E. R. DOUGLAS.

MACHINE FOR THREADING SHEET METAL CAPS.

APPLICATION FILED MAY 4, 1911.

1,010,740.

Patented Dec. 5, 1911.

11 SHEETS—SHEET 1.

Fig. 1.

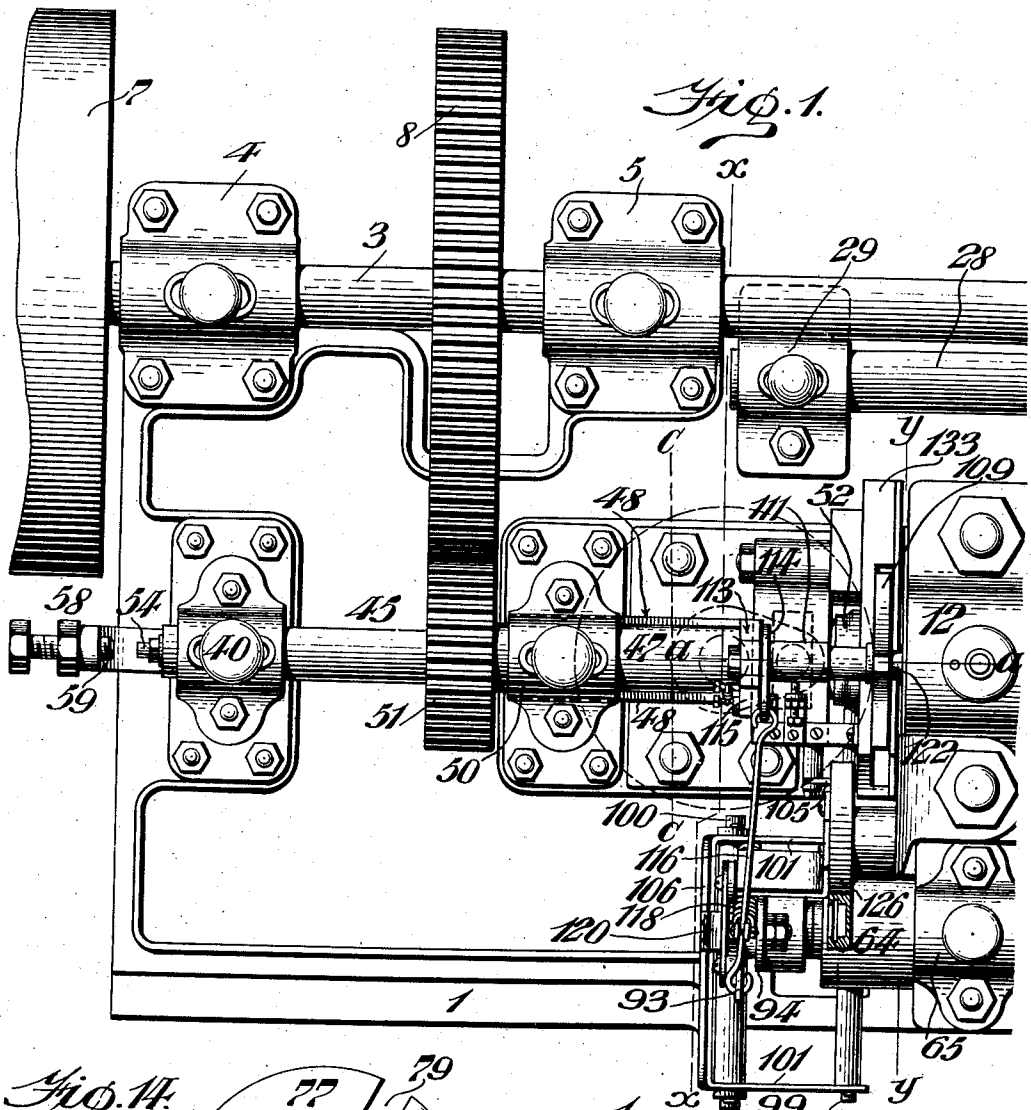

Fig. 14.

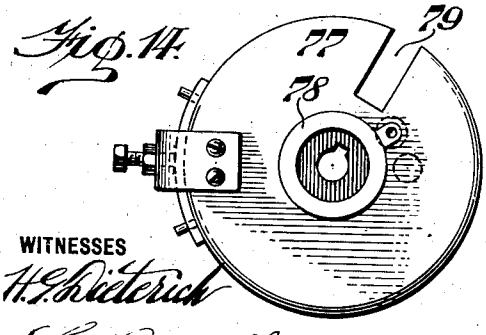

Fig. 16.

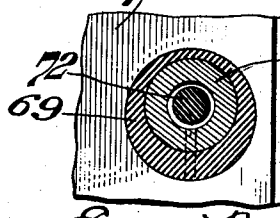

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Fig. 2.

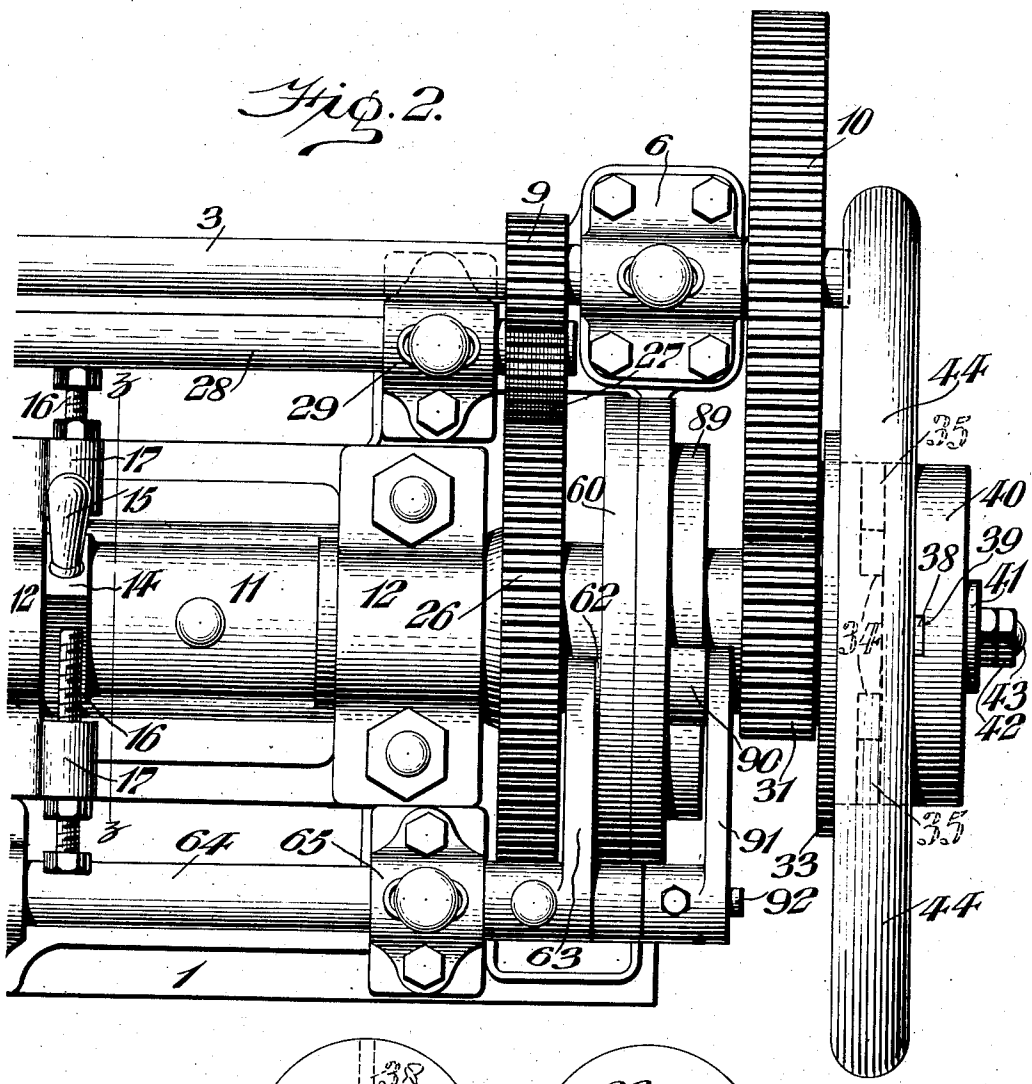

Fig. 17.

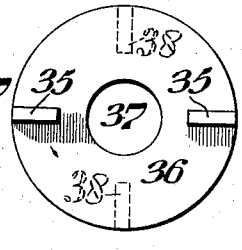

Fig. 18.

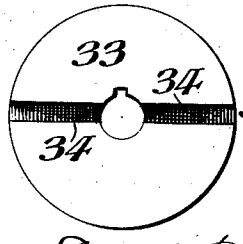

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Fig. 3.

