E. STUCK.

FEEDING MECHANISM.

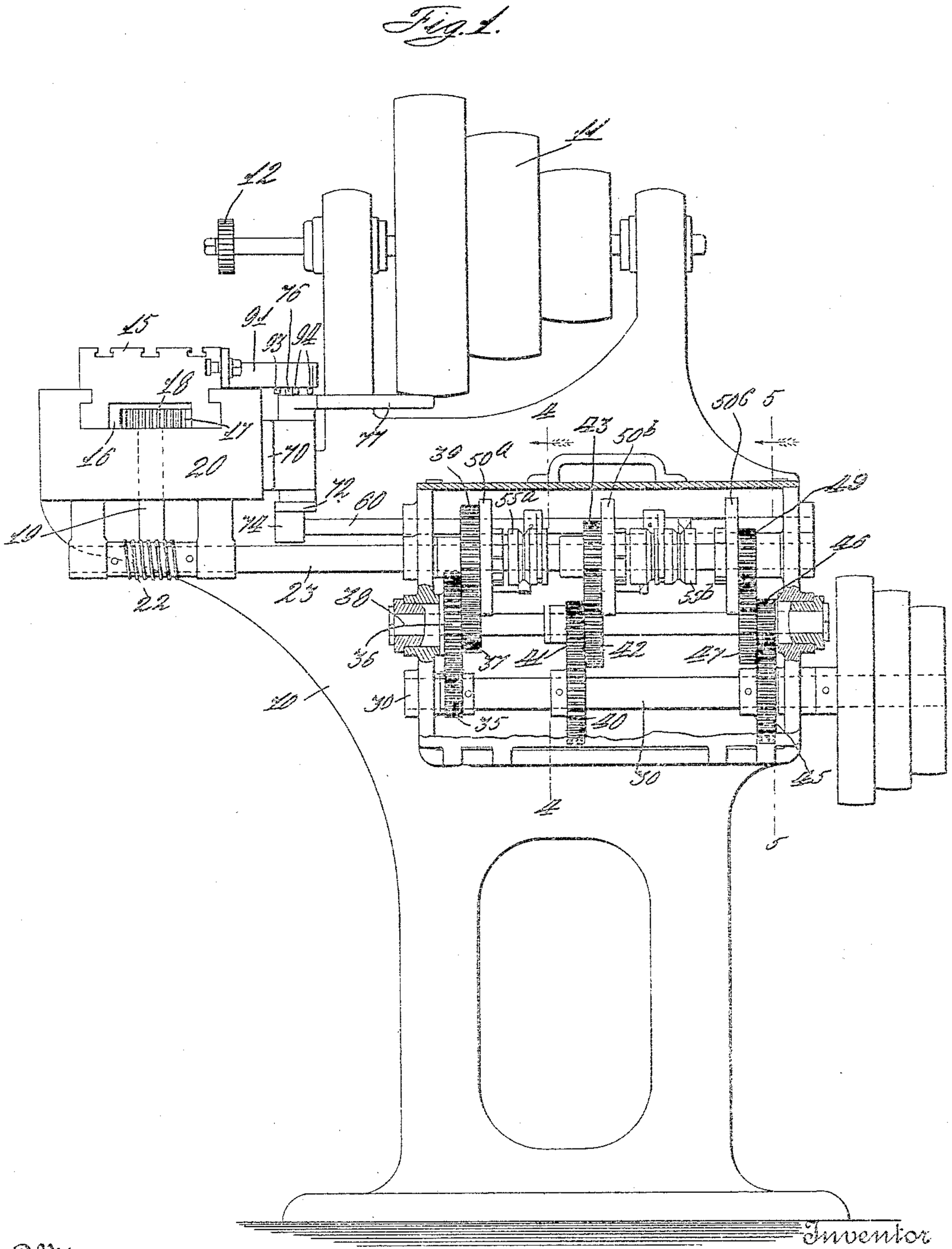
APPLICATION FILED DEC. 19, 1905.

956,444.

Patented Apr. 26, 1910.

3 SHEETS—SHEET 1.

Fig. 1.



