March 4, 1930. B. P. GRAVES 1,749,073

INTERLOCKING MANUAL AND POWER FEED CONTROL

Filed Aug. 20, 1928 5 Sheets-Sheet 1

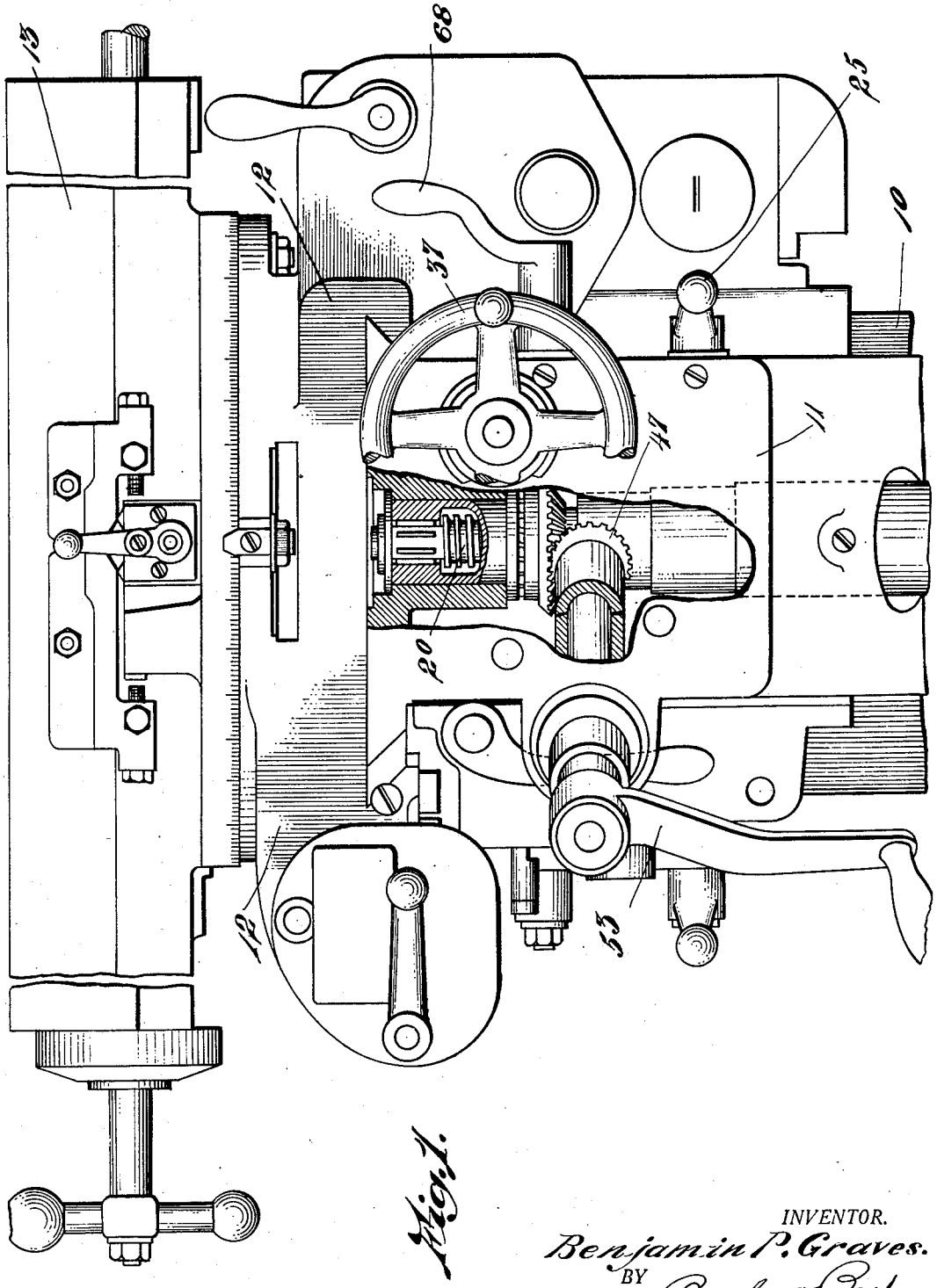

Fig. 1.

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Fig. 2.

