F. C. NICKOL.

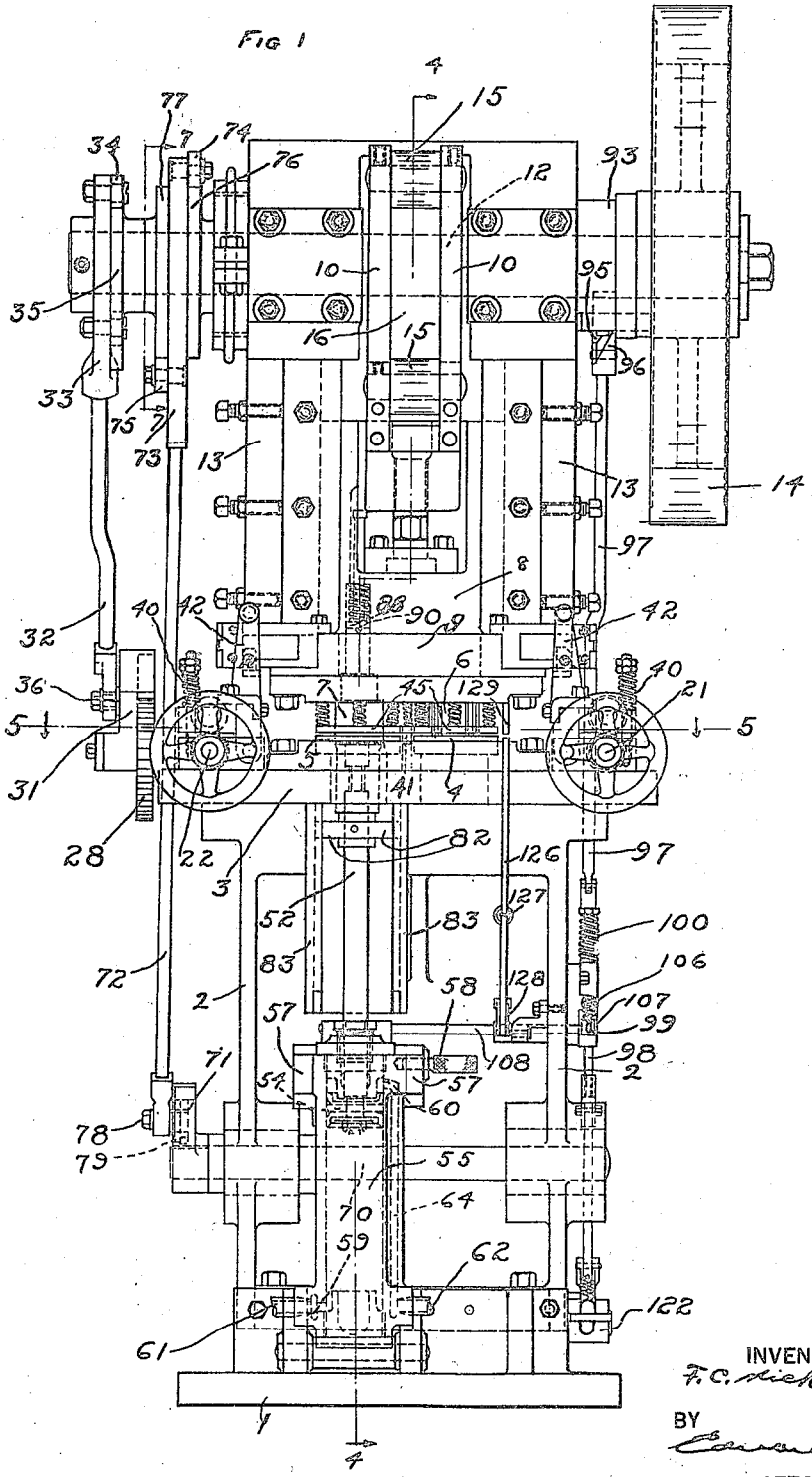
MACHINE FOR BUILDING LAMINATED ARMATURE CORES AND THE LIKE.

APPLICATION FILED JULY 2, 1920.

1,426,759. Patented Aug. 22, 1922.

5 SHEETS—SHEET 1.

FIG 1



INVENTOR

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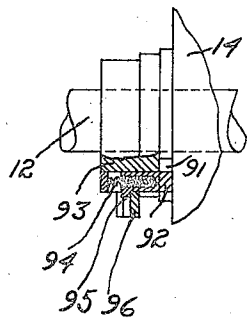
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5 SHEETS—SHEET 2.

FIG-8



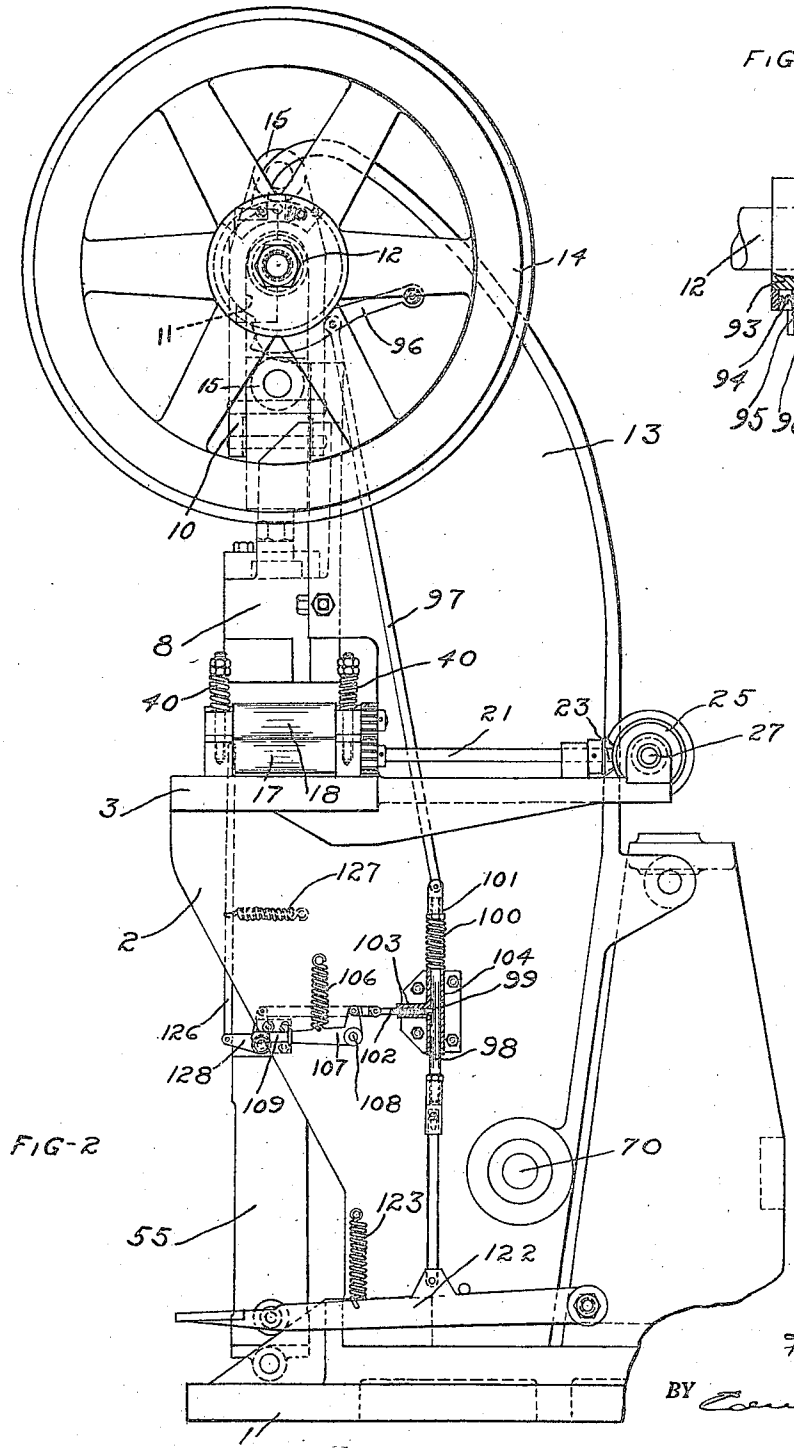


FIG-2

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5 SHEETS—SHEET 3.