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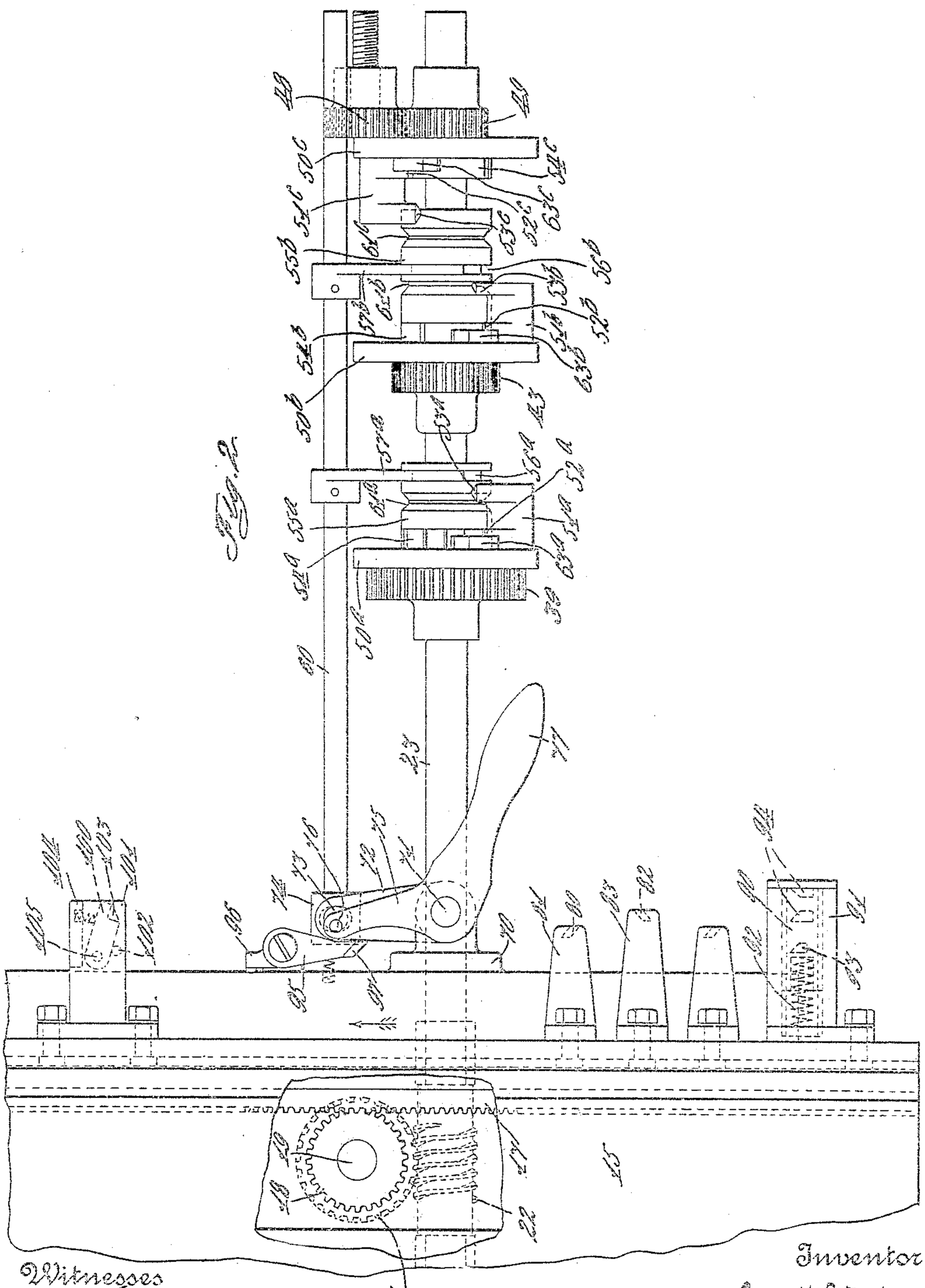
3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

Fig. 3.

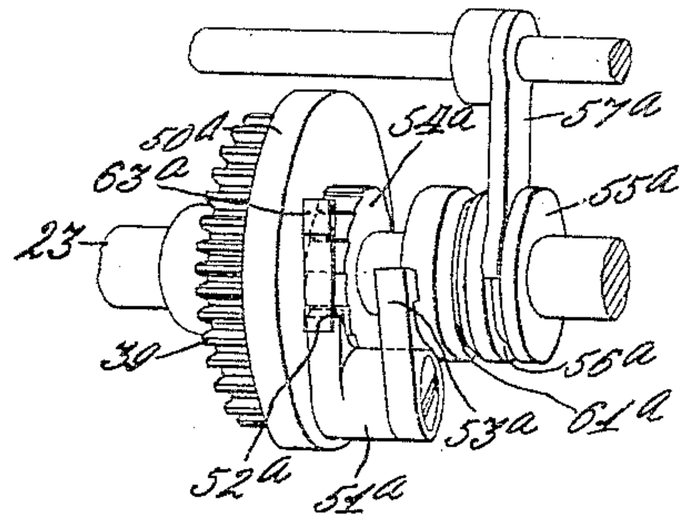

Fig. 4.

