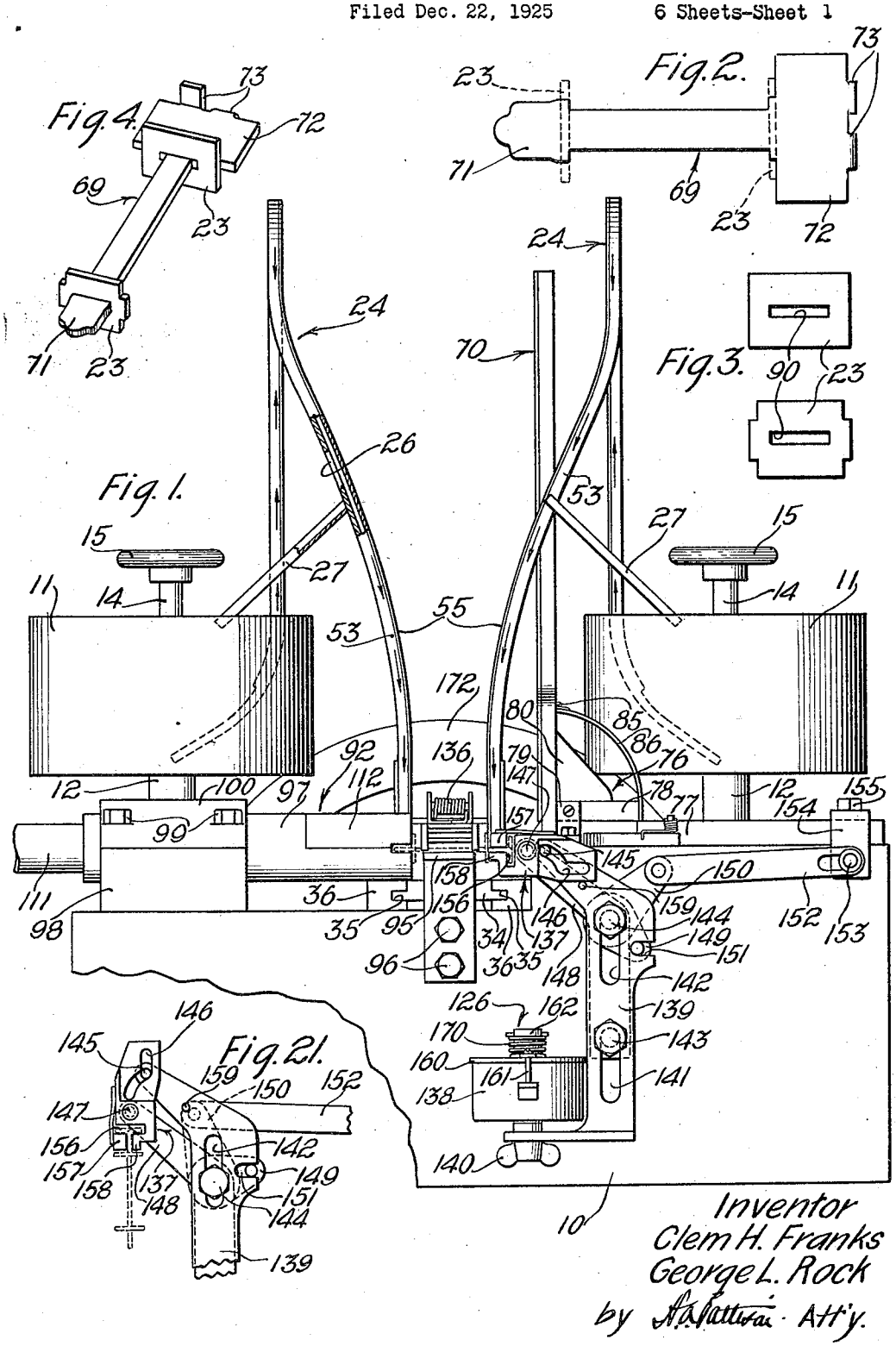
Jan. 8, 1929. 1,697,860

C. H. FRANKS ET AL

ASSEMBLING APPARATUS

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ASSEMBLING APPARATUS

Filed Dec. 22, 1925 6 Sheets-Sheet 2

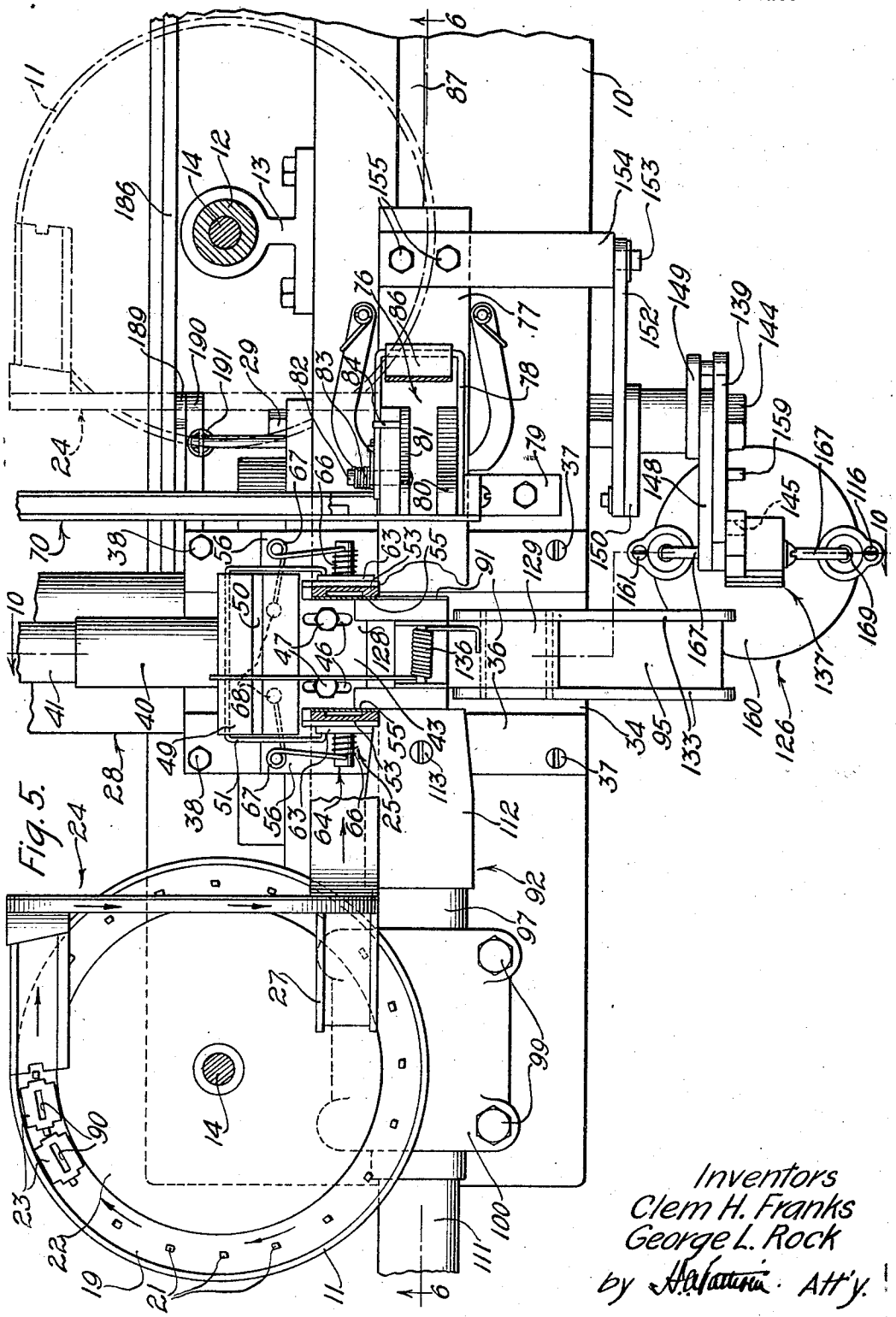


Fig. 5.

