

March 5, 1935.

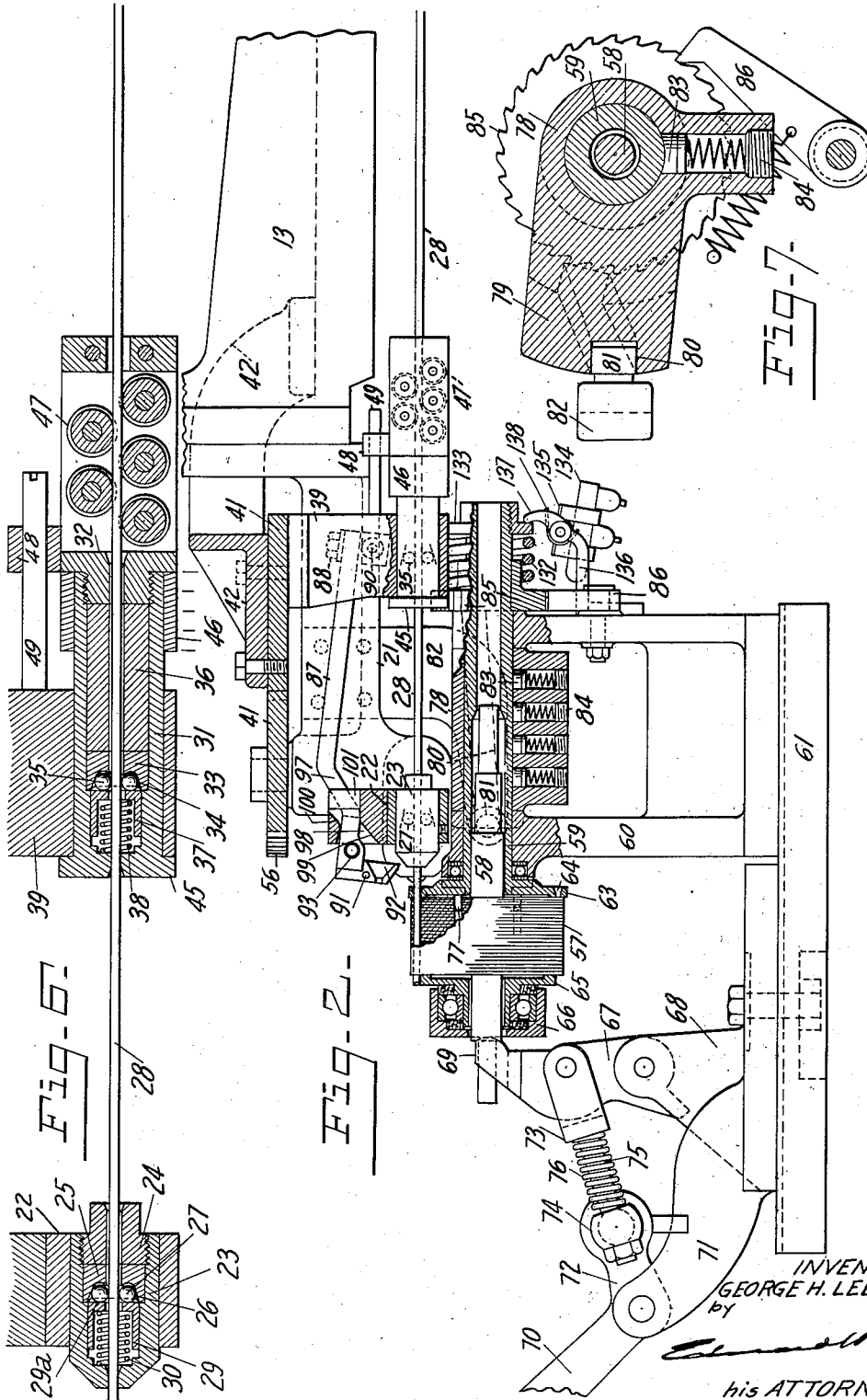
G. H. LELAND

1,993,483

ROD INSERTING MACHINE

Filed May 24, 1933

3 Sheets-Sheet 2



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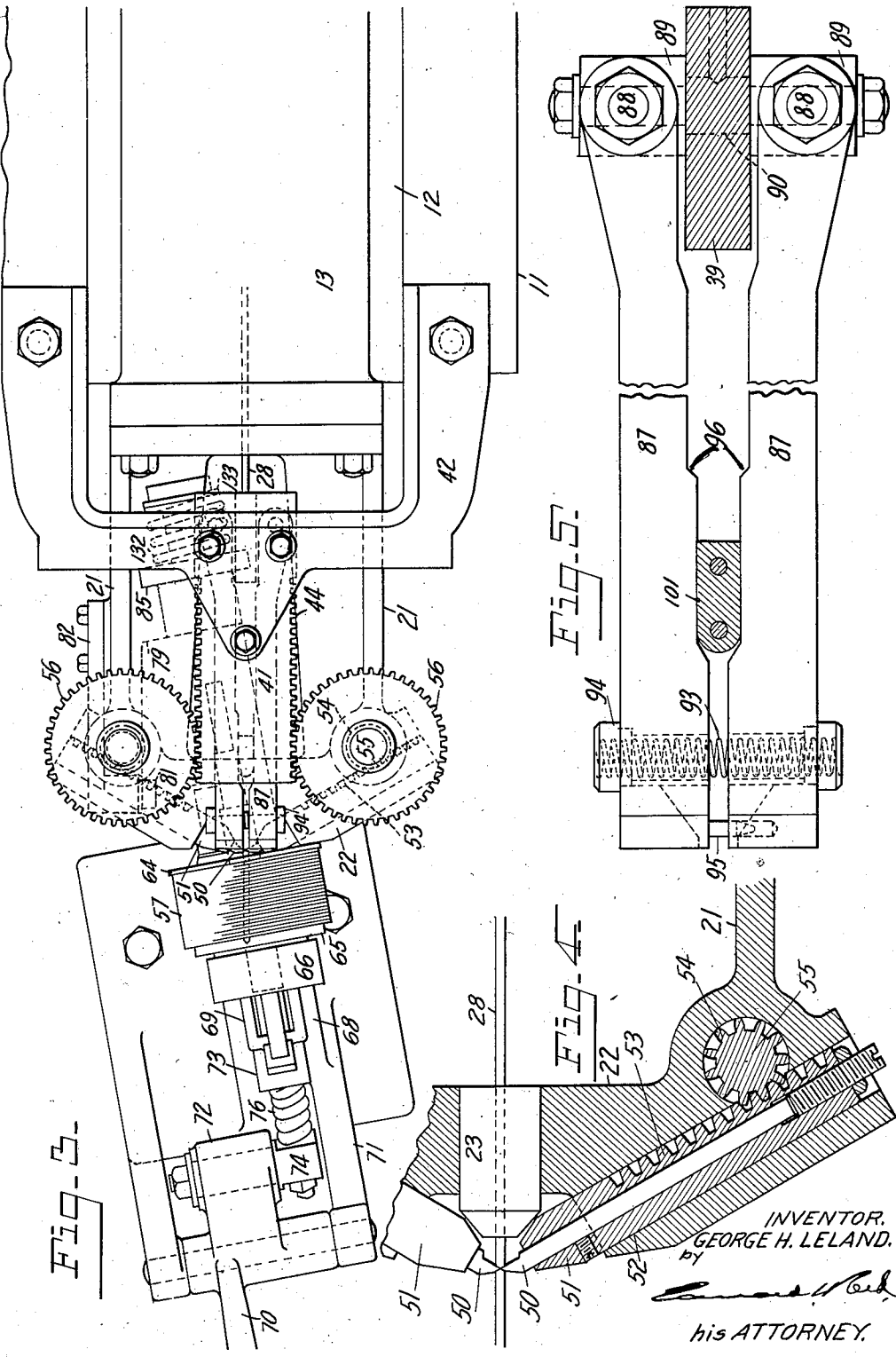
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UNITED STATES PATENT OFFICE

1,993,483

ROD INSERTING MACHINE

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Application May 24, 1933, Serial No. 672,563

42 Claims. (Cl. 29—33)

This invention relates to a rod inserting machine and is designed primarily for inserting rods in a structure having a plurality of openings to receive the same, such as the rotor of an electric motor. A rotor of the squirrel cage type is usually provided with a circumferential series of openings or slots arranged at or near the periphery thereof in which are mounted rods, the adjacent ends of which are electrically connected by end rings.