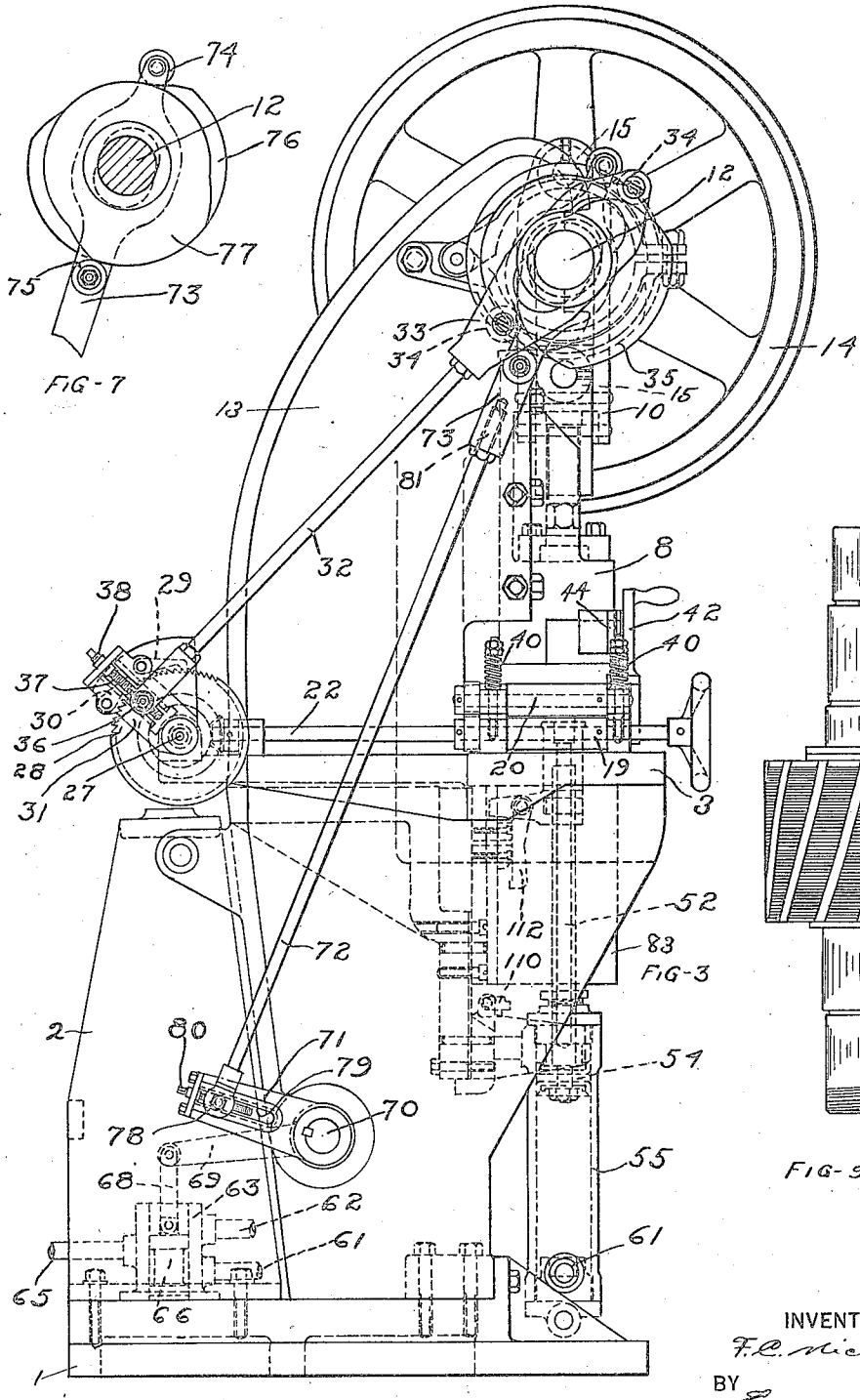


FIG-7

FIG-3

FIG-9

INVENTOR

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BY Edward Rector

ATTORNEY

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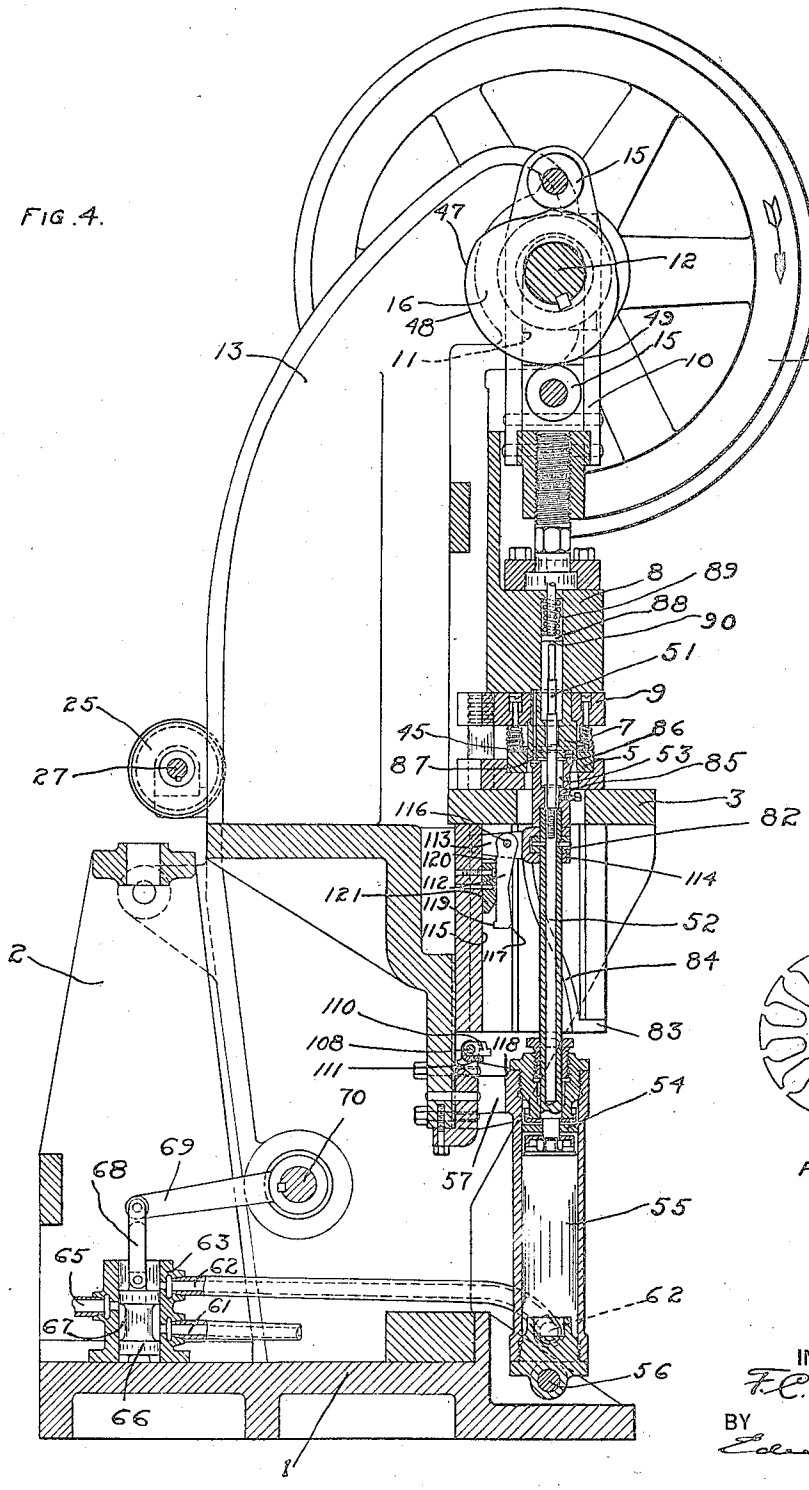
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5 SHEETS—SHEET 4.

FIG. 4.



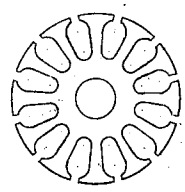


FIG-10

INVENTOR

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MACHINE FOR BUILDING LAMINATED ARMATURE CORES AND THE LIKE.

APPLICATION FILED JULY 2, 1920.

1,426,759. Patented Aug. 22, 1922.

5 SHEETS—SHEET 5.

FIG-5

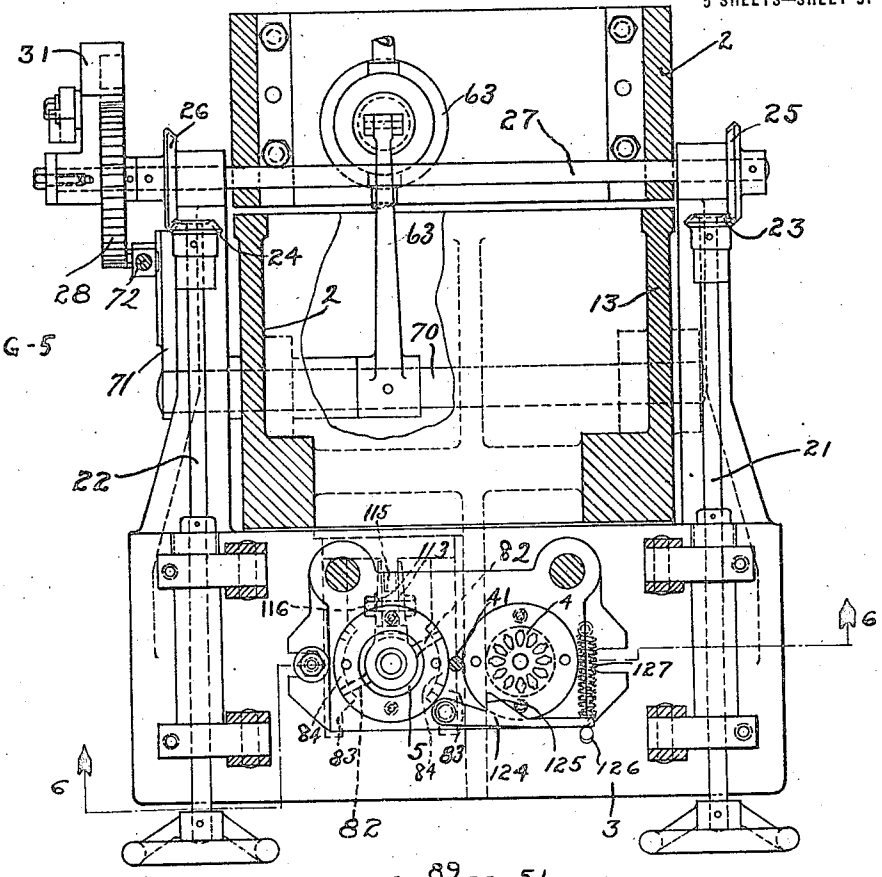
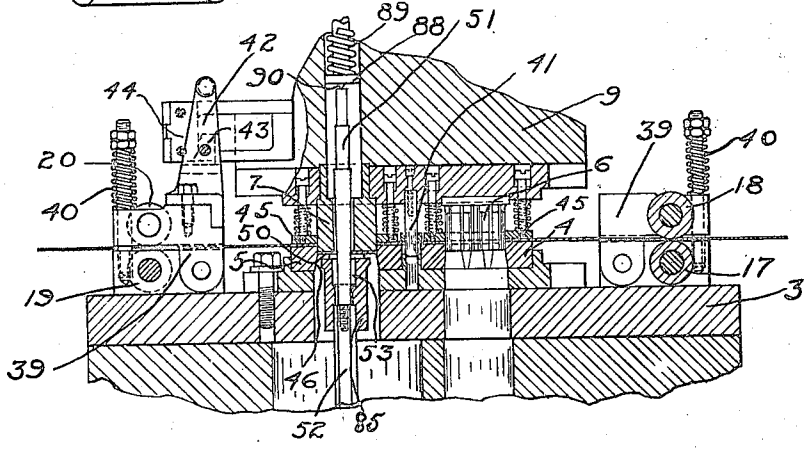


FIG-6



INVENTOR

F. C. Nickol

BY

Edward Reed

ATTORNEY

UNITED STATES PATENT OFFICE.