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ASSEMBLING APPARATUS

Filed Dec. 22, 1925 6 Sheets-Sheet 3

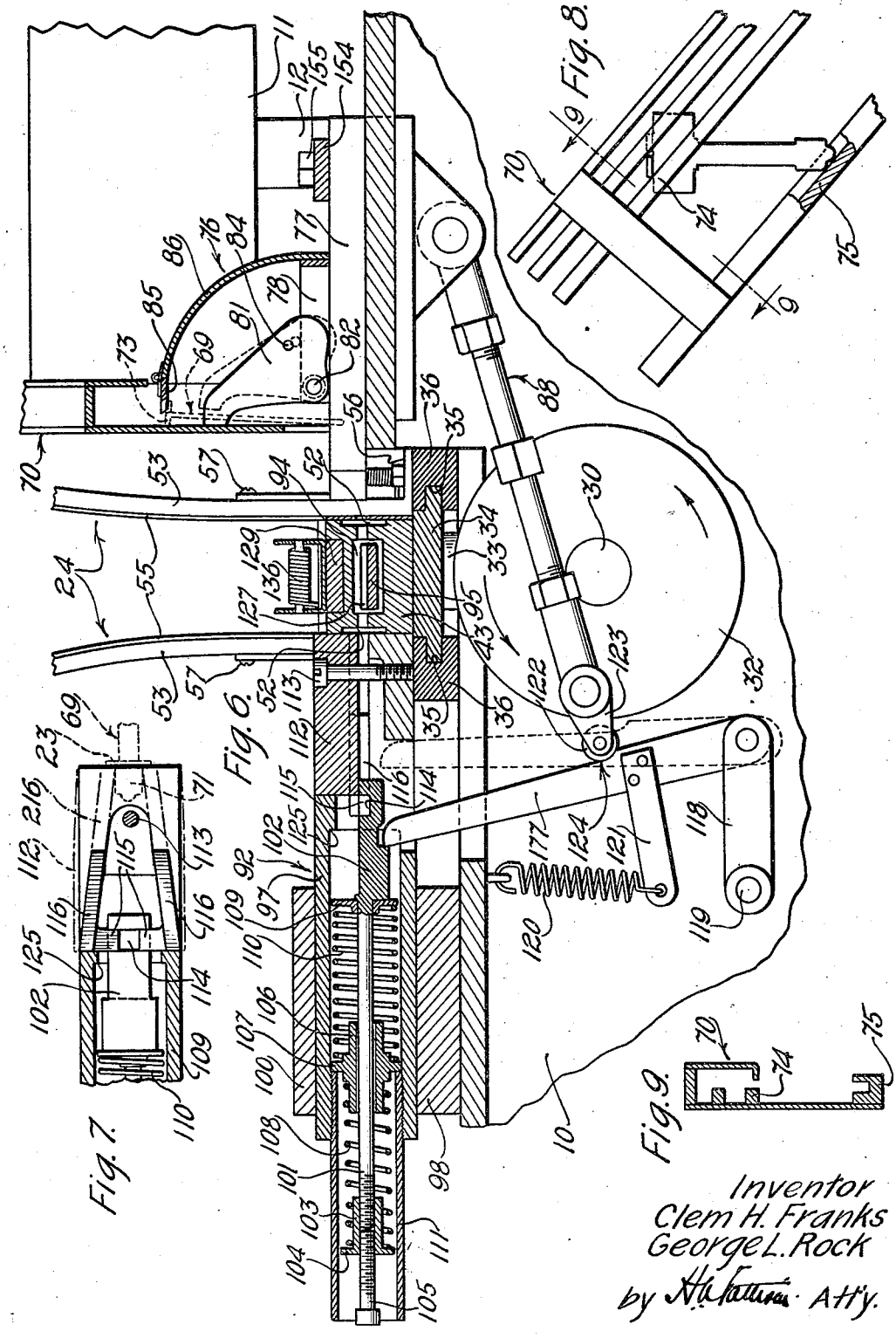


Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

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ASSEMBLING APPARATUS

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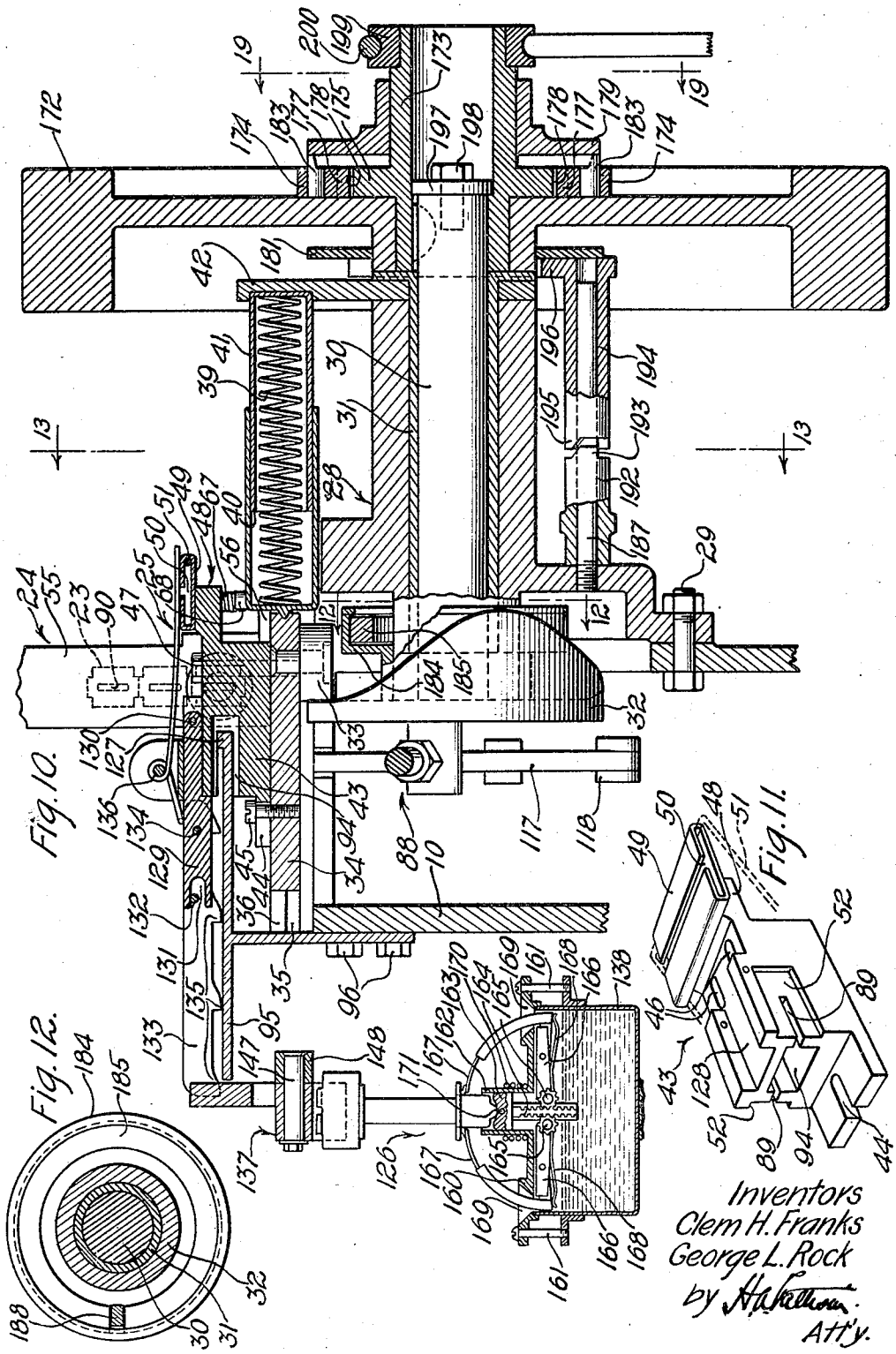


Fig. 10.

Fig. 11.

Fig. 12.