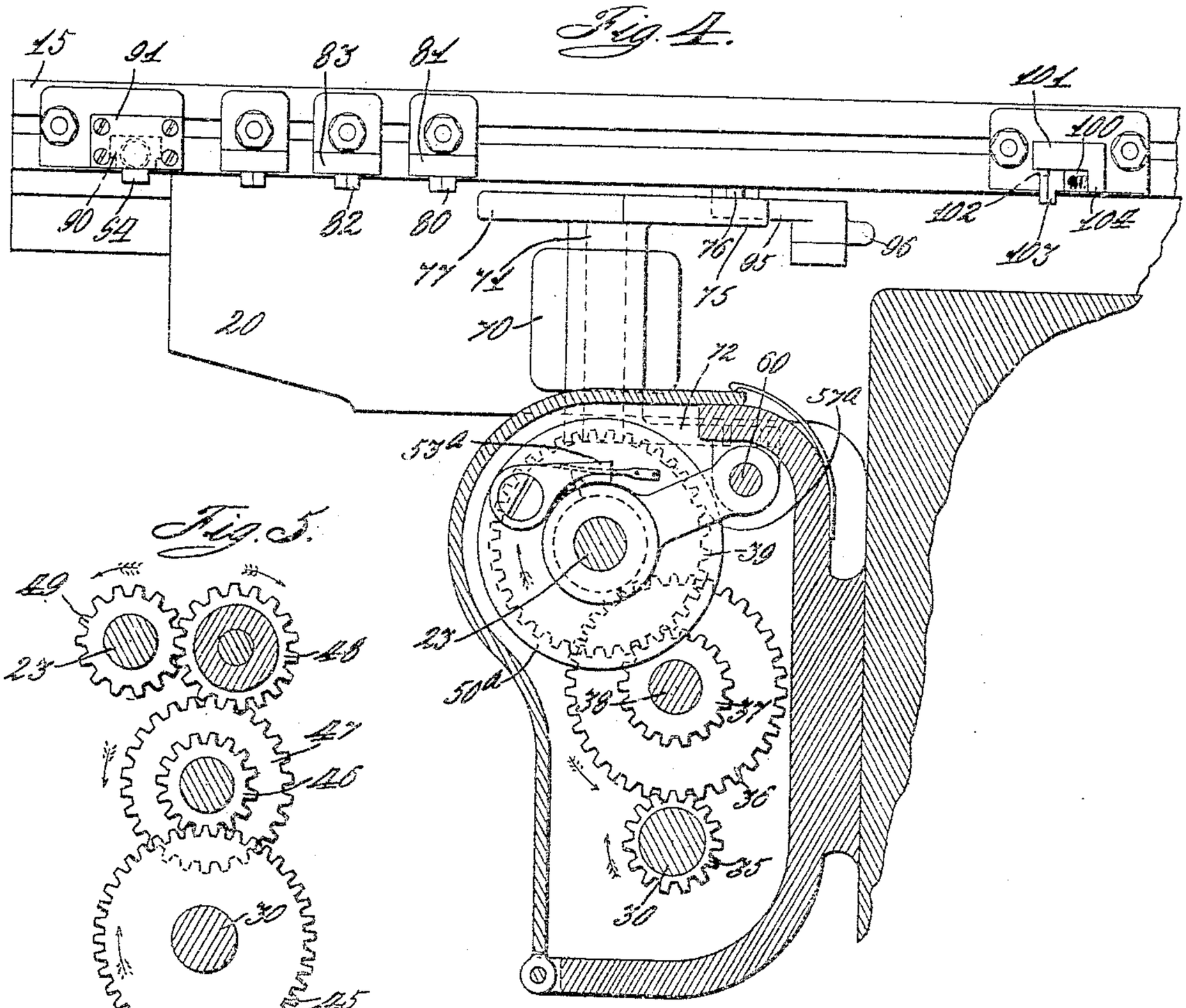

Fig. 5.