One object of the invention is to provide a machine for automatically inserting rods in the several openings of such a structure.

A further object of the invention is to provide a machine for automatically advancing a wire and severing therefrom portions of predetermined length.

A further object of the invention is to provide a machine which will insert the end portion of a continuous wire in an opening in the structure, sever the inserted portion of said wire and actuate the structure to move another opening into wire receiving position.

A further object of the invention is to provide such a machine with means for automatically interrupting the operation of the inserting mechanism when rods have been inserted in all the openings of the structure.

A further object of the invention is to provide such a machine with a guide for directing the end of a wire into an opening in the structure and having means for automatically withdrawing the guide prior to the wire severing operation.

A further object of the invention is to provide such a machine with means for supporting and automatically indexing the structure.

A further object of the invention is to provide such a machine with means for automatically interrupting the operation of the feeding mechanism if the wire does not properly enter the opening in the structure which is to receive the same.

A further object of the invention is to provide means for automatically interrupting the operation of the feeding mechanism if excessive resistance is offered to the withdrawal of the wire from the source of wire supply.

Other objects of the invention will appear as the mechanism is described in detail.

In the accompanying drawings Fig. 1 is a side elevation of a machine embodying my invention; Fig. 2 is a side elevation of a portion of such a machine, showing the inserting mechanism in section; Fig. 3 is a plan view of the inserting and severing mechanism; Fig. 4 is a sectional detail view of a portion of the severing mechanism; Fig. 5 is a plan view of the guide; Fig. 6 is a sec-

tional detail view of the wire feeding mechanism; Fig. 7 is a transverse sectional view of the indexing device; Fig. 8 is a detail view of a portion of the supporting plate for the rod receiving structure; Fig. 9 is a plan view of the device for stopping the motor if the wire becomes taut; Fig. 10 is a circuit diagram; and Fig. 11 is a detail view of the automatic stop switches.

In these drawings I have illustrated one embodiment of my invention and have shown the same as designed primarily for inserting rods in a rotor but it will be understood that this particular embodiment has been chosen for the purposes of illustration only and that the mechanism may take various forms and may be utilized for various purposes.

The rod forming and inserting mechanism may be supported and operated in any suitable manner but in the particular embodiment here illustrated the machine comprises a base 10 having mounted thereon an upright hollow frame or housing 11 the upper end of which is provided with a guide 12 in which is mounted a reciprocatory ram 13. Reciprocatory movement may be imparted to this ram in any suitable manner but I have here illustrated a conventional operating mechanism comprising a lever 14 pivotally mounted at its lower end on the base 10 and operatively connected at its upper end with the ram 13. This lever has a longitudinal slot 15 to receive a crank pin 16 which is connected with a worm gear 17 meshing with a worm 18 on a shaft 19 which is connected with a suitable source of power, such as an electric motor 20.

Rigidly connected with the forward end or head of the ram 13 is a supplemental frame which may be termed the actuating device as it controls the operation of various parts of the mechanism. As here shown, this actuating device comprises side members 21 rigidly secured to and supported by the ram and projecting forwardly therefrom. These side members are rigidly connected at their forward ends by a transverse member 22 which may if desired be formed integral with the side members. Operatively connected with the actuating device is a wire feeding device of such a character that it will advance a predetermined length of wire upon each complete reciprocation of the actuating device. In the present instance, this wire feeding device is also reciprocatory and is connected with the actuating device for movement therewith. The wire feeding device may take various forms but it preferably includes a gripping device adapted to engage the wire and cause

the same to move with the feeding device when the latter is moved forwardly and to release the wire and permit the feeding device to move with relation thereto when said feeding device is moved rearwardly.

In the particular construction here illustrated this feeding device comprises a tubular member 23 mounted in an opening in the transverse portion of the actuating device and rigidly secured thereto. The rear end of the tubular member is closed, as by a screw threaded plug 24, and mounted within the tubular member is a device, such as a block 25, having in its forward face an annular cavity or recess having an inclined wall 26. This recessed block is here shown, see Fig. 6, as formed separately from the screw threaded plug 24 and is rigidly secured in the tubular member 23 by that plug, both the block and the plug having axial openings for the passage of the wire 28. Mounted within the recess in the block are clutch balls 27 of such a diameter that the wire 28 may pass between them. The inclined wall of the recess is so arranged that when the balls are moved toward the rear end of the recess they will firmly grip the wire and cause the same to move with the tubular member but when moved forwardly in the recess they will release the wire and permit the tubular member to move with relation thereto. A spring pressed follower 29 acts on the balls to retain them in the recess and to move them toward the rear ends thereof, and this follower is provided with radial grooves 29a to properly space the balls. The spring 30 which actuates this follower is preferably of such a strength that the balls will frictionally engage the wire at all times with sufficient pressure to cause the wire to move rearwardly with the tubular member unless positive resistance is offered to the movement of the wire.

For the purpose of resisting the rearward movement of the wire with the feeding device I have mounted in the rear of the latter a detent through which the wire is passed and which has means for gripping the same to hold it against rearward movement with relation thereto but which will permit the forward movement of the wire with relation thereto. This detent is somewhat similar in construction to the feeding device and comprises a tubular member 31, the rear end of which is closed by a member 32 screw threaded into the same, and mounted in the tubular member is a block 33 having an annular recess provided with an inclined wall 34 and adapted to receive clutch balls 35 arranged as described in connection with the feeding device. In the present arrangement the tubular member 31 is of considerable length and a filler block 36 is inserted between the screw threaded member 32 and the clutch block 33. A spring pressed follower 37 acts on the balls 35 to retain the same in the recesses and to move the same rearwardly therein. The spring 38 of the follower is also preferably of such a strength as to cause the balls to normally grip the wire with a substantial frictional contact. It will be apparent therefore that when the feeding device moves forwardly it will pull the wire through the detent but when the feeding device moves rearwardly the wire will be gripped by the clutch balls 35 and held against rearward movement with relation to the detent. The detent may be mounted on any suitable fixed part of the machine and, as here shown, it is carried by a supporting member or lug 39 which is secured to and extends downwardly from a plate 41 which in turn is rigidly

