J. H. JANN.

TURRET OPERATING MECHANISM.

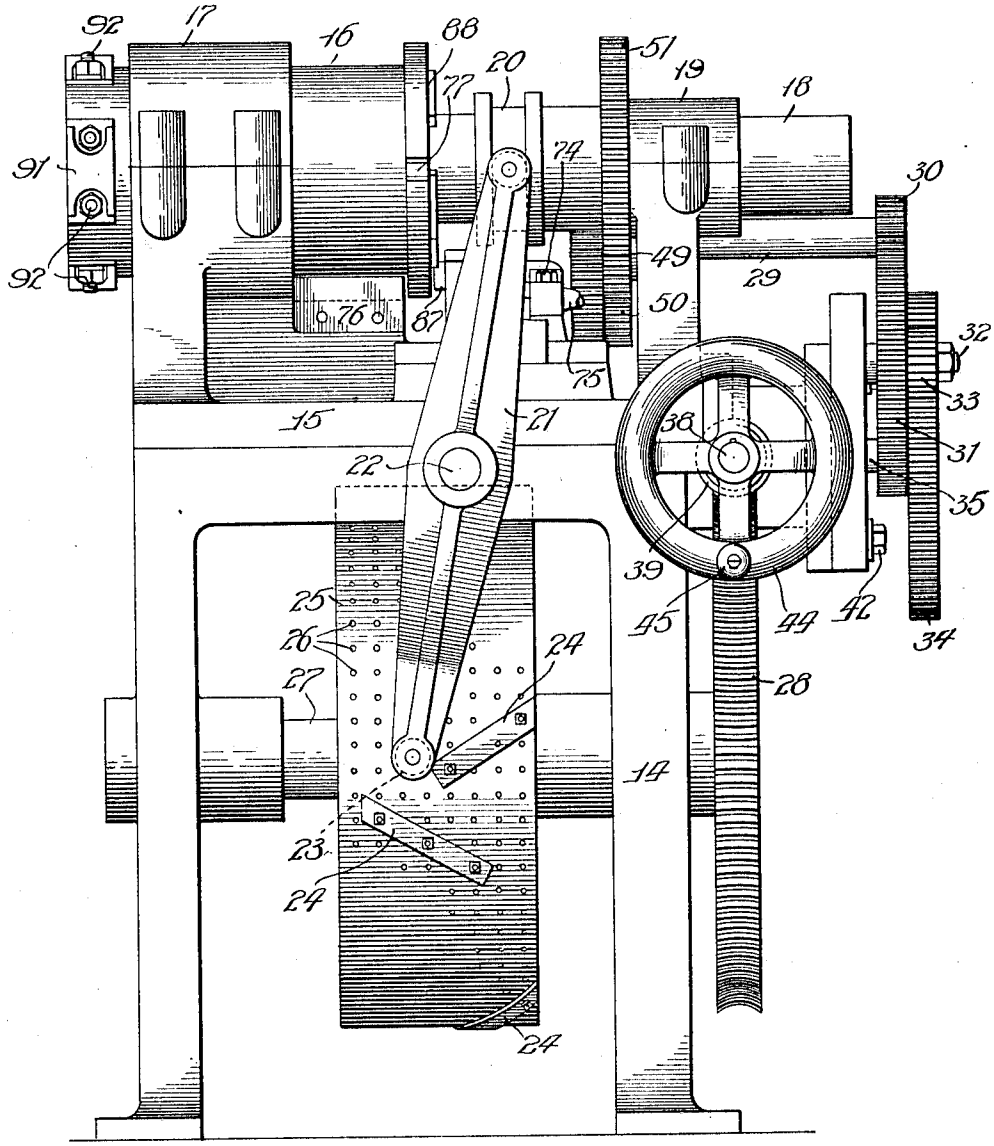
APPLICATION FILED OCT. 10, 1910.

1,022,086.

Patented Apr. 2, 1912.

5 SHEETS-SHEET 1.

Fig 1.



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5 SHEETS—SHEET 2.

Fig. 2.