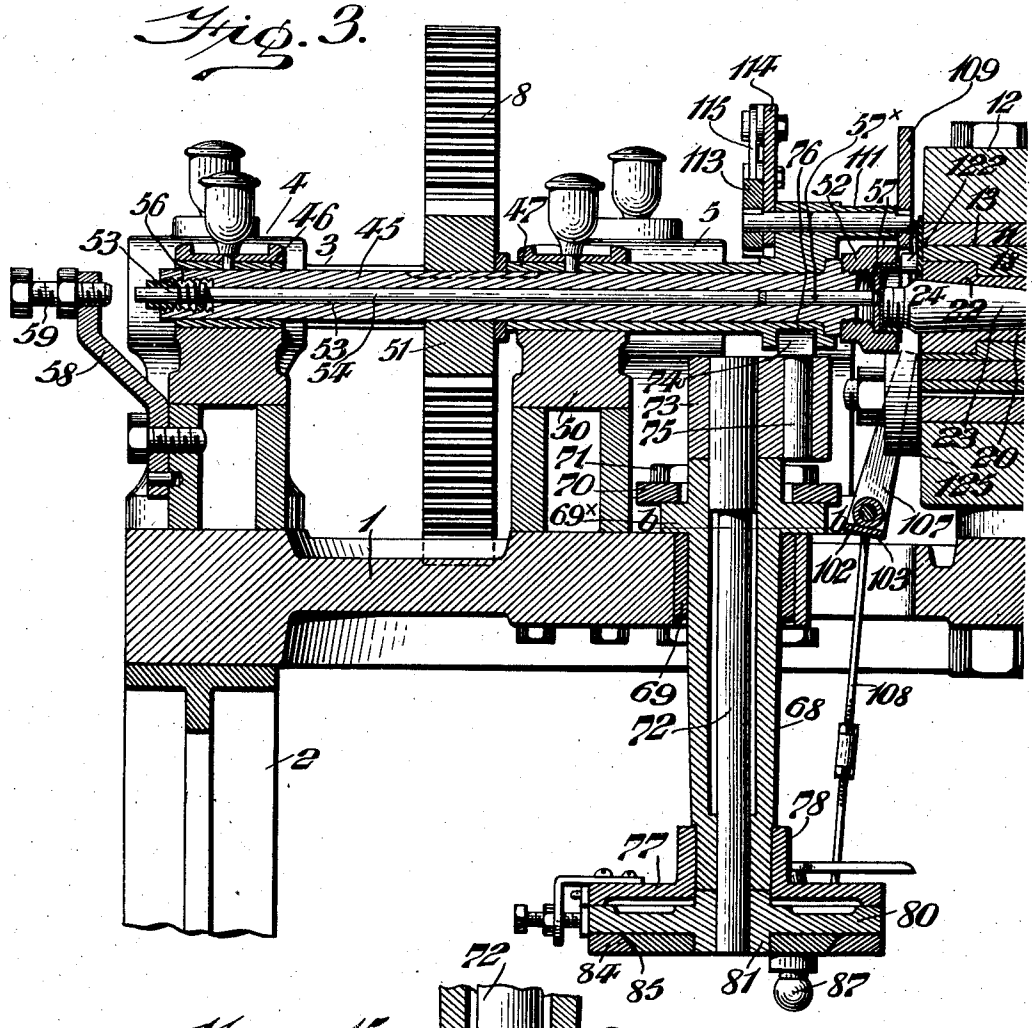
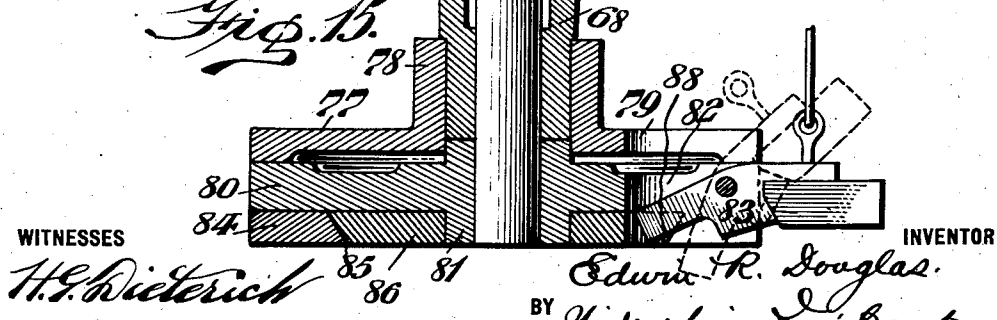


Fig. 15.



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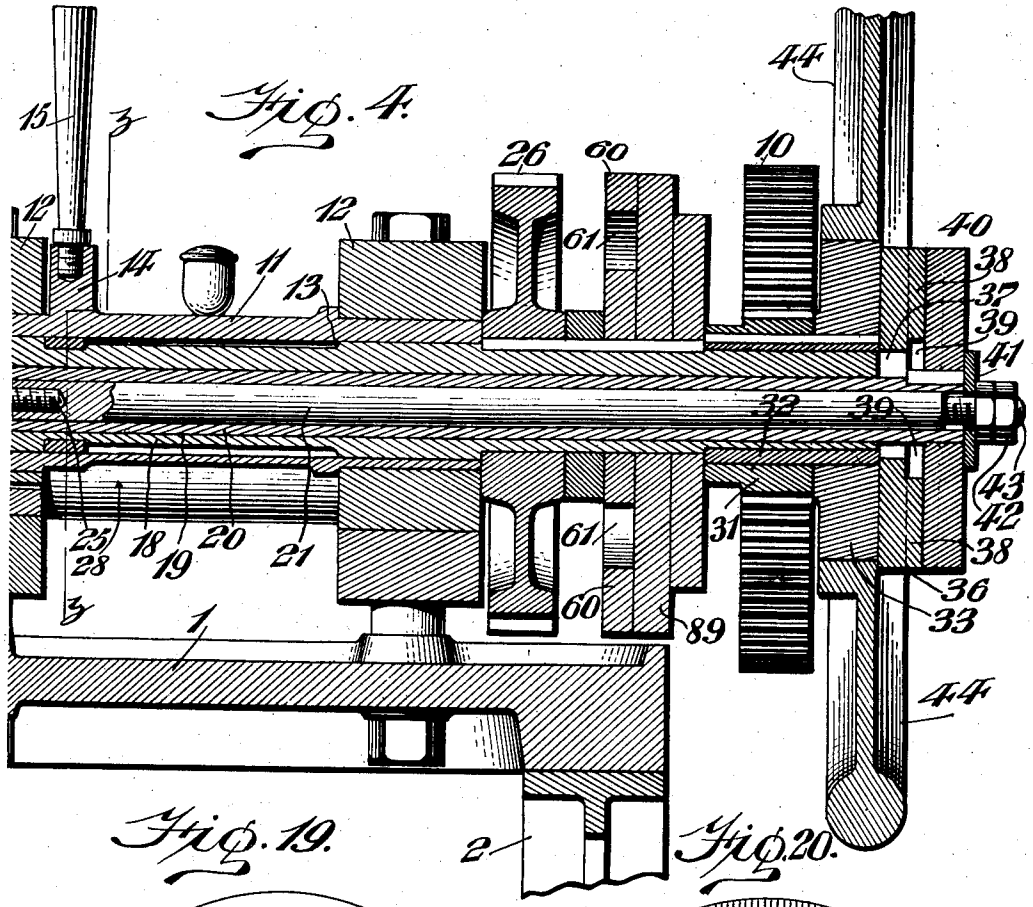
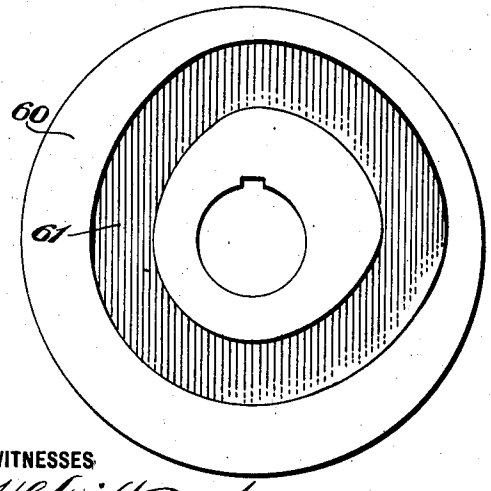
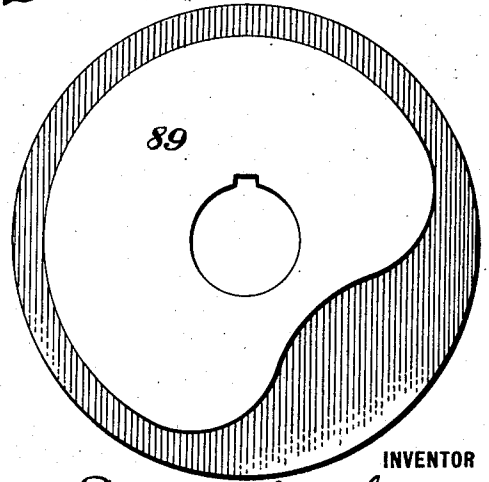


Fig. 4.

Fig. 19.

Fig. 20.