FREDERICK C. NICKOL, OF DAYTON, OHIO, ASSIGNOR TO CITY MACHINE & TOOL WORKS, OF DAYTON, OHIO, A COPARTNERSHIP CONSISTING OF FREDERICK C. NICKOL AND OSCAR M. POOCK.

MACHINE FOR BUILDING LAMINATED ARMATURE CORES AND THE LIKE.

1,426,759. Specification of Letters Patent. Patented Aug. 22, 1922.

Application filed July 2, 1920. Serial No. 393,713.

To all whom it may concern:

Be it known that I, FREDERICK C. NICKOL, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Machines for Building Laminated Armature Cores and the like, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to a machine for building laminated armature cores and the like.

The object of the invention is to provide a machine which will assemble the several laminations, or disks, comprising the core, on the shaft, or other supporting member, in proper relation one to the other; and further, which will first sever the laminations, or disks, from sheet metal and will then assemble them on the shaft.

A further object of the invention is to provide such a machine which will be automatic in its operation.

A further object of the invention is to provide such a machine which will be simple in its construction and operation; which will consist of a comparatively few parts; and which will have these parts of such a character that they will not be easily broken or disarranged.

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

In the accompanying drawings Fig. 1 is a front elevation of a machine embodying my invention; Fig. 2 is an elevation of the right hand side of such a machine, as shown in Fig. 1; Fig. 3 is an elevation of the left hand side of the machine of Fig. 1; Fig. 4 is a vertical sectional view taken on the line 4—4 of Fig. 1 looking in the direction of the arrows; Fig. 5 is a sectional view taken on the line 5—5 of Fig. 1 looking in the direction of the arrows; Fig. 6 is a section taken on the line 6—6 of Fig. 5 looking in the direction of the arrows; Fig. 7 is a detail view of the valve operating cam; Fig. 8 is a detail view, partly broken away, of the automatically operated clutch; Fig. 9 is a side elevation of a completed armature core; and Fig. 10 is a plan view of one of the laminations, or disks.

In carrying out my invention I provide a machine having means for delivering a plurality of perforated disks, or laminations, to a predetermined position, and for then mounting the same upon the shaft, or other supporting member on which the laminated structure is to be mounted. In the case of an armature core, this supporting member will be the armature shaft. Preferably the shaft is mounted in a suitable support and is moved longitudinally through the aperture in the disk until the latter is firmly seated on the shaft in its proper relation thereto and to the other disks thereon. The movement of the shaft is variable so that it will cease as soon as the disk, which is being mounted thereon, has been properly positioned thereon. In the case of an armature core the laminations, or disks, are provided with a circumferential series of slots and the slots of the several disks are so arranged with relation one to the other that they will form a plurality of grooves extending lengthwise of the completed core, and I have, in the present machine, provided means for causing the slots of the successive disks to be slightly offset one from the other so as to produce spiral grooves. Preferably the disks, or laminations, are produced by the same machine which assembles them on the shaft and I, therefore, prefer to provide the machine with mechanism which will sever the disks from sheet metal and which will serve to deliver the same to the position which they occupy while being assembled on the shaft. I also prefer to provide the machine with means for automatically interrupting the operation thereof when a sufficient number of disks have been assembled on the shaft to form a core, or other structure, of the desired length.

These several operations may be carried out by mechanism of various kinds and it will be understood that the particular machine illustrated in the present drawings has been chosen for the purpose of illustration only.

That form of the machine here illustrated comprises a unitary mechanism for first punching the disks from sheet metal and then assembling them on the shaft, or other supporting member, and, as here shown, this mechanism is mounted on a main frame comprising a base portion 1 and side frame members 2 and also having a horizontal portion,

or bed plate, 3. As here shown, the mechanism for producing the disks consists of two sets of punches and dies, one of which perforates the sheet metal stock to form therein the several openings and the other of which blanks out, or severs, the disk from the stock. Preferably both dies are fixed upon the bed plate 3, as shown at 4 and 5, and the punches, 6 and 7, are movably mounted for cooperation with the fixed dies. Preferably the two punches operate in unison and they are, in this instance, operated by a single ram 8 which is provided with a transverse portion, or cross head, 9, to which the punches are attached. Reciprocatory movement may be imparted to this ram in any suitable manner, but in the present instance I have shown the same as provided at its upper end with a yoke 10 which is slotted, as shown at 11, to embrace a driving shaft 12, which is journaled in arms, or brackets, 13 extending upwardly between the side members 2 of the main frame, and which may be driven from a suitable source of power in any suitable manner. In the present construction, it is provided with a belt wheel, or pulley, 14. The yoke 10 has mounted therein rollers 15 arranged above and below a cam 16 which is rigidly secured to the shaft 12 and which serves to positively move the ram in both directions.

The sheet metal stock is fed to the dies from the right hand side of the machine and moves transversely thereof; see Fig. 6. Power driven mechanism serves to feed the stock to and from the dies and, as here shown, this feeding mechanism comprises a pair of feeding rollers 17 and 18 arranged at the right hand side of the machine, and a second pair of feeding rollers 19 and 20 at the left hand side of the machine. One or both rollers of each pair may be positively driven and, as here shown, the lower rollers are geared to the respective upper rollers and are mounted on shafts 21 and 22 which extend rearwardly and have secured to their rear ends beveled pinions 23 and 24 which mesh with beveled gears 25 and 26 on a shaft 27 which is journaled in suitable bearings on the main frame. This shaft 27 is driven from the driving shaft 12 and the driving connection is of such a character that a proper amount of feeding movement will be imparted to the feed rollers at the desired time and these rollers will remain idle at all other times. In the present construction, I have provided the shaft 27 with a pawl and ratchet drive which is cam operated from the shaft 12. As here shown, a ratchet wheel 28 is rigidly secured to the shaft 27 and is acted upon by pawls 29 and 30 mounted on an arm, or pawl carrier, 31 which is mounted for movement about the shaft 27. Either one or two pawls may be employed but I prefer to employ the two pawls shown and to so arrange the same that when the nose of one pawl is in engagement with a tooth the nose of the other pawl will lie midway between two teeth, as in this manner I secure the effect of a very fine toothed ratchet without the necessity of reducing the size of the teeth to such a point as to weaken the same. The pawl carrier 31 is connected with a rod 32 which has at its opposite end a slotted yoke 33 embracing the shaft 12 and this yoke is provided at the opposite ends of the slot with laterally extending projections, or rollers, 34 which engage the opposite edges of the cam 35 which is so shaped that it will impart a single feeding movement to the pawl carrier upon each rotation of the shaft 12 and this movement is sufficient to advance the stock the desired distance. The point of connection between the connecting rod 32 and the pawl carrier 31 is adjustable radially of the carrier so that the amount of movement imparted to the ratchet wheel may be regulated. To this end the rod 32 is pivotally connected with a nut 36 which is slidably mounted in a slot 37 in the carrier and is threaded onto the screw 38, by means of which it can be moved toward or from the axis of the pawl carrier, thus varying the amount of movement imparted to the carrier by the cam.