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UNITED STATES PATENT OFFICE.

EVERETT STUCK, OF DAYTON, OHIO.

FEEDING MECHANISM.

956,444. Specification of Letters Patent. Patented Apr. 26, 1910.

Application filed December 19, 1905. Serial No. 292,500.

To all whom it may concern:

Be it known that I, EVERETT STUCK, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Feeding Mechanisms, of which I declare the following to be a full, clear, and exact description.

This invention relates to improvements in feeding mechanisms, for use in such machines as milling machines and the like, where a movable work carriage is arranged to have the work mounted upon it, the carriage then being fed automatically.

It is among the objects of this invention to provide such an improved form of feeding mechanism as will automatically give a slow feed movement to the work carriage during the interval of time in which the work is being operated upon, and then a fast feed when the work is to be moved without being operated upon, then an automatic reverse with a fast return feed of the carriage, and finally an automatic stop to arrest the carriage when it has been returned to normal position.

With these and incidental objects in view, the invention consists in certain novel features of construction and combinations of parts, the essential elements of which are set forth in appended claims and a preferred form of embodiment of which is hereinafter specifically described with reference to the drawings which accompany and form part of this specification.

Of said drawings: Figure 1 represents a side elevation of a milling machine to which these improvements are applied showing the various feeding gears set for the slow feed. Fig. 2 represents a top plan view of a portion of the work carriage with the adjustable feed controlling dogs mounted thereon and the mechanism connected with the feeding gears set for the fast feed. Fig. 3 represents a perspective detail view of one of the feed gears and clutches. Fig. 4 represents a detail sectional view on the line 4—4 of Fig. 1 looking in the direction of the arrow crossing said line. Fig. 5 represents a detail sectional view on the line 5—5 of Fig. 1 looking in the direction of the arrow crossing said line.

As a general description of the specific form of mechanism which has been adopted to carry out the purposes of this invention, it may be stated that a traveling work carriage is provided, which is fed by a revoluble shaft arranged to have different speeds of rotation and different directions of rotation. This is accomplished by having a main driving mechanism in the shape of a constantly revoluble shaft which has three separate gear connections, one for a slow feed forward, another for a fast feed forward, and another for a fast reverse feed. These various feeding gears are arranged to be clutched to the main driving shaft for the work carriage so as to give the latter the desired slow forward feed, fast forward feed or fast reverse feed. These clutch connections are controlled by a series of adjustable feed controlling dogs mounted upon the work carriage itself. These dogs may be adjusted to any desired position on the work carriage, according to the position of the work on the carriage and the nature of the work to be performed. An additional dog is also provided, which when the carriage has returned to normal position, automatically throws out of operation all of the feeding devices so that the carriage stops and no further work is performed until the operator has again started the feeding devices. These mechanisms will now be described in detail. As above stated, these improvements are in this particular instance shown as applied to a milling machine. In the standard 10 of this machine are mounted the driving pulleys 11 for rotating the milling tool 12 at any desired speed.

The traveling work carriage 15 has a groove 16 in its under side on one side of which is fastened a rack 17 (see Fig. 2). Meshing with this rack is a driving pinion 18 mounted on a short shaft 19 extending through the stationary table 20 in the groove of which the carriage 15 slides. The shaft 19 has fast to its lower end a worm wheel 21 which meshes with a worm pinion 22 fast to the feeding shaft 23. From this construction it will be readily understood that whenever the main feeding shaft 23 is rotated in either direction at a fast or slow speed, the carriage 15 will receive a corresponding reciprocating motion.

The shaft 23 is revolved in either direction at a fast or slow speed by the three sets of gears connecting it to the main power shaft 30, which is constantly driven by any suitable power. The above mentioned sets of gears and their relative speeds will now be described. In Fig. 4 is shown the gear con-