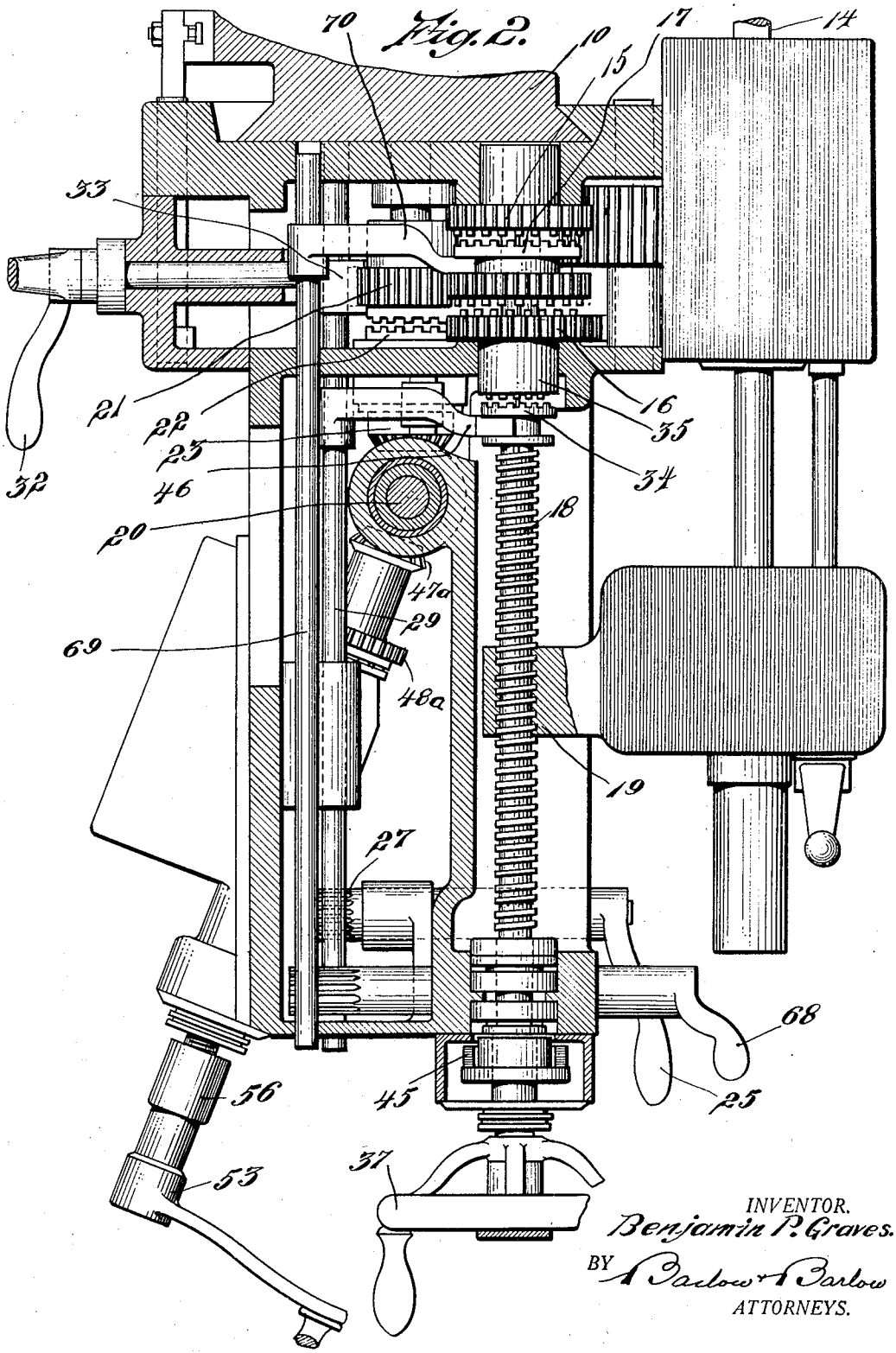

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