secured to a bracket 42, the lateral portions of which are mounted on the housing 11 on opposite sides of the ram. This plate is provided in each lateral edge with a series of teeth 44 so that it constitutes a double rack bar, the purpose of which will hereinafter appear. It is desirable, however, that the wire 28 should have a slight rearward movement following each feeding movement, for the purpose of clearing the severing device which will be later described. I have therefore slidably mounted the tubular member 31 in the lug 39 and have provided the same at its forward end with a flange 45 to engage the lug and limit the rearward movement of the detent. The forward movement of the tubular member 31 may be limited by contact of the screw threaded member 32 with the lug 39 but I prefer to mount on the tubular member a collar 46 which is held against rearward movement by the member 32 and has its forward edge spaced a desired distance from the lug 39. As has been explained, the wire gripping devices, or one-way clutches, of the feeding device and of the detent normally grip the wire with sufficient pressure to cause the same to move therewith. Consequently when the feeding device is moved forwardly the detent will move with the wire until the collar 46 engages the lug 39 and the wire will then move through the detent. When the feeding device is moved rearwardly the wire will move with the same and will move the detent rearwardly until the movement of the latter is positively checked by the contact of the flange 45 with the lug 39 and the wire will then be held against movement and the feeding device will move rearwardly with relation thereto. The feeding device moves an exact distance on each operation thereof, and the distance which it moves with relation to the wire is determined by the amount of rearward movement imparted to the wire. Therefore, by varying the amount of movement imparted to the detent the length of wire which is projected beyond the feeding device on each rearward movement of the same may be varied. When the stop collar 46 is of considerable width, as shown in Fig. 6, the detent will have only a slight fore and aft movement and the feeding device will move rearwardly with relation to the wire a relatively great distance, after the movement of the detent has been stopped. If the wide collar 46 is removed and a relatively narrow collar substituted therefor the detent will have a longer movement. Therefore, the wire may move rearwardly a greater distance and the rearward movement of the feeding device with relation to the wire will be correspondingly reduced, thereby causing a shorter length of wire to project beyond the feeding device. If desired, a wire straightening device may be provided to remove short bends or kinks from the wire and in the present construction the member 32, which is secured to the rear end of the detent, is in the form of a frame in which are mounted a series of wire straightening rollers 47 of a known character. The member 32 has an apertured lip 48 through which extends a rod 49 rigidly secured to the lug 39 and which serves to hold the member 32 against rotation. The wire straightening device is preferably of such a character that while it will remove kinks or short bends from the wire it will not eliminate all tendency of the wire to curve, which tendency is due to the fact that the wire is drawn from a coil. Consequently the severed portions of the

wire will have a slight tendency to curve about a transverse axis, which tendency is utilized to retain the rods in the openings in the structure in which they are inserted.

At the end of each forward movement a portion of the wire which projects forwardly beyond the feeding device is automatically severed to form a rod and for this purpose I have provided a severing device which is controlled by the actuating device so that it will operate in perfectly timed relation to the feeding device. In the present instance, the severing device has reciprocatory movement in unison with the actuating device and it is preferably mounted on that actuating device. As here shown, see Fig. 4, the severing device comprises two cutters 50 arranged on opposite sides of the wire 28 and adapted to be moved one toward the other such a distance that they will meet adjacent to the center of the wire and thereby completely sever the same. These cutters may be mounted and actuated in various ways. In the present instance, each cutter is mounted in a carrier 51 which is slidably mounted in a guideway 52 formed in the transverse portion 22 of the actuating device. Preferably these guideways extend obliquely to the line of movement of the actuating device so that the cutters 50 converge forwardly. Each carrier 51 is provided in one edge with a series of rack teeth 53 which mesh with a pinion 54 on a vertical shaft 55. Rigidly secured to each shaft 55 is a gear 56, and these gears mesh with the respective racks 44 on the stationary rack plate 41 above described. Consequently the reciprocatory movement of the actuating device will cause rotatory movement to be imparted to the gears and these in turn will impart reciprocatory movement to the cutters, the gear ratio being so arranged that the cutters will complete the severing operation at substantially the instant the feeding device completes its forward movement.

The structure which is to receive the rods is mounted in such a position as to support an opening therein in line with the feeding device on each forward movement of the latter. Where, as in the present instance, the structure is provided with an annular series of openings it is preferably mounted on a rotatable support and means are provided for automatically imparting a step by step rotation thereto to successively align the openings with the feeding device. The supporting means may be of any suitable character but a rotor of the kind here shown usually comprises a core 57 made up of a series of laminations and provided with a circumferential series of openings. This core is usually mounted on a shaft 58 before the rods are inserted in the openings. Therefore, I have, in the present instance, provided a support for the rotor in the form of a tubular member 59 which is rotatably mounted in bearings at the upper end of a frame 60 mounted on a base plate 61 which is carried by a work support or knee 62 adjustably mounted on the housing 11, and this tubular member is adapted to receive one end portion of the rotor shaft 58. Inasmuch as the openings formed in the core of the rotor extend obliquely to the axis thereof the tubular support is arranged obliquely to the line of movement of the feeding device so as to support the opening in the rotor in longitudinal alignment with the feeding device, see Fig. 3. Rigidly connected with the tubular member 59 of the support is a plate 63 against which one face of the core 57 bears and this plate is provided with a circumferential series of openings 64 cor-

responding in number with the openings in the rotor and arranged to register with those openings when the rotor is properly mounted on the rotatable support. The rotor may be rigidly secured to the support for rotation therewith in any suitable manner but I prefer to employ a clamping mechanism which, as here shown, comprises a clamping plate 65 rotatably mounted in a normally stationary casing 66, the plate 65 and casing 66 having axial openings to receive the adjacent end of the rotor shaft. The plate 65 is adapted to engage the outer face of the core of the rotor and is of such a diameter that it will engage the core just within the annular series of openings so that the rods inserted in the openings may project beyond that face and overlap the edges of the plate 65. A clamping lever 67 is pivotally mounted on a bracket 68 carried by the base plate 61 and has its upper end bifurcated, as shown at 69, see Fig. 3, to embrace the rotor shaft and engage the casing 66 on opposite sides of that shaft. The clamping lever 67 is actuated by an operating lever 70 pivotally mounted on an arm 71 projecting from the base 61 and this operating lever is pivotally connected with the clamping lever by means of a toggle, one arm 72 of which is rigidly connected with the operating lever 70 and the other arm 73 of which is pivotally connected with the clamping lever 67. A bearing block 74 is pivotally mounted in the outer end portion of the arm 72 and is apertured to receive the reduced portion 75 of the arm 73. A spring 76 is confined between the bearing block 74 and the outer portion of the arm 73 so that when the toggle is straightened the spring will exert pressure on the clamping arm 67 and will also tend to hold the toggle against breaking until the lever 70 is actuated. It will be apparent therefore that when the clamping device 65-66 has been placed on the shaft of the rotor and the lever 70 is moved upwardly the clamping lever 67 will be moved into engagement with the casing 66 and the toggle straightened to lock the same in that position and to cause the spring 76 to exert pressure thereon, thus firmly clamping the rotor on the rotatable support. Preferably the supporting plate 63 is provided with one or more studs 77 adapted to enter corresponding openings in the core of the rotor to properly align the openings in the core with the openings in the plate 63.

