Dec. 10, 1929. H. CREHAN ET AL 1,738,642

BOLT FINISHING MACHINE

Filed March 13, 1925 4 Sheets-Sheet 1

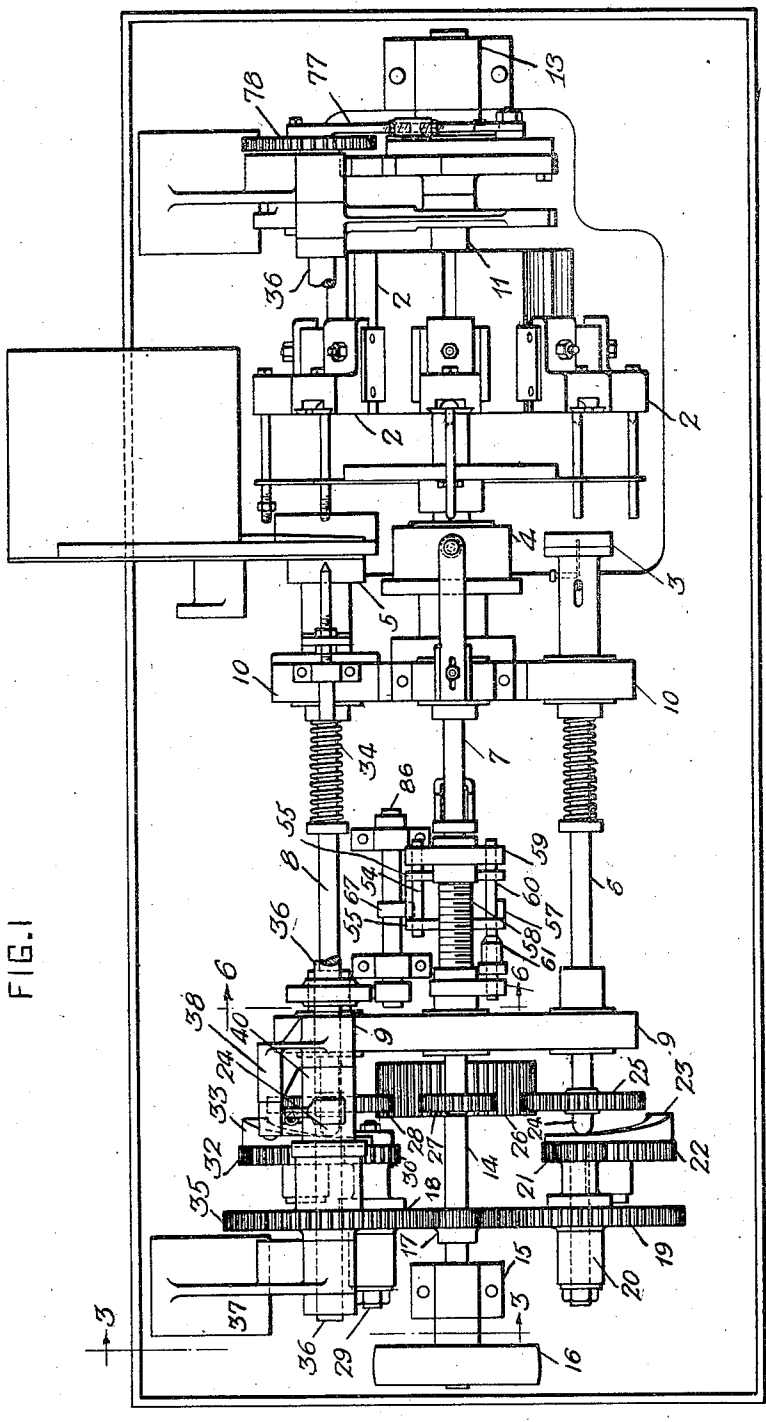


FIG. 1

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Dec. 10, 1929. H. CREHAN ET AL 1,738,642