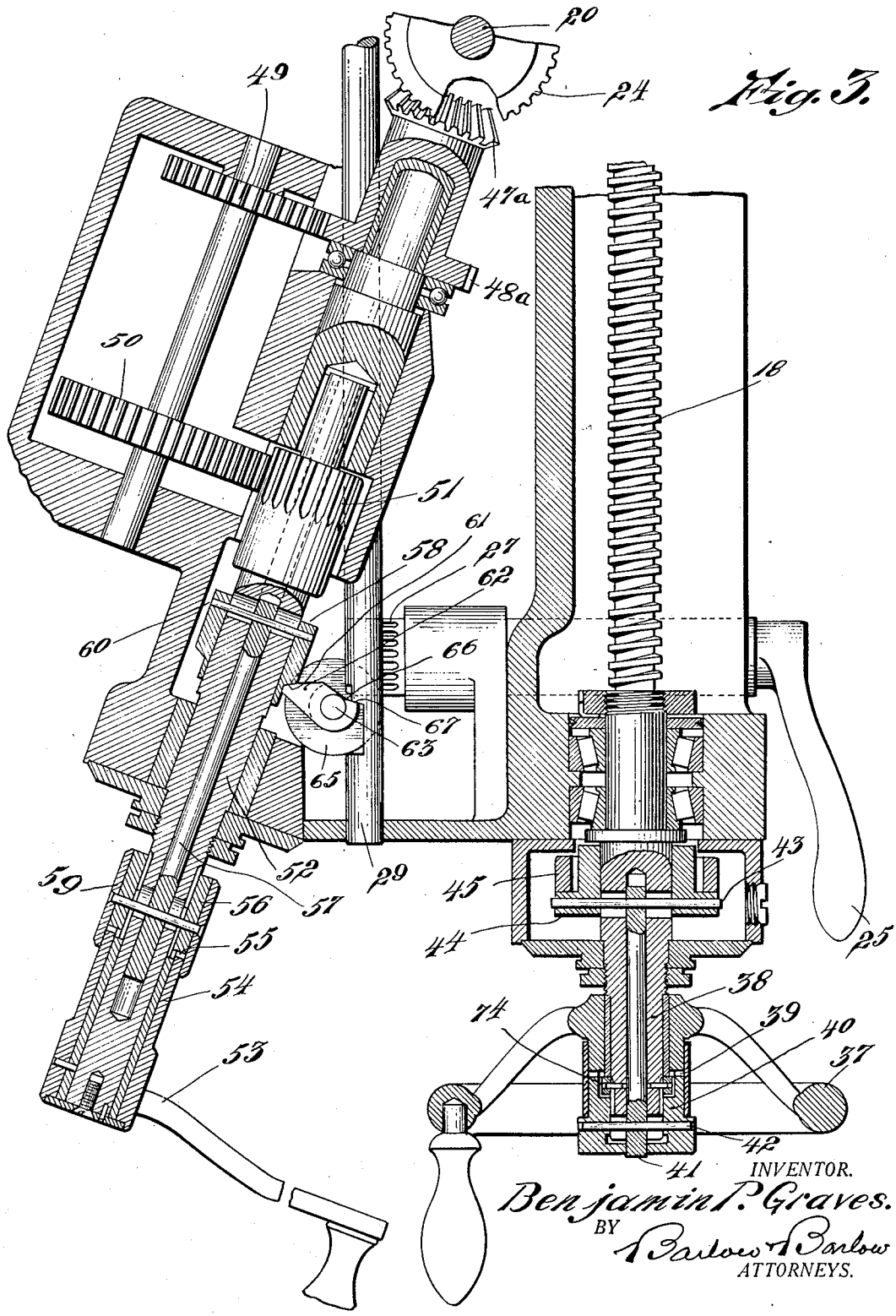
Fig. 3.