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ASSEMBLING APPARATUS

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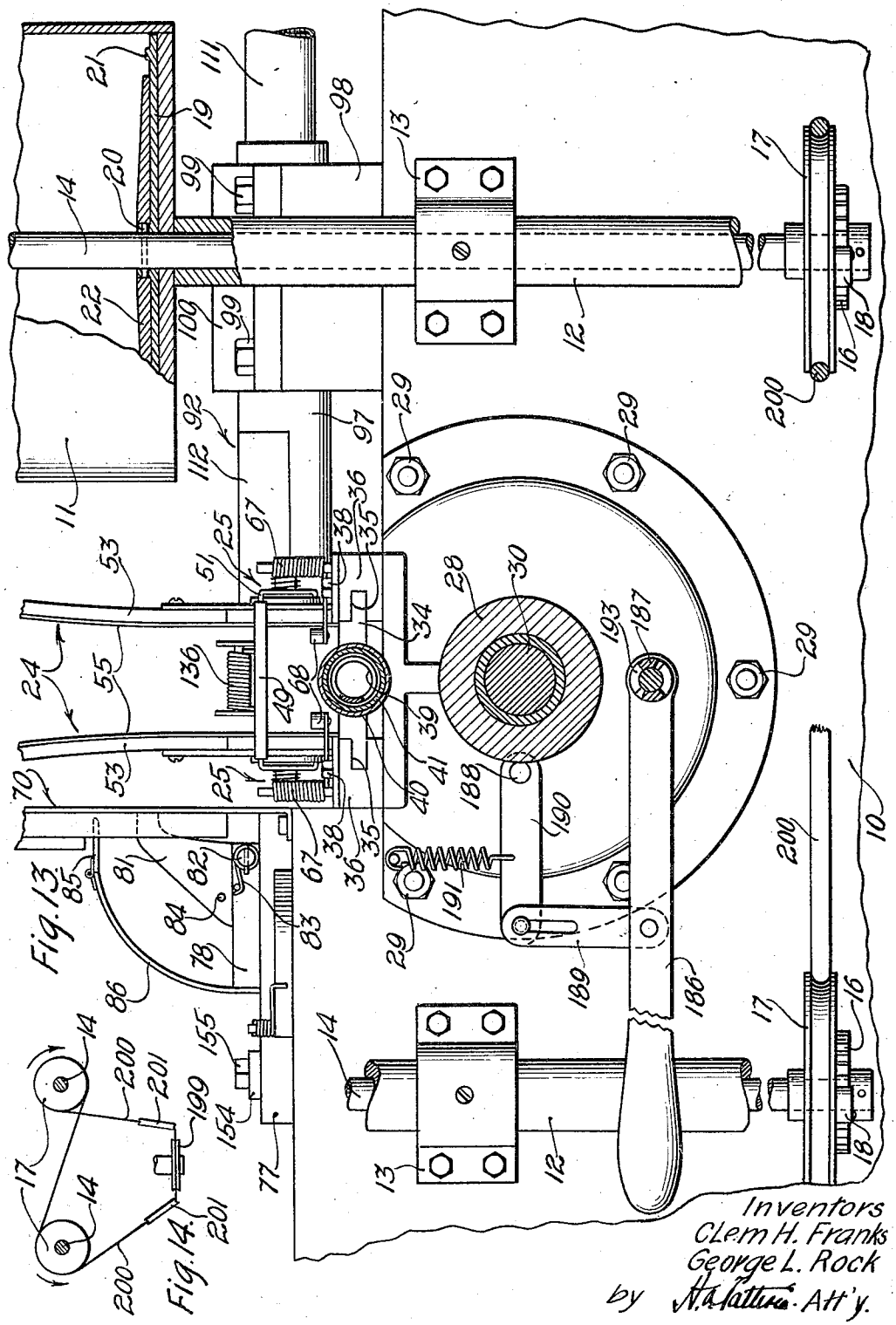


Fig. 13.

Fig. 14.

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ASSEMBLING APPARATUS

Filed Dec. 22, 1925 6 Sheets-Sheet 6

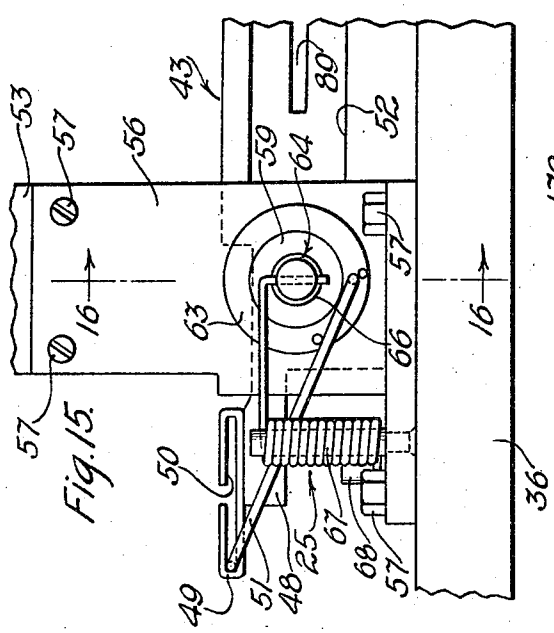


Fig. 15.

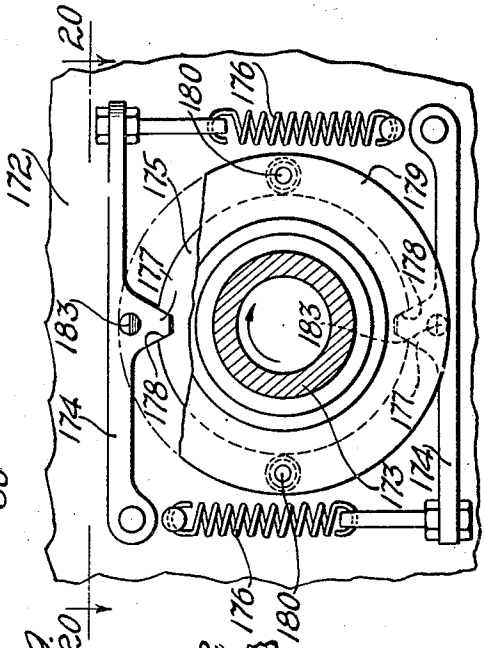


Fig. 19.

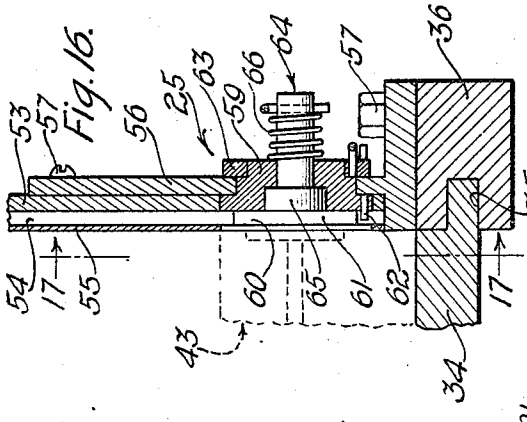


Fig. 16.

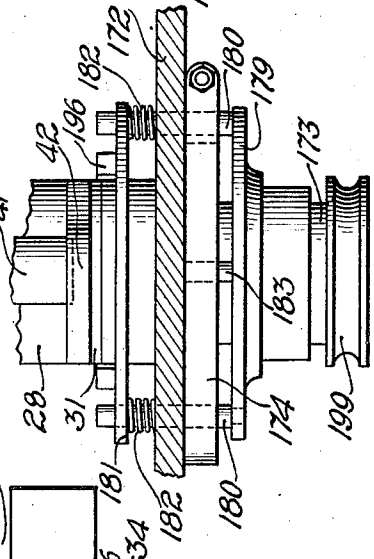


Fig. 20.

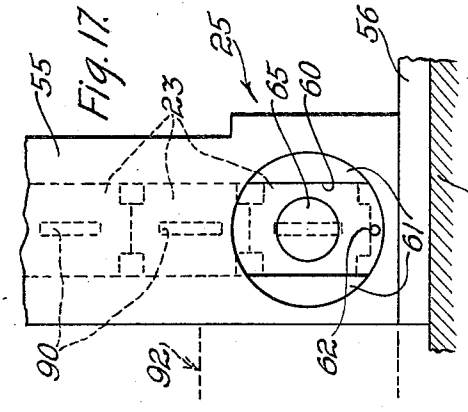


Fig. 17.

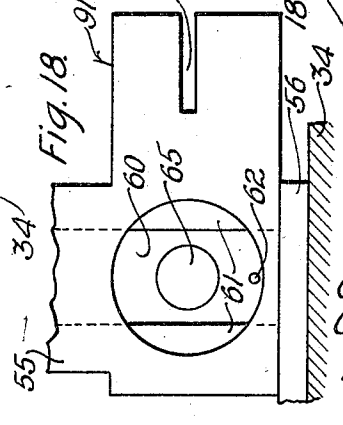


Fig. 18.

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UNITED STATES PATENT OFFICE.

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ASSEMBLING APPARATUS.

Application filed December 22, 1925. Serial No. 76,957.

This invention relates to an assembling apparatus, and more particularly to an apparatus for assembling relay spool elements.

Conventional types of electro-magnetic relays may comprise a central core member upon which the relay windings are wound, with spool heads or flanges positioned on the core at each end of the winding to secure the winding against longitudinal displacement on the core. Heretofore it has been the practice in some instances to assemble these heads upon the core by performing various operations manually which necessitated, for example, the individual selection of spool elements from a source of supply and a number of subsequent manual operations to properly assemble the elements thus selected.

The primary object of the present invention is to facilitate and accelerate the production of assembled spools by providing a self-contained, durable, and efficient machine to automatically select spool elements from sources of supply and subsequently to perform the operations necessary to complete the proper assembly of said elements.

In order to obtain these and other objects in accordance with the general features of the invention, an apparatus is provided having hoppers for retaining supplies of spool end members or heads and a machine designed to retain a supply of spool cores. A mechanical feeding mechanism is provided which selects spool heads from their respective hoppers and advances them into position to be subsequently assembled with a companion core member. Another feeding mechanism, functioning contemporaneously therewith, transfers a member from the magazine into position to be assembled with the advanced spool heads. After the companion core and head members are thus positioned, they are assembled by a ramming device which operates to thread the core member through a pair of spaced spool heads, thereby effecting the proper location of said heads upon the core. This core is then subjected to a swedging operation to secure a head in position upon the core by swedging or uplifting a portion of the core surface adjacent to the head. These assembled spool elements are then advanced to the receiver head of a device which applies a protective coating such as lacquer to that portion of the core surface previously subjected to abrasion during the aforementioned swedging operation. The assembly of the spool elements is then complete and the assembled spool is automatically ejected from the machine into a suitable receiving tray.