Rotatory movement may be imparted to the rotatable support, to move the openings in the rotor successively into line with the feeding device, in any suitable manner and, in the present machine, I have shown a very simple indexing device which is directly operated by the actuating device. As shown in Figs. 3 and 7 the indexing device comprises a sleeve 78 rotatably mounted on the tubular member 59 of the support and having a laterally extending portion 79 provided in its outer edge with a cam groove 80 which extends obliquely to the axis of the rotatable support 59 and is adapted to receive the end of a stud 81 carried by a bracket 82 rigidly secured to the actuating device, and therefore movable in unison with the feeding device. The indexing sleeve 78 is so connected with the tubular supporting member that the supporting member will move therewith in one direction but the sleeve will move with relation to the supporting member in the other direction. For this purpose I have established a frictional connection between the sleeve and the rotatable supporting member, this being preferably accomplished by inserting in the

sleeve 78 a plurality of friction members 83 which bear against the tubular support and are pressed into engagement therewith by springs supported on screw plugs 84. Rigidly secured to the tubular support 59 in the rear of the sleeve is a ratchet wheel 85 which is engaged by a spring pressed pawl 86. The direction of inclination of the oblique slot 80 in the indexing sleeve is such that when the feeding device moves rearwardly the stud 81 will act on the lower surface of the groove and thereby impart downward movement to the projecting part 79 of the sleeve. The tubular support being free to rotate in this direction this movement will be transmitted thereto through the friction devices and the rotor will be advanced. The angle of inclination of the groove is such with relation to the distance traveled by the stud 81 that the rotor will be advanced a distance approximately equal to the distance between the centers of adjacent openings therein, but preferably slightly greater than the distance between centers so that the pawl 86 will move slightly beyond the adjacent tooth of the ratchet wheel and will drop freely into the next recess. Upon the forward movement of the actuating device the stud 81 will act on the upper surface of the groove and will rotate the sleeve in a reverse direction and the tubular member will move with the sleeve until the pawl engages the tooth and will then be held against further rotation in that direction, and the sleeve will slip on the tubular member while the latter remains stationary. It will be noted that due to the frictional connection the reverse movement of the sleeve holds that tooth of the ratchet wheel which is in engagement with the pawl firmly in contact therewith during the feeding operation, thus preventing any lost motion or back lash which might serve to displace the rotor with relation to the feeding device.

The openings in the supporting plate 63 may be slightly flared to facilitate the entrance of the wire but I prefer to provide a guide which will positively direct the end of the wire into the opening in the supporting plate and into the rotor. This guide must be located between the supporting plate and the foremost position of the feeding device and inasmuch as the severing device operates on the wire in this same position it is necessary that the guide should be withdrawn prior to the severing operation. I have therefore provided a guide comprising a part having a tapered opening which is movable transversely to the line of feed into and out of an operative position with relation to the opening in the supporting plate. If the guide opening does not comprise a complete circle it may be formed in one piece and moved away from the wire before the latter is severed, but when, as is more desirable, the guide opening constitutes a complete circle it is necessary that the guide should be in two parts which can be separated to permit it to move out of its encircling position with relation to the wire. I have therefore shown the guide as comprising two arms 87 pivotally mounted at their rear ends on a fixed support. In the present construction these arms are pivotally mounted at their rear ends on upright studs 88 carried by sleeves 89 which are rotatably mounted on substantially horizontal studs 90 projecting from the opposite sides of the depending lug 39. The forward ends of these arms project beyond the

foremost position of the feeding device and are provided with depending members 91 in which is formed the guide opening 92, one-half of this opening being formed in each of the parts 91. The forward ends of the guide arms 87 are normally held in contact one with the other by a spring 93 which extends through openings therein and is anchored at its opposite ends in studs 94 threaded into the respective arms. The arms are held against vertical displacement with relation one to the other by a dowel pin 95. The adjacent edges of the two arms 87 preferably contact at their forward portions but have their rear portions spaced one from the other and provided with cam surfaces 96. The extreme forward ends of the arms 87 are offset downwardly from the rear portions of the arms and are connected therewith by inclined portions 97, which inclined portions provide the arms with upper and lower cam surfaces. These cam surfaces are preferably arranged a short distance in front of the cam surfaces 96. The guide arms are arranged above the feeding device and the upper portion of the transverse member 22 of the actuating device is provided with an opening 98 through which the two arms extend. The forward portion of this opening has its lower surface inclined upwardly and rearwardly, as shown at 99, and the rear portion of the opening has its upper surface inclined upwardly and rearwardly, as shown at 100. In line with the opening and slightly to the rear of the inclined surface 100, is a cam member 101, rigidly secured to the actuating device and extending between the two arms of the guide. When the feeding device is in its rearmost position the cam 101 will lie between the separated portions of the arms near the rear ends thereof and the spring 93 will hold the forward portions of the arms in contact one with the other. The part 22 of the actuating device will also be in engagement with the rear portions of the arms and the guide opening 92 will be supported in line with the feeding device and an opening in the rotor. As the actuating device moves forwardly the cam 101 will engage the cam surface 96 and spread the arms apart, thus separating the depending members 91 a distance sufficient to permit the same to move past the wire which extends through the opening 92. The further forward movement of the actuating device causes the forward cam surface 99 thereof to engage the lower cam surfaces on the arms, thereby elevating the arms and moving the parts 91 to an inoperative position above the level of the severing cutters 50. This upward movement of the arms takes place during the latter part of the forward movement of the actuating device but before the cutters have been advanced far enough to enter the space between the feeding device and the rotor. Upon the rearward movement of the actuating device the rear cam surface 100 thereof will engage the upper cam surfaces on the arms and positively move the same downwardly to their operative positions and the further rearward movement of the actuating device will carry the cam 101 between the separated portions of the arms, thereby releasing the latter and permitting the spring 93 to move the forward ends thereof into engagement one with the other.

The machine may be driven from any suitable source of power but, in the present instance, the mechanism is automatically controlled to in-

5 interrupt the operation of the feeding device when
 rods have been inserted in all the openings in
 the rotor and to interrupt the operation of that
 device upon the occurrence of conditions which
 10 might result in injury to the mechanism and I
 prefer to employ an electric motor as a source
 of power as this simplifies the automatic con-
 trolling mechanism. In the present machine the
 motor 20 is a three-phase alternating current
 15 motor and has the usual line conductors 103,
 104 and 105. Controlling switches 106 and 107
 are interposed in the conductors 104 and 105 and
 are actuated by a rod 108 which is held normally
 in its retracted position, to hold the switches
 20 open, by a spring 109. A magnet 110 is con-
 nected with the rod 108 to move the switches
 to their closed positions against the action of the
 spring. This magnet is connected by a conductor
 111 with the line conductor 104 and by a con-
 25 ductor 112 with a normally closed switch 113
 which is preferably of the push button type which
 will return to its normal position when released.
 This switch is connected with a second switch
 of the same type 114 which is normally open.
 30 The switch 114 is connected by conductors 115
 and 116 with the line conductor 105 and when
 the push button switch 114 is closed the circuit
 will be closed through the magnet 110 and the
 line switches 106 and 107 will be moved to their
 35 closed positions. In order to maintain the mag-
 net energized when the switch 114 has been re-
 leased an automatic switch is provided compris-
 ing a fixed contact 117 connected by a conductor
 118 with the normally closed push button switch
 40 113 and a second stationary contact 119 con-
 nected with the conductor 116 which leads to the
 line conductor 105. The movable member 120 of
 this automatic switch is connected with the ac-
 tuating rod 108 and so arranged that when the
 45 line switches have been closed the automatic
 switch will also be closed, thus establishing the
 magnet circuit through the conductor 116, mov-
 able member 120, conductor 118, push button
 switch 113, conductor 112, the magnet and con-
 50 ductor 111, thereby maintaining the energization
 of the magnet and holding the line switches
 closed, thus enabling the starting switch 114 to
 be closed momentarily and then released. When
 the motor is to be stopped the normally closed
 55 switch 113 is opened to deenergize the magnet
 and the spring 109 will instantly open the several
 switches connected with the rod 108.

