed mechanism is thrown out of action by a slight longitudinal movement of the shaft imparted by the engagement of one of the bars with the block, substantially as specified.

7. In a turret-machine in combination, a base, a slide movable on the base, a turret mounted on the slide, a non-revoluble series of bars adjustably supported by the slide, a block susceptible of longitudinal movement revolubly mounted in the base-line with, and adapted to be revolved into position to oppose the passage of, either one of said bars, a connection between the block and the turret whereby the block is rotated as the turret is revolved, a feed mechanism for moving the slide, and means connecting the revoluble

block with the feed mechanism whereby the feed mechanism is thrown out of action by a slight longitudinal movement of the block arising from the impingement of one of the bars upon said block, substantially as specified.

8. In a turret-machine in combination, a base, a slide having a turret revolvably mounted thereon and bars adjustably supported thereby, a trip-shaft with a perforated block in line with said bars and journaled lengthwise in the base so as to have a longitudinal movement, means connecting said shaft to and causing it to revolve with the turret, and a feed mechanism for moving the slide adapted to be thrown out of action by the longitudinal movement of the trip-shaft, which is caused by the impingement of one of said bars upon the face of said block substantially as specified.

9. In a turret-machine in combination, a base, a slide having an annular recess, a revoluble turret mounted on the slide, pins projecting from the lower surface of the turret into the recess, a series of bars adjustably supported by the slide, a shaft journaled in the base and adapted to be moved lengthwise, a shaft journaled in the slide with a star-wheel secured to its upper end in position to be engaged by the projecting pins of the turret, and a bevel-gear secured to its lower end and adapted to mesh with a bevel-gear keyed to the shaft journaled in the base, a block attached to the outer end of the shaft journaled in the base, said block being perforated with one less hole than there are tool-holding apertures in the turret, and adapted to be so revolved by the turret that a non-perforated part will be successively brought opposite each bar of the series, and a power-feed mechanism designed to be thrown out of action by

the longitudinal movement imparted to the trip-shaft as one of the bars impinges against the surface of the block, substantially as specified.

10. In a turret-machine in combination, a base, a trip-shaft susceptible of a slight longitudinal movement journaled in the base, a slide movable longitudinally on the base, a revoluble turret mounted on the slide, and connecting means that so unite the turret in all its various longitudinal positions relative to the trip-shaft that a revolution of the turret produces an equal rotation of the trip-shaft, substantially as specified.

11. In a turret-machine in combination, a slide, a shaft journaled in said slide, a star-wheel secured to one end of said shaft, a bevel-gear secured to the other end of said shaft, a turret mounted on the slide, means connected with the turret for rotating the star-wheel, a shaft located below the slide, a sleeve keyed upon said shaft, and a bevel-gear attached to the sleeve and adapted to mesh with the gear upon the end of the star-wheel shaft, substantially as specified.

12. In a turret-machine in combination, a slide, a turret revolvably mounted on the slide, a non-revoluble series of bars adjustably supported by the slide, a revoluble shaft susceptible of longitudinal movement journaled in the slide in line with the center of the series of bars, a block on the end of the shaft, and connecting means between the turret and the shaft whereby the block is revolved with the turret and successively brought opposite each bar of the series, substantially as specified.

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