BOLT FINISHING MACHINE

Filed March 13, 1925 4 Sheets-Sheet 2

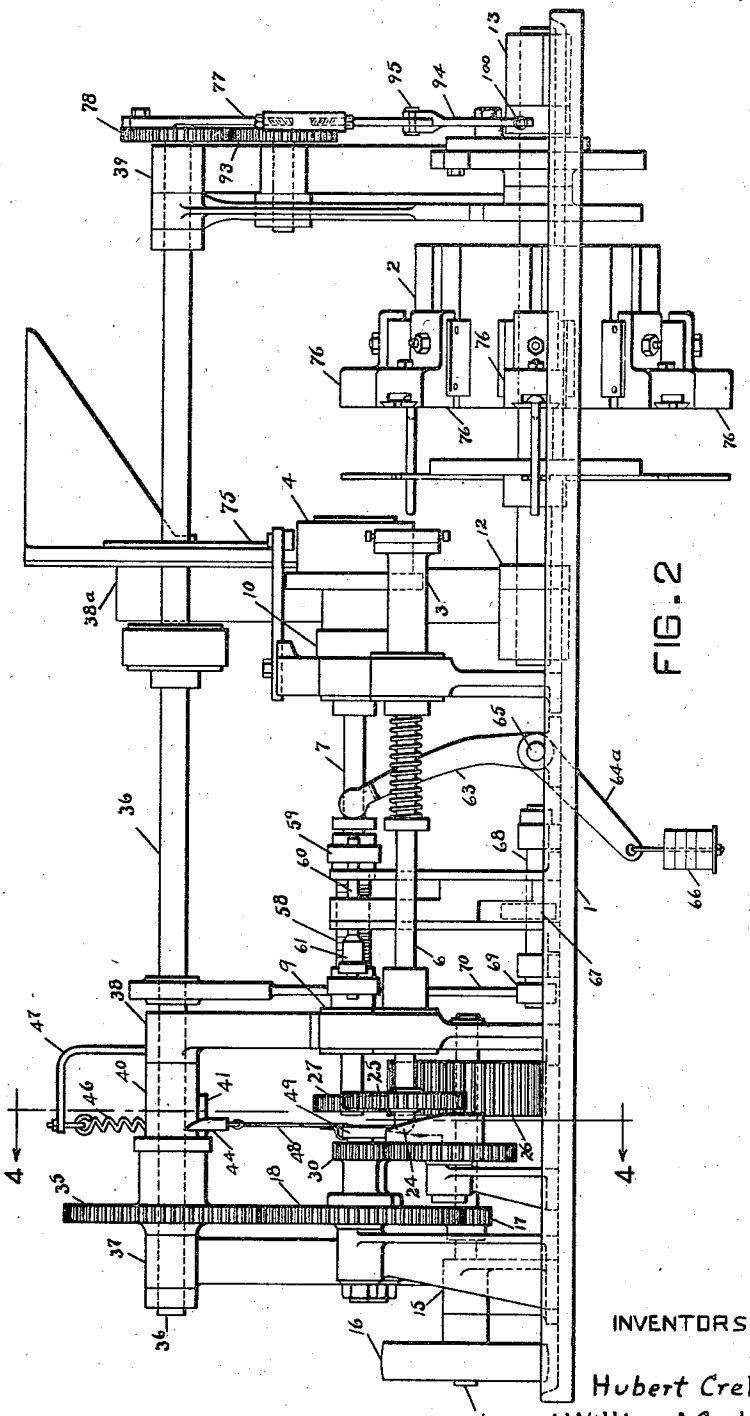


FIG. 2

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Dec. 10, 1929. H. CREHAN ET AL 1,738,642