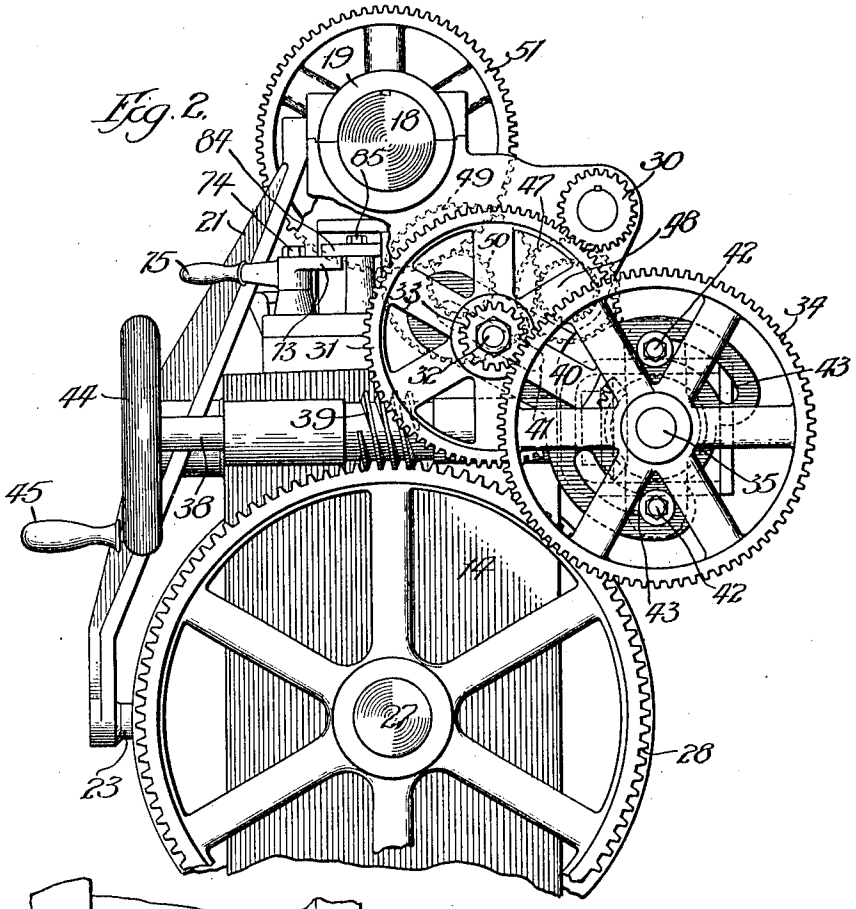
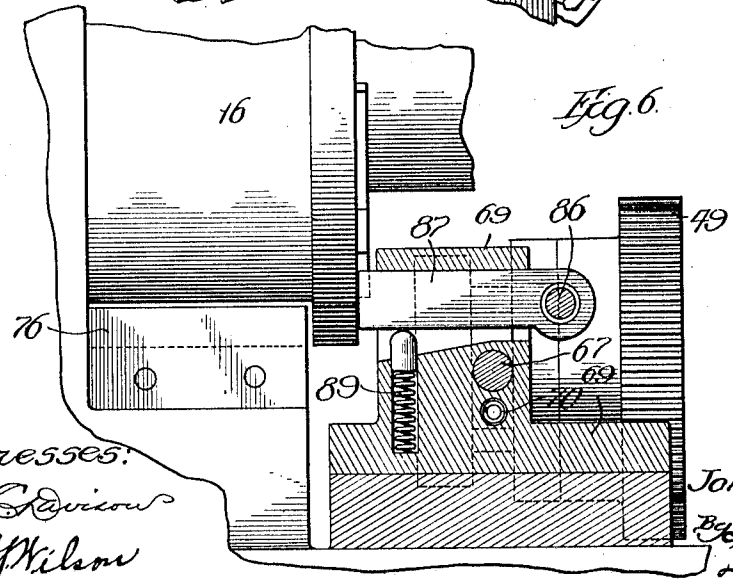


Fig. 6.



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5 SHEETS—SHEET 3.

Fig. 3.