In the present construction of the mechanism the lower rollers, 17 and 19, of each pair of feeding rollers is positively driven and the upper rollers, 18 and 20, are geared to the respective lower rollers and are movable relatively thereto so that they constitute pressure rollers. To this end, the upper rollers are mounted on pivoted brackets 39 which are acted upon by springs 40 to force the pressure rollers toward the lower rollers. Preferably, the piercing and blanking dies are spaced apart a distance sufficient to receive between them a portion of the sheet metal stock which has been acted upon by the piercing dies and this intermediate perforated portion is utilized to accurately position that perforated portion of the stock which is in operative relation to the blanking dies. To this end the cross head of the ram has secured thereto a downwardly extending pin 41, the lower end of which is slightly tapered and is arranged to enter the central opening in the intermediate perforated portion of the stock, which lies between the two sets of dies, and to thus shift the stock to accurately position the other perforated portion thereof with relation to the blanking die. In order that the stock may thus be shifted it is necessary that the pressure exerted thereon by the feeding rollers be relieved and I have provided means for automatically moving the pressure rollers, 18 and 20, away from the stock just prior to the time the guide pin 41 enters the aperture in the in-

termediate portion of the stock. To this end the brackets 39 have secured thereto upwardly extending arms 42, to the rear faces of which are secured lugs 43 each having one corner beveled and arranged to be engaged by a projection 44 carried by the cross head of the ram. The relative positions of the projections 43 and 44 are such that during the operative movement of the feeding rollers the projection 44 will lie above and out of engagement with the projection 43 on the arm 42, and the action of the rollers will not be interfered with, but as the ram moves downwardly, and after the completion of the feeding movement, the projection 44 on the cross head will engage the projection 43 on the arm 42 and move the arm in a direction to raise the roller 20, or 18, as the case may be, against the action of the spring 40 and thus relieve the pressure on the stock, thereby permitting the stock to be shifted, if need be, by the pin 41 on the cross head. Both punches are preferably provided with yieldable stripper plates 45 which may be of the usual, or any suitable, construction and which serves to disengage the stock from the punch as the latter moves upwardly. The fixed, or female, blanking die, 5, has an opening extending entirely through the same, the upper portion of which is cylindrical in shape and of a diameter corresponding to the diameter of the cutting edge of the die, and the lower portion thereof is flared outwardly, as shown at 46. The operative, or punching, stroke of the blanking punch 7 terminates at such a point that the disk which has been blanked out will lie within the cylindrical portion of the opening in the fixed die and the frictional contact between the disk and the die will be sufficient to retain the disk in position therein. However, the punch remains in engagement with the disk for a period of time long enough to permit certain operations of the machine which will now be described, this action of the punch being due to a dwell on the cam 16, it being noted that this cam is provided with an operative portion at 47 which imparts the operative movement to the punch and immediately following the portion 47 is a concentric portion, or dwell, 48 which causes the punch to be held in the position which it occupies at the end of its operative stroke. At the end of the dwell is a second operative portion 49 which serves to impart a slight further downward movement to the punch for a purpose which will be hereinafter described. After the disk, or lamination, has been severed and delivered to the cylindrical portion of the die 5, which serves to support the same, as shown at 50 in Fig. 6, the member upon which the several disks, or laminations, are to be assembled, and which is herein called the shaft, is moved lengthwise through the central aperture of the disk. The diameter of the shaft is very little less than the diameter of the central aperture of the disk and, consequently, when the shaft is forced through the same the disk will fit snugly about the latter and will be retained thereon in the position to which it is moved. The lengthwise movement imparted to the shaft is varied so that each succeeding movement will be less than the preceding movement thereof. Preferably the movement of the shaft is interrupted by the contact of the last disk previously placed upon the shaft with the disk then being assembled, it being noted that the disk which is being assembled is held against upward movement by the blanking punch which remains in contact therewith, and which is provided with a longitudinal opening through which the shaft may project. The shaft, which is shown at 51 in Figs. 4 and 6 may be supported, and may have lengthwise movement imparted thereto, in any suitable manner, but I prefer to mount the shaft in a movable support which is connected with suitable operating mechanism. As here shown, this support is in the form of a hollow rod 52 provided at one end with a socket 53 to receive one end of the shaft 51 and having its other end connected with a piston 54 of a fluid operated mechanism.

In the present instance this fluid operated mechanism comprises an air cylinder 55 which is pivotally supported at 56 on the base 1 of the main frame so that, when the piston rod 52 is in its retracted position the cylinder can be swung outwardly to permit the shaft and the finished core to be removed from the chuck and another shaft inserted therein. The upper end of the cylinder, when in its vertical position, fits between two parallel arms 57, extending forwardly from a part of the main frame and is locked in position between these arms by means of a pin 58 extending through one of the arms 57 and entering a socket in the upper end of the cylinder structure. The cylinder is provided at its upper and lower ends with inlet ports 59 and 60 which are connected by means of pipes 61 and 62 with a casing 63 of a valve which controls the admission of air to the upper and lower ends of the cylinder. Both pipes 61 and 62 preferably connect with the cylinder near the bottom thereof and the pipe 62 is connected with the port 60 by means of a conduit 64 formed in the side wall of the cylinder. The valve casing 63 is connected by a pipe 65 with any suitable source of air, or other fluid, under pressure, such for example as an air compressor. Mounted within the casing is a reciprocatory valve member 66 having a circumferential channel 67 of such a length that when the valve 66 is in one position the

inlet pipe 65 will be connected through the pipe 61 with the lower end of the cylinder and when the valve member is in its other extreme position the pipe 65 will be connected through the pipe 62 and conduit 64 with the upper end of the cylinder. The valve 66 may be operated in any suitable manner but its movement is preferably controlled by the shaft 12 to cause it to be operated in timed relation to the movements in the other parts of the mechanism. As here shown, the valve member is connected by means of a link 68 with an arm 69 rigidly secured to a shaft 70 journaled in the side members of the main frame. Rigidly connected with the shaft 70, on the outside of the frame member is a second arm 71 with which is connected a rod 72, having at its upper end a yoke 73, which is slotted as shown in Fig. 7, to embrace the shaft 12. Projecting from opposite sides of the yoke 73 are projections, or rollers, 74 and 75 arranged respectively above and below cams 76 and 77, rigidly secured to the shaft 12 and arranged on opposite sides of the yoke 73. These cams are so arranged that upon each rotation of the shaft 12 the valve member 66 will be moved into a position to cause air to be admitted to the bottom of the cylinder 55 and will be retained in that position for a period of time sufficient to cause a full upward stroke of the piston 54. The cams are so shaped as to provide at the end of the upward stroke a dwell in the action of the piston and at the end of this dwell the air is admitted to the upper end of the cylinder and the piston forced downwardly, the shape of the cams being such that the piston will be retained in its lowermost position for a period of time sufficient to permit of the feeding and stamping operations, above set forth. The amount of movement imparted to the valve member 66 may, if desired, be regulated and to this end the connecting rod 72 is adjustably connected with the actuating arm 71. As here shown, this connection comprises a nut 78 slidably mounted in a slot 79 in the arm 71 and threaded into this nut is a screw 80 by means of which the point of connection may be shifted radially of the arm. The length of the connection between the cams and the valve may also be adjusted to time the movement of the valve. As here shown, the rod 72 has a screw threaded connection with the yoke 73, as shown at 81, which permits the connecting rod to be lengthened or shortened, thereby altering the limits of movement of the valve member and, consequently, changing the relative times at which the air will be reversed.

As has been heretofore explained, the upward movement imparted to the shaft 51 upon each successive operation thereof is less than the amount of movement imparted thereto on the preceding operation thereof and this is accomplished by causing the uppermost disk on the shaft to be brought into engagement with the disk which is being assembled and to thus check the movement of the shaft and its supporting member, this being possible because of the character of the operating mechanism. In order that the slots in the several disks may be so arranged relatively one to the other as to produce a spiral groove in the outer surface of the finished core I have provided means for imparting rotatory movement to the shaft while it is being moved upwardly and the means for imparting this rotatory movement to the shaft is of such a character that the amount of rotation imparted thereto upon each successive operation thereof will be less than the amount of rotation imparted thereto upon the preceding operation thereof, thus causing the slots in each succeeding disk to be slightly out of register with the slots of the preceding disk. This is accomplished in the present instance by attaching to the supporting member, or piston rod, 52, cross arms 82 which travel in spiral guides arranged alongside the path of travel of the supporting member. As here shown, the supporting member operates in a housing comprising side walls 83 which depend from the bed plate 3 and I have formed in each of these side walls a spiral groove 84 in which the ends of the arms 82 move, and which serve to impart the desired rotatory movement to the shaft. The end disks, or laminations, of a laminated core are preferably of insulating material, such as fiber, and I prefer that the initial fiber disk shall be placed upon the shaft before the same is inserted in the machine and that the final fiber disk shall be placed thereon after it is removed from the machine. Means are provided for properly positioning the initial fiber disk with relation to the shaft support and its cooperating parts, and to this end I have mounted on the supporting member 52 a sleeve 85 the upper end of which projects beyond the socket 53 which secures the shaft in place and forms a support for the lowermost disk on the shaft, which, as has been explained, is usually a fiber disk. Attached to the upper edge of the sleeve 85 is a pin 86 which enters one of the slots in the fiber disk and thus holds the same in a predetermined position with relation to the supporting member, and, consequently, with relation to the disk which is next mounted on the shaft. In order to accurately position the disk which is being mounted on the shaft with relation to the last preceding disk I have mounted on the blanking punch a pin 87, the end of which projects slightly below the punch and into one of the slots in the disk which is to be blanked, thus insur-

ing that this disk occupies the correct position with relation to the die member, and consequently, with relation to the disk last applied to the shaft. The usual armature shaft is of different diameters and, as shown at 51, is of successively increasing diameter from its upper end to that portion thereof on which the disks are mounted. The smaller upper end of the shaft will enter the central opening in the disk, which is supported in alinement therewith, without difficulty, but in order to guide the larger portion of the shaft accurately into the aperture of the disk and eliminate the possibility of the edge of the disk about the opening being distorted I have provided a pilot, or guiding member, which will engage the end of the shaft after the same has passed the blanking punch and accurately center the same. As here shown, this pilot is in the form of a plunger 88, slidably mounted in a guideway in the ram and held normally in its lowermost position by a spring 89. This plunger has on its lower surface a centering point 90 which is arranged at the exact center of the guideway and is adapted to enter the centering recess which is formed in the end of each shaft. At the beginning of the upward movement of the shaft the plunger 88 is in its lowermost position adjacent to the lower edge of the ram and as the small end of the shaft passes through the disk and through the opening in the blanking punch, the end of the same will engage the pin 90 on the lower end of the plunger and, because of the tapered shape of the pin and the recess in the end of the shaft, the latter will be accurately centered with relation to the punch and the disk, and upon the further movement of the shaft the plunger will recede to permit the latter to continue its movement. If the upper end of the shaft is of such diameter as to make desirable, the pin 90 may be lengthened so that it will extend through the punch and the disk and engage the shaft and center the same before it enters the aperture in the disk.