BOLT FINISHING MACHINE

Filed March 13, 1925 4 Sheets-Sheet 3

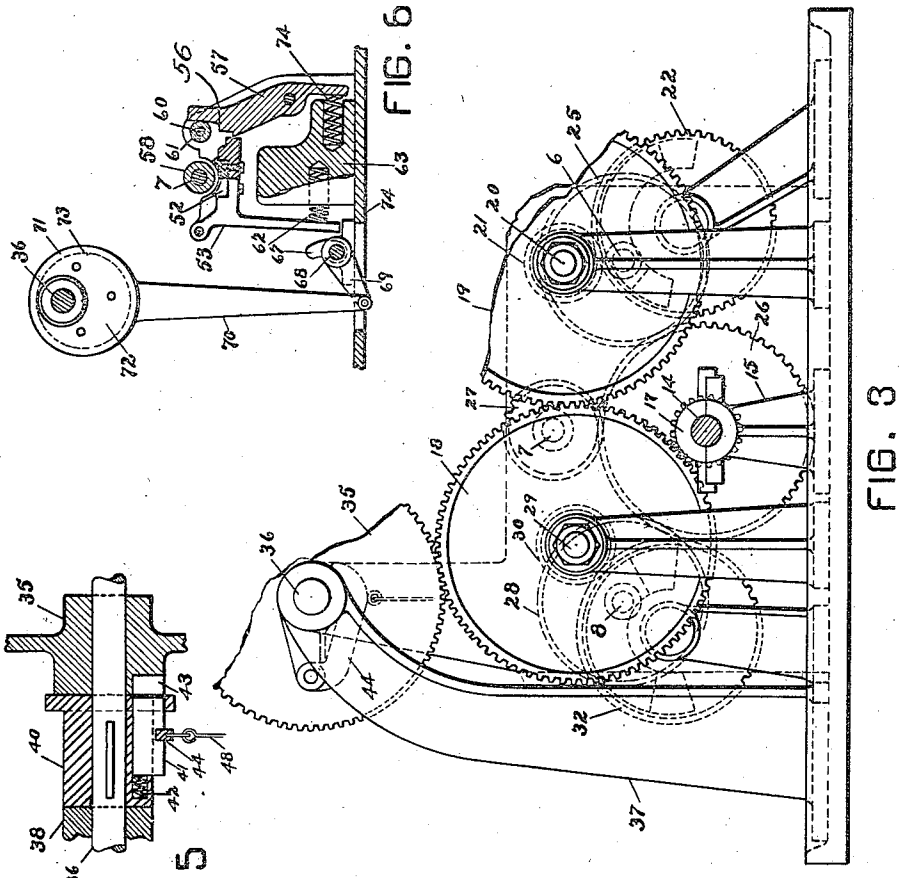


FIG. 3

FIG. 5

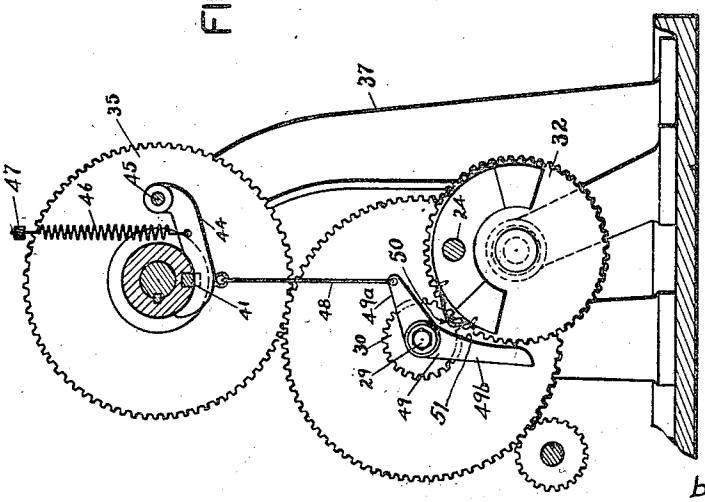


FIG. 4

FIG. 6

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Dec. 10, 1929. H. CREHAN ET AL 1,738,642