After a rotor has been placed on the supporting
 structure and the machine started in operation
 60 it will continue to operate automatically to insert
 rods in all the openings in the rotor and when a
 rod has been inserted in the last opening the
 feeding mechanism, in the present instance the
 machine as a whole, will automatically stop. In
 the construction here shown, automatic switches
 121 are interposed in the line conductors 104
 and 105 of the motor and automatic operating
 mechanism is provided to open those switches
 at the proper time to stop the feeding mechanism
 65 after the last rod has been inserted in the rotor.
 In the present construction, the switches 121 are
 mercury tube switches and are carried by a tilt-
 able bracket 122 which is mounted on the bracket
 or knee 62 and is provided with an operating
 70 handle 123 by means of which the switches may
 be moved to their closed positions. This bracket
 122 is connected by a Bowden wire with the wire
 feeding mechanism and the outer member or
 sheath of the Bowden wire is anchored at one
 75 end on the bracket 62 and at the other end is

connected with a bracket 125 on the actuating
 member 22 of the feeding device. The inner
 member 126 of the Bowden wire is connected at
 one end with the switch supporting bracket 122
 and the other end of this member projects beyond
 5 the bracket 125 on the actuating device 22. The
 bracket 125 is so arranged that the inner wire
 126 will move past the edge of the supporting
 plate 63 for the rotor without engaging the same
 until the desired number of rods have been in-
 10 serted in the rotor. The supporting plate 63 is
 provided with a peripheral lug 127 which is so
 arranged that it will be moved into the path of
 the wire 126 and will cause that wire to be ac-
 15 tuated to open the switches 121 when the sup-
 porting plate has been moved to a predetermined
 position, which position is so determined that
 the operation of the feeding mechanism will be
 interrupted after the last rod has been inserted in
 20 the rotor. Preferably an automatic brake is pro-
 vided to check the movement of the mechanism
 and the lug 107 is so arranged on the support-
 ing plate 63 that it will be engaged by the switch
 actuating wire 126 when the wire is inserted in
 25 the last opening in the supporting plate and the
 brake is so adjusted that the momentum will
 carry the ram and the actuating device rear-
 wardly far enough to advance the rotatable sup-
 port and move the lug out of line with the switch
 30 actuating device, so that the switch may be
 manually closed when another rotor is mounted
 on the supporting structure. If no brake is em-
 ployed the momentum may be such that the lug
 will be arranged to be engaged by the switch ac-
 35 tuating device when the wire is inserted in the
 next to the last opening in the supporting plate
 and the last inserting operation will be effected
 by momentum. In the present instance, a mag-
 netic brake 128 is applied to the motor and the
 controlling switch 129 therefore is arranged to
 40 be operated simultaneously with the switches
 121. The brake is of that type which is set by
 spring action and released by a magnet and
 therefore the controlling switch is closed while
 the machine is in operation. The brake circuit
 45 130, which is usually a direct current circuit, is
 provided with a main switch 131 which, in the
 present instance, is actuated by the magnet 110
 and the spring 109 simultaneously with the line
 switches 106 and 107, so that the brake circuit is
 50 closed to release the brake when the motor cir-
 cuit is closed. The automatic switch for the
 brake circuit is shown as a mercury tube switch
 mounted on the bracket 122 which carries the
 switches 121 for the motor circuit and it will
 55 therefore be automatically opened by the switch
 actuating device simultaneously with the open-
 ing of the motor circuit by the switches 121.

Should the end of the wire 28 fail to properly
 enter the opening in the supporting plate or in
 the rotor upon the forward movement of the
 feeding device there will be a possibility of the
 wire doubling up and presenting a rigid ob-
 struction between the feeding device and the
 supporting plate 63, which might cause sufficient
 65 pressure to be exerted upon the supporting plate
 to break the same or to otherwise injure the
 mechanism. I have therefore provided means
 for automatically interrupting the operation of
 the feeding device in the event excessive pres-
 70 sure is applied to the supporting plate 63 and
 in the present instance, the machine as a whole
 is stopped. The tubular member 59 of the rotor
 supporting structure, which carries the support-
 ing plate 63, is mounted in the frame 60 for both

rotatory movement and axial movement and is yieldable held in its rearmost or retracted position. In the construction here shown the tubular member 59 projects rearwardly beyond the frame 60 and a spring 132 is coiled about the same and confined between a collar 133 secured to the rear end of the tubular member and the ratchet wheel 85, which bears against the frame 60 and is splined to the tubular member so that the latter may have axial movement with relation thereto. A motor controlling switch is so controlled by the position of the supporting structure that the motor circuit will be maintained closed through that switch so long as the supporting structure is in its normal position but the switch will be opened when the supporting structure is moved forwardly from its normal position. Preferably this motor controlling switch is interposed in circuit with the magnet 110 which controls the line switches for the motor and is here shown as a mercury tube switch 134, Figs. 2 and 10, carried by a pivoted bracket 135 mounted on an arm 136 extending rearwardly from the frame 60. Connected with the bracket 135 is an actuating member or arm 137 which engages the rear surface of the collar 133 and holds the switch 134 in its closed position as long as the tubular member 69 is in its normal position. A spring 138 acts on the actuating arm 137, and on the switch, to move the latter to its open position when the tubular member is moved forwardly, thereby releasing the actuating arm for movement by the spring. The opening of the switch 134 deenergizes the magnet 110 and causes the motor line switches to be opened. As soon as the obstruction has been removed and the tubular supporting member restored to its normal position the switch 134 will be closed and the motor may again be set in operation by actuating the starting switch 114.

The wire 28 is usually supplied to the feeding device from a coil which is mounted upon a rotatable supporting member or reel 139 arranged in the rear of the machine. The action of the feeding mechanism will withdraw the wire from the coil and advance the same step by step upon successive operations of the ram 13. Should the wire become tangled so that it will not unwind from the coil or should such resistance be offered to its unwinding, by any cause, as to prevent it being drawn forward by the feeding device injury will probably result to the feeding device or to other parts of the mechanism, and I have therefore provided means for automatically interrupting the operation of the feeding device if the wire is maintained taut between the reel and the feeding device upon the rearward movement of the latter. Preferably a motor controlling switch 140 is mounted on the ram 13 for movement therewith and, in the present instance, this switch is connected in circuit with the magnet which controls the line switches for the motor, as shown in Figs. 9 and 10. The switch may be of any suitable character and is here shown as provided with an operating handle 141 which projects above the same. Yieldably mounted on the ram is a frame which carries a device for actuating the switch 140. This frame is shown as comprising side members 142 slidably mounted in suitable guides 143 and 144 on opposite sides of the ram 13. These side members are rigidly connected one to the other in the rear of the ram by a cross member 145 and a spring 146 interposed between the cross member 145 and the end of the ram

holds the frame normally in its retracted position and causes the same to reciprocate in unison with the ram and the feeding device. Carried by the cross member 145 of the frame is a switch actuating member 147 which is so arranged that the relative movement of the ram and the frame will cause this actuating member to engage the switch handle 141 and open the switch. The frame members 142 project rearwardly beyond the ram and have mounted therein a roller 148 arranged to be engaged by the wire 28 as it passes from the reel to the feeding device. In the normal operation of the mechanism the wire will contain sufficient slack to cause it to engage the roller lightly, or not at all, and there will be no relative movement between the frame and the ram. Should the wire become tangled on the reel or be otherwise held against unwinding one or two feeding operations will take up the slack and draw the wire taut so that upon the next rearward movement of the ram the roller 148 will engage the wire and the frame will be held thereby against rearward movement. Thus the ram will move rearwardly with relation to the frame and the handle of the switch 140 will be caused to engage the switch actuating member 147 to open the switch and deenergize the magnet 110, thereby opening the line circuit for the motor and applying the brake to the motor. The frame 142 and roller 148 also serve to overcome any resistance to the unwinding of the wire from the coil which may not be sufficient to entirely interrupt the unwinding of the wire, and to thus maintain sufficient slack in the wire to permit of each successive feeding operation without imposing an excessively heavy load upon the feeding device. The spring 146 is of sufficient strength to prevent the relative movement of the reciprocatory member 13 and the frame 142 unless the resistance to the unwinding of the wire is sufficient to practically stop the movement of the wire. Upon the rearward movement of the reciprocatory member the roller 148 will engage the wire and unwind a portion of the same from the reel and any resistance to the unwinding of the wire which is not sufficient to compress the spring 146 will be overcome by the roller and wire unwound from the reel during the rearward movement of the reciprocatory member, thus providing the necessary slack in the wire for the next forward movement of the reciprocatory member. It is only when the resistance to the unwinding of the wire is such that the wire cannot be unwound by the rearward movement of the frame and roller that the switch is operated to stop the machine.