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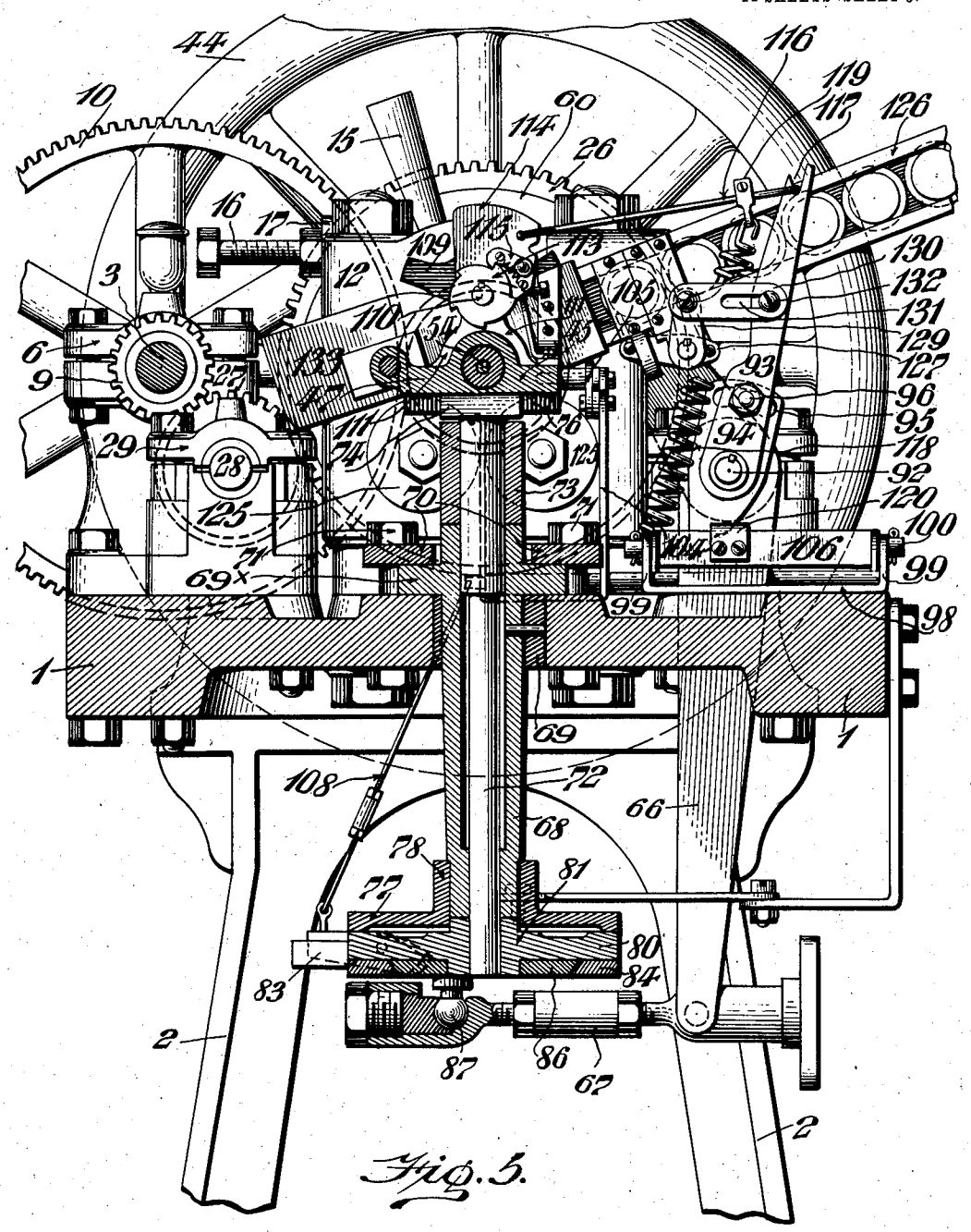

Fig. 5.

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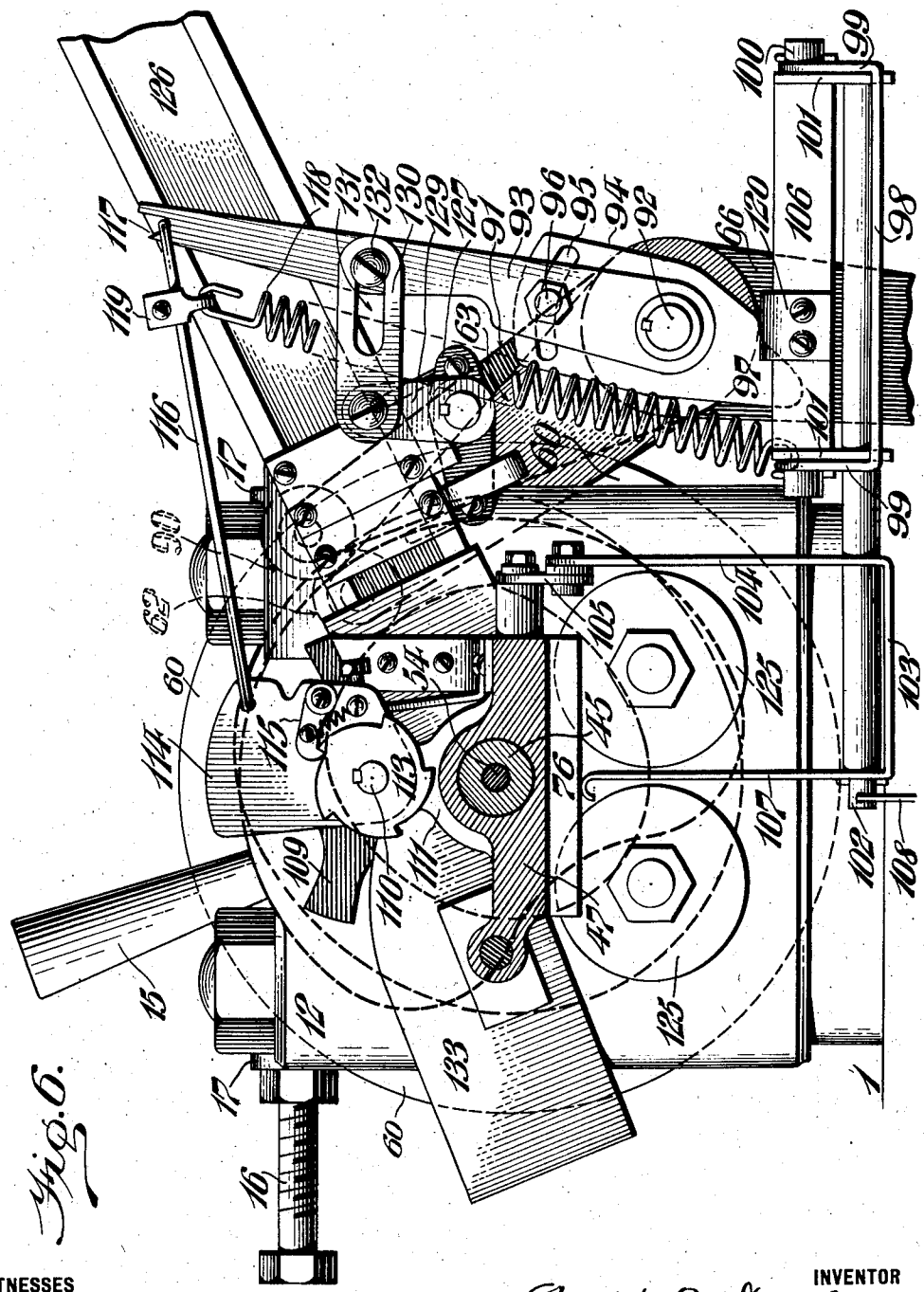

Fig. 6.

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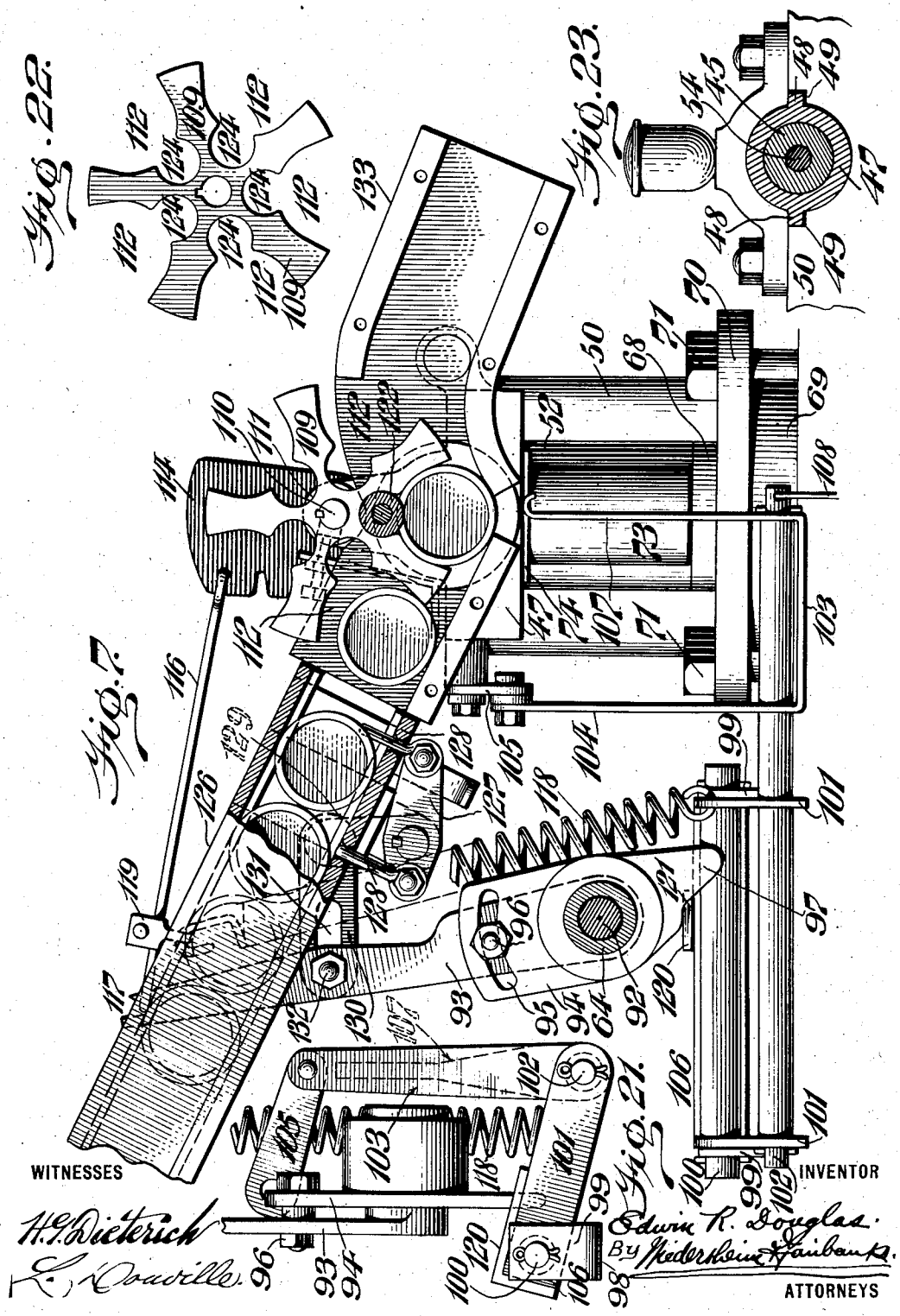