BOLT FINISHING MACHINE

Filed March 13, 1925 4 Sheets-Sheet 4

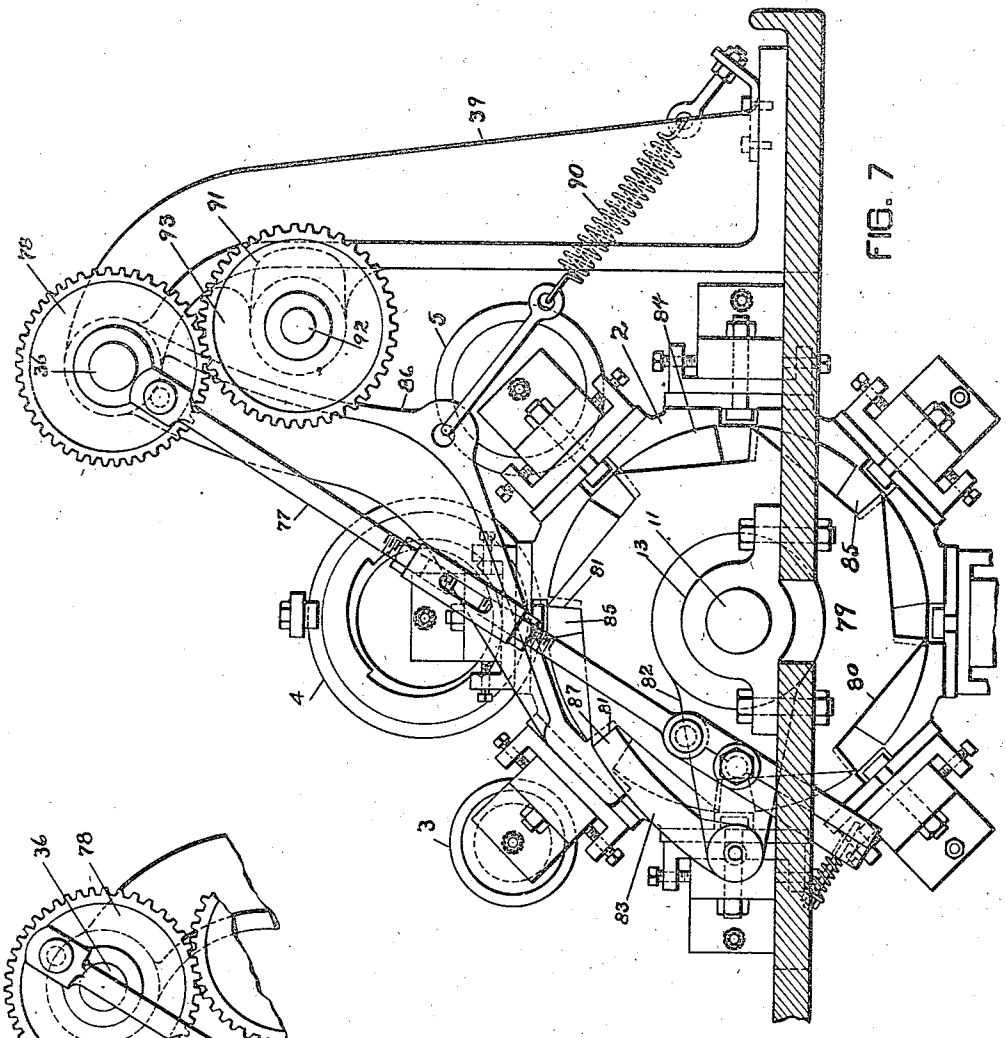


FIG. 7

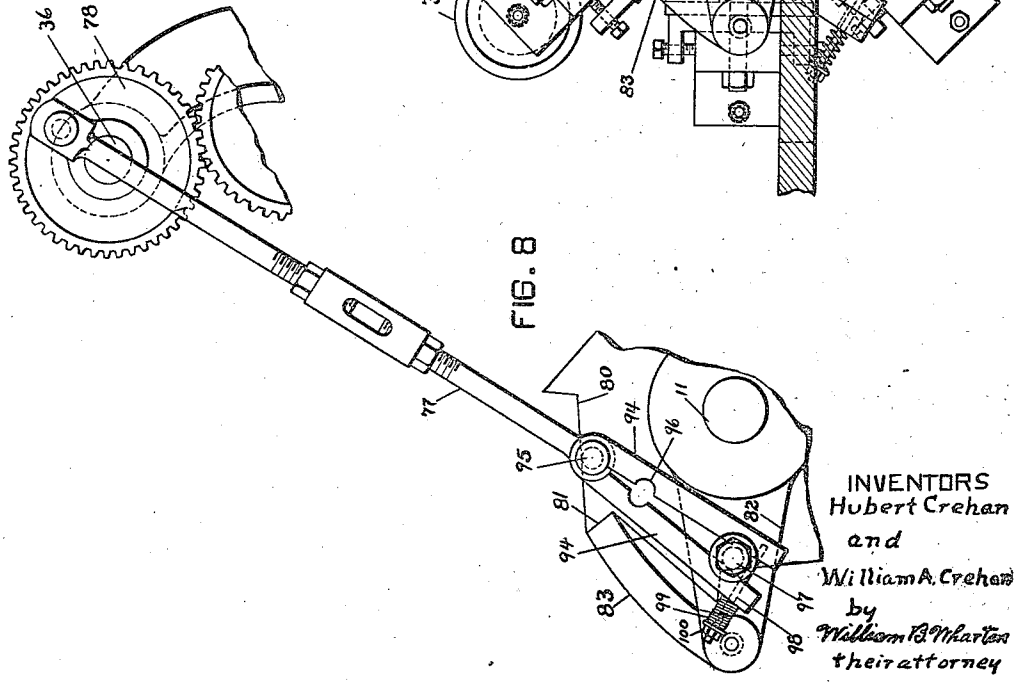


FIG. 8

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UNITED STATES PATENT OFFICE

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BOLT-FINISHING MACHINE

Application filed March 13, 1925. Serial No. 15,249.

This invention relates to a bolt finishing machine, and constitutes an improvement over the machine of Patent No. 1,420,410, granted June 20, 1922, to Hubert Crehan.

The machine of such patent comprises a plurality of spindles, carrying operating heads, which are advanced by means of a set screw on the spindle and a nut intermittently engaging such set screw. In such machine the spindles carrying the pointing, thread cutting, and nut attaching heads of the machine are simultaneously advanced to operate upon three bolts. A bolt carrying head or turret, the movement of which is controlled by movement of the spindles, advances the bolts upon the operating heads with a step by step movement to present each individual bolt to the three operating heads successively. This control is effected by tripping means actuated by the movement of one of the spindles itself.