While I have shown and described one embodiment of my invention I wish it to be understood that I do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

Having now fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a machine of the character described, a wire feeding device having means to advance a wire a predetermined distance upon each operation thereof, a severing device arranged to sever a portion of the wire which projects beyond said feeding device, and a reciprocatory member operatively connected with said feeding device and said severing device to cause the feeding and severing operations to be completed during the movement of said member in one direction.

2. In a machine of the character described,

a wire feeding device having means to advance the wire a predetermined distance on each operation thereof, a severing device arranged to engage said wire at a point beyond said feeding device, means operating in timed relation to said feeding device to actuate said severing device during the forward movement of said feeding device and cause the same to act on said wire prior to the completion of the feeding movement thereof.

3. In a machine of the character described, a wire feeding device having means to advance the wire a predetermined distance on each operation thereof, a severing device mounted for bodily movement in the direction of movement of said wire and for severing movement transversely to said wire, and means for imparting both movements to said severing device during the forward movement of said wire.

4. In a machine of the character described, a wire feeding device having means for gripping the wire at a point spaced from the end thereof and advancing the wire a predetermined distance upon each operation of said feeding device, a severing device connected with said feeding device for movement therewith and arranged to sever that portion of the wire which projects beyond said feeding device, and means for actuating said device and for causing said severing device to act on the wire during the feeding movement of the latter.

5. In a machine of the character described, a reciprocatory structure, a wire feeding device connected with said structure for movement therewith and having means for advancing the wire during each forward movement of said structure, a severing device carried by said structure and arranged to engage the wire in front of said feeding device, and means actuated by the movement of said structure to impart operative movement to said severing device during the operative movement of said feeding device.

6. In a machine of the character described, a reciprocatory structure, a wire feeding device connected with said structure for movement therewith and having means for advancing the wire during each forward movement of said structure, cutters mounted on said structure on opposite sides of the path of said wire for movement toward and from said path, and means controlled by the movement of said structure to actuate said cutters during the forward movement of said feeding device and cause the same to engage said wire as said feeding device nears the forward limit of its movement.

7. In a machine of the character described, a reciprocatory structure, a wire feeding device carried by said structure, a severing device mounted on said structure and arranged to act on said wire, an actuating member mounted on said structure and operatively connected with said severing device, and a stationary element arranged to engage said actuating member while said feeding device is being moved by said structure and cause operative movement to be imparted to said severing device.

8. In a machine of the character described, a reciprocatory structure, a wire feeding device connected with said structure for movement therewith and having means for advancing the wire during each forward movement of said structure, a severing device carried by said structure and arranged to engage the wire in front of said feeding device, a gear carried by said structure and operatively connected with said severing device,

and a stationary rack arranged to engage said gear and actuate said severing device while said feeding device is being advanced by said structure.

9. In a machine of the character described, a reciprocatory structure, a wire feeding device carried by said structure, cooperating cutters mounted on said structure on opposite sides of said feeding device and movable transversely to the line of movement of said structure, gears mounted on said structure, means for operatively connecting said gears with the respective cutters, and stationary racks meshing with the respective gears throughout the reciprocatory movement of said structure.

10. In a machine of the character described, a reciprocatory structure, a wire feeding device carried by said structure, cooperating cutters mounted on said structure on opposite sides of said feeding device and movable transversely to the line of movement of said structure, a toothed rack connected with each cutter, a pinion meshing with said rack, shafts mounted on said structure and connected with the respective pinions, a gear connected with each shaft, and stationary racks arranged to mesh with the respective gears during the movement of said feeding device.

11. In a mechanism for inserting rods in a structure having openings to receive the same, comprising a wire feeding device, means for supporting said structure with one of its openings in line with said feeding device, a device for severing the wire between said structure and said feeding device, and means acting simultaneously on said feeding device and said severing device to cause the wire to be inserted in said opening and to be severed.

12. A mechanism for inserting rods in a structure having openings to receive the same, comprising a wire feeding device, means for movably supporting said structure with one of its openings in line with said feeding device, a device for severing the wire between said structure and said feeding device, means for operating said feeding device to insert the wire in said opening, and means controlled by said operating means to cause said severing device to act on said wire during the forward movement of said feeding device and to actuate said structure to align another opening therein with said feeding device during the rearward movement of the latter.

13. A mechanism for severing a wire into sections of predetermined length, comprising a feeding device to impart lengthwise movement to the wire, a detent movable lengthwise of said wire and having means to grip said wire and prevent any rearward movement thereof with relation to said detent, means to positively limit the movement of said detent in both directions, said feeding device having means to cause said wire and said detent to move rearwardly therewith to the rearward limit of movement of said detent and to then permit said feeding device to move rearwardly with relation to said wire, a device to sever that portion of the wire which projects forwardly beyond said feeding device, and means for operating said feeding device and said severing device in timed relation.

14. A mechanism for severing a wire into sections of predetermined length comprising a feeding device mounted for movement lengthwise of the wire and having means for gripping the wire when said device is moved forwardly and for releasing the wire when said device is moved rearwardly, a detent mounted for movement length-

wise of said wire a distance less than the length of travel of said feeding device and having means to grip said wire and prevent the rearward movement thereof with relation to said detent, the gripping means of said feeding device having frictional engagement with the wire during the rearward movement of said feeding device sufficient to cause the wire and the detent to be moved rearwardly to the limit of movement of said detent, a device to sever a portion of the wire which projects beyond the feeding device at the end of its forward movement, and means for operating said feeding device and said severing device in timed relation.

15 15. A mechanism for severing a wire into sections of predetermined length comprising a feeding device mounted for movement lengthwise of the wire and having means for gripping the wire when said device is moved forwardly and for releasing the wire when said device is moved rearwardly, a detent mounted for movement lengthwise of said wire a distance less than the length of travel of said feeding device and having means to grip said wire and prevent the rearward movement thereof with relation to said detent, the gripping means of said feeding device having frictional engagement with the wire during the rearward movement of said feeding device sufficient to cause the wire and the detent to be moved rearwardly to the limit of movement of said detent, means to vary the distance traveled by said detent, a device to sever a portion of the wire which projects beyond said feeding device at the end of its forward movement, and means for operating said feeding device and said severing device in timed relation.