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11 SHEETS—SHEET 8.

Fig. 8.

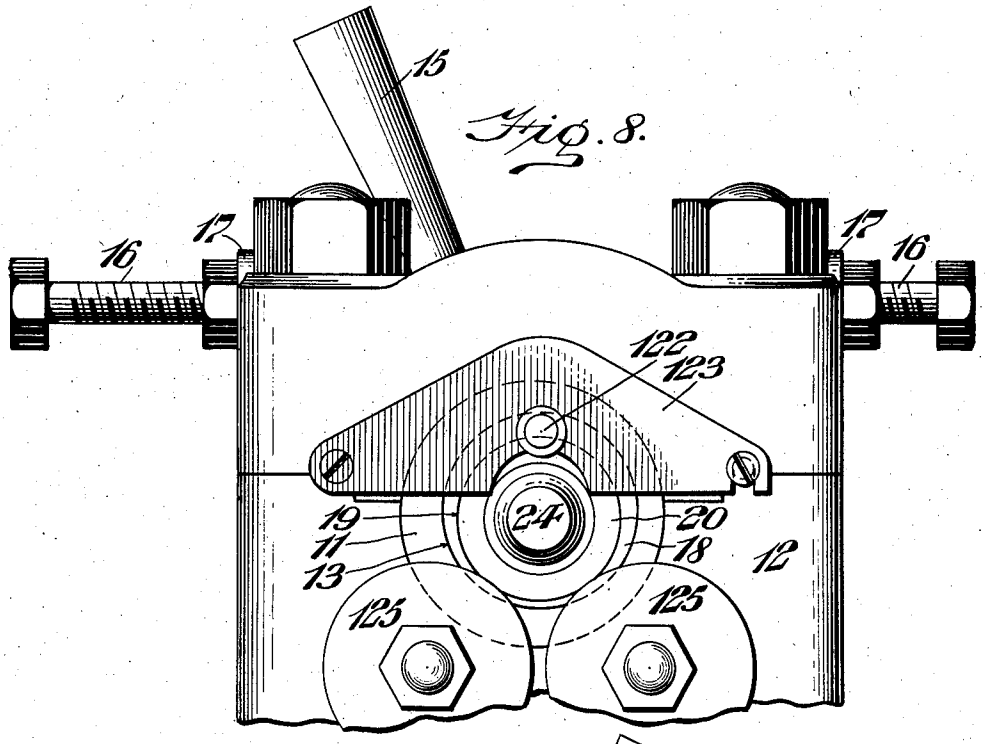
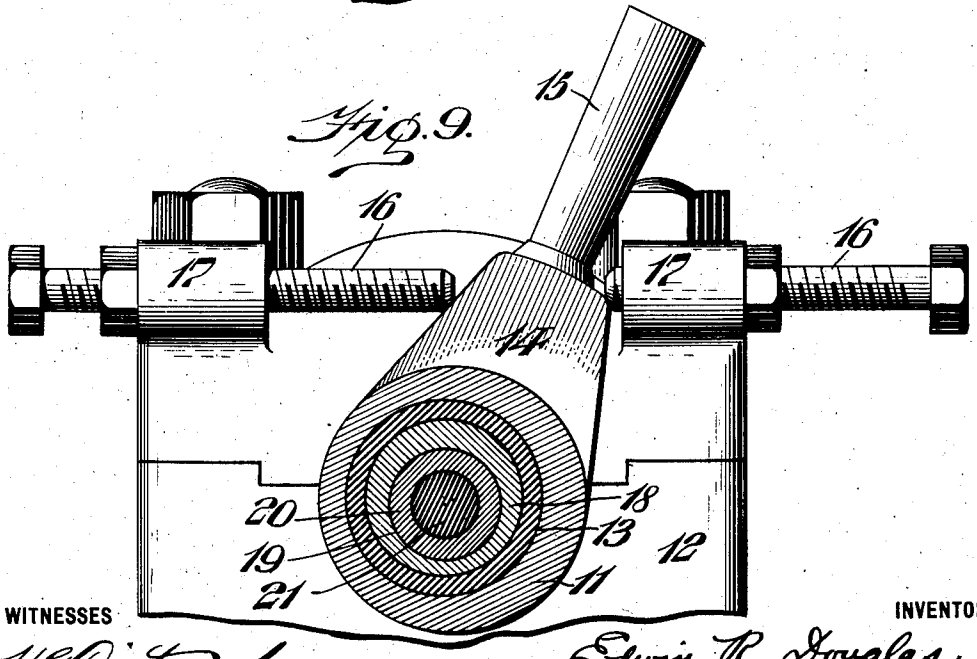


Fig. 9.



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11 SHEETS—SHEET 9.

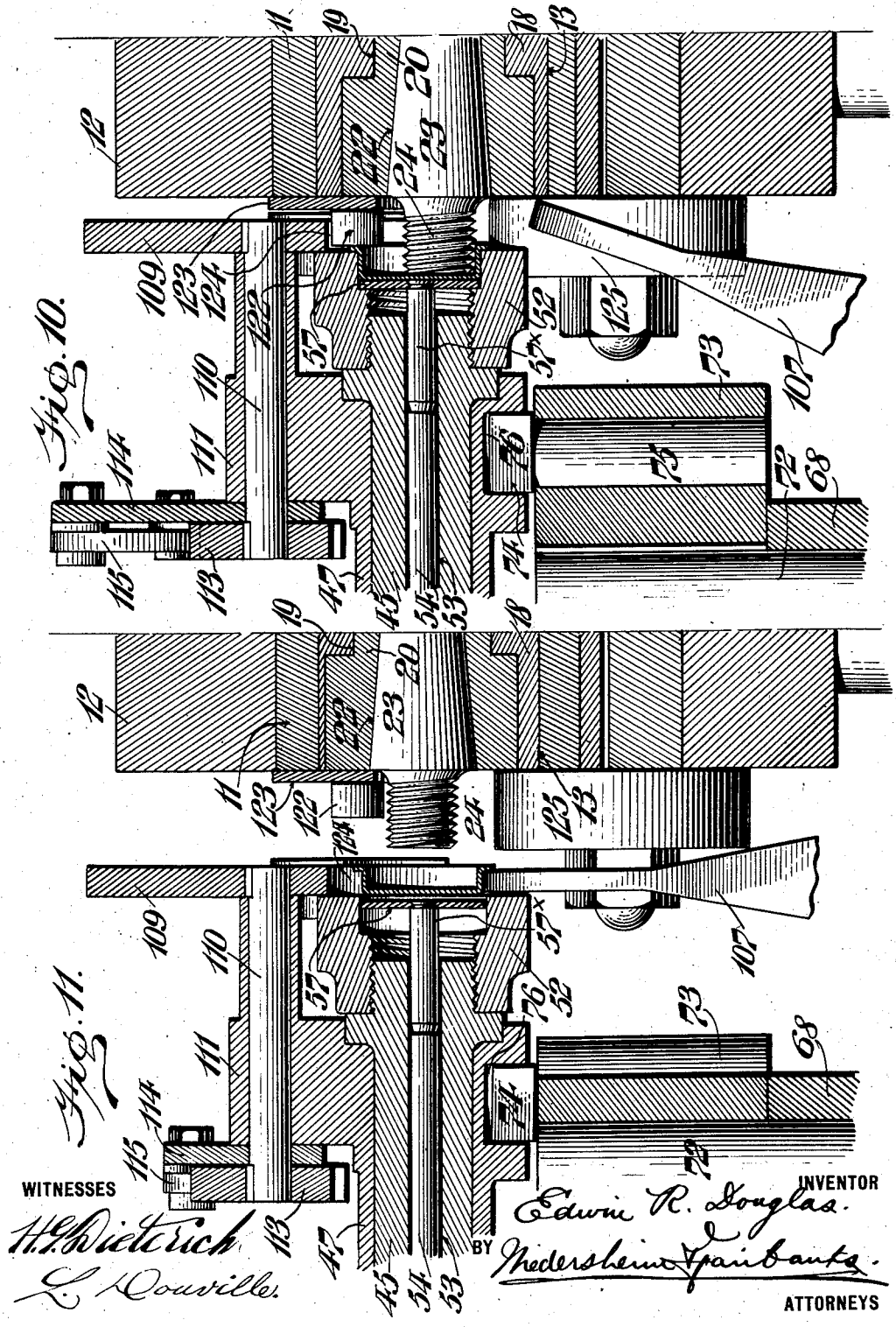

Fig. 10.