When the supporting member 52 has completed its upward movement and the disk is properly mounted on the shaft, a slight further downward movement is imparted to the blanking punch, this being due to the operative portion 49 of the operating cam 16, and this further movement of the punch forces the disk out of the cylindrical portion of the fixed die in which it has been supported and into the flared portion of that die, thereby releasing the disk from its support and freeing the same from all resistance to its downward movement with the shaft. This last downward movement of the blanking punch takes place while the air is applied to the lower side of the piston 54 so that the supporting device is forced downwardly against the action of the air. As the blanking punch approaches the end of this additional movement the valve 66 is reversed, thereby admitting air to the cylinder 55 above the piston 54 and causing the downward movement of the supporting member 52 and of the shaft to be continued by air pressure, thus carrying the shaft out of the path of the stock as the latter is again advanced to position the portions thereof in operative relation to the two sets of dies. The valve 66 is retained in a position to connect the supply pipe 65 with the upper end of the cylinder during the feed-ink operation and it is not until a new disk has been blanked and delivered to the cylindrical portion of the fixed blanking die that the valve is again reversed to admit air beneath the piston and force the shaft upwardly.

It is also desirable that means be provided to automatically interrupt the operation of the mechanism when a sufficient number of disks have been assembled on the shaft to form a core of the desired length. Inasmuch as there is more or less variation in the thickness of sheet metal this cannot always be determined by the number of disks applied to the shaft and I prefer to so construct the mechanism that its operation will be automatically checked when the core has been built up to a predetermined length. To accomplish this I control the operation of a clutch by the distance the supporting member 52 is moved upwardly upon each operation thereof. So long as the plunger moves beyond a predetermined point the clutch will not be operated but if the plunger fails to move beyond said predetermined point, as it will as soon as the core has been built up to the desired length, the clutch will be operated to disconnect the mechanism from the power. The clutch connection which controls the application of power to the mechanism may be of any suitable character and may be located at any desired point. In the present instance, it is interposed between the pulley 14 and the shaft 12. The pulley 14 is loosely mounted on the shaft and is provided with a recess 91 adapted to receive the end of a pin 92 slidably mounted in a collar 93 which is rigidly secured to the shaft. A spring 94 serves to move the pin 92 into the recess 91 and to retain the same therein. This pin has an outwardly extending portion 95 which projects beyond the periphery of the collar and is adapted to engage a tapered actuating member 96 when the latter is moved into an operative position. As shown in Fig. 2 this clutch operating member is pivotally mounted on the frame of the machine and has its tapered portion arranged adjacent to the projection 95 of the pin 92 and adapted to be moved into and out of the path thereof. The pivoted clutch actuating member 96 is

connected by means of a rod 97 with a second rod 98 which is slidably mounted in a suitable guideway 99 on one of the side members 2 of the main frame. A spring 100 coiled about the rod 98 between the guideway 99 and the stop 101 on the rod 98 tends to move the clutch actuating member into its operative position and a locking pin 102, which is slidably mounted in a lateral guideway 103, extends into a recess 104 in the slide rod 98 and locks the same in its lowermost position, that is, with the clutch operating member in an inoperative position. The locking pin 102 is held normally in its operative position by means of a spring 106 which is connected to one arm of a bell crank lever 107, the other arm of which is connected with the pin 102. The bell crank lever is rigidly secured to a shaft 108 and is provided with a handle 109 by means of which it may be manually operated to release the clutch operating member 96, should this be desired. The shaft 108 extends through the frame members 2 of the main frame in the rear of the cylinder 55 and near the upper end thereof, and has pivotally mounted thereon a trip finger 110, which is supported normally in a horizontal position by means of a stop 111 rigidly secured to the shaft 108, which stop holds the trip finger against downward movement about its axis. Connected with the shaft supporting member 52 is an actuating device, or trigger, the position of which is so controlled that when the supporting member fails to pass a predetermined point, above mentioned, the actuating device will, upon its next downward movement, engage the tripping finger 110 and rock the shaft 108 about its axis in a direction to withdraw the pin 102 and release the clutch actuating member 96. In the present drawings, the actuating member is shown at 112 and is pivotally connected at its upper end between the two parts of a U-shaped arm 113, which arm is so mounted on the supporting member 52 that it will move with that member when the latter is operated in a longitudinal direction but will permit the supporting member to rotate relatively thereto. As here shown, the U-shaped arm has a bifurcated portion, 114, the two parts of which fit loosely about the supporting member 52 above and below the cross arm 82. The U-shaped arm 113 is held against any tendency to rotate with the supporting member by causing the two arms thereof to straddle a vertical guide, or rib, 115 secured to the rear wall of the housing 83. Consequently, the U-shaped arm 113 will travel up and down with the supporting member 52 in a fixed path. The actuating device 112 has its upper end mounted between the two parts of the U-shaped arm and connected therewith by means of a bolt 116. By tightening down this bolt the two parts of the arm may be caused to grip the hub portion of the actuating member with a strong frictional engagement which will hold the actuating member against pivotal movement unless positive force is applied thereto. The actuating member, 112 has its lower forward corner beveled, as shown at 117, and adapted to engage a shoulder 118 on a normally fixed part of the mechanism, such as the upper end of the cylinder 55, as the supporting member approaches the lower limit of its movement, and to thus move the lower end of the actuating member rearwardly. Because of the frictional connection between the actuating member and the U-shaped arm the former is held in the position to which it has been moved and upon the next upward movement thereof a lateral projection, or toe, 119, which extends rearwardly from the lower end of the actuating member, will engage beneath the trip finger 110 and the latter will move upwardly to permit the actuating member to pass. As the actuating member approaches the upper limit of its movement a shoulder 120 on its upper portion will engage a projection 121 carried by the guide, or rib, 115 which will force the lower end of the actuating member forwardly so that upon the next downward movement of the supporting member 52 it will clear the trip finger 110. The projection 121 is so positioned with relation to the supporting member 52 that when the core has been built up to the desired length the shoulder 120 on the actuating member will not pass the fixed shoulder 121 and, consequently, the actuating member will not be moved forwardly but will remain in its rearmost position during the next downward movement of the supporting member. Consequently, the actuating member will engage the trip finger 110 and rock the shaft about its axis, thereby moving the locking finger 102 into an inoperative position and permitting the clutch actuating device 96 to be moved into a position to be engaged by the projection 95 on the clutch pin and retract the same, thus disconnecting the shaft 12 from the belt pulley. The slide rod 98, which actuates the clutch actuating member is connected with a foot lever 122 which is held normally in its uppermost position by means of a spring 123 and the downward movement of which serves to retract the clutch actuating device and permit the clutch pin to again move into its operative position.

To prevent an incomplete disk being formed and mounted on the shaft, I have provided means for releasing the clutch actuating member and causing the same to operate to interrupt the movement of the mechanism when the end of the sheet metal stock has passed the piercing die. To this end I have pivotally mounted, adjacent to the dies, a lever 124 having a nose 125 pro-

vided with an inclined edge arranged in the path of the stock as it is fed across the piercing die, and also having a straight transverse edge arranged substantially in line with the inner edge of the die. A rod 126 is held against the end of the lever 124 by a spring 127 and forces the nose 125 against the edge of the stock. The rod 126 is pivotally connected at its lower end to one arm of a bell crank lever 128 the other arm of which is connected with the locking pin 102. When the upper end of the rod 26 is moved inwardly it will lie in the path of a pin 129 depending from the cross head on the ram, but when the nose 125 of the lever is in engagement with the edge of the stock the end of the rod 126 will be held out of alinement with the pin 129. Consequently, so long as the stock is feeding continuously through the machine the end of the rod 126 will be held out of the path of the pin 129, but should there be an interruption in the feeding of the stock to the machine and the end of the stock should pass the nose on the lever, the latter will move inwardly under the influence of the spring 127, and the rod 126 will be brought into alinement with the pin 129 which will engage and operate the same upon the next downward movement of the ram, thus withdrawing the locking pin 102 and causing the clutch actuating device to be operated.

The operation of the mechanism will be readily understood from the foregoing description of the several parts thereof, and it will be apparent that the stock is fed to the machine by the feeding rollers and is first acted upon by the piercing die to form the several openings therein. Upon the second operation of the dies the perforated portion is fed to the intermediate position between the piercing die and the blanking die and it is not until the third operation of the press that a perforated portion of the stock is brought into a position to be operated upon by the blanking die. As the blanking punch descends after the completion of the feeding operation the pressure rollers of the feeding mechanism will be moved out of engagement with the stock and the guide pin 41 will enter the central opening in that perforated portion of the stock which lies between the two sets of dies, thus accurately positioning the stock with relation to the blanking die. The further movement of the punch blanks out the perforated portion of the stock and delivers the completed disk, or lamination, into the cylindrical opening in the fixed die member which supports it in proper position with relation to the shaft. The valve 66 is then operated to admit air beneath the piston 54 of the fluid operated device and the shaft is forced upwardly through the central opening in the disk and through the opening in the blanking punch until the disk which has just been formed engages the disk last placed upon the shaft, which, if this is the first operation of the shaft will be the fiber disk. During the upward movement of the shaft it has been rotated so as to properly position the slots in the disk which is being applied thereto in relation to the slots in the disk last previously applied thereto. Upon the completion of the upward movement of the shaft the operative portion 49 of the cam 16 imparts a further downward movement to the shaft supporting member 52 and to the shaft, thus forcing the disk out of the cylindrical portion of the opening in the fixed blanking die and into the flared portion thereof, thereby releasing the disk from the supporting structure and freeing the same from all resistance to its downward movement with the shaft. During this last downward movement of the blanking punch the lower port of the air cylinder is connected with the air supply so that the supporting member 52 is forced downwardly against the pressure of the air, but just prior to the completion of this movement of the blanking punch the valve 66 is reversed and air admitted to the cylinder above the piston, thereby continuing the downward movement of the supporting member and the shaft and moving the latter out of the path of the stock, which is then actuated by the feeding mechanism to advance other portions thereof into operative positions with relation to the two sets of dies. This cycle of operations is repeated until the core has been built up to the desired length, at which time the actuating member 112 will engage the trip arm 110 and release the clutch actuating device which will operate the clutch, thus disconnecting the mechanism from its source of power. The operator then removes the pin 58, swings the cylinder 55 outwardly, releases the shaft from the chuck, removes the same with the core thereon and inserts another shaft in the chuck after which he restores the cylinder to its vertical position and operates the foot lever 122 to cause the belt pulley to be again connected with the shaft, and the operation of the machine is continued as above described. It will be apparent that the machine is automatic in its connection and that the only duties of the operator are to insert and remove the shafts from the supporting member, feed the stock to the machine and set the latter in motion. The machine is of a simple construction, is positive in its operation and is of a strong durable character, and has no parts which may be easily broken or rendered inoperative.