16. In a mechanism for severing a wire into sections of predetermined length, a feeding device mounted for movement lengthwise of said wire and comprising a tubular member having an opening therethrough for said wire, clutch members arranged in said tubular member to grip said wire when said feeding device is moved forwardly, and yieldable means for holding said clutch members in frictional engagement with said wire during the rearward movement of said feeding device, a detent in the rear of said feeding device comprising a tubular member mounted for movement lengthwise of said wire, having an opening therethrough for said wire and having means to positively limit its movement in both directions, clutch members arranged in the tubular member of said detent to grip said wire and prevent its rearward movement with relation to said tubular member, yieldable means to hold the last mentioned clutch members normally in engagement with said wire, a device to sever a portion of said wire which projects beyond said feeding device at the end of its forward movement, and means for operating said feeding device and said severing device in timed relation.

17. In a mechanism for inserting rods in a structure having an annular series of openings to receive said rods, means for rotatably supporting said structure, a wire feeding device mounted for movement in the direction of the length of one of said openings and having means for gripping the wire and advancing the same when said device is moved toward said structure and for releasing said wire when said device is moved from said structure, a device for rotating said structure to successively align the openings therein with said feeding device, a device for severing the wire between said feeding device and said structure, and means for operating said

devices in timed relation to align an opening in said structure with said feeding device, to cause said feeding device to grip the wire at a point spaced from the end thereof and insert the end portion of said wire in said opening and to sever that portion of the wire which has been inserted in said opening.

18. In a mechanism for inserting rods in a structure having an annular series of openings to receive said rods, means for rotatably supporting said structure, a wire feeding device mounted for movement in the direction of the length of one of said openings and having means for gripping the wire and advancing the same when said device is moved toward said structure and for releasing said wire when said device is moved from said structure, a device for rotating said structure to successively align the openings therein with said feeding device, a wire guiding device movable into and out of alignment with the opening which is in line with said feeding device, a device for severing the wire between said feeding device and said structure, and means for operating said devices in timed relation to align an opening in said structure with said feeding device, to move said guiding device into line with said opening, to cause said feeding device to grip the wire at a point spaced from the end thereof and insert the end portion of said wire in said opening, to withdraw said guiding device and to sever that portion of the wire which has been inserted in said opening.

19. In a mechanism for inserting rods in a structure having openings to receive the same, a wire feeding device having means to advance the wire a predetermined distance upon each operation thereof, means for operating said feeding device, means to movably support said structure with one of said openings in a position to receive the end portion of the wire, means controlled by said operating means for imparting a predetermined movement to said structure upon each operation of said feeding device, and a device controlled by said operating means to sever that portion of the wire which has been inserted in said structure.

20. In a mechanism for inserting rods in a structure having openings to receive the same, a wire feeding device having means to advance the wire a predetermined distance upon each operation thereof, means for operating said feeding device, rotatable means to support said structure with one of said openings in a position to receive the end portion of the wire, a device for imparting step by step rotation to said supporting means comprising a guide inclined with relation to the axis of said supporting means, and a part engaging said guide and movable in a direction substantially parallel with said axis, means for causing said supporting means to move with said guide when the latter is moved in one direction and for causing said guide to move with relation to said supporting means when it is moved in the other direction, and a device controlled by said operating means to sever that portion of the wire which has been inserted in said structure.

21. In a mechanism for inserting rods in a structure having openings to receive the same, a wire feeding device having means to advance the wire a predetermined distance upon each operation thereof, means for operating said feeding device, rotatable means to support said structure with one of said openings in a position to receive the end portion of the wire, a device mounted for oscillatory movement about the axis

of said supporting means and having a cam groove extending lengthwise of said axis, an actuating member extending into said groove, means for moving said actuating member in a direction substantially parallel with the axis of said supporting means to impart oscillatory movement to said device, a frictional connection between said oscillatory device and said supporting means to cause the latter to move with said device when it is moved in one direction, a detent to hold said supporting means against movement with said device in the other direction, and a device controlled by said operating means to sever that portion of the wire which has been inserted in said structure.

22. In a mechanism for inserting rods in a structure having openings to receive the same, a wire feeding device, operating means for imparting reciprocatory movement to said feeding device, a rotatable support for said structure, a sleeve mounted on said support and having a laterally extending portion provided with a longitudinal cam groove, an actuating member extending into said cam groove and operatively connected with said operating means, a frictional connection between said sleeve and said support to cause said parts to move in unison in one direction, a detent to prevent the movement of said support in the other direction, and means controlled by said operating means to sever the wire at the end of the feeding operation.

23. In a machine for inserting a rod in a structure having an opening to receive the same, a wire feeding device to insert the end portion of a wire in said opening, means for operating said feeding device, means for supporting said structure in a position to receive said wire, a guide movable into a position between said feeding device and said structure to direct the wire into said opening, a device for severing the inserted portion of said wire between said structure and said feeding device, and means operating in timed relation to said severing device to withdraw said guide prior to the severing operation.

24. In a machine for inserting a rod in a structure having an opening to receive the same, a wire feeding device to insert the end portion of a wire in said opening, means for operating said feeding device, means for supporting said structure in a position to receive said wire, a guide movable into a position between said feeding device and said structure to direct the wire into said opening, a device for severing the inserted portion of said wire between said structure and said feeding device, and means controlled by said operating means to withdraw said guide after said wire has entered said opening and prior to the completion of the feeding operation and to then cause said severing device to sever the wire.

25. In a machine for inserting rods in a structure having openings to receive the same, a support for said structure, a wire feeding device movable toward and from said support and having means to grip a wire at a point spaced from the end thereof and insert the end portion of said wire in one of said openings, a guide movable into a position between said feeding device and said structure to direct said wire into said opening, a device for severing said wire between said structure and said feeding device, and an operating device to cause said feeding device to move the end of the wire through said guide and into said opening, to cause said guide to be moved to an inoperative position and to then cause said severing device to sever the wire.

26. In a machine for inserting rods in a structure having openings to receive the same, a support for said structure, an actuating device movable toward and from said support, a wire feeding device carried by said actuating device and having means to grip a wire at a point spaced from the end thereof and to insert the end portion of said wire in an opening in said structure, a guide mounted on a stationary support for movement into a position to guide the end of said wire into said opening, means movable with said actuating device to move said guide out of said position after the wire has entered said opening, a device to sever the wire between said feeding device and said structure, and means movable with said actuating device to cause said severing device to sever the wire at the end of the forward movement of said feeding device.

27. In a machine for inserting rods in a structure having openings to receive the same, a wire feeding device having means to grip a wire at a point spaced from the end thereof and to insert the end portion of said wire in one of said openings, means for moving said feeding device toward and from said structure, a guide comprising an arm pivotally mounted in the rear of said feeding device and having a part movable to a position between said feeding device and said structure to direct the wire into said opening, a member connected with said feeding device for movement therewith, said member and said arm having cooperating cam surfaces to move said guide to an inoperative position as said feeding device moves forwardly, a device to sever said wire between said structure and said feeding device, and means operating in timed relation to said feeding device to cause said severing device to sever the wire at the end of the forward movement of said feeding device.

28. In a machine for inserting rods in a structure having openings to receive the same, a wire feeding device having means to grip a wire at a point spaced from the end thereof and to insert the end portion of said wire in one of said openings, means for moving said feeding device toward and from said structure, a guide for said wire comprising two parts movable in unison to an operative position between said feeding device and said structure and movable with relation one to the other to separate the same, means connected with said feeding device for movement therewith to first separate said parts of said guide and then move the same to an inoperative position, a device to sever said wire between said structure and said feeding device, and means operating in timed relation to said feeding device to cause said severing device to sever the wire at the end of the forward movement of said feeding device.