This and other objects and features will be apparent from the following detailed description when considered with the accompanying drawings, in which

Fig. 1 is a front elevational view of an assembling apparatus disclosing an embodiment of the invention, the assembling ram thereof being shown in its retracted position and the container of the lacquering mechanism in its corresponding lowered position;

Fig. 2 is a detailed view of a conventional flat type electromagnetic relay core adapted to be fed into the machine shown in Fig. 1;

Fig. 3 are details of spool ends or heads adapted to be assembled with the core shown in Fig. 2;

Fig. 4 is a perspective assembly view of the spool elements disclosed in Figs. 2 and 3;

Fig. 5 is a fragmentary plan view of the assembly machine, the assembling ram thereof being shown in its forward position and one hopper being shown in dotted outline to expose mechanism otherwise hidden;

Fig. 6 is a fragmentary transverse vertical section taken on the line 6—6 of Fig. 5;

Fig. 7 is a detailed plan view of the head portion of the swedging mechanism shown partially in section, the cover block thereof being shown in dotted outline to disclose the swedging dies;

Fig. 8 is a side elevation of the upper portion of the core magazine with a core member shown in its normal vertical position within the magazine;

Fig. 9 is a transverse section of the core magazine taken on the line 9—9 of Fig. 8;

Fig. 10 is a longitudinal vertical section of the machine taken on the line 10—10 of Fig. 5;

Fig. 11 is a perspective detail of the carriage block and the guide member mounted thereon;

Fig. 12 is a sectional view taken on the line 12—12 of Fig. 10, disclosing the cooperating parts of the braking mechanism;

Fig. 13 is a fragmentary transverse section of the machine taken on the line 13—13 of Fig. 10;

Fig. 14 is a diagrammatic plan view of the hopper driving mechanism;

Fig. 15 is a side elevational view of the spool head loading mechanism adjacent to the head end of the swedging mechanism with the swedging mechanism removed to disclose the position of the carriage block;

Fig. 16 is a vertical section taken on the line 16—16 of Fig. 15, with the carriage block removed;

Fig. 17 is a vertical sectional view taken on the line 17—17 of Fig. 16 with the head end of the swedging mechanism shown in dotted outline;

Fig. 18 is a vertical sectional view similar to Fig. 17 showing the opposite loading mechanism;

Fig. 19 is a fragmentary vertical section of the rear end of the machine taken on the line 19—19 of Fig. 10;

Fig. 20 is a horizontal sectional view taken on the line 20—20 of Fig. 19, and

Fig. 21 is a detail front elevation of the upper portion of the lacquering mechanism, showing the receiver head thereon in its downwardly swung position.

Referring to the drawings wherein like numerals designate similar parts throughout the various figures, there is provided an elongated machine frame or base 10 and a pair of hoppers 11 supported at the upper ends of sleeve members 12 mounted in brackets 13 secured to the rear wall of the base. Revoluble within each sleeve 12 is a vertical shaft 14, the upper end thereof having a suitable hand wheel 15, and the lower end thereof having a ratchet wheel 16 secured thereto. A pulley 17 loosely mounted upon the shaft 14 immediately above the ratchet wheel 16 carries a pawl 18 designed for operative engagement with the ratchet wheel 16 upon rotation of the pulley 17 (see Fig. 13). By this construction the shaft 14 may be freely rotated independently of and in the same direction as the pulley 17, by manipulating the hand wheel 15. A circular plate 19 in the bottom of the hopper 11 is secured to the shaft 14 by means of a pin 20 extending through an annular shoulder formed centrally of the plate 19. A plurality of conveyor lugs 21 are formed in the plate 19 midway between the wall of the hopper and the periphery of a disk member 22 resting on the plate 19, said lugs being spaced to accommodate spool ends or heads 23 similar to the types disclosed in Figs. 3 and 5. The upper surface of the disk 22 is inclined downwardly from its central portion to its periphery and it will be understood that when a rotary movement is imparted to the shaft 14 either by manual manipulation of the handle 15 or by power applied to the pulley 17, spool heads within the hoppers 11 will be urged outwardly along the inclined surface of the disk 22 with the result that they will become lodged in the annular channel formed between the periphery of the disk and the inner surface of the hopper wall. Once lodged within this channel, each head will seek to align itself between adjacent lugs 21 upon the plate 19, and as a consequence thereof will be moved in a circular path provided by the channel until they reach the lower end or entrance of a chute 24. These chutes 24 are inclined upwardly from the bottom of the hoppers at the rear thereof, extending vertically to a point at which they curve forwardly and then downwardly, terminating at their other lower extremity in a spool head loading mechanism 25, the operating characteristics of which will be hereinafter fully described. The rotation of the disk 19 within each hopper will result in feeding spool heads into the chutes 24, and in this connection it is to be understood that the rotation of the plates 19 is such that the resulting speed with which the heads are advanced through the chutes will be in excess of that required to keep the loading mechanisms 25 sufficiently supplied with said heads. This excessive speed in the feeding operation is merely to insure a sufficiency of the spool heads supplied to the loading mechanisms 25 during the operation of the machine. It will be apparent that unless some means were provided to take care of an overflow of heads fed into the chutes, the continued rotation of the disk 19 would be prevented after the chutes had been entirely filled. In order to meet this condition, an opening 26 (Fig. 1) is provided in the front section of each chute 24 on the side nearest their respective hoppers and as the spool heads 23 pass through the chutes at their normal rate of speed, the velocity is sufficient to carry each head past the opening 26 and thus prevent any head from falling therethrough. However, when that portion of the chutes interposed between the loading mechanism 25 and the opening 26 is completely filled with spool heads, any subsequent heads advanced toward the opening in the chute will fall through the opening and will be directed back to their respective hoppers by an overflow chute 27. This construction enables the feeding mechanism within the hoppers to function uninterruptedly throughout the operation of the machine.

Referring now to Figs. 10 and 13 it will be observed that a flanged bearing member 28 is mounted on the rear wall of the base 10 medially of the ends thereof and is secured to the base by bolts 29 extending through the flanged portion of the bearing member. This bearing member 28 supplies a mounting for a main drive shaft 30 revoluble within a bushing 31 pressed within said bearing member. A cam 32 mounted at the forward end

of the drive shaft 30 is designed for operative engagement with a roller 33 carried on the underside of a carriage member 34. This carriage member is horizontally reciprocable in guideways 35 provided in a pair of spaced guide bars 36, which are secured at one end to the upper surface of the forward wall of the base 10 by machine screws 37 (Fig. 5) and at their opposite ends to the upper surface of the bearing member 28 by screws 38. A coil spring 39 housed within a pair of telescopic sleeves 40 and 41 interposed between the rear end of the carriage member 34 and a vertical arm 42 mounted on the bushing 31 at the rear end of the bearing member 28, serves to yieldingly preserve engagement between the roller 33 and the cooperating surface of the cam 32. In Fig. 10 the spring 39 is shown as holding the carriage 34 in its forward position and it will be obvious that as the cam 32 continues to rotate, the roller 33 will be actuated rearwardly against the action of the spring 39. The telescopic sleeves 40, 41 and their companion spring 39 may be readily removed when desired by merely telescoping the sleeves sufficiently to unseat them from the carriage 34 and the arm 42.

Mounted upon the carriage 34 is a carriage block 43 (Figs. 10, 11, and 13), the forward reduced portion thereof having a longitudinal slot 44 formed centrally thereof to receive an adjusting screw 45 threaded into the carriage member 34. A pair of screw slots 46 are formed in the rear portion of the carriage block 43 and are designed to receive companion screws 47 threaded into the carriage member 34. By this arrangement of screw slots, the carriage block 43 is adapted to be adjustably mounted longitudinally of the carriage member 34. The back end of the carriage block 43 is formed with a rearwardly extending bracket 48 which supplies a shelf for a rectangular guide member 49. An elongated guideway 50 formed within the guide member 49 is designed to receive the closed portion of a U-shaped rod 51, the extremities of which are engaged with one of the cooperating parts of each spool head loading mechanism 25 about to be described.