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 for building laminated armature cores and the like, a support for a shaft, mechanism for producing disks from a strip of material, and means for causing said disks to be assembled on said shaft in proper relation one to the other.

2. In a machine for building laminated armature cores and the like, a support for a shaft, mechanism for producing disks from a strip of material, each disk having a slot, and means for causing said disks to be assembled on said shaft with the slots in the several disks arranged to form a groove in the completed core.

3. In a machine for building laminated armature cores and the like, a support for a shaft, mechanism for producing disks, each having an opening therein, and means for moving said shaft lengthwise through the openings in said disks to assemble the latter thereon.

4. In a machine for building laminated armature cores and the like, a support for a shaft, mechanism for producing disks, each having a central opening and a slot extending inwardly from the periphery thereof, and means for moving said shaft lengthwise through the central openings in said disks and for rotating said shaft to cause the slots in the successive disks to occupy different circumferential positions relatively to said shaft.

5. In a machine for building laminated armature cores and the like, means for supporting a perforated disk, means for supporting a shaft on which said disk is to be mounted, and means for imparting movement to one of said supporting means to cause said shaft to enter the perforation in said disk.

6. In a machine for building laminated armature cores and the like, means for supporting a perforated disk, a support for a shaft on which said disk is to be mounted, and means for imparting lengthwise movement to said shaft to cause it to enter the perforation in said disk.

7. In a machine for building laminated armature cores and the like, means for supporting a perforating disk, a support for a shaft on which said disk is to be mounted, and means for imparting lengthwise movement to the support for said shaft to cause said shaft to enter the perforation of said disk.

8. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, and means for moving a shaft lengthwise through the perforation of the disk which is in said position.

9. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, and means for moving a shaft lengthwise through the perforation of the disk which is in said position and for releasing said disk to permit it to be moved from said position by said shaft.

10. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position, and for supporting the same in said position, and means for moving a shaft lengthwise through the perforation of the disk which is in said position, the amount of movement imparted to said shaft being controlled by the disks previously mounted thereon.

11. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, and means for moving a shaft lengthwise through the perforation of the disk which is in said position, and for imparting rotatory movement to said shaft.

12. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, and means for moving a shaft lengthwise through the perforation of the disk which is in said position, and for imparting rotatory movement to said shaft, the amount of lengthwise and rotatory movement imparted to said shaft being controlled by the disks previously mounted on said shaft.

13. In a machine for building laminated armature cores and the like, means for imparting successive lengthwise movements to a shaft, and means for delivering a perforated disk to a position with its perforation in the path of said shaft prior to each movement of said shaft.

14. In a machine for building laminated armature cores and the like, means for imparting successive lengthwise movements to a shaft, and means for delivering a perforated disk to a position with its perforation in the path of said shaft prior to each movement of said shaft, each successive lengthwise movement of said shaft being of less extent than the preceding lengthwise movement thereof.

15. In a machine for building laminated armature cores and the like, means for imparting successive lengthwise movements to

a shaft and for imparting rotatory movement to said shaft during its lengthwise movement, and means for delivering a perforated disk to a position with its perforation in the path of said shaft prior to each movement of said shaft.

16. In a machine for building laminated armature cores and the like, means for imparting successive lengthwise movements to a shaft and for imparting rotatory movement to said shaft during its lengthwise movement, and means for delivering a perforated disk to a position with its perforation in the path of said shaft prior to each movement of said shaft, each successive lengthwise and rotatory movement of said shaft being less than the preceding lengthwise and rotatory movements thereof.

17. In a machine for building laminated armature cores and the like, means for imparting successive lengthwise movements to a shaft, means for delivering a perforated disk to a position with its perforation in the path of said shaft prior to each movement of said shaft, and means to automatically interrupt the operation of said machine when a core of predetermined length has been built up on said shaft.

18. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, and means for moving a shaft lengthwise through the perforation of the disk which is in said position and for releasing said disk to permit it to be moved from said position by said shaft, and means controlled by the length of the core built up on said shaft to automatically interrupt the operation of said shaft and of said delivery means.

19. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for retaining the same in that position, a support for a shaft, and yieldable means for moving said support for said shaft to cause the latter to enter the perforation in the disk which is supported in said position.

20. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, a support for a shaft, and fluid operated means for actuating said support to move said shaft through the perforation in the disk which is supported in said position.

21. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, a support for a shaft, and fluid operated means for actuating said support to move said shaft through the perforation in the disk which is supported in said position, a valve to control said fluid operated device, and automatic means to reverse said valve to cause said shaft to be moved downwardly.

22. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, a support for a shaft, means for actuating said support to move said shaft through the disk which is supported in said position and to continue said movement until said disk engages the disk last previously mounted on said shaft, which engagement will check the further movement of said shaft.

23. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, a support for a shaft, means for actuating said support to move said shaft through the disk which is supported in said position and to continue said movement until said disk engages the disk last previously mounted on said shaft, a spiral guide arranged alongside of the path of movement of said support, and a part connected with said support and engaging said spiral guide to cause said support to rotate when longitudinal movement is imparted thereto.

24. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, a reciprocatory member to support a shaft in line with the opening in a disk which is supported in said position, arms rigidly secured to said reciprocatory member, and parts arranged on the opposite sides of said reciprocatory member and having spiral grooves to receive the ends of said arms.

25. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, a member to support a shaft in line with the perforation of that disk which is in said position, a part carried by said support to engage a disk mounted on said shaft, and means for actuating said support to move said shaft through the perforation in the first mentioned disk.

26. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, a member to support a shaft in line with the perforation of that disk which is in said

position, a part carried by said support to engage a disk mounted on said shaft, and means for actuating said support to move said shaft through the perforation in the first mentioned disk, means for positioning each disk with relation to the supporting means, and other means for imparting rotatory movement to said shaft as it moves through said disk.

27. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, a support for a shaft, means for actuating said support to move said shaft lengthwise through the perforations in that disk which is in said position, a power operated device, a clutch for connecting said power operated device with said mechanism, a device to actuate said clutch to disconnect said power operated device from said mechanism, and means controlled by the movement of said support for said shaft to operate the actuating member for said clutch.

28. In a machine of the character described, piercing and blanking dies, means to feed stock to said dies, means associated with one of said dies to support a perforated disk which has been severed from said stock, and means to move a shaft longitudinally through the perforation of said disk to cause the disk to be mounted on the shaft.

29. In a machine of the character described, a die, a punch cooperating with said die to sever a perforated disk from stock which is fed to said die, means for supporting the severed disk in a position adjacent to said die, and means to move a shaft longitudinally through the perforation in said disk to cause the disk to be mounted on the shaft.

30. In a machine of the character described, a die, a punch cooperating with said die to sever a perforated disk from stock which is fed to said die, means for actuating said punch and for causing the same to remain in a position adjacent to said die for an interval of time following the severing of the disk, means to support the severed disk adjacent to said punch, and means to move a shaft longitudinally through the perforation in said disk to cause the disk to be mounted on the shaft.

31. In a machine of the character described, a die, a punch cooperating with said die to sever a perforated disk from stock which is fed to said die, means for actuating said punch and for causing the same to remain in a position adjacent to said die for an interval of time following the severing of the disk, means to support the severed disk adjacent to said punch, means to move a shaft longitudinally through the perforation in said disk to cause the disk to be mounted on the shaft, and means for centering said shaft with relation to said disk.

32. In a mechanism of the character described, a piercing die, a blanking die, movable punches for said dies, said dies being spaced apart to receive a perforated portion of the stock between them, means for feeding stock to said dies, a part connected with and movable with the movable punch for the blanking die to enter the perforation in that portion of the stock between the two sets of dies to position the stock with relation to said blanking die, means to support a perforated disk which has been severed from said stock by said blanking die, and means to move a shaft longitudinally through the perforation of said disk to cause the disk to be mounted on the shaft.

33. In a mechanism of the character described, a piercing die, a blanking die, movable punches for said dies, said dies being spaced apart to receive a perforated portion of the stock between them, a single operating member connected with the movable punches for both dies, means for feeding the stock to said dies, a pin connected with said operating member and arranged to enter the perforation in that portion of the stock which lies between the two dies to position the stock with relation to said blanking die, means to support a perforated disk which has been severed from the stock by said blanking die, and means to move a shaft longitudinally through the perforation of said disk to cause the disk to be mounted on the shaft.