29. In a machine for inserting rods in a structure having openings to receive the same, a wire feeding device having means to grip a wire at a point spaced from the end thereof and to insert the end portion of said wire in one of said openings, means for moving said feeding device toward and from said structure, a pair of arms mounted in the rear of said feeding device for movement about both horizontal and vertical axes, extending forwardly beyond said feeding device and having at their forward ends parts cooperating to form a guide for the end portion of said wire, yieldable means to hold said parts normally in engagement one with the other, the rear portions of said arms being spaced one from the other, a member connected with said feeding de-

vice and movable therewith, said member and said arms having cooperating cam surfaces to cause said guiding parts to move to a position between said feeding device and said structure as said feeding device moves rearwardly and to move said parts from said position as said feeding device moves forwardly, said member also having a part extending between and acting on said arms to separate said guiding parts before the last mentioned movement is imparted thereto, a device for severing said wire between said structure and said feeding device, and means operating in timed relation to said feeding device to cause said severing device to sever the wire at the end of the forward movement of said feeding device.

30. In a machine for inserting rods in a rotor the core of which has an annular series of openings to receive said rods, a rotatable tubular support to receive one end of the shaft of said rotor, a plate mounted on said support to engage the adjacent face of said core and having openings to register with the openings in said core, a clamping device comprising a rotatable member to engage the other face of said core, and means acting on said rotatable member to press said core against said plate, a wire feeding device having means to insert the end portion of a wire through the aligned openings in said plate and said core, means to actuate said feeding device, a device to sever said wire between said plate and said feeding device, and means operating in timed relation to said feeding device to actuate said severing device.

31. In a machine for inserting rods in a rotor the core of which has an annular series of openings to receive said rods, a rotatable tubular support to receive one end of the shaft of said rotor, a plate mounted on said support to engage the adjacent face of said core and having openings to register with the openings in said core, clamping mechanism comprising a normally stationary clamping member, a rotatable member mounted on said stationary member and arranged to engage the other face of said core, an arm pivotally mounted on a fixed axis and adapted to engage said stationary member, an actuating lever, and a toggle connecting said actuating lever with said arm, a wire feeding device having means to insert the end portion of a wire through the aligned openings in said plate and said core, a device to sever the wire between said feeding device and said plate, and means to actuate said feeding device and said severing device in timed relation.

32. In a machine for inserting rods in a structure having openings to receive the same, a wire feeding device, means for operating said wire feeding device, means for movably supporting said structure with one of said openings in a position to receive an end portion of a wire advanced by said feeding means, means for severing the inserted portion of said wire, means operating in timed relation to said feeding device to actuate said structure to move said openings successively into wire receiving position, and means controlled by the position of said structure to interrupt the operation of said feeding device when a predetermined number of rods have been inserted in said structure.

33. In a machine for inserting rods in a rotor the core of which has an annular series of openings to receive said rods, a rotatable tubular support to receive one end of the shaft of said rotor, a plate mounted on said support to engage the adjacent face of said core and having openings

in register with the openings in said core, means to hold said core in engagement with said plate, a wire feeding device having means to insert the end portion of a wire through aligned openings in said plate and said core, a device to sever said wire between said feeding device and said plate, means including an electric motor for actuating said feeding device and said severing device, a switch to control the operation of said motor, a switch actuating device connected with said feeding device for movement therewith, and a part carried by said plate and arranged to be engaged by said switch actuating device to open said switch and cause the operation of said feeding device to be interrupted when a rod has been inserted in the last of the openings in said core.

34. In a mechanism for inserting rods in a structure having an annular series of openings to receive the same, means for rotatably supporting said structure, a wire feeding device movable toward and from said structure and having means to engage a wire at a point spaced from the end thereof and insert the same in an opening in said structure, a device to sever said wire between said feeding device and said structure, electrically operated means to operate said feeding device and said severing device in timed relation, a switch to control the operation of said electrically operated means, a switch actuating device connected with said feeding device for movement therewith, and a part connected with said supporting means and arranged to be moved into the path of said switch actuating device when said structure has been rotated a predetermined distance.

35. In a mechanism for inserting rods in a structure having openings to receive the same, a wire feeding device, a yieldable support for said structure adapted to be moved from its normal position by excessive pressure thereon, means for severing the wire between said wire feeding device and said support, means for operating said wire feeding device, and means controlled by said support to interrupt the operation of said wire feeding device by said operating means when said support is moved from its normal position.

36. In a mechanism for inserting rods in a structure having openings to receive the same, a reciprocatory wire feeding device, a support for said structure mounted for movement by said wire feeding device under abnormal conditions, yieldable means for retaining said support normally in its retracted position, means for severing the wire between said feeding device and said support, means for operating said wire feeding device, and means for interrupting the operation of said wire feeding device by said operating means comprising an actuating member arranged to be held in an inoperative position by said support when the latter is in its normal position, and means acting on said actuating member to cause said interrupting device to interrupt the operation of said wire feeding device when said support is moved from its normal position.

37. In a mechanism for inserting rods in a structure having an annular series of openings to receive the same, a reciprocatory wire feeding device, a support for said structure mounted for rotatory movement and axial movement, yieldable means to hold said support normally against axial movement, means for severing the wire between said support and said wire feeding device, an electric motor for operating said wire feeding device, a switch to control the operation of said motor, a member connected with said switch

and engaging a part of said support to hold said switch in its closed position when said support is in its normal position, and means acting on said switch to open the same when said support is moved from its normal position.

38. In a mechanism for inserting rods in a rotor comprising a core and a shaft, a support for said rotor comprising a tubular member to receive one end of a rotor shaft and a plate to engage the adjacent end of said rotor core, said support being mounted for both rotatory and axial movement, yieldable means for holding said support normally against axial movement, a reciprocatory wire feeding device movable toward and from said plate, means for severing the wire between said feeding device and said plate, a motor to operate said mechanism, a switch to control the operation of said motor, an actuating member connected with said switch, a part carried by the tubular member of said support to engage said actuating member and hold said switch in its closed position when said tubular member is in its normal position, and means acting on said actuating member to open said switch when said tubular member is moved from its normal position.

39. In a wire feeding mechanism, a rotatable support for a coil of wire, a reciprocatory feeding device to advance the wire step by step from said coil, means for operating said feeding device, and means comprising a part movable with said feeding device and arranged to engage said wire during the rearward movement of said feeding device to unwind a portion of the wire from said coil.

40. In a wire feeding mechanism, means to rotatably support a coil of wire, a reciprocatory member, a wire feeding device actuated by said

reciprocatory member to advance the wire step by step, a bar connected with said reciprocatory device for movement therewith, and a part connected with said bar and arranged to engage said wire during the rearward movement of said reciprocatory member and unwind a portion of said wire from said coil.

41. In a wire feeding mechanism, means to rotatably support a coil of wire, a reciprocatory member, a wire feeding device actuated by said reciprocatory member to advance the wire step by step, a bar slidably mounted on said reciprocatory member, yieldable means for holding said bar normally against movement with relation to said reciprocatory member, a part carried by said bar and arranged to engage said wire during the rearward movement of said reciprocatory member and unwind a portion of said wire from said coil.

42. In a wire feeding mechanism, means for rotatably supporting a coil of wire, a reciprocatory member, wire feeding means actuated by said reciprocatory member to advance the wire step by step from said coil, a frame comprising substantially parallel members slidably mounted on the respective sides of said reciprocatory member, a transverse member connecting said side members in the rear of said reciprocatory member, a spring confined between said transverse member and the adjacent end of said reciprocatory member, a roller carrier by said side members in the rear of said transverse frame member and arranged to engage the wire between said coil and said feeding device during the rearward movement of said reciprocatory member to unwind a portion of the wire from said coil.

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