Fig. 11.

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11 SHEETS—SHEET 10.

Fig. 12.

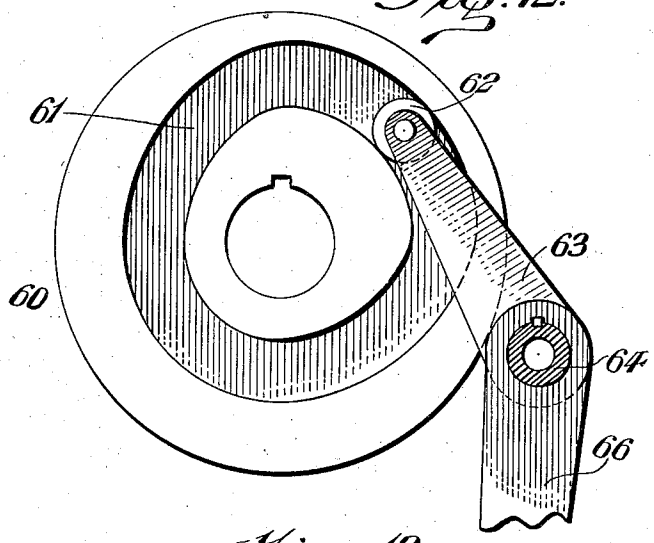
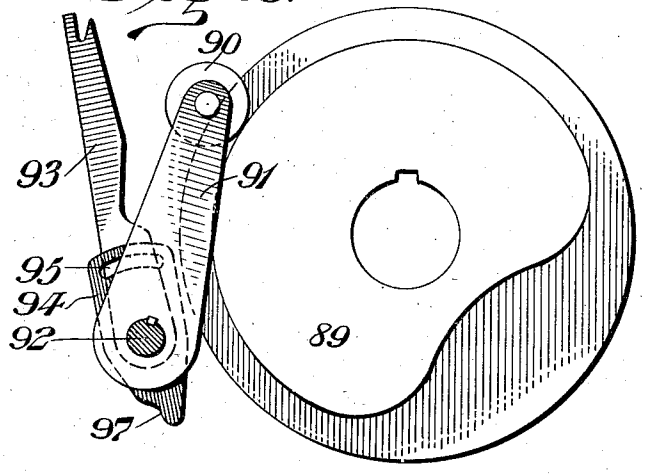


Fig. 13.



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11 SHEETS—SHEET 11.

Fig. 26.

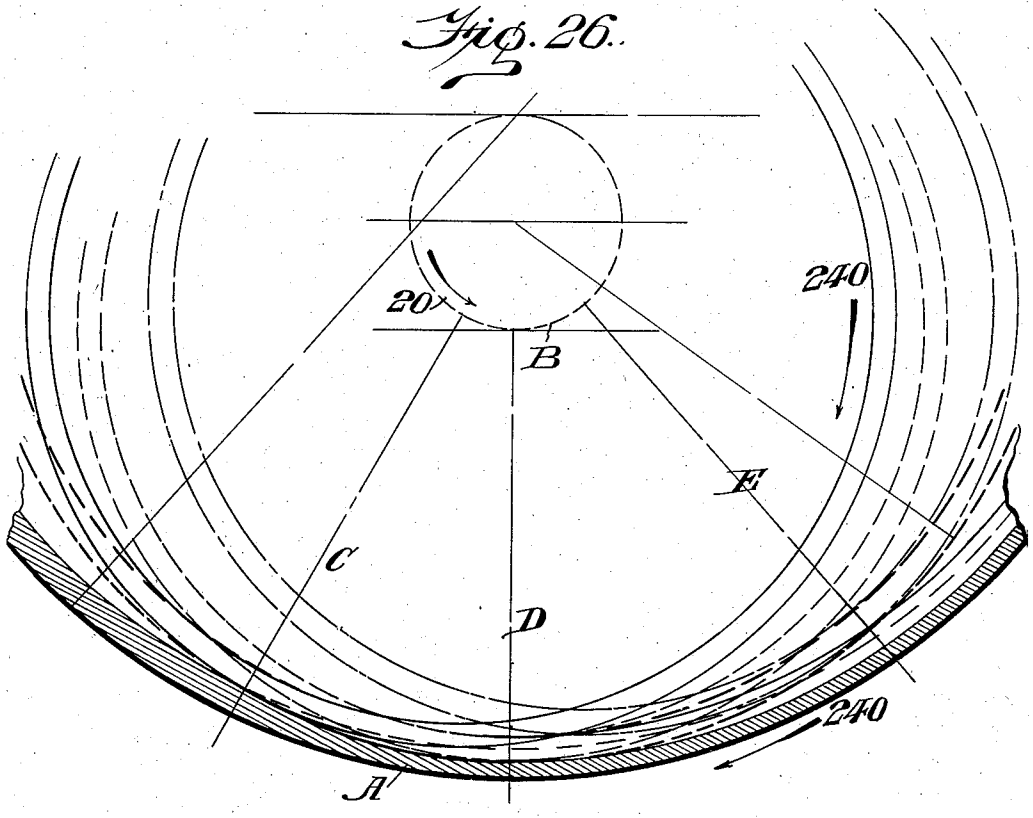


Fig. 24.

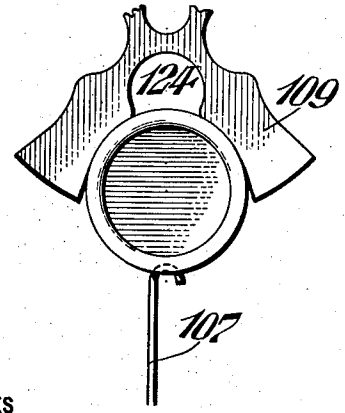
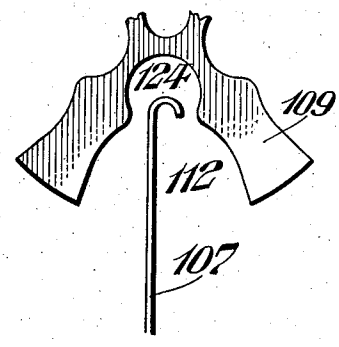


Fig. 25.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR THREADING SHEET-METAL CAPS.

1,010,740. Specification of Letters Patent. Patented Dec. 5, 1911.

Application filed May 4, 1911. Serial No. 624,979.

To all whom it may concern:

Be it known that I, EDWIN R. DOUGLAS, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Machine for Threading Sheet-Metal Caps, of which the following is a specification.

My invention relates to machines for forming internal screw threads in stamped or drawn sheet-metal caps, and it has for its object to form said threads on the inner side, only, of the rim of the cap by crowding or pressing the metal of such rim to form the screw thread while retaining the outer side smooth.

To this end my invention consists of a machine in which the outer side of the cap is confined in a revolving chuck while a threading tool rolls or forces the metal on the inner side into a raised screw thread.

It further consists of improved means for communicating circular rotation to the axis of a revolving threading tool.

It further consists of improved means whereby the chuck in which the cap is held is supported against the pressure of the threading tool.

It further consists of improved means for confining the cap within the chuck and for rolling the flange of the cap.

It further consists of improved means for adjusting the threading tool to operate upon caps of different sizes and dimensions.

It further consists of improved means for preventing the chuck from presenting to the threading tool when no caps are fed to said chuck.

It further consists of improved means for feeding blank caps to the chuck.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

For the purpose of illustrating my invention, I have shown in the accompanying drawings one form thereof which is at present preferred by me, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described.