34. In a mechanism of the character described, piercing and blanking dies, movable punches for said dies, means to feed stock to said dies, operating means for said movable punches, means actuated by said operating means to position the stock with relation to said dies, means to automatically release the stock from the feeding mechanism to permit it to be positioned by said means, means to support a perforated disk which has been severed from the stock thereby, and means to move a shaft longitudinally through the perforation in said disk to cause the disk to be mounted on the shaft.

35. In a mechanism of the character described, a piercing die, a blanking die, movable punches for said dies, said dies being spaced apart to receive a perforated portion of the stock between them, an operating device for said movable punches, feeding rollers to feed stock to said dies, a part carried by said operating device to enter a perforation in that portion of the stock lying between the two dies, means actuated by said operating device to move one of said feeding rollers out of engagement with said stock to permit the latter to be positioned by the part carried by said operating device, means to

support a perforated disk which has been severed from the stock thereby, and means to move a shaft longitudinally through the perforation of said disk to cause the disk to be mounted on the shaft.

36. In a mechanism of the character described, a piercing die, a blanking die, movable punches for said dies, said dies being spaced apart to receive a perforated portion of the stock between them, a ram carrying said movable punches and having a shoulder, feeding rollers to feed stock to said dies, one of said rollers being movably mounted relatively to the other, a spring to press said movable roller into engagement with the stock, an arm connected with said movable roller and having a part lying in the path of the shoulder on said ram whereby the downward movement of said ram will actuate said arm to move said movable roller out of engagement with the stock, a pin carried by said ram and adapted to enter a perforation in that portion of the stock lying between the two dies while said movable roller is out of engagement with the stock, means to support a perforated disk which has been severed from the stock by said blanking die, and means to move a shaft longitudinally through the perforation in said disk to cause the disk to be mounted on the shaft.

37. In a mechanism of the character described, a fixed die having an opening therethrough, a movable punch cooperating with said fixed die and having a longitudinal opening therethrough, a ram carrying said punch and having an opening in line with the opening in said punch, means to support a disk which has been severed from the stock, means for moving a shaft longitudinally through the opening in said disk to cause the disk to be mounted on the shaft, and a device mounted in the opening in said ram to engage the end of said shaft and center the same with relation to said disk.

38. In a mechanism of the character described, a fixed die having an opening therethrough, a movable punch cooperating with said fixed die and having a longitudinal opening therethrough, a ram carrying said punch and having an opening in line with the opening in said punch, means to support a disk which has been severed from the stock, means for moving a shaft longitudinally through the opening in said disk to cause the disk to be mounted on the shaft, and a plunger yieldably mounted in the opening in said ram and having a centering point arranged to enter a recess in the end of said shaft and center the shaft with relation to the opening in said disk.

39. In a mechanism of the character described, a fixed die having an opening therethrough comprising a cylindrical portion and a flared portion, a movable punch cooperating with said fixed die to sever a perforated disk from the stock and having an opening in line with the perforation in said disk, means for actuating said movable punch to cause it to sever said disk and to move the same into the cylindrical portion of the opening in the fixed die, means to move a shaft through the perforation in said disk while the latter is supported in the cylindrical portion of said opening to mount the disk on the shaft, and means to cause said disk to be moved into the flared portion of said opening after it has been mounted on said shaft.

40. In a mechanism of the character described, a fixed die having an opening therethrough comprising a cylindrical portion, a movable punch cooperating with said fixed die to sever a disk from the stock and having an opening in line with the perforation in said disk, means for actuating said movable punch to cause it to sever said disk and to move the same into the cylindrical portion of the opening in said fixed die, means to move a shaft through the perforation in said disk while the latter is supported in the cylindrical portion of said opening in said fixed die to mount the disk on the shaft, and means to impart further movement to said punch to cause said disk to be moved out of the cylindrical portion of said opening.

41. In a mechanism of the character described, a fixed die having an opening therethrough comprising a cylindrical portion, a movable punch cooperating with said fixed die to sever a perforated disk from the stock and having an opening in line with the perforation in said disk, a cam for actuating said punch to cause it to sever said disk and to move the same into the cylindrical portion of the opening in said fixed die, and means to move a shaft through the perforation in said disk while the latter is supported in said fixed die to mount the disk on the shaft, said cam being shaped to impart further movement to said punch to cause said disk to be moved out of the cylindrical portion of said opening after it has been mounted on said shaft.

42. In a mechanism of the character described, a fixed die having an opening therethrough comprising a cylindrical portion, a movable punch cooperating with said fixed die to sever a perforated disk from the stock and having an opening in line with the perforation in said disk, a cam for actuating said punch to cause it to sever said disk and to move the same in the cylindrical portion of the opening in said fixed die, means to move a shaft through the perforation in said disk while the latter is supported in said fixed die to mount the disk on the shaft, and

means to actuate said shaft and said disk to move the latter out of the cylindrical portion of said opening.

43. In a mechanism of the character described, a fixed die having an opening therethrough comprising a cylindrical portion, a movable punch cooperating with said fixed die to sever a perforated disk from the stock and having an opening in line with the perforation in said disk, a cam for actuating said punch to cause it to sever said disk and to move the same in the cylindrical portion of the opening in said fixed die, and means to move a shaft through the perforation in said disk while the latter is supported in said fixed die to mount the disk on the shaft, said cam being shaped to impart further movement to said punch after said shaft has been inserted in said disk to move the shaft in the opposite direction and force said disk out of the cylindrical portion of the opening in said fixed die.

44. In a mechanism of the character described, a fixed die having an opening therethrough comprising a cylindrical portion, a movable punch cooperating with said fixed die to sever a perforated disk from the stock and having an opening in line with the perforation in said disk, a cam for actuating said punch to cause it to sever said disk and to move the same in the cylindrical portion of the opening in said fixed die, means to move a shaft through the perforation in said disk while the latter is supported in said fixed die to mount the disk on the shaft, said cam being shaped to impart further movement to said punch after said shaft has been inserted in said disk to move the shaft in the opposite direction and force said disk out of the cylindrical portion of the opening in said fixed die, and other means to cause the movement of said shaft to be continued in the direction in which it had been started by said punch.

45. In a mechanism of the character described, a fixed die having an opening therethrough comprising a cylindrical portion, a movable punch cooperating with said fixed die to sever a perforated disk from the stock and having an opening in line with the perforation in said disk, means for actuating said punch to cause it to sever said disk and to move the same into the cylindrical portion of the opening in the fixed die, a support for a shaft, fluid operated means for actuating said support to move the shaft through the perforation in said disk while the latter is supported in the cylindrical opening in said fixed die, a reversing valve to control the movement of said fluid operated means, means to impart initial movement to said shaft in a reverse direction to force the disk out of the opening in said fixed die, and means for actuating said reversing valve after initial movement has been imparted to said shaft.

46. In a mechanism of the character described, a fixed die having an opening therethrough comprising a cylindrical portion, a movable punch cooperating with said fixed die to sever a perforated disk from the stock and position the same in the opening in said fixed die, said punch having an opening in line with the perforation in said disk, a driving shaft, a cam mounted on said driving shaft for actuating said punch, a support for a shaft capable of movement to move said shaft through the perforation in a disk supported in said opening in said fixed die, a fluid operating device to move said shaft support in both directions, a reversing valve to control the operation of said fluid operated device, and a cam controlled connection between said driving shaft and said reversing valve, said punch operating cam being shaped to first impart cutting movement to said punch and to then impart a further movement to said punch after said shaft has been inserted in said disk, and the valve controlling cams being so arranged with relation to said punch operating cam that said reversing valve will be actuated after said last mentioned movement of said punch has begun.

47. In a mechanism of the character described, piercing and blanking dies, movable punches for said dies, a device to feed stock to said dies, a driving shaft, operative connections between said driving shaft and said punches and said feeding device, a shaft support having movement to insert a shaft in a disk formed by said dies, a device controlled by said driving shaft to actuate said shaft support, a power transmitting device, a clutch connection between said power transmitting device and said driving shaft, and means controlled by the movement of said shaft support for actuating said clutch connection to disconnect said power transmitting device from said driving shaft.

48. In a mechanism of the character described, piercing and blanking dies, movable punches for said dies, a device to feed stock to said dies, a driving shaft, operative connections between said driving shaft and said punches and said feeding device, a shaft support having movement to insert a shaft in a disk formed by said dies, a device controlled by said driving shaft to actuate said shaft support, a power transmitting device, a clutch connection between said power transmitting device and said driving shaft, an actuating device for said clutch to disconnect said power transmitting device from said driving shaft, means for holding said clutch actuating device normally in an inoperative position, and means controlled by the movement of said shaft support for mov-

ing said clutch actuating device into an operative position.

49. In a mechanism of the character described, piercing and blanking dies, movable punches for said dies, a device to feed stock to said dies, a driving shaft, operative connections between said driving shaft and said punches and said feeding device, a shaft support having movement to insert a shaft in a disk formed by said dies, each successive movement of said shaft support being less than the preceding movement thereof, means controlled by said driving shaft for actuating said shaft support, a power transmitting device, a clutch connection between said power transmitting device and said driving shaft, and means controlled by the amount of movement imparted to said shaft support to actuate said clutch and disconnect said power transmitting device from said driving shaft.