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INTERLOCKING MANUAL AND POWER FEED CONTROL

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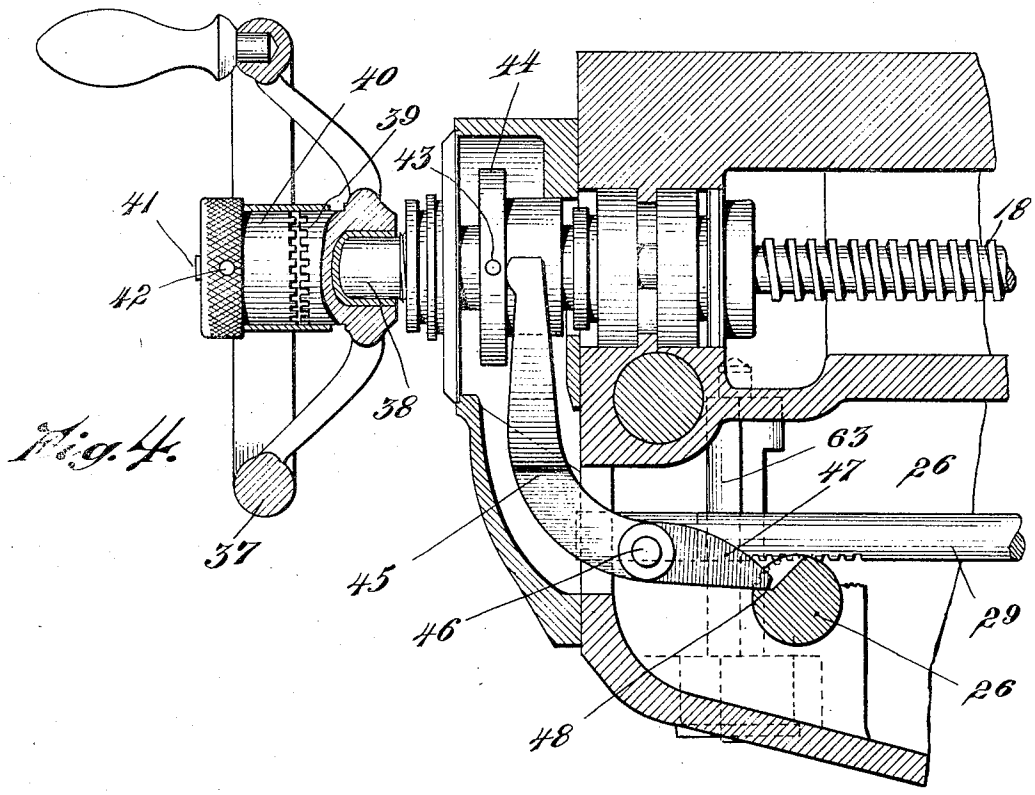

Fig. 4.

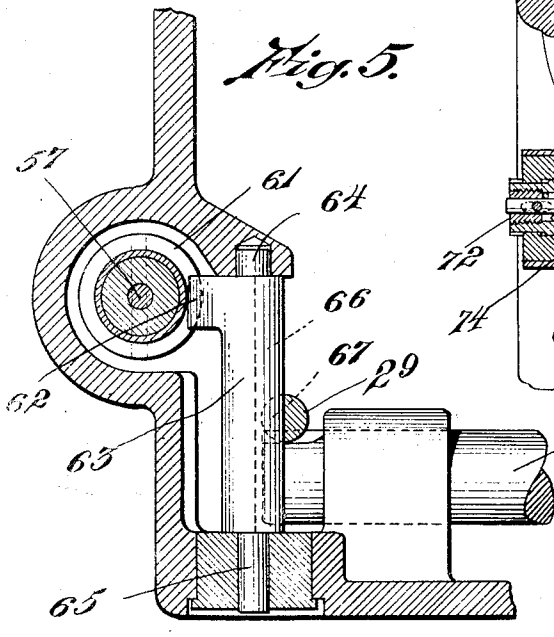

Fig. 5.

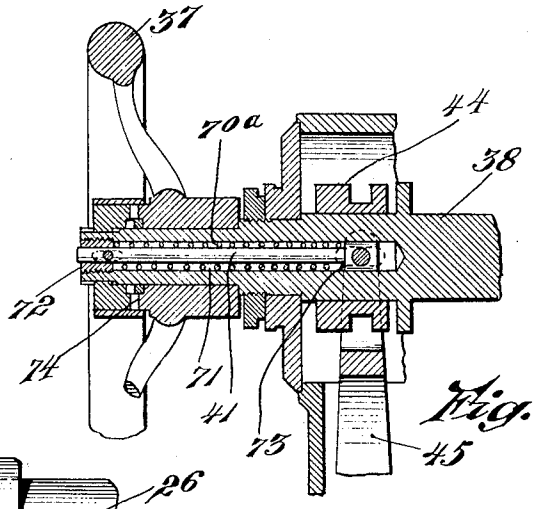

Fig. 8

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INTERLOCKING MANUAL AND POWER FEED CONTROL

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Fig. 6.