Figure 1 represents a top plan view of one half of my improved machine for screw threading metallic caps. Fig. 2 represents a top plan view of the other half of the machine. Figs. 3 and 4 represent longitudinal sections of the halves of the machine respectively illustrated in said figures. Fig. 5 represents a transverse section of the machine on the line *x*—*x* in Fig. 1. Fig. 6 represents a transverse section of parts of the machine on the same line as Fig. 5, but on an enlarged scale. Fig. 7 represents a transverse section, also on an enlarged scale, on the line *y*—*y* in Fig. 1 and looking toward the feed-disk and its associated mechanism. Fig. 8 represents an elevation of the bearing for the threading mechanism and its associate parts. Fig. 9 represents a transverse section on the line *z*—*z* in Figs. 2 and 4. Figs. 10 and 11 represent sections on the line *a*—*a* in Fig. 1, of the threading tool and its surrounding parts and of the chuck and spindle in actuating and disengaged positions, respectively. Fig. 12 represents an elevation of the cam and its roller and arm which actuates the reciprocations of the work-holding and feeding mechanism. Fig. 13 represents an elevation of the cam and its associated parts which actuate the cap-feeding device and control the reciprocations of the work-holding and feeding mechanism. Fig. 14 represents a top plan view of the disks by which the work-holding and feeding mechanism is reciprocated. Fig. 15 represents a vertical section thereof. Fig. 16 represents a transverse sectional detail view on the line *b*—*b* in Fig. 3. Fig. 17 represents an elevation of a member of the "Oldham" coupling. Fig. 18 represents an elevation of another member of such coupling. Fig. 19 represents an elevation of the cam which actuates the reciprocations of the work-holding and feeding mechanisms. Fig. 20 represents an elevation of the cam which actuates the cap-feeding device and controls the reciprocations of the work-holding and feeding mechanisms. Fig. 21 represents a detail view of a part of the mechanism which controls the cap-feeding mechanism. Fig. 22 represents an elevation of the cap-feeding disk or dial. Fig. 23 represents a transverse section on the line *c*—*c* in Fig. 1. Fig. 24 represents a detail view of a portion of the feeding-disk with a cap in the pocket and the controlling finger bearing against the same. Fig. 25 represents a similar detail view with

the pocket empty and the controlling finger projecting into the same. Fig. 26 represents a diagram illustrating the progress of the threading tool in cutting the thread in the cap.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings. The machine has a bed, 1, supported upon legs, 2. A drive-shaft, 3, is journaled in bearings, 4, 5 and 6, upon the bed of the machine, and has a pulley, 7, upon one end, or other means for communicating rotary motion to it. The drive-shaft has a cog-wheel, 8, secured upon it between the bearings 4 and 5, and has a pinion, 9, at the bearing 6, and a cog-wheel, 10, upon its outer end. A cylindrical trunk, 11, is journaled to rock in longitudinal boxes, 12, upon the bed of the machine, and has an eccentric bore, 13, through it. An arm 14, carrying a handle, 15, projects from the trunk, and adjusting screws, 16, are threaded in ears, 17, upon one of the boxes for the trunk and bear with their ends against the arm of the trunk, so that the latter may be rocked and adjusted for purposes which will later be explained and apparent. A sleeve, 18, is journaled in the eccentric bore of the trunk and extends beyond the end of the same, and said sleeve has an eccentric bore, 19, in which a tubular shaft, 20, is journaled. A rod, 21, passes through said tubular shaft and the latter has at its inner end an enlarged head having a tapering socket, 22, into which the tapering shank, 23, of the threading tool, 24, is fitted, said shank having a reduced and screwthreaded end, 25, which screws into a bore in the end of the rod within the tubular shaft. The sleeve 18 having the eccentric bore has a cog-wheel, 26, secured upon it, and said cog-wheel meshes with a transmission pinion, 27, upon a shaft, 28, journaled in bearings, 29, upon the bed, parallel with the drive-shaft. This pinion meshes with the pinion 9 upon the drive-shaft. A pinion, 31, meshes with the cog-wheel 10 upon the drive-shaft and is keyed to a bushing 32, rotatable upon the end of the sleeve 18. A so-called "Oldham" coupling is formed by a disk, 33, keyed upon the bushing and formed with a diametrical groove, 34, in its outer face, into which engage two diametrically alined tongues, 35, upon the inner face of a disk, 36, having an enlarged central opening, 37, to admit of eccentric relative movement of said disk and the tubular shaft and rod. The outer face of said disk has two diametrically alined tongues, 38, at right angles to the former tongues, and said tongues engage a diametrical groove, 39, in a disk, 40, keyed upon the tubular shaft and further secured by a washer, 41, clamped against the face of the disk by nuts, 42, upon the threaded end, 43, of the axial rod within said tubular shaft. A balance-wheel, 44, is secured upon the periphery of the inner disk.

A tubular spindle, 45, is journaled in a bearing, 46, at the end of the machine bed and in a long bushing, 47, sliding with two splines, 48, in grooves, 49, in a bearing-bracket, 50, upon the machine bed. A pinion, 51, is secured upon the spindle and slides with it and said pinion meshes with the cog-wheel 8, and said pinion and cog-wheel are of such width that they will not get out of mesh when the bushing, shaft and pinion are slid to the extreme of their throw. A chuck, 52, having a recess of the dimensions of the cap to be threaded, is secured upon the inner end of the spindle, and the spindle has an axial bore, 53, in which slides a rod, 54, which is normally held outward by a spring, 55, in an enlargement, 56, of the axial bore. A disk, 57, forms the bottom of the chuck and has a stem, 57ˣ, in the bore of the spindle and bearing against the inner end of the sliding rod. A bracket, 58, projects from the outer bearing and has a stop-bolt, 59, screwed through its upper end to be engaged by the sliding rod in the spindle to force such rod inward when the spindle is moved outward, so that a cap will be discharged from the chuck during such movement. A cam, 60, having a cam-groove, 61, in its face, is keyed upon the sleeve 18 having the eccentric bore, and a roller, 62, engages said groove and is journaled upon an arm, 63, secured upon and projecting from a tubular shaft, 64, journaled to rock in bearings, 65, upon the machine bed. An arm, 66, is secured upon the tubular rock-shaft, and projects downward, where it is pivotally connected to the outer end of a pitman, 67. A tubular bearing, 68, has an eccentric, 69, secured upon it, and said eccentric is fitted to turn in a bearing in the machine bed. The tubular bearing has a flange 69ˣ, above the eccentric and resting upon the upper surface of the bed. A ring, 70, bears against the upper side of the flange and is clamped against it by means of screw bolts, 71. A shaft, 72, is journaled in the long bearing and has an eccentric arm, 73, secured upon its upper end above the upper end of the bearing. A cross-head, 74, is swiveled by a bolt or stem, 75, upon the upper side of the eccentric arm and engages a transverse groove, 76, in the under side of the bushing 47, near the inner end of the same. A disk, 77, is secured by a hub, 78, to the lower end of the long tubular bearing, and has a radial slot or notch, 79, in its periphery. A disk, 80, is secured with its hub, 81, upon the lower end of the vertical shaft and bearing against the under side of the former disk, and said disk has a radial slot, 82, in its periphery, in which is pivoted a dog, 83, the outer arm of which is provided with a weight. A flat ring, 84, is secured

to the under side of the disk 80, and has a beveled inner edge, 85, and a disk, 86, fits with its central opening to turn upon the hub of the middle disk and with its beveled periphery within the beveled inner edge of the ring. A spherical crank-pin, 87, projects upon the under side of this lower disk and is pivotally connected to the pitman 67. The bevel-edged disk has a radial slot, 88, which corresponds to and may be brought to register with the radial slots in the two other disks.

When the weighted outer arm of the dog is permitted to drop into the position illustrated in Fig. 15, with its inner arm engaging the slot in the lower, bevel-edged disk, and the latter is rocked from the pitman and the rock-arm of the tubular rock-shaft, the disk upon the vertical rock-shaft and said shaft will be rocked, moving the bushing 47 and the spindle and chuck by the cross-head and arm upon the vertical shaft, so as to bring the mandrel and the cap therein toward the threading tool. When the weighted arm of the dog is raised, the inner arm of the same is drawn out of engagement with the slot in the bevel-edged lower disk, so that the latter may continue rocking without imparting motion to the vertical shaft. A cam, 89, is secured upon the sleeve 18 at the side of the cam 60 and said cam 89 has its cam-periphery engaged by a roller, 90, journaled upon an arm, 91, secured upon the end of a solid rock-shaft, 92, journaled to rock within the tubular rock-shaft 64. An arm, 93, is secured upon the opposite end of the solid rock-shaft, and a cam, 94, is movably fitted upon the shaft and has a segmental slot, 95, through which passes a nutted bolt, 96, into the arm 93, so that the cam is adjustable in its relation to the arm. The lower end of the cam has a nose, 97, formed with a curved edge. A cradle, 98, is supported upon the machine bed and has two ears, 99, in which is journaled a rod, 100, upon which two arms 101, of an open sided rectangular frame, 106, are pivoted. Said arms are connected at their outer ends by a rod, 102, which passes through the lower ends of the sides of a rectangular frame, 103, one side, 104, of which is pivoted at its upper end to a link, 105, pivoted to the sliding bushing. The other side of the frame is formed by an upright finger, 107, the upper end of which is preferably curved and registers with the chuck. A link, 108, is attached at its upper end to the rod, 102, and the lower end is attached to the dog in the slotted disks. A feed-disk or dial, 109, is secured upon the end of a short shaft, 110, journaled in a bearing, 111, forming a part of the reciprocating bushing 47, above the chuck, and said disk has circularly outlined open pockets, 112, of a diameter equal to that of the caps to be screw-threaded and successively registering with the chuck as the disk is rotated. A ratchet-wheel, 113, having as many teeth as the disk has pockets, is secured upon the shaft of the disk, and an arm, 114, is fulcrumed to rock on the shaft and has a pawl, 115, engaging the ratchet-wheel. A rod, 116, is pivotally connected to this rock-arm and has an eye at its outer end which engages a notch, 117, in the upper end of the rock-arm 93 upon the solid rock-shaft. A coiled spring, 118, has its lower end connected to one of the arms 101 and has its upper end secured to a block, 119, adjustably secured upon the rod 116. A cam-plate 120, having a beveled edge, 121, is secured to the cross-bar of the frame 106 and is engaged and depressed by the cam 97, when the solid rock-shaft is rocked. A roller or button, 122, is journaled upon a plate, 123, secured to the face of the box 12, above the threading tool and the feed-disk has circular notches, 124, in the inner sides of its pockets, into which such button may enter when the reciprocating bushing 47 is moved inward to present a cap to the threading tool. Two rollers, 125, are journaled upon the face of the box 12, below the threading tool and the chuck may rotate and be supported from below upon said rollers when it is moved inward to have the threading tool act upon the cap.