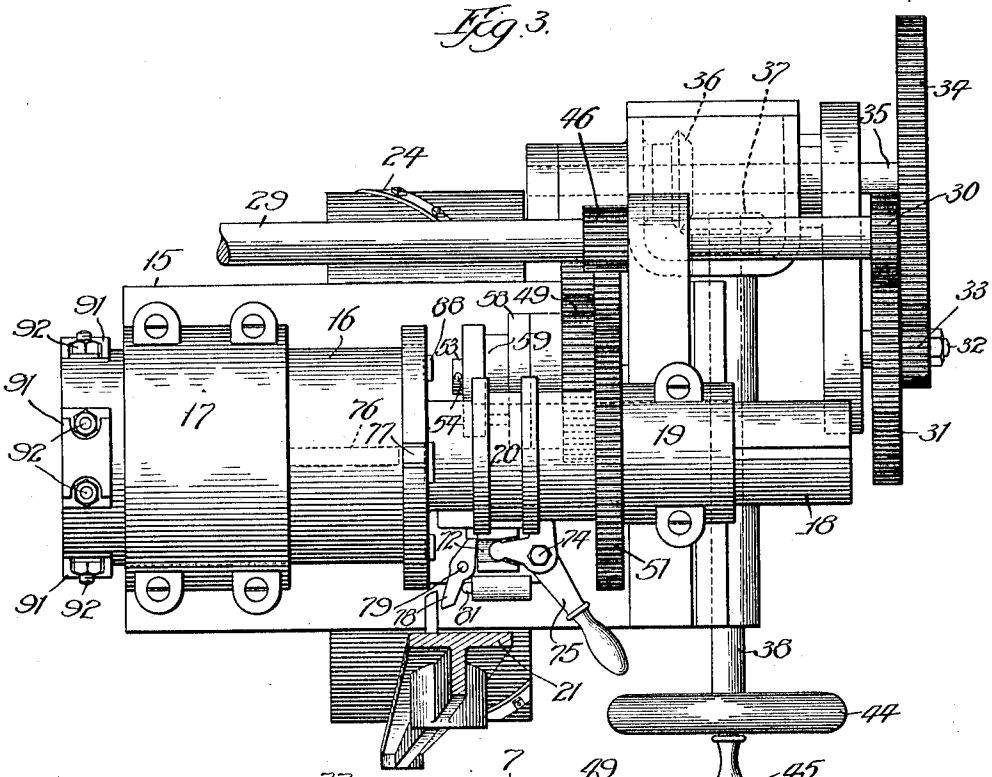
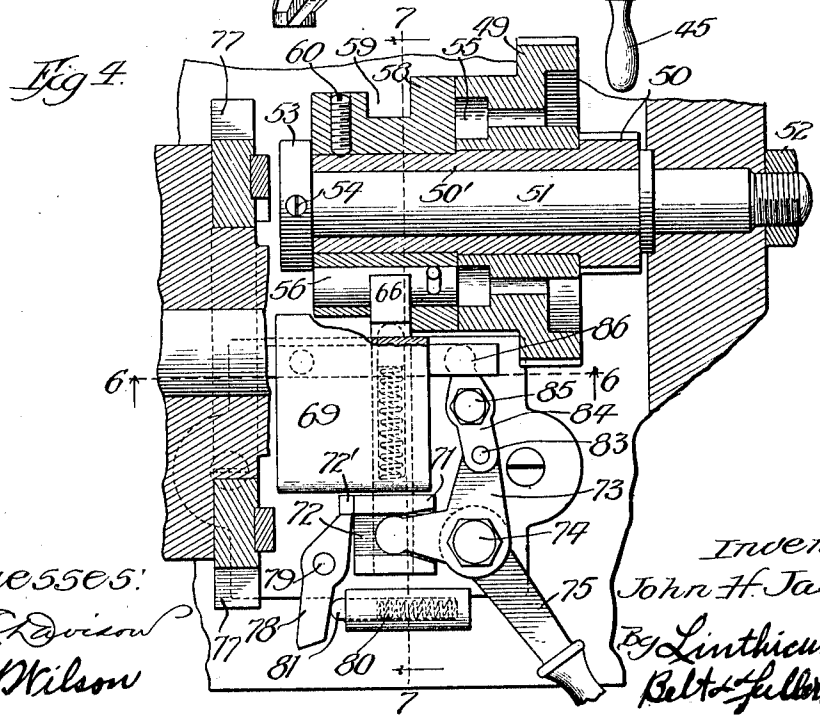


Fig. 4.



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5 SHEETS—SHEET 4.

Fig. 5.

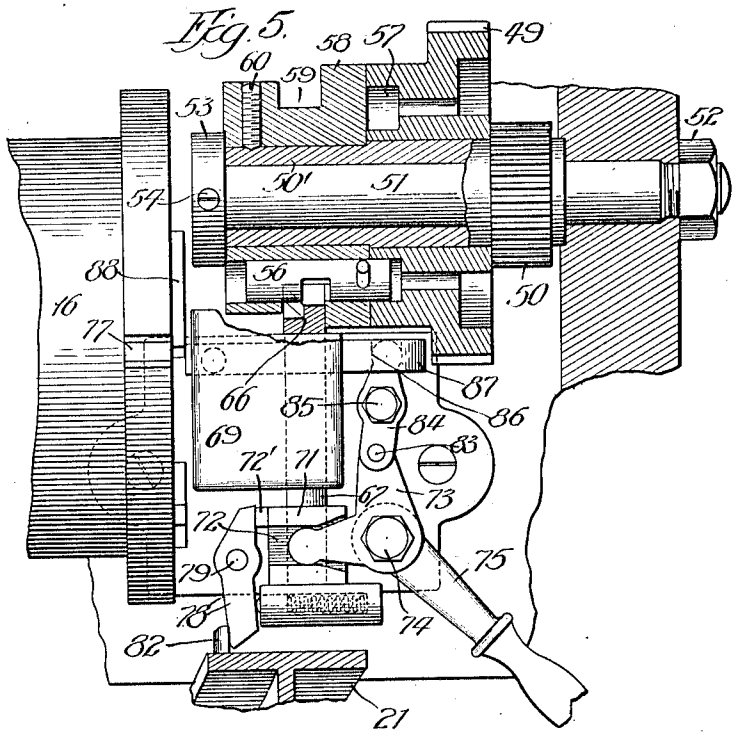


Fig. 8.