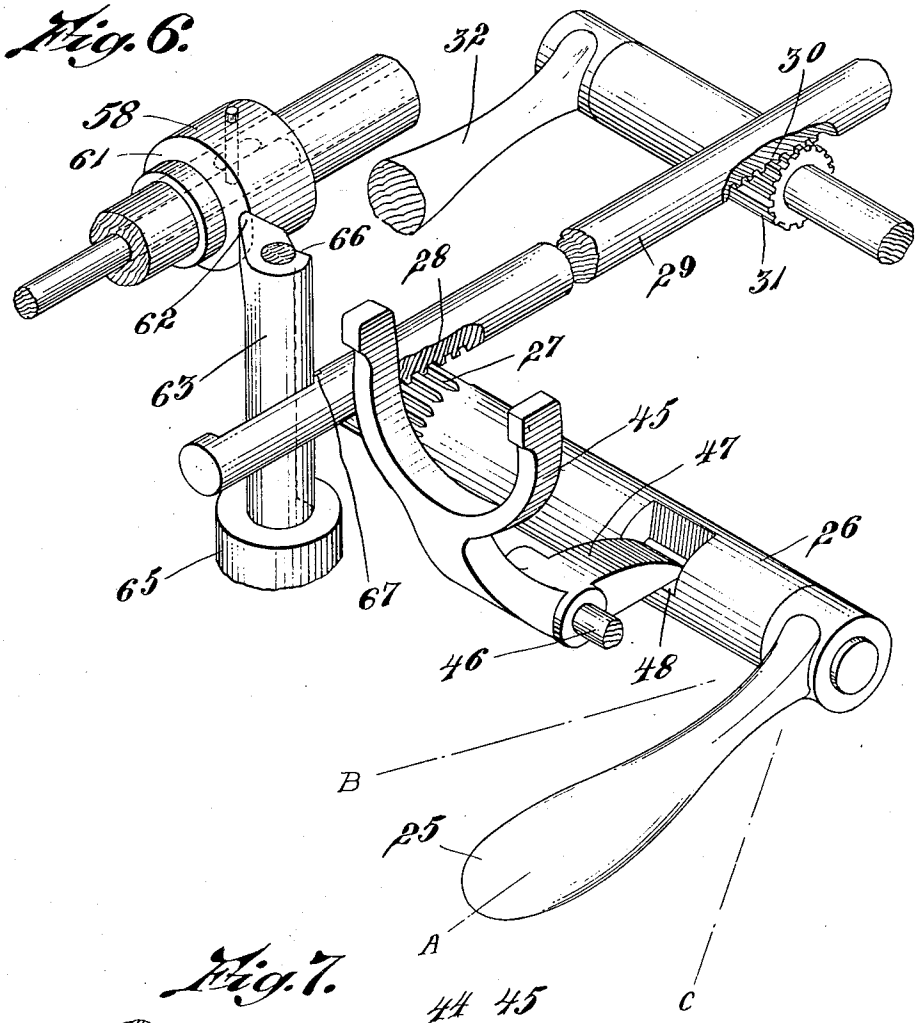
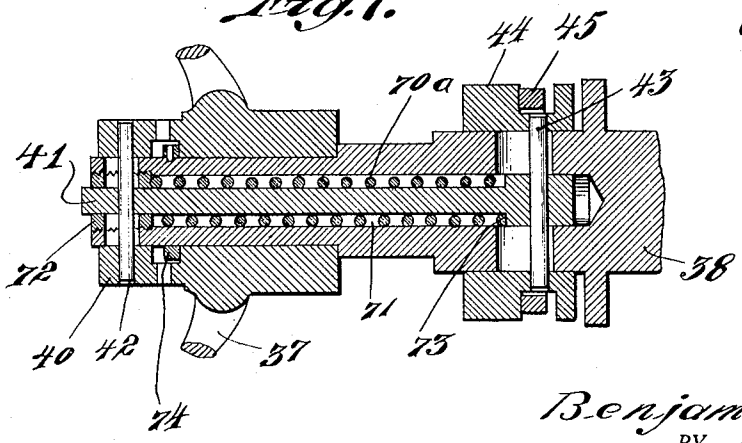


Fig. 7.



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Patented Mar. 4, 1930

1,749,073

UNITED STATES PATENT OFFICE

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INTERLOCKING MANUAL AND POWER FEED CONTROL

Application filed August 20, 1928. Serial No. 300,902.

This invention relates to improvements in feed operating mechanism for milling machines and the like and is an improvement on my copending application Serial No. 181,050, filed April 5, 1927; and the invention has for one of its objects to provide a train of feeding parts which includes both power and manually operable means for the traveling member of the machine and to also provide a control device connected to mechanism responsive to its movement for engaging the train of parts to throw in the power feed and at the same time render inoperative the corresponding manually operable feed of this train of parts.

The invention further consists in the provision of a train of feed operating parts for each of a plurality of different traveling members of the machine, each train having both hand and power operating mechanisms and means being provided for selectively engaging the desired train and so operate the same that when the power feed of that train engaged is thrown in, the hand operating mechanism of that train is automatically thrown out of operating engagement.