An inclined chute, 126, is supported upon the machine frame to hold the blank caps and feed them to the feed-disk by gravity, and at the lower end of said chute is fulcrumed a lever, 127, carrying fingers, 128, traversing the chute. An arm, 129, is connected to rock with said lever, and a link, 130, is pivoted to said arm and has a longitudinal slot, 131, engaging a bolt, 132, upon the rock-arm 93 upon the solid rock-shaft. A discharge chute, 133, receives the finished caps as they are carried around by the feed-disk after being discharged from the chuck, and discharges them into a suitable receptacle.

In practice, the feed-chute is filled with the flanged caps with the open sides facing in the direction opposite the threading tool, and the lowermost finger in the chute will hold the caps and prevent them from sliding down into the feed-disk. When now the machine is started, the fingers in the chute will release a cap-blank which will drop down into a pocket and be carried to opposite the chuck and threading tool. As a cap is now in the pocket, the finger 107 cannot be drawn upward by the spring 118, and the pawl of the clutch-mechanism at the lower end of the vertical bearing and shaft will connect the rocking-disk and the disk upon the shaft, so that the shaft is rocked and the chuck and attached mechanism is moved toward the threading tool. The latter

tool will push the cap into the chuck which will rest upon the two chuck-supporting rollers, 125, and the flange-straightening button or roller 122 upon the face of the box 12 will bear against the flange of the blank, as appears clearly in Fig. 7 of the drawings. The chuck and the threading tool revolve in the same direction and at the same speed, while the axis of the threading tool describes a circle around a center eccentric to the axis of the chuck in a direction of rotation opposite to that of the chuck and at a considerably less speed. A satisfactory ratio of speeds has been found to be two hundred and forty revolutions per minute for the threading tool and mandrel and twenty revolutions per minute for the axis of the tool. The revolving threading tool crowds the metal of the rim of the cap up between its threads, and as the chuck is rotated, it is brought into contact with the entire inner circumference of the cap, while the rotation of the tool in a circle eccentric to its axis of revolution gradually forces the tool into the metal, crowding it up between the threads of the tool to form the screw threads. The outer side of the flange of the cap remains smooth as the cap fits snugly in the chuck, so that the flange is not corrugated but the metal forming the threads is pressed inward. The progress of the formation of the screwthread is diagrammatically illustrated in Fig. 26, where the wall of the cap is indicated by the letter A, the travel of the threading tool by a series of circle-segments in various styles of lines, and the circular path of the axis of the threaded tool by a dotted circle, B. The direction of rotation of the respective parts are indicated by arrows, and the number of revolutions per minute by the corresponding numerals.

The circumference of the threading tool as it begins to act upon the cap is indicated by two full-line circles described by a radius, C, at about thirty degrees (30°) from the point where the tool cuts deepest, as indicated by a radius, D, and two dotted-line circles, and the tool leaves the inner periphery of the cap at a point forty-five degrees (45°) from the radius D, as indicated by a radius, E, and two dotted line circles described by the latter. As the threading tool and the cap revolve in the same direction and at about the same speed, the metal of the cap will be drawn or rolled up into the threads of the tool, and the latter will gradually bear deeper into the metal as it rotates and will thereupon be drawn away from the rim of the cap by its eccentric rotation. The threading tool rotates within each cap for somewhat more than one rotation, so that the thread will be of substantially even depth, and, at the ratio of speeds above stated, the tool and chuck will make at least twelve revolutions to each one rotation of the tool.

When the cap is finished, the chuck and feed-disk and the bushing in which the chuck-spindle is journaled are withdrawn, and as the end of the push-rod in said spindle reaches the stop-bolt, said rod is pushed inward and pushes the disk forming the bottom of the chuck to cause the latter to discharge the finished cap which is carried along by the feed-disk and discharges through the discharge chute 133. The button or small roller, the face of which bears against the flange of the cap, will roll the same flat and smooth between it and the end of the chuck. The arm which is secured upon the solid longitudinal rock-shaft 92 will be rocked from the cam 89 to rock the pawl-arm and rotate the feed-disk, and will, at the same time, rock the lever carrying the stop-fingers in the feed-chute to release a cap to be carried forward by the feed-disk. When a cap is in place in a pocket in the feed-disk, the finger 107 upon the rocking frame actuated by the rocking cam 94 and nose 97, will be drawn upward by the spring 118 and bear against the cap, as illustrated in Fig. 10. This will prevent the spring from pulling the frame upward and exerting upward pull upon the link 108 and upon the outer arm of the dog in the lower clutch mechanism, by the operation of which the bushing and chuck are reciprocated, allowing the clutch to meet the threading tool and to push the cap into the chuck to be acted upon by the threading tool. If no cap is in the pocket of the feeding disk the finger enters said pocket, being drawn upward by the spring, and the link 108 will be drawn upward, tilting the dog in the clutch disks, as shown in dotted lines in Fig. 15, so as to allow the slot in the continuously oscillated beveled disk to clear the inner arm of said dog, resulting in the middle disk upon the vertical rock-shaft not being oscillated, and, consequently, in the bushing and chuck not being brought toward the threading tool. This is a provision of great importance, inasmuch as the threading tool travels so close to the inner walls of the chuck that, if there is no cap in the chuck, the threads of such tool will come in contact with the walls of the chuck, and its threads will be injured by said walls and the walls will be injured by the threads. The cam 97 and cam-plate 120 will act to tilt the rocking frame downward and thus relax the link 108 to drop the dog in the lower clutch-mechanism to engage the beveled disk and thus maintain the reciprocations of the bushing and chuck as long as the caps feed to the feeding disk.

Whenever a cap happens to be caught in the feed-disk or dial or for some other reason the feeding device should be obstructed,

the eye of the link 116, connecting the pawl and ratchet device of the feed-mechanism and engaging the notch 117 in the upper end of the rocking arm 93 will slip out of such notch and the spring 118 being released, the entire hinged frame-work which holds the dog in the lower clutch-mechanism in position to reciprocate the chuck and its connections will drop, allowing the weighted outer arm of the dog to drop so as to disengage the inner arm of said dog from the slot in the lower bevel-edged disk and stop the reciprocations of the bushing and chuck, thereby preventing said parts from coming in contact with the threading tool.

By means of the eccentric adjustment of the long, vertical bearing sleeve for the vertical rock-shaft, the approach of the clutch to the threading tool may be accurately adjusted to bring the clutch nearer or less near to the threading tool according to the depth of the cap and length of the threading tool. The stop-bolt at the end of the machine may also be adjusted to suit the length of the movement of the bushing and chuck.

The cylindrical trunk may be rocked by its handle and the adjusting-screws 16 to throw its eccentric bore or bearing more or less eccentric to the axial line of the machine, according to the interior diameter of the caps to be threaded.

The so-called "Oldham" coupling for the eccentric sleeve 18 and threading tool-shaft 20 admits of said sleeve being slowly rotated while the tool-shaft is rapidly revolved, whereby the threading tool receives revolving motion while its axis rotates around a center.

While the machine is here illustrated as adapted to internally thread flat screw-caps, it is evident that caps of any shape and size may be threaded by changing the chuck and threading tool and adjusting the gearing.

It is evident that this machine may, with changes of detail construction, needing neither invention nor detail description and illustration, be adapted to form external screwthreads upon sheet-metal circular and hollow articles as well as internal screwthreads.

It will now be apparent that I have devised a new and useful construction of a machine for threading sheet metal caps which embodies the features of advantage enumerated as desirable in the statement of the invention and the above description, and while I have, in the present instance, shown and described a preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit or scope of the invention or sacrificing any of its advantages.

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

1. In a machine of the character stated, a cap-supporting chuck, a screw-threaded threading tool, means for revolving said chuck and tool, and means for gradually feeding said tool into the metal of the cap.

2. In a machine of the character stated, a cap-supporting chuck, a screw-threaded threading tool, means for revolving said chuck and tool in the same direction, and means for gradually feeding said tool into the cap in the chuck.

3. In a machine of the character stated, a cap-supporting chuck, a screw-threaded threading tool, means for revolving said chuck and tool in the same direction, and means for rotating the axis of the revolving tool in a circle and in a direction opposite to that of the revolution of the chuck.

4. In a machine of the character stated, a cap-supporting chuck, a threading tool, means for revolving said elements in the same direction and at substantially the same speed, and means for rotating the axis of the revolving tool in a circle and in a direction opposite to that of the revolution of the chuck.

5. In a machine of the character stated, a cap-supporting chuck, a screw-threaded threading tool, means for revolving said chuck and tool, and means for rotating the axis of the revolving tool in a circle and in a direction opposite to that of the revolution of the chuck.

6. In a machine of the character stated, a cap-supporting chuck, a screw-threaded threading tool, means for revolving said chuck and tool in the same direction and at substantially the same speed, and means for rotating the axis of the revolving tool in a circle and in a direction opposite to that of the revolving chuck and at a comparatively slower speed.

7. In a machine of the character stated, a cap-supporting chuck having means for revolving it, a bearing opposite said chuck, a sleeve in said bearing and having means for rotating it and formed with an eccentric bore, a shaft in said bore and having means for revolving it, and a screw-threaded threading tool in one end of said shaft.