nections of the slow forward feed, comprising a pinion 35 fast to the shaft 30, gears 36 and 37 rigidly secured to each other and loosely mounted on an intermediate shaft 38 and a gear 39 loosely mounted on the shaft 23 and meshing with the gear 37. The relative sizes of these gears are such that the gear 39 will receive a slow revoluble movement. It will be clearly seen by reference to the arrows in Fig. 4 that the top of gear 39 will be revolved toward the machine. As seen in Fig. 1 the gear connections for the fast forward feed comprises a gear 40 fast to the shaft 30, gears 41 and 42 rigidly secured to each other and loosely mounted on the shaft 38 and a gear 43 loosely mounted on the shaft 23 and meshing with the gear 42. The relative sizes of these gears are such that the gear 43 will receive a fast revoluble movement in the same direction as the gear 39. In Fig. 5 is shown the gear connections for the return feed. The gear 45 is rigidly secured to the shaft 30 and meshes with the gear 46 which is rigidly secured to the gear 47. The gears 46 and 47 are loosely mounted on the shaft 38, the gear 47 meshing with an intermediate gear 48 which is mounted on a stub shaft secured to the framework of the machine. The gear 49 meshes with the gear 48 and is revolved in a direction reverse to that of the gears 39 and 43.

The clutch mechanism will now be described. Fast to the gears 39, 43, and 49 are disks 50^a, 50^b and 50^c respectively to which are pivoted engaging pawls 51^a, 51^b and 51^c having engaging noses 52^a, 52^b and 52^c and releasing arms 53^a, 53^b and 53^c (see Fig. 2.) These engaging pawls are thrown into and out of engagement with ratchet wheels 54^a, 54^b and 54^c which are rigidly secured to the main feeding shaft 23. The mechanism for operating the engaging pawls consists of sleeves 55^a and 55^b each having a circumferential groove 56^a and 56^b adapted to receive shifting arms 57^a and 57^b which are secured to a shifting or controlling shaft 60. The sleeve 55^a for the slow forward feed has a single beveled circumferential operating groove 61^a which is adapted to receive the releasing arm 53^a of the engaging pawl 51^a. When the arm 53^a is in the groove 61^a the engaging nose 52^a of the pawl 51^a will engage the ratchet wheel 54^a and the shaft 23 will then be rotated forward at a slow speed as the gear 39 and the disk 50^a carrying the pawl 51^a are constantly in motion. When the sleeve 55^a is now shifted in either direction by the shifting arm 57^a the releasing arm 53^a will be cammed out of the groove 61^a and will raise the engaging nose 52^a of the pawl 51^a out of engagement with the ratchet wheel 54^a thereby stopping this feeding mechanism until the sleeve 55^a has again been shifted to its engaging position. The springs 63^a, 63^b and 63^c serve to hold the pawls 51^a, 51^b and 51^c in engagement with the sleeves 55^a and 55^b. The sleeve 55^b has two beveled operating grooves 61^b and 61^c which serve to operate the pawls 51^b and 51^c in the same manner as the previously described sleeve 55^a operates the pawl 51^a. The pawl 51^b is pivoted on the disk 50^b of the gear 43 and revolves continuously in the same direction as the gear and disk of the slow feeding mechanism. The pawl 51^c is pivoted to the disk 50^c of the gear 49 which revolves continuously in the opposite direction. The relative speeds of the above described three feeding mechanisms are such that the fast forward feed is intermediate in speed between the slow forward feed and the fast return feed.

The effect of the shifting of the sleeves 55^a and 55^b will now be explained. As seen in Fig. 1 the sleeves are set for the slow forward feed with the releasing arm 53^a of the pawl 51^a in engagement with the groove 61^a. As previously explained this will cause the engaging nose of the said pawl to engage its ratchet wheel and thereby rotate the shaft 23 to give the work carriage a slow forward feed. It will be noticed in Fig. 1 that the releasing arms of the pawls 51^b and 51^c have been cammed out of the operating grooves 61^b and 61^c and are resting on the outer periphery of the sleeve 55^b. This will hold the engaging noses of these pawls out of engagement with their ratchet wheels.

In Fig. 2 the mechanism is shown as set for the fast forward feed. In this position the controlling shaft 60 and the sleeves 55^a and 55^b are shifted as far as they can go toward the front of the machine, that is, the left in Fig. 2. It will be seen in this position that the releasing arm 53^a of the pawl 51^a has been cammed out of the operating groove 61^a so as to disengage its engaging nose 52^a from the ratchet wheel 54^a. (See Fig. 3.) The releasing arm 53^b of the pawl 51^b has dropped into the operating groove 61^b thereby allowing its engaging nose 52^b to engage the ratchet wheel 54^b and rotate the shaft 23 at a fast forward speed. The pawl 51^c is still held raised as when the mechanism is set for slow forward feed by the periphery of the sleeve 55^b which sleeve has shifted to the left but not far enough to let the said pawl drop from the rear end of said sleeve.