The invention further consists in the provision of clutch mechanism through which the power drive is connected to the feed of the different traveling members and to also provide clutch and cam operated mechanism for connecting the hand-operated parts by which the traveling member may be manually operated and to so arrange these mechanisms that when the power feed clutch is thrown in the clutch connecting the manual feed will be thrown out so that the manual parts will not operate when the power feed is doing the driving.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings:

Figure 1 is a front elevation partly broken away of a milling machine to which my improved feed operating mechanisms are attached.

Figure 2 is a top view partially in section illustrating the power and the hand operated mechanism for imparting feeding motion to the traveling members.

Figure 3 is a plan view partly in section showing a detailed construction of the hand operating feed of the traveling members.

Figure 4 is a sectional elevation showing the mechanism for operating the hand drive clutch for one of the train of operating parts for imparting a transverse movement to its traveling member.

Figure 5 is an elevation partly in section and illustrating a portion of the mechanism for disconnecting the hand feed from the power operated vertical feed of its traveling member.

Figure 6 is a diagrammatic view illustrating the hand operated control lever connected to a portion of the mechanism which is responsive to the movement of this lever for selectively engaging one of the trains of operating parts to throw in the power feed and simultaneously throw out or render inoperative the hand or manual operating feed.

Figure 7 is a top view partly in section illustrating a modified construction in which a spring is arranged to automatically return the hand operated clutch into engagement when the power drive is thrown out.

Figure 8 is an elevation partly in section showing the mechanism illustrated in Figure 7.

It is found in the practical operation of milling machines of this character, necessary to provide a power operating feed for both the traveling knee member and traveling saddle member and to also provide another attachment whereby this feed may be operated by hand when the power is thrown out for fine adjustment in setting the work relative to the cutting tool and also it is found of advantage to provide means for automatically disconnecting the hand operating members such as the crank and hand wheel from the power driving parts when the power feed is connected so that these hand operating members will cease to rotate or operate when the machine is being driven by power for the reason that these revolving handles when rotating rapidly are at times to say the least

annoying and dangerous to the operator when working about the machine, and to obviate this difficulty, I have provided means whereby the operating of the control lever in one direction serves to connect the power feed to the vertical feed of the knee member and simultaneously disconnects the hand operating mechanism from this train or group of parts and by throwing this hand control lever to another position the power feeding mechanism is connected to operate the transverse feed of the saddle member and at the same time disconnects the hand operating feed of this train of parts. In this way it will be seen that the hand crank of each of these trains of operating parts is disconnected and stopped or is not caused to rotate through the power feeding operation and, therefore, the annoyance of its continuous rotation is entirely avoided, and when the lever is again thrown back to neutral to throw out the power feed then, in some instances, the hand feed member may again be connected by a hand operation, while in other instances this hand feed may be arranged to be connected automatically if so desired; and the following is a detailed description of the present embodiment of my invention and showing one arrangement of parts by which these advantageous results may be obtained:

With reference to the drawings, 10 designates the frame of the machine on which is mounted the vertically traveling knee member 11; on this knee member is mounted the transversely traveling saddle member 12 and on this saddle member is mounted the longitudinally traveling table 13, all operatively mounted to receive their respective motions when the proper mechanism is thrown in.

In order to obtain this vertical movement of the knee member, power is applied through the shaft 14 and gears (not herein shown) to drive gear 15 in one direction and gear 16 in the reverse direction, both of which gears are provided with suitable clutch teeth on their inner faces either of which may be selectively engaged by the teeth of the master clutch 17 to cause the members to travel in the desired direction, the transverse feed of the saddle being effected through the lead screw 18 and nut 19 by mechanism not shown, while the vertical feed is effected from the clutch gear 21, clutch 22 and bevel gear 23 engaging the bevel gear 24 on this shaft 20.

In order to select which group or train of feeding parts shall be operated, I provide a control lever 25, mounted on the cross shaft 26 which shaft also carries a pinion 27 engaging the teeth 28 of the rack rod 29. Another set of teeth 30 of this rack rod are connected to the pinion 31 which in turn is connected to the lever 32 of the dual control, the latter lever being herein shown in Figure 1 as positioned on the side of the machine opposite to that of the lever 25 for convenience in operation. This endwise movable rack rod is connected through the yoke 33 to move the main power transmitting clutch gear 21 into and out of engagement with the drive clutch 22 connected to the vertical feed shaft 20 of the knee member and also move the clutch 34 into and out of engagement with the clutch 35 through which the transversely movable saddle member may be operated.