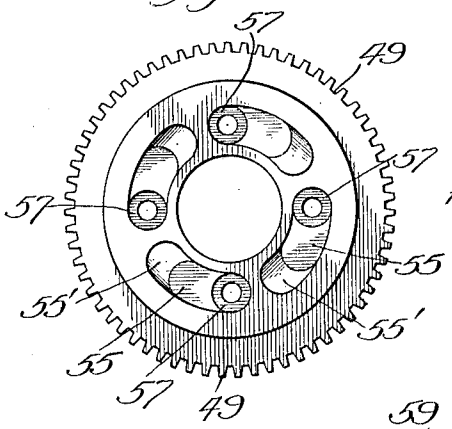


Fig. 9.

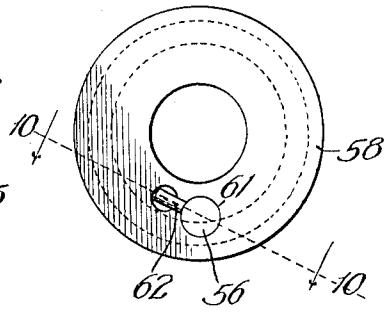
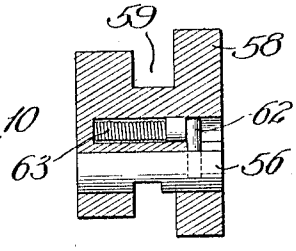


Fig. 10



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5 SHEETS—SHEET 5.

Fig. 7.

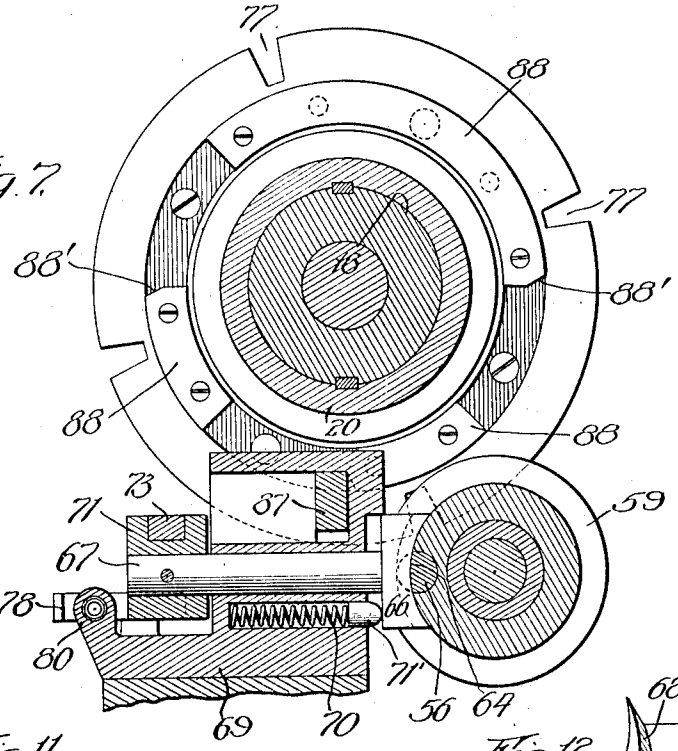


Fig. 11

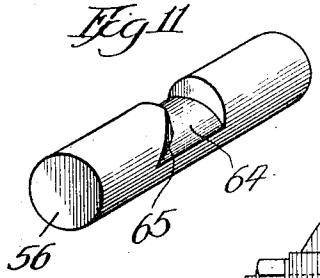
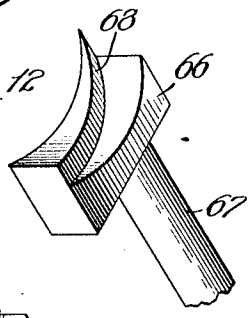


Fig. 12



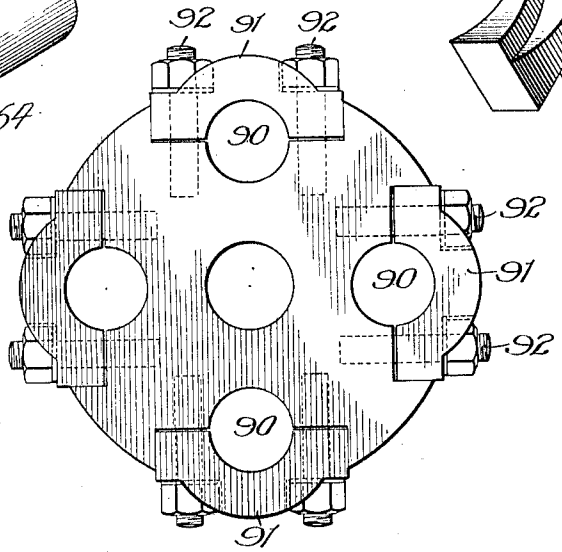


Fig. 13

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UNITED STATES PATENT OFFICE.