By reference to Fig. 1 it will be clearly understood that if the sleeve 55^a and 55^b are shifted farther toward the rear of the machine (the right in Figs. 1 and 2) the following will result. The arm 53^a of the pawl 51^a will be cammed out of the operating groove 61^a thereby causing its engaging nose 52^a to be disengaged from its ratchet wheel 54^a. The periphery of the

front end of the sleeve 55^b will still hold the arm 53^b of the pawl 51^b in its raised position to keep its engaging nose 52^b out of engagement with its ratchet wheel 54^b. The arm 53^c of the pawl 51^c will drop into the operating groove 61^c thereby allowing its engaging nose 52^c to engage with its ratchet wheel 54^c and revolve the shaft at a fast speed in the reverse direction. By a still further shifting movement (to the rear of the machine or the right in Figs. 1 and 2) of the sleeves 55^a and 55^b the arm 53^c of the pawl 51^c will be cammed out of the operating groove 61^c and when the mechanism is in this adjustment, all of the pawls 51^a, 51^b and 51^c are in a disengaging position and therefore the shaft 23 will stop, and hence the feeding of the work carriage stops.

The shifting or controlling shaft 60 is shifted to its different positions by the mechanism which will now be described. Mounted in a bracket 70 on the rear of the stationary table 20 is a short vertical shaft 71 to which is pivoted at its lower end an arm 72 having a downwardly projecting pin 73 which engages in an elongated slot formed in a block 74 fast to the shifting shaft 60. Fastened to the upper end of the shaft 71 is an arm 75 in the outer end of which is mounted a forwardly projecting pin 76 which is operated upon by different dogs as will be described later on. The rear end of the arm 75 is formed in the shape of a handle 77 which is operated by hand to shift the shifting shaft 60 to set the mechanism for the fast forward feed after the automatic stop acts upon the pin 76 to stop the work carriage 15. As shown in Fig. 2 with the feeding mechanism set for fast forward feed, the work carriage 15 will be traveling in the direction of the arrow. As the carriage travels the pin 76 and controlling shaft 60 will be cammed to the right by a lug 80 extending downwardly from a feed controlling dog 81 which is adjustably mounted in a groove in the work carriage 15 as are all the feed controlling dogs. This will shift the sleeves 55^a and 55^b into the position shown in Fig. 1 which position sets the clutch mechanism for a slow forward feed. The pin 76 will next be engaged and cammed to the left again by a lug 82 extending downwardly from a feed controlling dog 83. This will set the sleeves 55^a and 55^b for a fast forward feed. This shifting movement from fast to slow forward feed and back to fast forward feed again may be repeated as often as the nature of the work requires, the last movement being to shift the sleeves 55^a and 55^b to the slow feeding position. The returning dog 90 is slidably mounted in an adjustable bracket 91 and is spring pressed by a spring 92 to its outer position as shown in Fig. 2. Extending downwardly from it is a camming lug 93 and two guiding lugs 94 between which the pin 76 rests at certain times as will hereinafter be explained. Pivoted to the stationary table 20 is a tripping pawl 95 which is spring pressed toward the position shown in Fig. 2 and has a rearwardly extending stop nose 96 to limit its movement in one direction. The lug 97 extends upwardly into the path of the camming lug 93 of the return dog 90. When the lug 93 strikes the beveled lug 97 of the tripping pawl it cams the returning dog 90 inward against its spring 92 so that the two guiding lugs 94 pass on either side of the pin 76. As soon as the lug 93 passes the lug 97 the spring 92 will force the returning dog 90 outwardly with a quick snapping movement thereby shifting the pin 76 and controlling shaft 60 to the right by reason of the position of the pin 76 between the two lugs 94. This will set the two sleeves 55^a and 55^b in a position which will set the feeding mechanism for the fast return feed. The lug 93 on the return movement of the carriage 15 will strike the rear bevel of the lug 97 and will compress the spring of the tripping pawl and wipe past said pawl. The automatic stop pawl 100 is mounted in a bracket 101 and is spring pressed against a stop pin 102. It is pivoted at 105 and is adapted to be engaged by the pin 76 and pressed rearwardly until it strikes the lug 104 which forms part of the bracket 101. Its operation is as follows. On the return movement of the carriage 15 the pin 76 will strike a downwardly extending lug 103 of the pawl 100 and will first move the pawl against the lug 104 and then will be cammed rearward to shift the sleeves 55^a and 55^b to their stop position, being the extreme position to the right. As soon as the pin 76 is cammed into this position the pawl 100 snaps back against the stop pin 102 thereby assuming its normal position as shown in Fig. 2. When the feeding mechanism is started again the operator, by pushing inward on the handle 77 swings the lever 75 toward the front of the machine. This will cause the pin 76 to pass in the rear of the lug 103 and set the controlling shaft 60 and sleeves 55^a and 55^b in the fast forward feeding position, being the extreme position to the left, after which the operation of the machine as above described is repeated.