In order to be able to also operate the feed of these different members by hand, I have connected a hand-operated wheel 37 which is rotatably mounted on the sleeve 38 and is provided with clutch teeth 39 in its outer end adapted to engage the adjacent teeth of the clutch member 40. This clutch member is connected by a pin 42 to the outer end of the spindle 41 while the inner end of this spindle is connected through a pin 43 to the yoke operated collar 44.

A yoke 45 is mounted to swing on the pin 46 and is provided with an arm 47 engaging the cam pocket 48 on the shaft 26, whereby an upward movement of the lever 25 causes the yoke 45 to rock on its pin, its forked end swinging outwardly to act on the collar 44 through the spindle 41 to move the clutch member 40 out of engagement with the teeth of the hand wheel and at the same time this upward motion of lever 25 acts to throw the clutch 34 into engagement with clutch 35 to impart a power feeding transverse travel to the saddle. It will be seen that the hand wheel itself is prevented from following an outward movement of the clutch with the collar 74 fixed to the sleeve 38 (see Figure 3).

In order to connect the hand operating lever to the vertical feed shaft 20 for causing the knee lever to travel in a vertical direction, I have provided a bevel gear 47^a, see Figure 3, which is connected through gears 48^a, 49, 50 and 51 to the sleeve 52 on which sleeve is loosely mounted the operating handle member 53; the inner end of the hub 54 of this handle member is provided with teeth 55 which are arranged to be engaged by those of the endways slidable clutch 56, which clutch is keyed to the sleeve 52 and is arranged to be moved endwise through the spindle 57 to which it is connected by a pin 58 to the inner end of which spindle is connected the sleeve 59 by a pin 60 and this sleeve 59 is provided with a shoulder 61 arranged to be engaged by a cam 62 on the vertical shaft 63, which shaft, as best illustrated in Figure 5, is pivotedly supported at its upper end to the member 64 and at the lower end to the member 65.

A portion of one side of this shaft 63 is cut away as at 66 to be engaged by a shoulder 67 of the rack rod 29.

By this construction when the control lever 25 is in its neutral position A, in Figure 6, the hand operating mechanism is connected

through its clutch to the screw 18 which may be rotated by hand to operate the transverse feed of the saddle through the nut 19 and when thrown up to position B, this handle operates the yoke 45 to withdraw the clutch 40 from engagement with the hand wheel 37 and simultaneously operates through arm 46 to engage the clutch 34 with clutch 35, which engagement causes the power to rotate the lead screw 18 to impart a transverse feed to the saddle member.

When this control lever 25 is thrown down from position A to position C (see Figure 6), this movement through an endways movement of the rack rod 29 withdraws clutch 56 from engagement with the operating handle 53 and through the yoke 33 moves the power feed clutch gear 21 into engagement with clutch 22 to cause the power to drive the vertical shaft 20 and so apply a vertical feed to the knee member, at the same time this movement operates the mechanism described above to disconnect the hand crank 53.

The direction of drive of these different parts is controlled by a movement of the directional lever 68 through the endwise movable rod 69 and yoke 70 to move the master clutch into engagement with one of the oppositely rotating clutch gears adjacent its opposite faces.

In some instances it is found of advantage to provide a construction as illustrated in Figures 7 and 8 of the drawings, in which a coil spring 70^a is mounted in the hollow center 71 of a sleeve 38 having one end acting against the plug 72 and the other end against the shoulder 73 of the spindle 41 to move this spindle and the end clutch 40 through its pin 42 to cause its teeth 39 to automatically reengage those of the handle 37 when the power feed is thrown out in the manner above described, the outward movement of this handle clutch when the clutch member 40 is disengaged being prevented by the fixed collar 74.

By the operation of my improved mechanism, it will be seen that whenever the power feed is thrown in to drive the saddle member transversely or the knee member vertically, the hand operated member of each set of mechanism engaged is automatically disconnected so that it will not operate or rotate during the power driving operation.

The foregoing description is directed solely towards the construction illustrated, but I desire it to be understood that I reserve the privilege of resorting to all the mechanical changes to which the device is susceptible, the invention being defined and limited only by the terms of the appended claims.

I claim:—

1. In a milling machine, a saddle member having a transverse feed, a knee member having a vertical feed, a train of parts including power and manually operable feeding means for each of said members, a manually operable control device and means responsive to operation of said device for selectively engaging either of said trains to simultaneously render one feed of the train operative and the other feed of the train inoperative.