One object of the invention is to provide improved and simplified means for advancing a spindle which carries a pointing or nut attaching head.

Another object of the invention is to provide means actuated by the means for advancing one of such spindles for controlling the step by step movement of the bolt carrying turret.

A further object of the invention is to provide simplified and improved means, actuated by the turret actuating means for producing forward movement of the spindle which carries the thread cutting head of the machine.

A still further object of the invention is to provide improved actuating connections for the bolt carrying turret, which prevent movement of the turret if any obstruction to such movement should be presented.

In the accompanying drawings Figure 1 is a plan view of the bolt finishing machine of the present invention; Figure 2 is a side elevation thereof; Figure 3 is a vertical sectional view on the line 3—3 Figure 1; Figure 4 is a vertical sectional view on the line 4—4 Figure 2; Figure 5 is a longitudinal sectional detail view of the means for engaging the actuating shaft of the bolt carrying turret for rotation thereof; Figure 6 is a vertical sectional view of the means for controlling advancement of the spindle which carries the thread cutting head, taken on the line 6—6 Figure 1; Figure 7 is a front elevation of the portion of the machine, showing in detail the bolt carrying turret and the means for actuating the same; and Figure 8 is a similar but fragmentary view, illustrating the action of the turret operating rod when an obstruction to the rotation of the turret is encountered.

The machine, as a whole is mounted upon a suitable table 1, and comprises primarily the bolt carrying turret 2, a pointing head 3, a screw threading head 4, and a nut attaching head 5. These heads are mounted respectively on spindles 6, 7, and 8, all of which have bearings in the two standards 9 and 10. The bolt carrying turret 2 is mounted on a shaft 11, having bearings 12 and 13. All the elements of the machine are actuated by means of a main shaft 14, having bearings in the standards 9 and 15, and which has thereon a pulley 16 for the attachment of a driving belt. On the main shaft 14 is a pinion 17 meshing with a gear 18, which in turn meshes with a similar gear 19. The stub shaft 20 to which gear 19 is keyed carries a pinion 21 meshing with the cam gear 22. Cam gear 22 has on its forward face a cam 23 having an inclined surface which bears against the rounded end 24 of the spindle 6 during a portion of each revolution of the cam.

Rotation of the spindle 6 is produced by means of a gear 25, carried by the spindle, and which meshes with a wide gear 26 on the main shaft 14. With this wide gear 26 also mesh a gear 27, on the spindle 7 which carries the thread cutting head, and a gear 28 on the spindle 8 which carries the nut attaching head.

On the shaft 29 of the gear 18 is a pinion 30, similar to the pinion 21, which meshes with the cam gear 32. This gear carries a cam 33 similar with that on the gear 22, and which bears against the rounded end 24 of the spindle 8 which carries the nut attaching head of the machine.

After their forward movement, and when they ride off the cams 23 and 33, each spindle is forced rearwardly by a compression spring

34, which surrounds the spindle and bears against the standard 10.

The means for producing step by step rotation of the bolt carrying turret is actuated and controlled by the same means which produced forward movement of the pointing and nut attaching spindles. Such means comprise the gear 18, which meshes with a gear 35. This gear 35 is free on the actuating shaft 36 for the bolt carrying turret 2, which shaft is mounted in standards 37, 38, and 39. Keyed to the shaft 36 and abutting the gear 35 is a collar 40. This collar 40 is provided with a key 41 which is forced by a coiled spring 42 into a locking recess 43 in gear 35, to mutually engage the gear 35 with the collar 40 and the shaft 36 with which it is rigidly connected. The key 41 is held out of locking recesses 43 by means of a latch hook 44 which is pivotally mounted on a shaft 45 on standard 38, and which is arranged to enter a recess in the key 41. A helical spring 46, connected with the overhanging support 47 normally holds the latch hook 44 in engagement with the collar 40 and in the recess of key 41.

The latch mechanism as above described, is identical with that illustrated and described in the patent noted above. The mechanism for tripping the latch is, however, novel, and presents an improvement over the mechanism of such patent. This mechanism comprises a rod 48, which is secured to the latch hook 44 and to the arm 49^a of a bell crank lever 49, which is pivotally mounted on the shaft 29 of gear 18 and pinion 30. Cam gear 32 has thereon a dog or tripping member 50, which extends beyond the periphery of the gear at a point not occupied by the cam 33. Following forward movement of the spindle 8, this dog 50 comes into contact with the arm 49^b of the bell crank lever 49, and raising this arm depresses the arm 49^a of the lever.