The spool head loading mechanisms 25, positioned at the lower extremity of each chute 24 are designed to contemporaneously transfer the lowermost spool head from within each chute to a recess 52 formed on each side of the carriage block 43 (see Fig. 11), when the carriage member 34 upon which the block is mounted, reaches its rearward position as hereinbefore described. Referring to Figs. 16 and 17 it will be seen that the chutes 24 are comprised of two sections, one being a bar 53 having a channel 54 formed therein, said channel being substantially the same in cross-section as the transverse section of a spool head 23. The other section is a covering strip 55 of relatively thin material, traversing the channel 54 and suitably secured to the bar 53. Loader brackets 56, secured to the guide bar 36 by bolts 57, supply an anchorage and support for the lower extremity of each chute 24, the chutes being secured to the brackets 56 by screws 57. The lower extremity of each chute 24 is similarly apertured to provide a mounting for a cylindrical turn table 59, that portion of the turn table lying within the channel 54, having a channel 60 milled therein forming lugs 61 on each side thereof, said channel being milled to a depth and width corresponding to the dimensions of the channel 54. When the channels 60 assume a vertical position as disclosed in Figs. 16 and 17, the lowermost spool head 23 (dotted lines Fig. 17) in each chute 24 will become lodged in its respective channel 60 between the guide lugs 61 thereof with the lower end of each head 23 resting upon a pin 62 secured to the turn table 59. The loader brackets 56 like the chute bars 53 serve as mountings for portions of a reduced diameter of turn tables 59. A ring 63 having a pressed fit upon the outer end of each of the turn tables prevents longitudinal displacement of each turn table and guides the same as it rotates within the corresponding bracket 56 and bar 53. Axially positioned within each turn table 59 is an ejector plunger 64, the inner end thereof being enlarged to form a head 65 normally seated within the inner end of the turn table. A spring 66 coiled about each plunger 64 and interposed between the outer end of the companion turn table 59 and the forwardly extending arm of a spring 67 reaching through the outer end of the plunger serves to yieldingly retain the head 65 in its normal, seated position within its respective turn table 59. The terminals of the U-shaped rod 51, hereinbefore mentioned, are pivotally secured to the outer surface of the ring 63 mounted upon each turn table 59. The closed portion of the U-shaped rod 51 within the guideway 50 of the guide member 49 is reciprocated during the corresponding movements of the carriage block 43, said reciprocation serving to impart a relative reciprocating movement to the turn tables 59. Thus, when the carriage block 43 reaches its limiting forward position, the rod 51 will have rotated the turn tables 59 into the positions shown in Figs. 15 to 18, inclusive, namely, with the channels 60 vertically disposed and forming a continuation of the chute channels 54. Upon the return rearward movement of the carriage block 43 the guide member 49 is again carried into engagement with the rod 51 and when the carriage block has reached its limiting rearward position, the turn tables 59 will have been rotated through an angle of 90° with the channels 60 horizontally disposed and adjacently coinciding with respective recesses

52 in the carriage block 43. With the turn tables in this position the spool members carried therein between the lugs 61 are ready to be transferred from the turn tables into the recesses 52 of the carriage block 43. As the carriage block approaches the completion of its rearward movement it engages with rollers 68 mounted upon the terminal of a rearwardly inclined arm of each coil spring 67, said springs being coiled about vertical pins suitably mounted upon the bracket 56. The movement of these arms acting through the medium of the spring 67 causes the oppositely disposed arms of the springs 67, secured at their terminals to the plungers 64, to effect the inward movement of said plungers with the result that the spool heads carried within the turn tables 59 are transferred to the adjacent recess 52 in the carriage block 43. When the carriage block starts on its forward movement each of the spool heads thus lodged within the recesses 52 are carried forwardly into position to be threaded by a spool core member 69 of the type disclosed in Fig. 2.

Suitably secured to the upper surface of the base 10 near one of the loading mechanisms 25 is a spool core magazine 70 which is inclined rearwardly and upwardly from said base. The core members 69 (Fig. 2) are formed with a small head 71 at one end and a large head 72 at the opposite end, the latter having a pair of oppositely disposed lugs 73 formed thereon. Referring to Fig. 8 it will be observed that the cores 69 are adapted to slide downwardly within the magazine 70 in a vertical position with one of the lugs 73 bearing upon the surface of a guide bar 74 and the lower end of the smaller head 71 resting upon the upper surface of a lower guide bar 75. The core members 69 slide freely within the magazine 70, the lowermost core member being carried by gravity into association with a positioning fixture 76 (Fig. 6), which is adapted to tip the core member from its vertical position within the magazine 70 to a horizontal position upon an assembly ram 77 in a manner about to be described.

The positioning fixture 76 comprises a horizontal U-shaped frame 78 longitudinally disposed immediately above the assembly ram 77 and secured in position by a bracket 79 mounted upon the upper surface of the base 10. Within the frame 78 and secured to the front side thereof is a fixed stop 80 which is similar in shape to a stop finger 81 pivoted to the rear side of the U-shaped frame 78 by a stud 82 and is adapted to be engaged by the upper surface of the ram 77 when it is advanced. The stud 82 extends inwardly beyond the frame 78 and supports a coil spring 83 which retains the stop finger 81 in its normal position (dotted lines Fig. 6) with a lug 84 mounted on the finger 81 engaging with the rear upper edge of the frame 78 when the assembly ram 77 occupies its retracted position (Fig. 1), disengaged from the finger. With the finger 81 in its normal position disengaged from the ram 77, the upper end thereof is spaced from the side of the magazine 70 sufficiently to permit a core member to slide therebetween. As the lowermost core member 69 within the magazine 70 passes between the side of the magazine and the finger 81, the upper end of the fixed finger 80 serves as a rest or support for the underside of the head 72 of the core 69, with the smaller head depending slightly below the plane of the upper surface of the ram 77. To prevent the core member 69 from being prematurely tipped to a horizontal position, a hinged gate 85 supported at the upper extremity of an arcuately shaped arm 86 secured to the closed portion of the U-shaped frame 78, serves to prevent the upper end of the core from from falling away from the magazine 70 without the application of a tipping force which is sufficient to overcome the opposing weight of said gate 85. It will be understood that when the core member 69 is in this vertical position, the assembling ram 77 is in its retracted position, it being reciprocable in a guideway 87 provided in the upper surface of the base 10. The reciprocation of the ram 77 is occasioned by the rotation of the cam 32 through the medium of an adjustable connecting rod 88 interposed between a crank pin suitably mounted on the front surface of said cam and a depending bracket carried by the ram. As the ram 77 advances, it is first carried into contact with the pivoted finger 81, said finger being elevated to the position shown in Fig. 6 with the upper end thereof carried into proximity with the side of the magazine 70 and upon continued movement of the ram the depending tip of the smaller head 71 is engaged by the advancing end of the ram. As a result, the core 69 is tipped to a horizontal position within the fixture 76, with the head 72 resting within the frame 78 adjacent to the closed end thereof. The lowermost or next following core member within the magazine is prevented from passing between the finger 81 and the side of the carriage 70 until the core member now lying upon the ram 77 within the frame 78 has been removed therefrom. As the ram 77 is again moved toward its retracted position the head 72 of the core member 69 resting thereon, engages with the closed end of the frame 78 with the result that said core member is precipitated to the upper surface of the base 10 with the head 72 thereof positioned immediately in front of the head end of the ram. A pair of arcuately shaped fingers, pivoted to the base 10 adjacent to opposite sides of the assembling ram 77, operate to yieldingly grip the corners of the head 72 and properly position the shank of the

core member 69 when said core is advanced by the return movement of ram 77. Upon the return of the ram 77 the advancing or head end thereof is carried into contact with the head 72 of the core member 69 and said core is subsequently threaded through companion spool heads in a manner about to be described.

As the ram 77 approaches the limit of its advancing movement as shown in Fig. 6, the carriage block 43 mounted upon the carriage member 34 will occupy its forward position as shown in Fig. 10. Slots 89 provided in the carriage block 43 medially of the recesses 52 (Fig. 11) correspond in width to elongated apertures 90 (Fig. 3) formed in the spool heads 23 and coincide therewith when the heads are lodged within the recesses 52. A forwardly extending portion 91 of the lower extremity of the strip 55 of the chute 24 positioned near the magazine 70 (see Figs. 6 and 18) and the head end of a swedging mechanism 92 positioned adjacent to the side of the carriage block 43 on the opposite side of and in parallelism with said extending strip portion 91, serve as lateral guides to retain the spool heads 23 in their respective recesses 52 when said recesses are moved forwardly away from the loading mechanisms 25. A slot 93 provided in the strip portion 91 similar to the slots 89 formed in the carriage block 43 permits the advancing head 71 of the core member 69 to be threaded through the aperture 90 of the spool head 23 within the recess 52 nearest to the advancing head of the ram 77. After passing through said last mentioned spool head, the core head 71 enters a chamber 94 (Fig. 11) formed within the carriage block 43 and slides over the inner end surface of a fixed guide plate 95 secured to the front wall of the base 10 by bolts 96 (see Figs. 6 and 10). As the core 69 advances along the guide plate 95 it is directed to the aperture 90 of the spool head 23 carried in the recess 52 on the opposite side of the carriage block 43 and when the ram 77 completes its forward stroke the first threaded spool head will be snugly fitted against the larger head 72 of the core member 69 and the second threaded spool head will be properly positioned at the base of the head 71 (Figs. 2 and 4). As the assembly ram 77 approaches the completion of its advancing stroke the swedging mechanism 92 operates to secure said last mentioned spool head in position upon the core head 71 in a manner about to be described.