50. In a mechanism of the character described, piercing and blanking dies, movable punches for said dies, a device to feed stock to said dies, a driving shaft, operative connections between said driving shaft and said punches and said feeding device, a shaft support having movement to insert a shaft in a disk formed by said dies, each successive movement of said shaft support being less than the preceding movement thereof, means controlled by said driving shaft for actuating said shaft support, a power transmitting device, a clutch connection between said power transmitting device and said driving shaft, an actuating device for said clutch, a spring tending to move said actuating device into its operative position, a locking member to hold said actuating device in its inoperative position, a trip finger to actuate said locking member to release said clutch actuating device, a trigger connected with said shaft support, and means for causing said trigger to engage said trip finger when the movement imparted to said shaft support does not exceed a predetermined minimum movement.

51. In a mechanism of the character described, devices for producing perforated disks and for supporting each disk in a predetermined position after it has been produced, a support for a shaft having movement to cause the shaft to enter the perforation in a disk supported in said position, a driving shaft for said mechanism, a power transmitting device, a clutch connection between said power transmitting device and said driving shaft, a clutch actuating device, means for controlling the movement of said clutch actuating device comprising a trip finger, means for actuating said shaft support, said actuating means being such that said shaft support will be moved a less distance upon each successive operation thereof, an actuating device for said trip finger connected with said shaft support, means to move said actuating device into a position to engage said trip finger, and other means to move said actuating device into a position in which it will not engage said trip finger, said last mentioned means being so arranged that it will impart movement to said actuating device only when said shaft support moves beyond a predetermined position.

52. In a mechanism of the character described, devices for producing perforated disks and for supporting each disk in a predetermined position after it has been produced, a support for a shaft having movement to cause the shaft to enter the perforation in a disk supported in said position, a driving shaft for said mechanism, a power transmitting device, a clutch connection between said power transmitting device and said driving shaft, a clutch actuating device, means for controlling the movement of said clutch actuating device comprising a shaft arranged adjacent to said shaft support, a trip finger mounted on said shaft in a normally horizontal position, held against downward movement relatively to said shaft and capable of free upward movement about the axis of said shaft, a device connected with said shaft support and having a part movable into and out of a position to engage said trip finger, means acting upon said device as said shaft support approaches the limit of its downward movement to move the same into a position beneath said trip finger, another part arranged to engage said device upon the upward movement of said shaft support and move the same out of alinement with said trip finger, said last mentioned part being so arranged that it will actuate said device only when said shaft support moves beyond a predetermined point.

53. In a mechanism of the character described, piercing and blanking dies, means to feed stock to said dies, means associated with one of said dies to support a perforated disk which has been severed from said stock, means to move a shaft longitudinally through the perforation in said disk to cause the disk to be mounted on said shaft, a driving shaft for said mechanism, a power transmitting device, a clutch connection between said power transmitting device and said driving shaft, a clutch actuating device, and means controlled by the stock as it is fed to said dies for operating said clutch actuating device.

54. In a mechanism of the character described, piercing and blanking dies, means to feed stock to said dies, means associated with one of said dies to support a perforated disk which has been severed from said

stock, means to move a shaft longitudinally through the perforation in said disk to cause the disk to be mounted on said shaft, a driving shaft for said mechanism, a power transmitting device, a clutch connection between said power transmitting device and said driving shaft, a clutch actuating device, a spring tending to move said clutch actuating device into its operative position, a locking device to hold said clutch actuating device in an inoperative position, and means controlled by the stock as it is fed to said dies to actuate said locking member.

55. In a mechanism of the character described, piercing and blanking dies, means to feed stock to said dies, means associated with one of said dies to support a perforated disk which has been severed from said stock, means to move a shaft longitudinally through the perforation in said disk to cause the disk to be mounted on said shaft, a driving shaft for said mechanism, a power transmitting device, a clutch connection between said power transmitting device and said driving shaft, a clutch actuating device, a spring tending to move said clutch actuating device into its operative position, a locking device to hold said clutch actuating device in an inoperative position, and means controlled by the stock as it is fed to said dies to actuate said locking member, and other means controlled by the means for moving said shaft for actuating said locking member.

56. In a mechanism of the character described, a blanking die and a piercing die, punches for said dies, a ram to operate said punches, means to feed stock to said dies, means associated with said blanking die to support a perforated disk which has been severed from said stock, means to move a shaft longitudinally through the perforation in said disk to cause the disk to be mounted on the shaft, a driving shaft for said ram, a power transmitting device, a clutch to connect said power transmitting device to said driving shaft, a clutch actuating device, a locking member to hold said clutch actuating device normally in an inoperative position, a projection depending from said ram, a rod operatively connected with said locking member and having its end movable into and out of the path of the projection from said ram, a spring tending to move said rod into the path of said projection, a lever pivotally supported adjacent to said dies and having a part engaging said rod and another part adapted to bear against the edge of the stock as the latter is fed to said die to hold said rod out of the path of said projection, said last mentioned part of said lever being so arranged that when the end of the stock passes a predetermined point said lever will move inwardly under the action of said spring and permit said rod to be moved into the path of the projection on said ram, thereby causing the locking member to be withdrawn and permitting said clutch operating device to be moved into an operative position.

57. In a mechanism of the character described, means for producing perforated disks and successively supporting the same in a predetermined position, a reciprocatory member having means to support a shaft, an annular support carried by said reciprocatory member and arranged to engage a disk mounted on said shaft, and means for actuating said reciprocatory member to move said shaft through the perforation in a disk supported in said predetermined position until the last mentioned disk is engaged by a disk previously mounted on said shaft.

58. In a mechanism of the character described, a fixed die having an opening therein to receive and support a disk severed by said die, a movable punch cooperating with said fixed die to sever a disk from the stock and move the same into the opening in said fixed die, a fluid operated device comprising a cylinder, a piston mounted in said cylinder, and a piston rod having means to support a shaft, said fluid operated device being pivotally mounted to permit said piston rod to be moved into and out of alinement with the opening in said fixed die, and means for controlling the operation of said piston.

59. In a mechanism of the character described, a piercing die and punch to form an aperture in a strip of metal stock, a blanking die and punch to sever the apertured portion of said stock from the strip, means for feeding stock to said dies, means to support the severed portion of said stock, means to move a shaft through the aperture in the severed portion of said stock to mount the latter on the shaft, said dies being spaced apart to receive a perforated portion of said stock between them, and a part connected with and movable with the punch for said blanking die to enter the perforation in that portion of the stock between the two dies to so position the stock that the aperture in the severed portion thereof will be in line with said shaft.

60. In a mechanism of the character described, a piercing die and punch to form an aperture in a strip of metal stock, a blanking die and punch to sever the apertured portion of said stock from the strip, means for feeding stock to said dies, means to support the severed portion of said stock, means to move a shaft through the aperture in the severed portion of said stock to mount the latter on the shaft, operating means for said punches, means actuated by said operating means to so position the stock that the aperture in the severed portion thereof will be in line with said shaft, and means to automati-

cally release the stock from the feeding mechanism to permit it to be positioned by said means.

61. In a mechanism of the character described, a piercing die and punch to form an aperture in a strip of metal stock, a blanking die and punch to sever the apertured portion of said stock from the strip, means for feeding the stock to said dies, rollers to support the severed portion of said stock, means to move a shaft through the aperture in the severed portion of said stock to mount the latter on said shaft, said dies being spaced apart to receive a perforated portion of the stock between them, an operating device for said punches, a part carried by said operating device to enter the perforation in that portion of the stock lying between the two dies, and means actuated by said operating device to move one of said feeding rollers out of engagement with said stock to permit the latter to be positioned by the part carried by said operating device.

62. In a mechanism of the character described, piercing and blanking dies, punches for said dies, a device to feed stock to said dies, a driving shaft, operative connections between said driving shaft and said punches and said feeding device, a shaft support having movement to insert a shaft in a disk severed by said dies, means to actuate said shaft support, a power transmitting device, a clutch connection between said power transmitting device and said driving shaft, and means controlled by the movement of said shaft support for actuating said clutch connection to disconnect said power transmitting device from said driving shaft.

63. In a mechanism of the character described, piercing and blanking dies, punches for said dies, a device to feed stock to said dies, a driving shaft, operative connections between said driving shaft and said punches and said feeding device, a shaft support having movement to insert a shaft in a disk severed by said dies, each successive movement of said shaft support being less than the preceding movement thereof, means for actuating said shaft support, a power transmitting device, a clutch connection between said power transmitting device and said driving shaft, and means controlled by the amount of movement imparted to said shaft support to actuate said clutch and disconnect said power transmitting device from said driving shaft.

64. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, means for moving a shaft lengthwise through the perforation of the disk which is in said position, each successive movement of said shaft being of less length than the preceding movement, a device to interrupt the movement of said shaft, said device comprising a trip finger, a part movable with said shaft and arranged normally to actuate said trip finger, and means controlled by the amount of movement imparted to said shaft to move said part into an inoperative position with relation to said trip finger.

65. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated disks successively to a predetermined position and for supporting the same in said position, means for moving a shaft lengthwise through the perforation of the disk which is in said position, each successive movement of said shaft being of less length than the preceding movement, a normally inoperative device to interrupt the movement of said shaft, and means controlled by the amount of movement imparted to said shaft to render said device operative.

66. In a machine for building laminated armature cores and the like, a support for a shaft, mechanism for producing disks from a strip of material, each disk having a slot, and means for causing said disks to be assembled on said shaft and for causing the slot in each disk to be arranged slightly out of line with the slot in the preceding disks, whereby the slots in the several disks will form a spiral groove in the completed core.

67. In a machine for building laminated armature cores and the like, means for delivering a plurality of perforated, slotted, disks successively to a predetermined position and for supporting the same in said position, means for moving a shaft lengthwise through the perforations in the disk which is in said position, and means for causing the slots in the successive disks to occupy different circumferential positions with relation to said shaft.

In testimony whereof, I affix my signature hereto.

FREDERICK C. NICKOL.