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TURRET-OPERATING MECHANISM.

1,022,086. Specification of Letters Patent. Patented Apr. 2, 1912.

Application filed October 10, 1910. Serial No. 586,220.

To all whom it may concern:

Be it known that I, JOHN H. JANN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Turret-Operating Mechanisms, of which the following is a specification.

This invention relates to turret operating mechanisms adapted to be applied to metal-working machines in general and particularly to screw-machines of the class comprising a tool carrying turret adapted to reciprocate and carry the tools toward and from the chuck-spindle, and indexing mechanism for rotating the turret to bring the tools successively into alinement with the chuck-spindle.

One feature of the invention consists in so constructing and arranging the indexing mechanism that the turret during its backward movement away from the stock will set in operation the turret rotating mechanism to bring the next filled socket into alinement with the chuck-spindle.

Another feature of the invention relates to improved means for controlling the indexing movements of the turret so that a constant angular speed of the turret will be maintained between each successive filled socket with no abatement at intermediate empty sockets.

A further feature of the invention resides in the employment of a safety device which prevents the operation of the turret rotating mechanism until the turret has assumed the proper predetermined longitudinal position.

Other novel features and advantages of this invention will become apparent as it is better understood by reference to the following description when taken in connection with accompanying drawings.

Referring to the drawings—Figure 1 is a front elevation of a screw-machine embodying the feature of the present invention in their preferred forms. Fig. 2 is an end elevation thereof. Fig. 3 is a plan view of the machine. Fig. 4 is an enlarged horizontal detail view partially in section showing the turret indexing mechanism locked in the position which it assumes during the forward movement of the turret. Fig. 5 is a similar view showing the position of the turret indexing mechanism just prior to the indexing operation. Fig. 6 is a vertical section on the line 6—6 of Fig. 3. Fig. 7 is a vertical sectional view on the line 7—7 of Fig. 3. Fig. 8 is a detail view of the clutch gear. Fig. 9 is a detail end view of the clutch collar. Fig. 10 is a sectional view on the line 10—10 of Fig. 9. Fig. 11 is a perspective view of the clutch bolt. Fig. 12 is a detail perspective of the clutch bolt operating cam block; and Fig. 13 is an end elevation of the turret.

The main frame 14 of the machine is provided with a horizontal bed 15 (Fig. 3) upon which the turret 16 is supported in a bearing 17 so as to be capable of a rotary indexing movement and a longitudinal reciprocatory movement. The rear end of the turret terminates in a shaft 18 suitably mounted in a bearing 19 upon the bed of the machine. A grooved collar 20 is fixedly secured upon the turret shaft and is adapted to receive a pin or roll (not shown), projecting rearwardly from the upper end of a feed lever 21 mounted to oscillate about a pivot 22 projecting from the main frame. The lower end of the feed lever is provided with a pin or roll 23 adapted to be engaged by the cams 24 bolted upon the surface of the cam drum 25. The periphery of the cam drum is provided with a plurality of holes 26 so that the cams 24 may be mounted in any required position to engage the roll or pin 23 as the drum revolves and oscillate the feed lever to cause the desired reciprocations of the turret. The cam drum is fixedly mounted upon a shaft 27 which has secured upon its outer end a worm-gear 28.

Power is applied to the machine from any suitable source through the drive shaft 29 which has secured upon its outer end a spur-gear 30. A gear 31 carried by a stub shaft 32 meshes with the spur-gear 30, and a smaller gear 33 integral with the gear 31 meshes with and drives a gear 34 fixed on the shaft 35. The inner end of the shaft 35 carries a bevel-gear 36 which drives a similar bevel-gear 37 fixed upon a worm-shaft 38 provided with a worm 39 which drives the gear 28.

When the machine is in operation the cam drum is slowly revolved by the driving mechanism above described, at a constant speed causing the turret to be moved forward and backward toward and from the stock by the oscillatory feed lever. The speed at which the turret will be fed in both directions may be regulated by adjusting the positions of the cams 24 on the cam drum

and furthermore the speed of the cam may be varied by substituting smaller or larger gears for the integral gears 31 and 33. The stub shaft 32 upon which these gears are carried is adjustable longitudinally of a bracket-arm 40 in a slot 41. Said bracket-arm 40 is supported upon the frame of the machine by bolts 42 and is provided with slots 43 through which the bolts pass; this construction permitting an angular adjustment of the arm about the shaft 35. The worm-shaft 38 carries a hand-wheel 44 provided with a handle 45, by means of which the machine may be turned over by hand, if desired, when the power is off.