The swedging mechanism 92 includes a cylindrical body member 97 clamped against a block 98 on the upper surface of the base 10 by tightening bolts 99 (Figs. 1 and 5) reaching through a cap member 100. A charging ram rod 101 (Fig. 6) housed within the body 97 is formed with a semi-cylindrical head 102 at its inner end and is threaded at its opposite end to receive a collar 103 provided with a shoulder 104. A locking bolt 105 is threaded into the collar 103 to lock it in any desired position upon the rod 101. Interposed between the collar 103 and the head 102 of the ram rod 101 is a sleeve 106 slidable upon the rod 101 and formed with an annular shoulder 107. Between the shoulder 107 of the sleeve 106 and the shoulder 104 of the collar 103 is a coil spring 108 and between the collar 107 and a washer 109 (Fig. 7) slidable upon the rod 101 is a second and stronger coil spring 110, the washer being held normally against the head 102 by the spring 110. Threaded into the outer end of the body 97 is a tension sleeve 111, the shoulder 107 of the sleeve 106 being normally held in abutting relation with respect to the inner end of the tension sleeve 111 through the medium of the spring 110. The upper half of the inner or head end of the body 97 is designed to receive a die block 112, which is secured to the body by a machine screw 113. The inner end portion of the head 102 of the ram rod 101 is reduced in size and is provided with a transverse recess 114 in the upper flat surface thereof, which recess is designed to slidably receive a pair of opposed arms 115 of angularly related companion swedging dies 116 (Fig. 7). These dies 116 are adapted to be reciprocated longitudinally of the body 97 on the upper surface of the head end thereof and are guided in companion angularly related ways 216 formed on the face of the block 112 (dotted lines Fig. 7).

A charging bar 117 (Fig. 6) is designed for engagement at its upper end with the underside of the head 102 and is pivoted at its lower extremity to one end of an arm 118, pivotally secured at its opposite end to the base 10 by means of a stud 119. A spring 120 secured at one end to the underside of the upper portion of the base 10 is connected at its opposite end to the extremity of an arm 121 rigidly secured to the charging bar 117. A roller 122 is mounted in a forked arm 123 which forms a continuation of the end of the connecting rod 88 from the point of pivotal connection of said rod with the cam 32. Said roller 122 is arranged to engage with a cam surface 124 on the charging bar 117 during a certain part of the cycle of rotation of the cam 32. When the roller 122 is in a disengaged position with respect to the charging bar 117, the bar will assume the dotted position shown in Fig. 6 through the action of the spring 120, and it is to be understood that when the bar occupies this position the head 102 of the ram rod 101 will occupy its advanced position toward the head end of the body 97 due to the action of the spring 110 acting upon the washer 109 which is in operative engagement with said head 102. As the cam 32 rotates in the direction shown by the arrows (Fig. 6) and the roller 122 is brought into contact

with the charging bar 117, the movement of the upper extremity of the bar engaging with the head 102 causes the head to be moved outwardly against the action of the spring 110 and the consequent movement of the collar 103 carried at the opposite extremity of the ram rod 101 permits the spring 108 to expand. The spring 110 is charged in this manner until the roller 122 engages with the cam surface 124 of the charging bar 117 at which time said charging bar experiences a downward throw, which causes it to become disengaged from the head 102. Upon such disengagement, the charging force stored up within the spring 110 acting upon the washer 109 results in the head 102 being carried inwardly with great force. This driving force exerted by the spring 110 will be effective against the head 102 until the movement of the washer 109 is suddenly arrested by striking a shoulder 125 (Fig. 7) formed within the body 97. The inertia stored up within the head 102 will continue to carry it inwardly after the movement of the washer 109 has been arrested and it is this driving force, effected by the inertia stored up within the head 102, which is employed to simultaneously swedge the opposite sides of the head 71 of the core member 69 positioned between the die member 116 as shown in dotted lines Fig. 7. The spring 108 which is compressed during the sudden inward advance of the head 102 serves to quickly retract the head after the swedging operation is completed and thereby effectively withdraw the die members 116 sufficiently to clear the smaller head 71 of the core 69 as the assembled spool is advanced toward a lacquering fixture denoted generally by the numeral 126.

After the spool heads 23 have been positioned upon the core member 69 and the swedging of the head 71 is completed, the carriage block 43 begins to move rearwardly. The assembled spool is prevented from being carried rearwardly in the carriage block 43 by means of the inner end of the guide plate 95 which is turned upwardly to form an engaging stop 127. This stop 127 engages with the edge of the shank portion of the core 69 as the carriage block 43 moves rearwardly and thus the spool heads 23 are liberated from their respective recesses 52 and the core 69 is liberated from the slots 89 in said carriage block. A channel 128 formed on the upper side of the carriage block 43 (Fig. 11) has a bar member 129 hingedly mounted therein by means of a pin 130 (Fig. 10) traversing the channel 23 at the rear end thereof. The opposite end of the bar 129 is formed with a recess 131 and a rod 132 extending transversely of the bar 129 within said recess is secured at its opposite ends in companion ejector fingers 133, said ejector fingers being pivoted at their inner extremities to the sides of the bar 129 by means of a pin 134. Teeth 135 formed along the lower edges of the ejector fingers 133 are designed to engage with each end of the shank portion of the assembled spool cores as they are advanced along the surface of the guide plate 95. The hinged construction of the bar 129 as well as the hinged construction of the fingers 133 permit the teeth 135 to slide over the cores superimposing the guide plate 95 as the carriage block 43 is carried rearwardly. In this connection it will be noted that a coil spring 136 is suitably mounted upon the upper surface of the hinged bar member 129 which is adapted to exert a yielding downward force against the bar 129 so as to effectively lodge the teeth 135 behind the core members in position to advance them upon the return forward movement of said carriage block. The outermost tooth 135 of each ejector finger 133 engages with the assembled spool core at the outer end of the forward movement of the fingers and advances the spool core to receiver head 137 of the lacquering fixture 126.

The lacquering fixture 126 comprises a container 138 mounted upon the lower end of a vertically slidable bracket 139 (Figs. 1, 5, and 10), and secured thereto by a wing bolt 140 as shown in Fig. 1. The bracket 139 is provided with a pair of aligned slots 141 and 142 arranged longitudinally thereof and a pair of companion guide bolts 143 and 144 extending through the slots 141 and 142, respectively, said bolts being secured at their inner ends to the front wall of the base 10. The upper portion of the bracket 139 is inclined from the vertical and carries a guide pin 145 which reaches into a cam slot 146 formed in the shank of the spool receiver head 137. The inner extremity of a stub shaft 147 extending transversely of the receiver head 137 and providing a pivot therefor is mounted in the upper end of a fixed bar 148 supported by the guide bolts 143 and 144. A pair of integral and angularly related bell cranks 149 and 150 are revoluble upon the guide bolt 144, the extremity of the crank 149 being pivotally mounted within a slot 151 provided in the upper side of the slidable bracket 139. The extremity of the crank 150 is pivoted to one end of a link 152, the opposite end of which has a slotted connection with a stud 153 secured to the depending arm of a strap 154 which is mounted at its inner end upon the assembling ram 77 by bolts 155. The horizontal reciprocation of the ram 77 results in a relative vertical reciprocation of the bracket 139 through the medium of the bell crank 149 pivoted within the slot 151, the bell crank 150 and the link 152 connecting said crank 150 with the strap 154. Vertical movement of the guide pin 145 on the bracket 139 within the cam slot 146 in the shank of the receiver head 137, causes the head to be swung through an angle of 90° about the stub shaft 147. The receiver head 137 is provided

with a transverse opening 156 and a yielding finger member 157 and when the head is swung upwardly into its horizontal position as shown in Fig. 1 the opening will lie in the path of the lugs 73 of the outermost core member upon the guide plate 95. The head 72 of the core member will be advanced between the tip of the yielding finger 157 and a companion tip 158 formed on the receiver head 137 of the lugs 73 will enter the opening 156 (Fig. 1). It will be observed that the limit of the upward swing of the receiver head 137 is determined by the shank of the head engaging with a stop pin 159 mounted in the bracket 139. After the assembled spool has been fed to the receiver head 137 by the teeth 135 at the outer extremity of the ejector fingers 133 as above described, the advancement of the ram 77 will cause the receiver head to be swung downwardly, thereby carrying the core of the spool member lodged therein to a vertical position as shown in Figs. 5 and 21. The bracket 139 will continue to move upwardly after the core, carried by the receiver head 137 has attained the vertical position shown in Fig. 21 and during this portion of the upward movement of said bracket the container 138 is carried into operative engagement with the smaller head 71 of the vertically positioned core member.