Arm 49^a of the lever being depressed withdraws the latch hook 44 from the recess in the key 41, against the resistance of the helical spring 46. The coiled spring 42 is thus permitted to force key 41 into the locking recess 43 in the gear 35, to connect the gear 35 with collar 40 and produce rotation of the shaft 36.

It will be noted by reference to Figure 4 of the drawings, that the dog 50 has a rounded extremity, and that the arm 49^b of the bell crank lever 49 has a concave surface 51 for the contact of the dog. As long therefore as the dog 50 remains in contact with the surface 51 of the lever arm latch hook 44 is kept from engagement with the recess 45 in the key 41. As soon, however, as the dog 50 passes beyond the arm 49^b in rotation of the cam gear 32, spring 46 is permitted to again bring latch hook 44 into engagement with the recess 45 in the key 41. The latch hook 44 is beveled, as shown in Figure 2, so that it is enabled to enter the recess in the key when the latter is in operative position, and withdraw it from locking recess 43. The length of the contact surface of lever arm 49^b may be readily made such that the shaft 36 is given but a single revolution before it is again disconnected from the gear 35.

It is desirable that means differing from those described for advancing the pointing and nut attaching spindles be used on the screw threading spindle 7. The immediate means for engaging and advancing the spindle correspond in general to those described and claimed in patent to Hubert Crehan No. 1,327,312 dated January 6, 1920, and patent to Hubert Crehan No. 1,420,410 dated June 20, 1922. With particular reference to Figure 6 of the drawings, such mechanism comprises a segmental nut 52, carried by a bell crank lever 53 pivotally mounted on a shaft 54 in supports 55. Engaging by means of a shoulder 56 with the lever 53 is a latch lever 57, which when in engaging position serves to lock the segmental nut 52 in engagement with a screw threaded portion 58 on the spindle 7. As the spindle is being constantly rotated, this engagement causes it to travel forward carrying with it its operating head. Arranged to be carried forward by the spindle 7 is a guide frame 59, on one of the rods 60 of which is carried a cone 61. When forward movement of the spindle has progressed to a predetermined point, the cone 61, coming into contact with the latch lever 57 forces its shoulder 56 out of engagement with the nut supporting lever 53, permitting the lever 53 to drop carrying with it the segmental nut 52. This action is assisted by a spring 62 bearing against a central block 63 and against the lower portion of the nut supporting lever 56.

Upon disengagement of the segmental nut 52 from the screw threaded portion 58 of the spindle 7, the spindle is carried rearwardly by means of a bell crank lever 63 pivoted at 65 in the table 1, and having its lower arm 64^a provided with a counterweight 66. This rearward movement is continued until the guide frame 59 comes into contact with the standard 9, and the screw threading head 4 comes into contact with the standard 10.

It is to be understood that the rearward movement of the spindles 6 and 8 may be simultaneous with that of the spindle 7, under the force exerted on them by the compression springs 34; or the other spindles may lead the screw threading head, in order to allow more time for the operations of the nut attaching head. In this movement the gears 25, 27, and 28 on the three spindles move rearwardly on the wide gear 26, while still being in mesh therewith.

The automatic means for restoring the segmental nut 52 to its operative position differ from those shown in the prior patent to

Hubert Crehan No. 1,420,410, and present a novel and improved structure thereover. Such means comprise a cam 67, on a shaft 68 mounted on the table 1. Shaft 68 is connected by means of a link 69 with a lever arm 70. This lever arm is connected with a collar 71, which surrounds an eccentric 72 secured to the actuating shaft 36 for the bolt carrying turret. Interiorly of the collar 71 is a surface 73 so arranged that rotation of the shaft 36 in causing a forward movement of the bolt carrying turret acts on the collar 71 to produce movement of lever 70, link 69, and shaft 68, to operate the cam 67. When the levers of the spindle engaging mechanism are in their disengaged and operative position, oscillation of the cam 67 causes the cam to strike the lower portion of the nut supporting lever 53, which has been forced outwardly by the spring 62. This action, assisted by a spring 74 bearing against central block 63 and the lower portion of lever 57, causes the upper portions of the levers 53 and 57 to be forced upwardly into such position that the shoulder 56 of the latch lever 57 again engages the nut supporting lever. The segmental nut 52 is thus again brought into contact with the screw threaded portion 58 of the spindle 7 for advancing the spindle.