2. In a milling machine, a saddle member, a knee member, a transverse feed for one of said members and a vertical feed for the other of said members, an assemblage of parts including power and manually operable feeding means for each of said members, and a feed control lever, said lever being movable to selectively operate either of said assemblages of parts to cause the engagement of the power feed and the disengagement of the corresponding manually operable feed of the selected assemblage.

3. In a milling machine, a traveling work feeding member, power and manually operable feed mechanism for said member, a control means for said mechanism including a cam actuated clutch and a motion transmitting rack and pinion, and a manually operable control lever connected to operate said rack and pinion to throw in the power feed and simultaneously actuate said cam to disconnect the hand feed.

4. In a milling machine, a saddle member having a transverse feed, a knee member having a vertical feed, a power and manually operating feeding train of parts for each of said members and a lever moved in one direction to selectively operate one of said trains to throw in its power and throw out its manual feed, and moved in another direction to select the other of said feeding trains to throw in its power and throw out its manual feed.

5. In a milling machine, a saddle member having a transverse feed, a knee member having a vertical feed, a power feeding and a manual feeding train of parts for each of said members, a clutch through which each of said separate feeds may be individually connected to said trains, and a lever for selectively operating each of said feeding trains to throw in the power operated clutch and throw out the manually operated clutch of the train selected at a single operation.

6. In a milling machine, a saddle member having a transverse feed, a knee member having a vertical feed, a feeding train of parts including power and manually operable feeding means for each of said members, a control lever, means responsive to the movement of said lever for selectively operating either of said trains to throw in its power and render inoperative its manual feed, and means for automatically reengaging the manual feed of its train when the power feed has been thrown out.

7. In a milling machine, a plurality of traveling members, a feeding train of parts including power and manual feed means for each of said members, a control lever, means

operated by the movement of said lever for selectively affecting either of said feed trains to throw in its power feed and render inoperative its corresponding manual feed, and a spring arranged to reengage the hand feed with its train when the power feed with its train has been thrown out.

8. A milling machine having a plurality of different traveling members, each having both a power and manually operated feeding train of parts, widely spaced associated control levers each adapted to be operated individually, and means responsive to movement of a control lever to selectively affect either of said feed trains to throw in its power feed and render ineffective its corresponding manual feed.

9. A milling machine having in combination, table, saddle and knee members, transverse and vertical feed mechanisms for said members, power and hand operated means for operating each of said mechanisms, control means for said mechanisms each including a cam, a cam actuated clutch and a motion transmitting rack rod and rack pinion, and a control lever for operating said rack and pinion to selectively connect the desired set of mechanism to throw in its power feed and actuate the cam and the cam operated clutch to disengage its manually operable feed.

10. In a milling machine or the like, a plurality of travelling members, a train of parts including power and manually operating feeds for each travelling member, a control device, and means responsive to operation of said device for selectively engaging either of said trains to simultaneously render one feed of the train operative and the other inoperative.

11. In a milling machine or the like, a travelling member, a feeding train of parts including power and manually operating feeds for said member, control means for selectively engaging said feeding train to throw in one operating feed and simultaneously render the other operating feed inoperative comprising a movable member positioned transversely of the machine and control clutches actuated upon movement thereof, and a plurality of independent levers engaging said control means for actuation thereof, one lever being operatively connected to the movable member at one side and one end thereof, and the other lever being operatively connected at the opposite side to the other end thereof.

12. In a milling machine or the like, a saddle member having a transverse feed, a feeding train of parts including power and manually operating feeds for said member, control means for selectively engaging said feeding train to throw in one operating feed and simultaneously render the other operating feed inoperative comprising a movable member positioned transversely of the machine and control clutches actuated upon movement thereof, and a plurality of independent levers engaging said control means for actuation thereof, one lever being operatively connected to the movable member at one side and one end thereof, and the other lever being operatively connected at the opposite side to the other end thereof.

13. In a milling machine or the like, a knee member having a vertical feed, a feeding train of parts including power and manually operating feeds for said member, control means for selectively engaging said feeding train to throw in one operating feed and simultaneously render the other operating feed inoperative comprising a movable member positioned transversely of the machine and control clutches actuated upon movement thereof, and a plurality of independent levers engaging said control means for actuation thereof, one lever being operatively connected to the movable member at one side and one end thereof, and the other lever being operatively connected at the opposite side to the other end thereof.

In testimony whereof I affix my signature.

BENJAMIN P. GRAVES.