Referring to Fig. 10 it will be seen that the container 138 is provided with a cover 160 clamped thereto by screws 161. The central portion of the cover 160 is formed with a neck 162 which has a plunger 163 vertically slidable therein. This plunger 163 is provided with a depending double rack bar 164, which is engaging a pair of oppositely disposed pinions 165, each pinion supporting the end of a radial arm 166. Each of these arms has an arcuate member 167 hingedly mounted therein, yieldingly held in position with respect to the arm 166 by a leaf spring 168 and adapted to pass upwardly through companion apertures 169 in the cover 160 when the plunger 163 is actuated downwardly. A spring 170 encircling the neck 162 of the cover 160 cooperates with a pin 171 in the plunger 163 to normally retain the plunger in its upper position with the arcuate members 167 swung downwardly within the container and immersed in a bath of suitable protective compound such as lacquer.

After the core of the assembled spool is swung to a vertical position by the receiver head 137 as hereinbefore described, the continued upward movement of the bracket 139 carries the plunger 163 into engagement with the tip of the smaller head 71 of the assembled spool core (Fig. 10). This results in the upward swinging of the arcuate members 167 through the apertures 169 to bring the tips of the members contemporaneously into contact with the opposed surfaces of the core head 71 adjacent to the spool head 23 mounted thereon. A globule of protective compound is in this manner applied to the swedged portions of the core head. The leaf spring 168 serves in this connection to prevent any possible distortion of the members 167 when the tips thereof are carried into contact with the core head 71. It has been the practice in some instances to employ spool cores which have been previously treated to form a protective coating thereon and from the foregoing it will be obvious that the lacquering mechanism will be particularly effective in such instances to supplant the portions of the protective coating on the core, which may be removed during the swedging operation, with a coating of lacquer. Following this lacquering operation the spool carried in the receiver head 137 is swung back to its horizontal position and is subsequently ejected from the receiver head by the next advancing spool member.

Referring to Figs. 10, 19, and 20, it will be observed that rotation is imparted to the drive shaft 30 from a source of power (not shown) through the medium of a fly wheel 172 which is revoluble upon a bearing member 173 keyed to the drive shaft 30 and a pair of levers 174 carried by the fly wheel, designed for engagement with a driving flange 175 formed integrally with the bearing member 173. These levers 174 are pivoted at one end to the web of the fly wheel 172, the opposite free ends of each lever being connected with one end of a spring 176. The springs 176 function to yieldingly retain a tapered tooth 177 formed medially of each lever, in operative engagement with a companion notch 178 formed in the periphery of the driving flange 175. Obviously, the force exerted by the spring 176 to retain the teeth 177 within the notches 178 will be effective within a certain limit, which is dependent upon the force necessary to propel the working parts of the machine under normal operating conditions. If for any reason the working parts of the machine are subjected to duty or stresses which are in excess of those occasioned during normal operation, the teeth 177 will be forced away from the notches 178 against the force of the springs 176. A flange member 179 slidable upon the bearing 173 is secured to one end of a pair of oppositely disposed guide pins 180 which reach through the web of the fly wheel 172 and are secured at their opposite ends to a disk 181 slidable upon the hub of the fly wheel (Fig. 20). Springs 182 encircling the guide pins 180 and interposed between the disk 181 and the adjacent surface of the web of the fly wheel 172, cause the face of the flange 179 to yieldingly bear against the tips of protruding lock pins 183 mounted medially of each of the levers 174, when the teeth 177 are engaged with their respective notches 178. When the levers 174 are swung outwardly towards their

disengaged position the beveled portion of the end of the lock pins 183 clear the flange member 179, thereby permitting the springs 182 to elevate levers 174 and to carry the face of the flange member toward the opposing face of the driving flange 175. The teeth 177 are thus held disengaged from the driving flange 175 with the lock pins 183 bearing against the periphery of the flange 179, the fly wheel 172 thereby being free to rotate upon the bearing member 173 without supplying a propelling force to the drive shaft 30. In order to impart a rotary movement to the driving shaft 30 it is necessary to move the flange 179 and the disk 181 against the action of the springs 182 to permit the springs 176 to carry the levers into operative engagement with the driving flange 175.

Mounted upon the hub of the cam 32 is a brake drum 184 of conventional design (Figs. 10 and 12) and housed therewithin is an annular brake shoe 185 designed for frictional engagement with the inner surface of the brake drum. By lowering a lever arm 186 (Fig. 13) which is pivoted at its inner end upon a longitudinal shaft 187 threaded into the flange of the bearing member 28, a second stub shaft 188 reaching through the flange of the bearing member 28 is rotated by a pair of connecting links 189 and 190. The link 189 is slotted to permit the lever arm 186 to be raised without imparting rotation to the stub shaft 188. The inner end of the shaft 188 terminates in the form of a rectangular head between the ends of the annular brake shoe 185 (Fig. 12) and it will be understood that a slight counter clockwise rotation of the shaft 188 will expand the shoe against the drum 184. The braking effect of the shoe 185 against the drum occasioned by lowering the lever arm 186 will be sufficient to cause the teeth 177 of the lever 174 to become automatically disengaged and thereby render the impelling force of the fly wheel 172 ineffective. A spring 191 secured to the link 190 serves to maintain the lever arm 186 in its normal horizontal position.

The pivoted end of the lever 186 is formed integral with a sleeve 192 (Fig. 10) provided with cam teeth 193 at the end thereof. A second sleeve 194 longitudinally slidable and nonrotatable upon the shaft 187 is also formed with cam teeth 195 designed to be engaged by the cam teeth 193 of the sleeve 192, the rear portion of the sleeve 194 being enlarged to form a yoke 196 which is frictionally engaged with a face of the disk 181. When the levers 174 are moved to their disengaged positions, the flange member 179 and disk 181 are subsequently actuated forwardly (to the left Fig. 10) by the action of the springs 182 with the result that the sleeve 194 is likewise moved forwardly and the teeth 195 on said sleeve are interlocked with the cam teeth 193 on the sleeve 192. By raising the lever arm 186 the teeth 193 on the sleeve 192 cooperate with the teeth 195 on the sleeve 194 to actuate the latter to the right (Fig. 10) and this results in the flange member 179 becoming disengaged from the lock pins 183.

A lock washer 197 (Fig. 10) secured to the rear end of the drive shaft 30 by a threaded bolt 198 prevents the bearing member 173 from being longitudinally displaced upon the drive shaft. A drive pulley 199 mounted upon the outer end of the bearing 173 is connected with the pulleys 17 at the lower end of the vertical hopper shafts 14 through the medium of a belt 200 as shown diagrammatically in Fig. 14. A pair of idler pulleys 201 may be employed to properly guide the portion of the belt 200 extending between the drive pulley 199 and the pulleys 17.

In the operation of the machine, spool heads 23 are supplied to the hoppers 11 and core members 69 are supplied to the magazine 70 through the upper end thereof. The core members will occupy a vertical position within the magazine as shown in Fig. 8 and will slide downwardly therein by the force of gravity with the lowermost core in position to be acted upon by the positioning fixture 76 at the lower end of the magazine. The shafts 14 are rotated by the hand wheels 15 in a direction to advance the spool heads 23 within the hoppers 11 upwardly into the chutes 24 until that portion of each chute extending from the loading mechanism 25 up to the overflow openings 26 is filled with spool heads. Power is supplied to the fly wheel 172 from a suitable source and the lever arm 186 is raised to engage the teeth 177 with the notches 178 of the driving flange 175, thereby causing the rotation of the drive shaft 30. The rotation of the pulley 199 operates the spool feeding mechanism within each of the hoppers through the medium of the driving belt 200 and the pulleys 17 carried at the lower end of each shaft 14. Considering the rotation of the drive shaft 30 as commencing when the surface of the cam 32 and the roller 33 engaging therewith occupy the relative positions shown in Fig. 10, it will be understood that the assembling ram 77 will be positioned at the limit of its advancing stroke as shown in Fig. 6. Continued rotation of the cam 32 will result in the rearward movement of the carriage block 43 and a relative retraction of the ram. At this time in the cycle of operation the turn table 59 within each spool head loading mechanism 25 is positioned as shown in Figs. 15 to 18, inclusive, and permits the lowermost spool head in each chute to become lodged within the channel 60 which now assumes a vertical position. As the carriage block 43 approaches its limiting rearward position by the engagement of the raised surface of the cam 32 with the