For the purpose of imparting a rotary movement to the turret to index the same, I have provided a train of gears between the turret shaft and the power shaft 29 and a clutch for connecting this train of gears. I have also provided novel mechanism for controlling the clutch to cause the indexing movement of the turret to be effected at the proper time. The train of gears comprises a spur-gear 46 secured upon the drive shaft 29, a gear 47 meshing with the drive gear and integrally associated with a gear 48, a clutch gear 49 meshing with said gear 48, a gear 50 adapted to be clutched to the gear 49 in a manner hereinafter to be described, and a turret gear 51 splined upon the turret shaft 18 and meshing with and driven by the gear 50. As best shown in Figs. 4 and 5, the gear 50 is provided with an elongated collar 50′ loosely mounted upon a stub shaft 51 which projects through and is secured to the main frame of the machine by a nut 52. An adjustable collar 53 secured in position upon the stub shaft 51 by a set-screw 54 engages the outer end of the collar 50′ and maintains the gear 50 in proper position on the stub shaft 51. The clutch gear 49 is loosely journaled upon the larger part of the collar 50′ and is provided on its rear face, as best shown in Fig. 8, with a plurality of elongated sockets 55 inclined at one end 55′ to permit the ready entrance of a clutch bolt 56, and equipped with hard steel plugs 57 to prevent wear. A clutch collar 58 provided with a circumferential groove 59 is fixedly secured upon the collar 50′ adjacent the clutch gear 49 by means of a set-screw 60. The clutch collar is provided with a longitudinal bore 61 intersecting the peripheral groove 59 and in which is slidingly mounted the clutch bolt 56 (Figs. 9 and 10). Said clutch bolt is provided with a laterally extending pin 62 projecting into an adjacent longitudinal bore in the clutch collar in which is seated an expansion spring 63 adapted to normally urge the clutch bolt into engagement with the sockets 55 of the clutch gear. The clutch bolt, where it intersects the circumferential groove of the clutch collar, is provided with a transverse recess 64 having one corner thereof beveled off at 65 as shown in Fig. 11. The clutch gear 49 is continuously driven by the gear 48 and when the clutch bolt 56 is extended by the expansion spring 63 to engage in one of the sockets 55, the gear 50 is locked to the clutch gear 49 and revolves therewith to impart a rotary movement to the turret through the turret gear 51. The clutch bolt is held out of engagement with the clutch gear except at such times as an indexing movement of the turret is required, by a cam block 66 (Fig. 12) secured upon a plunger rod 67 and provided with a cam surface 68. The plunger rod which is supported in a bearing block 69 is normally urged into the groove 59 of the clutch collar by an expansion spring 70 (Fig. 7) positioned in a bore in the bearing block parallel with the plunger and acting upon an arbor 71′ which bears against the rear face of the cam block 66. When the cam block assumes the position shown in Fig. 7, the plunger bolt during the rotation of the clutch collar in a counter-clockwise direction will be engaged by the cam 68 and withdrawn longitudinally from engagement with the clutch gear, thereby stopping the rotation of the turret and permitting the clutch gear to run idly.

For the purpose of withdrawing the cam block from engagement with the plunger bolt at predetermined intervals, I have secured upon the outer end of the plunger 67 a head 71 provided at its upper side with a transverse bearing groove 72 adapted to receive the rounded end of one arm of a bell-crank lever 73. The lever 73 is pivoted upon the bolt 74 and is provided with a handle 75 by means of which the lever may be moved toward the right, viewing Figs. 4 and 5, to withdraw the cam block from the groove 59 and permit the clutch bolt to lock the gears 49 and 50 rigidly together.

The turret is guided in its longitudinal movement and held against rotation by a guide 76 which is slidingly engaged by radial notches 77 with which the rear head of the turret is provided. The guide 76 is of such a length that the turret will be disengaged therefrom when it is in its rearmost position, so that rotary indexing movement of the turret may take place. In order to prevent injury to the machine, such as would result if the gears 49 and 50 were locked together when the turret was prevented from rotation by the guide 76, I have provided means for preventing the cam block from being disengaged from the clutch bolt except when the turret is disengaged from the guide 76. This means comprises a latch 78 (Figs. 4 and 5) pivotally mounted at 79 on the frame of the machine and adapted to engage behind a shoulder

72′ of the head 71 when the cam block is situated in the groove 59 of the clutch collar. The latch is yieldingly retained in locking position by an expansion spring 80 which, through an arbor 81 normally urges the latch into the position shown in Fig. 4. In order to release the latch to permit the indexing movement of the turret when it is withdrawn from the guide 76, I have provided on the lever 21 a rearwardly projecting stud or shoulder 82 positioned to engage the outer end of the latch 78 as the feed lever approaches its rearmost position as shown in Fig. 5. The latch except when released by the lever 21, locks the cam block in the groove 59 and prevents accidental manipulation of the handle 75 such as would clutch the gears 49 and 50 together with disastrous results to the machine.