It will thus be seen that the feeding movements of the work carriage may be under the absolute control of the adjustable dogs mounted on the carriage; and the dogs are adjusted to proper positions by the operator so that the various feeding movements will take place as desired. That is, where for example, this feeding device is used on a milling machine after the work to be milled is suitably clamped on the work carriage in position to be operated upon by the milling tool, the operator adjusts the

said dogs so that as soon as the machine has been started to feed the work carriage (by operation of the lever 77,) the fast feed of the carriage will take place until the work has been brought opposite the tool and a certain surface of the work is thereupon brought into position to be milled, whereupon the feed automatically shifts from the fast forward feed to the slow forward feed, this slow feed obtaining so long as the tool is milling the desired surface of the work. As soon however as this particular surface has been milled and it is desired to have the work moved on to the next surface which is to be milled, the fast feed again takes place by the operation of the fast feed dog 83 as above described, so that less time is lost by moving the work rapidly over the intervals in which no milling is to be done. In this manner much time is saved by feeding the piece of work rapidly while no milling is being done, of course feeding at the slow rate for the milling process. Furthermore, as soon as the entire piece of work has been milled upon its various separated surfaces in this manner, the returning dog operates to automatically restore the carriage to normal position whereupon the stop dog automatically stops the feed so that thereby the operator has to give no attention to the machine except to start it and keep watch to see when the machine has stopped, whereupon a new piece of work may be immediately inserted into the machine for a repetition of this operation.

The peculiar construction of the tripping pawl 95 and returning dog 90 is utilized for the purpose of securing a quick spring action in the shifting of the clutches from the forward feed to the reverse feed. If an ordinary beveled camming dog were used, such as is used in the dogs 81 and 83, the shifting from the slow forward feed to the rapid reverse feed would take place by a slow movement and this would give rise to likelihood of the two clutches interfering and the possibility of their not being thrown out of and into operation at the proper relative times. By means of the quick spring action which results from first retarding the action of the restoring dog 90 and then permitting the same to spring outward rapidly to shift the controlling shaft 60, the necessary shifting of the clutches is effected in the proper manner to shift from the slow forward feed to the fast reverse feed.

While the form of mechanism herein shown and described is admirably adapted to fulfil the objects primarily stated, it is to be understood that it is not intended to confine the invention to the one form herein disclosed, for it is susceptible of embodiment in various forms, all coming within the scope of the claims which follow.

What is claimed is:

1. In a feeding device for milling machines and the like, the combination with a movable work carriage, of driving connections for same comprising two different speed forward driving devices and a reverse driving device, clutch mechanisms for connecting any one of said driving devices to the work carriage, a bar differentially movable to control said clutch mechanisms, and feed controlling devices on said carriage for moving said bar in opposite directions and to different extents.

2. In a feeding device for milling machines and the like, the combination with a movable work carriage, of driving connections for same, comprising two different speed forward driving devices and a reverse driving device, clutch mechanisms for connecting any one of said driving devices to the work carriage, an element movable to actuate any one of said clutch mechanisms, and feed controlling devices on said carriage for differentially moving said element.

3. In a feeding device for milling machines and the like, the combination with a work carriage, and a continuously driven main operating shaft, of a driving shaft connected with said work carriage; carriage feeding devices driven from said main shaft and comprising separate gears having a slow forward feed, a fast forward feed and a return feed; clutch devices for connecting said gears to said driving shaft; a feed controlling shaft having connections with said clutches for selectively operating the same; and adjustable dogs mounted on said carriage having provisions for operating said feed controlling shaft and causing variable feeding movements of the carriage according to the position of said dogs.