8. In a machine of the character stated, a cap-supporting chuck having means for revolving it, a bearing opposite said chuck, a sleeve in said bearing and formed with an eccentric bore and having means for rotating it in a direction opposite to that of the chuck, a shaft journaled in said eccentric bore and having means for revolving it in the same direction as the chuck, and a screw-threaded threading tool secured in the end of said shaft.

9. In a machine of the character stated, a

cap-supporting chuck having means for revolving it, a box opposite the same, a trunk turning in said box and having one end opposed to said chuck and formed with an eccentric bore, means for rotating such trunk and adjusting the same, and a threading tool journaled within the eccentric bore of said trunk and having means for revolving it.

10. In a machine of the character stated, a cap-supporting chuck having means for revolving it, a box opposite said chuck, a trunk revolubly supported in said box and formed with an eccentric bore, means for revolving such trunk and for adjusting the same, a sleeve in said bore and formed with an eccentric bore and having means for rotating it, a shaft journaled in said eccentric bore and having means for revolving it, and a screw-threaded threading tool secured in the end of said shaft.

11. In a machine of the character stated, a cap-supporting chuck having means for revolving it, a box opposite said chuck, a trunk revolubly supported in said box and provided with a radiating arm and an eccentric bore, adjusting screws bearing against opposite sides of said arm and threaded through ears upon the box, and a threading tool journaled within the eccentric bore of the trunk and having means for revolving it.

12. In a machine of the character stated, a cap-supporting chuck having means for revolving it, a screw-threaded threading tool having means for revolving it and for rotating its axis in a circle, and rollers journaled to afford rolling support for said chuck.

13. In a machine of the character stated, a cap-supporting chuck having means for revolving it, a screw-threaded threading tool having means for revolving it and for rotating its axis in a circle, and a pair of rollers journaled to have the chuck bear against their peripheries to thus have rolling support upon the same.

14. In a machine of the character stated, a cap-supporting chuck having means for revolving it, a threading tool having means for revolving it, and a roller journaled adjacent said threading tool to have its end bear against the flange of the cap to roll the same between such end and the face of the revolving chuck.

15. In a machine of the character stated, a cap-supporting chuck having means for revolving the same, a threading tool having means for revolving the same, means for axially reciprocating one of said elements in its relation to the other, a clutch device connected to said reciprocating means to throw the same into and out of action, means for feeding caps in front of the chuck, and a finger movably supported to traverse the path of feed to engage a cap in register with the chuck and connected to the clutch to hold the same in engagement when the finger engages a cap and to throw the clutch-device out of engagement when the finger traverses the path of feed unobstructed by a cap.

16. In a machine of the character stated, a cap-supporting chuck having means for revolving it, a threading tool having means for revolving it, means for axially reciprocating one of said elements in its relation to the other, a clutch device connected to said reciprocating means to throw the same into and out of action, means for feeding caps in front of the chuck, a rocking frame having a finger movable to traverse the path of feed in front of the chuck and connected to the clutch device to hold the same into and out of engagement, and a spring connected to said frame to draw the finger into and across the path of feed, whereby the clutch will be disengaged when the spring pulls the finger across the path of feed when no cap is fed and stops the reciprocations.

17. In a machine of the character stated, a cap-supporting chuck having means for revolving it, a threading tool having means for revolving it, means for axially reciprocating one of said elements in its relation to the other, a clutch device connected to said reciprocating means to throw the same into and out of action, a cap-feeding device for feeding caps in front of the chuck, and means connected to said clutch device to operate the same and controlled by said feeding device, whereby the reciprocating motion is stopped when no cap is fed to the chuck.

18. In a machine of the character stated, a cap-supporting chuck having means for revolving it, a reciprocable support for such chuck, a vertical rock-shaft connected to reciprocate such support, a vertical bearing for such shaft, a disk secured upon the lower end of said bearing and having a radial slot through its periphery, a disk secured upon the lower end of the rock-shaft and having a radial slot through its periphery, a dog pivoted in said slot and having a weighted outer arm, a disk supported below said last-recited disk to oscillate independent of the same and formed with a radial slot in its periphery, means for oscillating said disk, a feeding mechanism constructed to feed caps to the chuck, and a connection controlled by such feed-mechanism and connected to the dog to raise or lower the same, whereby the dog may be engaged with or disengaged from the notch in the oscillating disk and the oscillatory movement of the latter communicated to or cut off from the disk upon the shaft.

19. In a machine of the character stated, a cap-supporting chuck having means for revolving it, a threading tool having means

for revolving it, means for axially reciprocating one of said elements in its relation to the other, a clutch mechanism controlling such reciprocating means, a rocking arm having a notch, a cap-feeding device, a slip-link connecting said device to said arm and engaging such notch, and means between said clutch and link and constructed to throw out the clutch when the link under undue strain slips off from the notch of the arm.

20. In a machine of the character stated, a cap-supporting chuck having means for revolving it, a threading tool having means for revolving it, means for axially reciprocating one of said elements in its relation to the other, a clutch mechanism controlling such reciprocating means, a dog engaging such clutch mechanism when in normal middle position and disengaging the same when raised or lowered from such position, a cap-feeding mechanism having a ratchet, a rock-arm having a pawl engaging the same, a rocking arm having a notched end, a slip-link connected to the pawl arm and detachably engaging the notch of the rocking arm, a rocking frame having a finger which may engage a cap opposite the chuck, a spring connected to said frame and to the slip-link, and a link connected to the rocking frame and to the dog in the clutch.

21. In a machine of the character stated, a cap-supporting chuck having means for revolving it, a threading tool having means for revolving it, a flanging roller journaled adjacent the threading tool and having its end opposite the face of the chuck, means for axially reciprocating the chuck, a feed-chute, and a feed-disk having means for revolving it and formed with pockets of circular outline and registering with the feed-chute and chuck and formed with circular notches in the inner portions of said pockets to receive the flanging roller.

22. In a machine of the character stated, a cap-supporting chuck, a screw-threaded threading tool, means for revolving said chuck and tool, means for gradually feeding said tool into the metal of the cap, and rollers journaled to afford rolling support for said chuck.

23. In a machine of the character stated, a cap-supporting chuck, a screw-threaded threading tool, means for revolving said chuck and tool in the same direction, means for gradually feeding said tool into the cap in the chuck, and rollers journaled to afford rolling support for said chuck.

24. In an automatic machine of the character stated, a chuck suitably mounted for rotation, a screw-threaded threading tool operatively mounted with respect thereto, a device for feeding an article to be threaded to said chuck, means for rotating said tool eccentrically with respect to said chuck, automatic means for bringing said article and said tool into operative relation to effect a threading operation, and means for ejecting said article after said operation.

25. In an automatic machine of the character stated, a chuck suitably mounted for rotation, a screw-threaded threading tool operatively mounted with respect thereto, means for rotating said tool, a support for said tool forming a bearing therefor, means for rotating said support eccentrically with respect to said chuck, and automatic means for bringing said article and said tool into operative relation to effect a threading operation.

26. In an automatic machine of the character stated, a chuck suitably mounted for rotation, a screw threaded threading tool operatively mounted with respect thereto, means for rotating said tool, a support for said tool forming a bearing therefor, means for rotating said support eccentrically with respect to said chuck, automatic means for bringing said article and said tool into operative relation to effect a threading operation, and means for ejecting said article after said operation.

27. In an automatic machine of the character stated, a chuck suitably mounted for rotation, a screw-threaded threading tool operatively mounted with respect thereto, a device for successively feeding automatically to said chuck articles to be threaded, means for rotating said tool eccentrically with respect to said chuck, and automatic means for bringing said article and said tool into operative relation to effect a threading operation.

28. In an automatic machine of the characted stated, a chuck suitably mounted for rotation, a screw-threaded threading tool operatively mounted with respect thereto, a device for successively feeding automatically to said chuck articles to be threaded, means for rotating said tool eccentrically with respect to said chuck, automatic means for bringing said article and said tool into operative relation to effect a threading operation, and means for ejecting each article after said operation.

29. In a machine of the character stated, a chuck suitably mounted for rotation, a screw-threaded threading tool operatively mounted with respect thereto, a device for feeding an article to be threaded to said chuck, means for rotating said tool eccentrically with respect to said chuck, means for bringing said article and said tool into operative relation to effect a threading operation, and means for ejecting said article after said operation.

30. In a machine of the character stated, a chuck suitably mounted for rotation, a screw-threaded threading tool operatively mounted with respect thereto, means for ro-

tating said tool eccentrically with respect to said chuck, a device for feeding an article to be threaded to said chuck, and means for bringing said article and said tool into operative relation to effect a threading operation.

31. In a machine of the character stated, a chuck suitably mounted for rotation, a screw-threaded threading tool operatively mounted with respect thereto, means for rotating said tool, a support for said tool forming a bearing therefor, means for rotating said support eccentrically with respect to said chuck, and means for bringing said article and said tool into operative relation to effect a threading operation.

32. In a machine of the character stated, a chuck suitably mounted for rotation, a screw-threaded threading tool operatively mounted with respect thereto, means for rotating said tool, a support for said tool forming a bearing therefor, means for rotating said support eccentrically with respect to said chuck, means for bringing said article and said tool into operative relation to effect a threading operation, and means for ejecting said article after said operation.

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Witnesses:
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