roller 33, the turn table 59 of each spool head loading mechanism 25 will be rotated through an angle of 90° and the ejector plungers 64 mounted therein subsequently transfer the spool heads into their respective recesses 52 in the sides of the carriage block 43. Contemporaneously with the reciprocation of the carriage block 43, the assembling ram 77 is retracted to the position shown in Fig. 1. During this retraction the stop finger 81 of the positioning fixture 76 is disengaged from the upper surface of the ram 77 and the upper end of the finger moves away from the side of the magazine 70 sufficiently to permit the lowermost core member 69 within the magazine to drop into position within the fixture 76, with the lower edge of the core head 72 resting upon the upper end of the fixed finger 80 and the upper edge thereof immediately adjacent to the free end of the hinged gate 85. When the carriage block 43 reaches its forward position, the ram 77 will have started upon its advancing stroke and as it continues to advance, the core member 69 is tipped from its vertical position within the fixture 76 to a horizontal position upon the upper surface of the ram within the U-shaped frame 78. The apertures 90 of the spool heads 23, now lodged within the recesses of the carriage block, are in position to be threaded by a core member, but from the foregoing it will be obvious that no core member has as yet been positioned to be advanced and assembled by the head of the ram 77. Therefore, it will be understood that this first pair of spool heads thus advanced by the carriage block 43 will not be assembled upon a core member but will be removed from the block and replaced within their respective hoppers. During the second rotating cycle of the cam 32, the carriage block is returned to receive a second pair of spool heads from the loading mechanism 25 in the manner above described and the assembling ram 77 is again retracted, with the result that the core member 69 previously tipped to its present horizontal position is precipitated to the upper surface of the base 10, immediately ahead of the advancing ram. The second pair of spool heads are carried forwardly by the carriage block 43 and as the ram 77 starts upon its advancing stroke, the apertures 90 of the spools in the block will lie in the path of the advancing core head 71. As the ram approaches the completion of its advancing stroke, the swedging mechanism 92 functions to form burrs upon the opposed edges of the core head 71 adjacent to the spool head just threaded thereon, thereby rigidly securing said spool head in position. A spool assembly is completed, as described above, during each subsequent cycle of rotation of the drive shaft 30 and the spools thus assembled are advanced step by step along the surface of the guide plate 95 by the teeth 135 of the fingers 133 engaging with the shanks of said spools. The outermost assembled spool upon the guide plate 95 is fed into the receiver head 137 of the lacquering mechanism 126, when the head occupies the raised position shown in Fig. 1. During the advancing movement of the assembling ram 77, the receiver head is swung downwardly and the core member carried therein moved to a vertical position. The arcuate members 167 within the lacquer container 138 are then actuated and a globule of lacquer is subsequently applied by the tips thereof to the swedged portions of the core head 71. During the retracting movement of the ram 77 the spool thus treated is swung upwardly into its original horizontal position and subsequently ejected by the next advancing spool. If the cooperating parts of the machine are subjected to stresses in excess of those experienced during the normal operation thereof, the mechanism positioned at the rear end of the drive shaft 32 will automatically operate to render the propelling force of the fly wheel 172 ineffective and the machine inoperative until the necessary connection is effected again by lowering the lever arm 186. To stop the machine during the course of its operation, it is only necessary to lower the lever arm 186, and thereby cause the brake shoe 185 to frictionally engage with the brake drum 184 with sufficient force to operate the disengaging mechanism above mentioned.

Although the invention as herein illustrated and described is particularly well adapted for use in connection with an apparatus for assembling spool elements, it should be understood that the novel features thereof are capable of other applications and should be limited only by the scope of the appended claims.

What is claimed is:

1. In an assembling apparatus for assembling spool heads and cores, a core magazine, retaining means for spool heads, means for assembling spool heads in spaced relation upon a core, means for advancing spool heads from the retaining means to the assembling means, and means for advancing a core from the magazine to said assembling means.

2. In an assembling apparatus for assembling spool heads and cores, a core magazine, retaining means for spool heads, means for assembling spool heads in spaced relation upon a core, means for advancing spool heads from the retaining means to the assembling means, means for advancing a core from the magazine to said assembling means, and means for securing a spool head in position upon the core.

3. In an assembling apparatus for assembling spool heads and cores, retaining means for spool heads, a core magazine, means for assembling spool heads in spaced relation upon a core, means for advancing spool heads from the retaining means to the assembling means,

means for advancing a core from the magazine to said assembling means, and means for swedging a spool head in position upon the core.

4. In an assembling apparatus for assembling cores and end members, a core magazine, a container for core end members, means for applying a core end member to a core, means for advancing an end member from the container to the assembling means, means for advancing a core from the magazine to said assembling means, a swedging device for swedging the core to secure an end member in position thereon, and means for applying a protective coating to the swedged portion of the core.

5. In an assembling apparatus for assembling spool heads and cores, a core magazine, retaining means for spool heads, means for applying spool heads in spaced threaded relation upon a core, means for advancing spool heads from the retaining means to the applying means, and means for advancing a core from the magazine to said applying means.

6. In an assembling apparatus for assembling spool heads and cores, a core magazine, retaining means for spool heads, means for threading a core through spaced spool heads, means for advancing spool heads in to spaced position to be threaded by a core, and means for advancing a core from the magazine into position to be threaded through the positioned spool heads by the threading means.

7. In an assembling apparatus for assembling spool heads and cores, a core magazine, retaining means for spool heads, means for threading a core through spaced spool heads, means for advancing spool heads into spaced position to be threaded by a core, means for advancing cores from the magazine into position to be threaded through positioned spool heads by the threading means, and means for securing a spool head in assembled position upon the core.

8. In an assembling apparatus for assembling spool heads and cores, a core magazine, retaining means for apertured spool heads, means for threading a core through the aperture of spaced spool heads, means for advancing spool heads from the containers into spaced position to be threaded by a core, and means for advancing cores from the magazine into position to be threaded through the aperture of positioned spool heads by the threading means.

9. In an assembling apparatus for assembling cores and end members, a container for end members, a core magazine, a driving means, means operated by said driving means for assembling an end member with a core, means for advancing an end member from the container to the assembling means, means for advancing a core from the magazine to said assembling mechanism, and means responsive to the machine load for controlling the driving means.

10. In an assembling apparatus for assembling cores and end members, a container for end members, a core magazine, a driving means, means operated by said driving means for assembling an end member with a core, means for advancing an end member from the container to the assembling means, means for advancing a core from the magazine to said assembling means, and a braking means for controlling the driving means.

11. In a spool assembling apparatus for assembling spool heads and cores, hoppers for spool heads, a magazine for spool cores, an assembling ram designed to thread a core through spaced, positioned spool heads, means adapted to receive a core from the magazine and locate said core in position to be acted upon by the assembling ram, and means for advancing spool heads from the hoppers into spaced position to be assembled with a core by the assembling ram.

12. In a spool assembling apparatus for assembling spool heads and cores, hoppers for spool heads, a magazine for spool cores, an assembling ram designed to thread a core through spaced, positioned spool heads, means adapted to receive a core from the magazine and locate said core in position to be acted upon by the assembling ram, a spool head positioning mechanism, and means for advancing spool heads from the hoppers to said positioning mechanism.

13. In a spool assembling apparatus for assembling spool heads and cores, hoppers for spool heads, a magazine for spool cores, a driving means, an assembling ram operated by said driving means and designed to thread a core through positioned spool heads, means adapted to receive a core from the magazine and locate said core in position to be acted upon by the assembling ram, a spool head positioning mechanism, means for advancing spool heads from the hoppers to said positioning mechanism, means for swedging a spool head in assembled position upon a core, means for applying a protective coating to the swedged portion of the core, and means responsive to the machine load for controlling the driving means.

14. In an assembling apparatus for assembling cores and end members, means for applying a core end member to a core, a coating container, means for causing relative movement between a core and the container, and a coating device capable of engaging a portion of a core adjacent to an applied end member in response to said relative movement.

15. In an apparatus for assembling members, a container for said members, a rotatable element therein designed for engagement with the members, a guideway for the mem-

bers terminating within the container, and means for rotating the element to elevate members through the guideway from the container and advance said members to an assembly position.

16. In an apparatus for assembling spool heads and cores, means for swedging a core to secure a spool head thereon, said means having cutters slidable in angular relation to the core.

17. In an apparatus for assembling members, means for swedging a member to secure another member thereon, a resilient means adapted to effect the swedging engagement of said swedging means with a member, and a second resilient means designed to be energized by said first mentioned resilient means to effect the restoration of said swedging means.

18. In an assembling apparatus for assembling cores and end members, means for positioning end members in assembly relation with a core, means to establish assembled relation of the core and end members, means for swedging a portion of the core to secure an end member thereon, said last mentioned means having cutters movable in angular relation to the axis of the core.

19. In an assembling apparatus for assembling apertured spool heads with cores having a polyhedral cross section, a core magazine, retaining means for spool heads, means for assembling spool heads having apertures corresponding to the polyhedral core cross section in a predetermined position upon a core, means for advancing spool heads from the retaining means to the assembling means with the apertures thereof in proper predetermined position, and means for advancing a core from the magazine to the assembling means in position to be assembled with positioned spool heads.

In witness whereof, we hereunto subscribe our names this 12th day of December, A. D., 1925.

CLEM H. FRANKS.
GEORGE LYNDEN ROCK.