For the purpose of automatically clutching the gears 49 and 50 together at the proper time, *i. e.*, when the turret is in its rearward position and disengaged from the guide 76, I have provided mechanism disposed in the path of the rearwardly moving turret which will be engaged by the turret to automatically release the clutch bolt 55. To effect this result the outer end of the bell-crank lever 73 is connected at 83 with a short-lever 84 pivoted at 85 and having a rounded inner end 86. The bearing block 69 is provided with a transverse slot or recess adapted to receive a thrust member 87 which has a socket at one end into which the rounded end 86 of the lever 84 fits, as shown in Figs. 4, 5 and 6. The free end of the thrust member 87 when the parts are in the normal position shown in Fig. 4, is extended to a point close to but not engaging the rear face of the turret.

A number of arc-shaped index segments 88 are secured upon the rear face of the turret in proximity to the guiding notches 77, as shown in Fig. 7. These index segments project beyond the surface of the head as will be evident from an inspection of Fig. 4, and the forward end of each segment is beveled off to form a cam surface 88′ which is adapted to engage and depress the outer end of the thrust member 87 when the turret is rotated in its rearmost position. When, in the continued rotation of the turret, the index segment passes off from the end of the thrust member, the expansion spring 89 disposed in a socket in the block 69, as shown in Fig. 6, elevates the thrust member to its normal position.

The working end of the turret is provided with the usual tool holding sockets 90, the tools being held in position therein by clamping sectors 91 which are forced into clamping engagement with the tools by means of bolts 92. It will be noted that a filled socket is in proper indexed position to perform the desired work when its corresponding guiding notch 77 on the rear head of the turret is in alinement with the guide 76.

Assuming that the turret has been rotated to bring a filled socket into the proper alined position, the turret will be fed forward by the cam drum through the instrumentality of the feed lever, the guide 76, during the forward and backward movement, maintaining the turret in proper working position. When the turret is in working position the clutch gear 49 is running idly and the indexing mechanism is locked by the latch 78 in the position shown in Fig. 4, while the thrust member 87 is maintained in the elevated position shown in Fig. 6. The free end of the thrust member is now in alinement with the index segment adjacent the guiding notch which is engaged with the guide 76. As the turret is returned to its rearmost position the latch 78 is released by the lug 82 on the feed lever 21, and the outer face of the index segment engages with the end of the thrust member and forces the same to the right, viewing Figs. 4, 5 and 6. This longitudinal movement of the thrust member will actuate the lever 84 and the bell-crank lever 73 to withdraw the cam block from engagement with the clutch bolt and permit the same to engage in one of the sockets 55 of the clutch gear. Rotary movement will now be imparted to the turret in a clockwise direction, looking at Fig. 7, through the gear 50. As soon as the index segment 88 is carried beyond the end of the thrust member 87, the spring 70 will return the indexing mechanism to its normal position shown in Fig. 4, and when the plunger bolt in its rotation is withdrawn from the clutch gear by the cam block 66, the rotary movement of the turret will cease. The gears 50 and 51 are so proportioned that each revolution of the gear 50 will impart a quarter turn to the turret and bring the next guiding notch 77 into alinement with the guide 76. Since the cam block 66 will be retained in inoperative position as long as the thrust member is maintained in retracted position by the outer face of the index segment, it will be evident that by the employment of a longer index segment, such as is shown uppermost in Fig. 7, the block will be maintained in inoperative position until the gear 50 has completed more than one revolution and the turret has been given more than a quarter turn. An index segment of a length of that shown in the upper position in Fig. 7, will maintain the thrust member in retracted position and permit the turret to make a half revolution before the plunger bolt is withdrawn. Each of the other two index segments, shown in Fig. 7, will permit only a quarter turn of the turret before unclutching the gear 50 from the clutch gear 49. It will thus be apparent that

the distance which the turret will be rotated may be controlled by substituting index segments of the required length. If each socket of the turret is filled and it is desired to impart only a quarter turn to the turret at each indexing movement, the shorter index segments, as shown in Fig. 7, are employed. If it is desired to skip an empty socket a longer index segment such as is shown in the upper position in Fig. 7, is employed, which will permit the turret to rotate half a revolution and past the empty socket.