It will be understood that the arrangement of shaft 68, links 69, lever arm 70, and collar 72, may be such that the last movement of rotation of the shaft 36 actuates the mechanism to engage the segmental nut 52 with the screw threaded portion 58 of the spindle for advancing the spindle. The spindle is not advanced, therefore, until the bolt carrying turret has come to rest in proper position.

Mechanism, indicated generally by the reference numeral 75, for feeding nuts to the nut attaching head of the machine is supported by the standard 38a. It is unnecessary to describe this mechanism herein, as it is fully disclosed in the two prior patents to Hubert Crehan above noted, and as its mechanism has no direct bearing upon the novel features of the invention. The structures of the three working heads 3, 4, and 5 of the machine are also not described, nor illustrated in detail herein; because they are fully described and illustrated in the prior patent to Hubert Crehan No. 1,420,410 dated June 20, 1922.

The bolt carrying turret 2, and the actuating connections therefor, are similar to the turret and connections of Patent No. 1,420,410, except in one important detail of construction. The bolt carrying turret supports a plurality of bolt holding chucks 76, for presenting a bolt in operative relation to the pointing head 3, thread cutting head 4, and nut attaching head 5 of the machine. In order to present three bolts simultaneously for these three operations, it is necessary that the turret be rotated with a step by step movement, and locked in position between steps with the bolts in proper position before the operating heads.

The turret is rotated and locked by means of connections with the actuating shaft 36. Such actuating connections, with particular reference to Figure 7 of the drawings, comprise an operating arm 77 eccentrically connected with the face of the gear wheel 78, which is rigidly mounted on the shaft 36. A driving wheel or plate 79 is provided with a plurality of peripherally arranged cuts or ledges 80, furnishing engaging shoulders 81. The operating rod 77 is connected with an arm 82, which is rotatably mounted on the hub of the driving wheel or plate 79. Pivoted on the arm 82 is an actuating dog 83 arranged to engage shoulders 81 on the driving wheel or plate. In rotating the turret 2, rotation of shaft 36 and gear 78 causes the operating rod 77 and arm 82 to first disengage the dog 83 from the shoulder 81 of the driving wheel against which it lies, and to drag it backwardly until it enters the next succeeding cut or ledge 80 of the driving wheel or plate. The further action of the operating rod 77, during the same rotation of shaft 36, causes the dog to engage the shoulder 81 of the succeeding ledge and to rotate the turret one step.

The means for positively locking the turret 2 after a single forward step comprise a locking wheel 84, rigidly secured to the turret shaft 11 and having in its periphery a plurality of locking recesses 85; and a lever arm 86 carrying a suitable locking piece 87 arranged to engage in the recess 85. Lever arm 86 is supported on shaft 36 between a collar 88 and a bearing 89 in the standard 39, and has connected therewith a spring 90 arranged to exert a force tending to maintain the locking piece 87 in one of the locking recesses 85. Lever arm 86 is lifted intermittently by means of a cam 91, which is mounted on the shaft 92 of a gear 93. The gear 93 is actuated by gear 78, at an equal rate of speed therewith, and during each rotation of the gear 78 with that of the shaft 36, the cam 91 serves to raise the lever arm 86 and cause the locking piece 87 to be withdrawn from the recess in which it lies. After the cam has passed the lever arm, the spring 90 forces the lever arm into such position that the locking piece 87 engages the next succeeding notch, to hold the turret securely in proper position before the operating heads. Cam 91 is so positioned and designed with relation to the mechanism for positively rotating the turret that the disengagement of the locking piece leads by an instant the rotating impulse imparted to the turret.

In so far as described, the turret and mechanism for rotating the same are identical with those shown and described in patent to

Hubert Crehan No. 1,420,410. In the present invention, however, the operating rod 77 for actuating the turret is so arranged as to prevent injury to the operating heads of the machine, or the turret, in the event that the heads should not be properly withdrawn before a rotating impulse of the turret, or that some other cause should produce material resistance to such movement. For this purpose the operating rod 77 terminates in two tines 94, which are pivoted at 95 to the upper portion of the rod.

The two tines 94 are cut out to provide a rounded aperture or seat 96 for embracing a pin 97 on the arm 82 which carries the dog 83. The two tines 94 are normally held together to embrace the pin 97, by means of a pin 98 in both tines, and a coiled spring 99 bearing against one tine and against a nut 100 on the end of the pin 98.