4. In a feeding device for milling machines and the like, the combination with a work carriage, and a continuously driven main operating shaft, of a driving shaft connected with said work carriage; carriage feeding devices driven from said main shaft and comprising separate gears having a slow forward feed, a fast forward feed and a return feed; clutch devices for connecting said gears to said driving shaft; a feed controlling shaft having connections with said clutches for selectively operating the same; adjustable dogs mounted on said carriage having provisions for operating said feed controlling shaft and causing variable feeding movements of the carriage according to the position of said dogs; and a stop dog also adjustably mounted on said carriage for operating said feed controlling shaft to throw all of the clutches out of operation to stop the feed of the carriage.

5. In a feeding device for milling machines and the like, the combination with a work carriage, and a continuously driven main operating shaft, of a driving shaft

connected with said work carriage; carriage feeding devices driven from said main shaft and comprising separate gears having a slow forward feed, a fast forward feed and a return feed; clutch pawls carried by said feeding gears; a clutch ratchet for each of said pawls, said ratchets being connected with said carriage driving shaft; clutch controlling collars for said pawls having provisions for holding said pawls free from said ratchets or permitting engagement of the pawl with the ratchet according to the position of said collars; a feed controlling shaft having connections for shifting said clutch controlling collars; and adjustable dogs mounted on said carriage and having provisions for engaging said feed controlling shaft to shift said collars to throw in any desired clutch and thereby give the carriage a slow or fast forward feed or a return feed.

6. In a feeding device for milling machines and the like, the combination with a work carriage, and a continuously driven main operating shaft, of a driving shaft connected with said work carriage; carriage feeding devices driven from said main shaft and comprising separate gears having a slow forward feed, a fast forward feed and a return feed; clutch pawls carried by said feeding gears; a clutch ratchet for each of said pawls, said ratchets being connected with said carriage driving shaft; clutch controlling collars for said pawls having provisions for holding said pawls free from said ratchets or permitting engagement of the pawl with the ratchet according to the position of said collars; a feed controlling shaft having connections for shifting said clutch controlling collars; adjustable dogs mounted on said carriage and having provisions for engaging said feed controlling shaft to shift said collars to throw in any desired clutch and thereby give the carriage a slow or fast forward feed or a return feed; and a stop dog also mounted on said carriage and having provisions for shifting said feed controlling shaft to throw all of the clutch controlling collars into position to free all of the clutch pawls from their ratchet wheels and thereby stop the feed of the carriage.

7. In a feeding device for milling machines and the like, the combination with a work carriage, and separate feeding devices having variable speeds of feeding movement, of spring actuated means mounted on said work carriage for quickly shifting from one feed to another.

8. In a feeding device for milling machines and the like, the combination with a work carriage, and a continuously driven main operating shaft, of a driving shaft connected with said work carriage; variable feed devices connected with said main shaft; means for connecting said feeding devices with the carriage driving shaft to drive the carriage at variable speed; a spring-pressed feed shifting device for operating upon said latter connecting means and mounted upon said carriage; and means for putting said spring device under tension upon the movement of the carriage and subsequently releasing the same whereby to cause the feed shifting to take place under a quick spring action.

9. In a feeding device for milling machines and the like, the combination with a work carriage and a driving shaft connected with the same, of a continuously driven main driving shaft; carriage feeding devices connected with said main shaft and comprising a forward feeding device and a return feeding device; means for connecting said feeding devices to said carriage driving shaft to feed the carriage forward or backward; and spring-actuated means mounted on said carriage for shifting from the forward feed to the reverse feed.

10. In a feeding device for milling machines and the like, the combination with a work carriage, and means for driving the same at variable speeds, of spring-actuated means on said carriage for quickly changing the feed, and means for tensioning the spring and holding same in a condition of tension until the feed changing point is reached.

11. In a feeding device for milling machines and the like, the combination with a work carriage and means for driving the same at variable speeds, of means for shifting from one driving speed to another, spring means for operating said shifting means, and devices constructed to put said spring means under tension by the movement of said work carriage and then suddenly completely release said spring means to cause a quick change of said driving speed.

12. In a feeding device for milling machines and the like, the combination with a work carriage and separate feeding devices therefor having variable speeds of feeding movement, spring actuated means mounted on said carriage for quickly shifting from one feed to another, and means for compressing said spring constructed to suddenly completely release the same.

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

EVERETT STUCK.

Witnesses:
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CARL W. BEUST.