In the operation of the machine after an index segment has passed beyond the end of the thrust member said member will assume its normal position, shown in Fig. 6, in the path of the next succeeding index segment. As such succeeding segment is brought into engagement with the thrust member the cam portion 88′ thereof will depress the free end of the member so that said end will be maintained beneath the lower edge of the segment. When, however, the turret is moved forward longitudinally and the index segment is withdrawn from the thrust member, said member will be elevated to a position to be engaged by the outer face of the plate upon the rearward movement of the turret.

While I have shown and described a preferred embodiment of my invention, it will be apparent that various mechanical changes may be resorted to without departing from the spirit of the invention or sacrificing any of the material advantages thereof.

What I desire to claim is:

1. In a metal-working machine, the combination of a turret, means for reciprocating said turret, a continuously rotating element, means for connecting said element to said turret to rotate the same, and a device mounted on said turret for actuating said means to establish said connection.

2. In a metal-working machine, the combination of a turret, means for reciprocating said turret, a continuously rotating element, means adapted to connect said element and said turret, and means mounted on the turret to actuate said connecting means and effect rotation of the turret when it reaches a predetermined longitudinal position and to control the extent of said rotation.

3. In a metal-working machine, the combination of a turret, means for reciprocating said turret, means for rotating said turret comprising a continuously rotating gear, a gear having driving connections with the turret and a clutch for connecting said gears, and means controlled by the longitudinal position of said turret for closing said clutch and by the angular position of the turret for opening said clutch.

4. In a metal-working machine, the combination of a turret, means for reciprocating said turret, turret rotating mechanism, a clutch for connecting said turret to said rotating mechanism, and means for controlling said clutch comprising a member disposed in alinement with said turret and adapted to be actuated thereby and connections between said member and the clutch and means mounted on the turret for actuating said controlling means to open and close the clutch.

5. In a metal-working machine, the combination of a turret, means for reciprocating said turret, turret rotating mechanism, a clutch for connecting said rotating mechanism with the turret, and clutch controlling means comprising a thrust member located at one end of and in alinement with said turret to be reciprocated thereby, a cam head adapted to engage with the clutch, and lever connections with said clutch member and cam head whereby longitudinal movement of the thrust member by the turret will actuate said cam head to permit the closing of the clutch.

6. In a metal-working machine, the combination of a turret, means for reciprocating said turret, a continuously driven member, a clutch for connecting said member with said turret, a clutch operating mechanism, and means mounted upon the head of the turret for actuating said clutch operating mechanism to close the clutch and retain the same in closed position for a variable predetermined period.

7. In a metal-working machine, the combination of a turret, means for reciprocating said turret, a continuously driven member, a clutch for connecting said member with the turret clutch controlling mechanism, and an index segment carried by the turret head for actuating said clutch controlling mechanism to index the turret.

8. In a metal-working machine, the combination of a turret, means for reciprocating said turret, an index segment secured upon the turret head, a thrust member normally disposed in alinement with said index segment, a continuously driven member, a clutch for connecting said continuously driven member with the turret, and clutch controlling mechanism connected with said thrust member for actuating said clutch upon longitudinal movement of the thrust member by the index segment to impart a rotary indexing movement to the turret.

9. In a metal-working machine, the combination of a turret, means for reciprocating said turret, a countinuously driven member, a clutch for connecting said member with the turret, clutch controlling means adapted to normally maintain said clutch in released position, an index segment secured upon the turret head, a thrust member disposed in alinement with said segment, and means including a bell-crank lever connecting said thrust member with the clutch controlling means.

10. In a metal-working machine, the combination of a turret, a continuously driven member, a clutch for connecting said member with said turret, means for locking said clutch in open position, means for reciprocating said turret, a device carried by said turret reciprocating means for unlocking said clutch, and means carried by the turret for permitting said clutch to close after the unlocking operation.

11. In a metal-working machine, the combination of a turret, means for reciprocating the same, a clutch controlling member, a latch for locking said clutch controlling member in clutch release position, said latch being positioned to be released by the turret reciprocating means, and manual means for actuating said clutch controlling mechanism.

12. In a metal-working machine, the combination of a turret, an index plate secured on said turret and having a cam surface at one end thereof, and turret controlling means comprising a thrust member positioned with its free end in the path of said cam whereby said free end will be depressed and yielding means for returning said member into horizontal alinement with said segment.

13. In a metal-working machine, the combination of a turret, means for reciprocating said turret, a thrust member located at one end of the turret, a plurality of index segments secured upon the turret head to impart a longitudinal movement to said thrust member when the turret assumes its rearmost position, a continuously driven member, a clutch for connecting said continuously driven member with the turret for rotating the same, clutch controlling mechanism comprising a cam block, a plunger, and a bell-crank lever connected with said thrust member, a latch for locking said clutch controlling mechanism in clutch releasing position, means for releasing said latch, and manual means for actuating said clutch controlling mechanism.

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