If therefore any obstacle is presented to the movement of the turret, the tines 94 are spread by the action of the rod on the pin 97, and against the resistance of the coiled spring 99. The operating rod 77 therefore simply moves without affecting the position of the pin 97 and the arm 82 to which it is attached; there being no movement of this arm except when the pin 97 is engaged in the seat 96 and the tines 94 are held together by the action of the spring 99.

What we claim is:

1. In a bolt finishing machine the combination of a spindle, an operating head on said spindle, a main shaft, a gear on said main shaft, a pinion on the spindle meshing with said gear for rotating the spindle, a second gear operatively connected with said main shaft, a cam on said gear bearing directly against the end of the spindle opposite that which carries the operating head for advancing the spindle and operating head, a rotatable bolt carrier, a shaft operatively connected with said bolt carrier for rotating the same, and a member on the gear carrying the spindle advancing cam and positioned thereon with respect to the operating face of the spindle advancing cam for controlling rotation of said shaft.

2. In a bolt finishing machine the combination of a spindle, an operating head on said spindle, a main shaft, a gear on said main shaft, a pinion meshing with said gear for rotating the spindle, a second gear driven from said main shaft, a cam on said gear bearing directly against the end of the spindle opposite that which carries the operating head for advancing the spindle and operating head, a rotatable bolt carrier, a shaft connected with the bolt carrier for rotating the same, driving means, means for connecting said shaft with said driving means and a member carried by the cam gear and positioned with respect to the operating face of the cam for actuating the means for connecting the operating shaft with the driving means.

3. In a bolt finishing machine the combination of a spindle, an operating head on said spindle, a rotatable cam bearing directly on the end of the spindle opposite that which carries the operating head for advancing the spindle and operating head, a rotatable bolt carrier, a shaft connected with the bolt carrier for rotating the same, driving means, a member for connecting said shaft with said driving means, yieldingly mounted means for maintaining said connecting member out of operative position, a pivoted lever arranged to act upon said yieldingly mounted means to release said connecting member, and a member carried by the spindle advancing cam arranged to act on said pivoted lever.

4. In a bolt finishing machine the combination of a spindle, an operating head on said spindle, a main shaft, a gear on said main shaft, a pinion on the spindle meshing with said gear for rotating the spindle, a second gear driven indirectly from said main shaft, a cam on said gear bearing directly against the end of the spindle opposite that which carries the operating head for advancing the spindle and operating head, a rotatable bolt carrier, a shaft connected with said bolt carrier for rotating the same, driving means, a member for connecting said shaft with said driving means, yieldingly mounted means for maintaining said connecting member out of operative position, a pivoted lever arranged to act upon said yieldingly mounted means to release said connecting member, and a member carried by the spindle advancing cam arranged to act on said pivoted lever.

5. In a bolt finishing machine the combination of a main shaft, a rotated spindle, a rotatable bolt carrier, a shaft operatively connected with said bolt carrier for rotating the same, a driving gear intermittently connected with said operating shaft, an intermediate gear meshing with said driving gear, a pinion on the main shaft meshing with said intermediate gear, a rotatable cam for advancing the spindle, means connected with said intermediate gear for rotating said cam, and means associated with said cam for controlling the connection between said operating shaft and driving gear.

6. In a bolt finishing machine the combination of a rotatable bolt carrier, a shaft operatively connected with said bolt carrier for rotating the same, a spindle having an operating head thereon, means for engaging the spindle to advance the same, an eccentric connection with said operating shaft for actuating said spindle engaging means, means for actuating said shaft, a second spindle, means for advancing said second spindle, and a member associated with one of said spindle advancing means for controlling the actuation of said operating shaft.

7. In a bolt finishing machine the combination of a rotatable bolt carrier, a shaft operatively connected with said bolt carrier for rotating the same, a spindle having an operating head thereon, means operatively connected with said operating shaft and arranged to be actuated thereby to cause engagement of the spindle for producing forward movement thereof, means for actuating said operating shaft, a second spindle having an operating head thereon, a rotatable cam bearing directly on the end of the spindle opposite that which carries the operating head, and means associated with said cam for controlling actuation of said operating shaft.

8. In a bolt finishing machine the combination of a rotatable bolt carrier, a shaft operatively connected with said bolt carrier for rotating the same, a spindle having an operating head thereon, means for engaging said spindle to advance the same, an eccentric connection with said operating shaft for actuating said spindle engaging means, means for actuating said shaft, a second spindle having an operating head thereon, a rotatable cam bearing directly on the end of the spindle opposite that which carries the operating head, and means associated with said cam for controlling actuation of said operating shaft.

In witness whereof, we hereunto set our hands.

HUBERT CREHAN.
WILLIAM A. CREHAN.