J. A. EDEN, Jr.

DRILLING MACHINE.

APPLICATION FILED MAY 27, 1914.

1,166,514.

Patented Jan. 4, 1916.

5 SHEETS—SHEET 1.

Fig. 1.

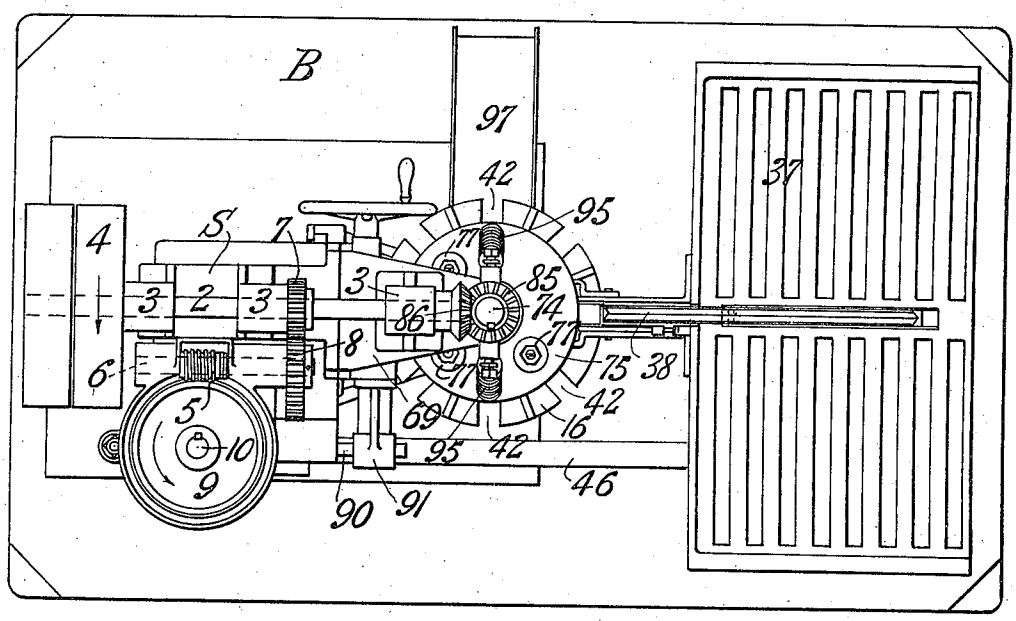


Fig. 8.

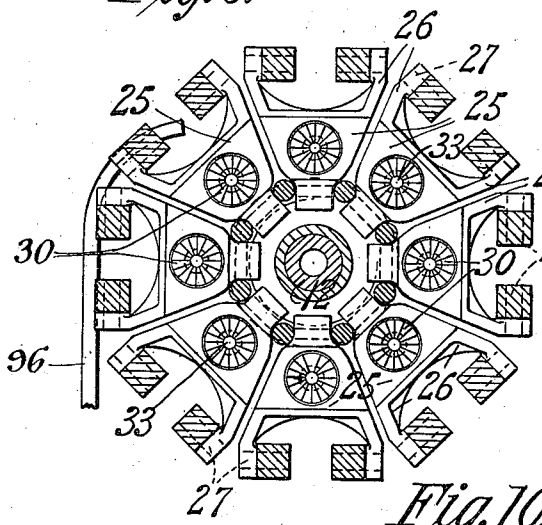


Fig. 9.

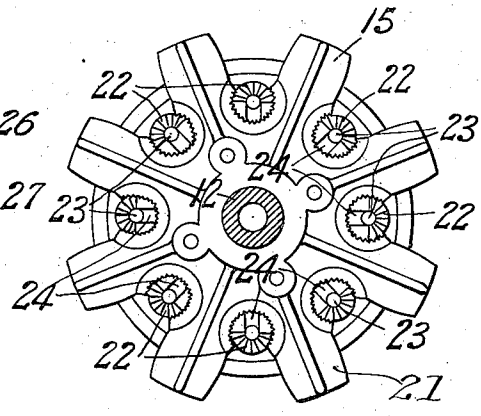
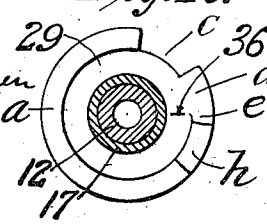


Fig. 10.



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5 SHEETS—SHEET 2.

Fig. 2.

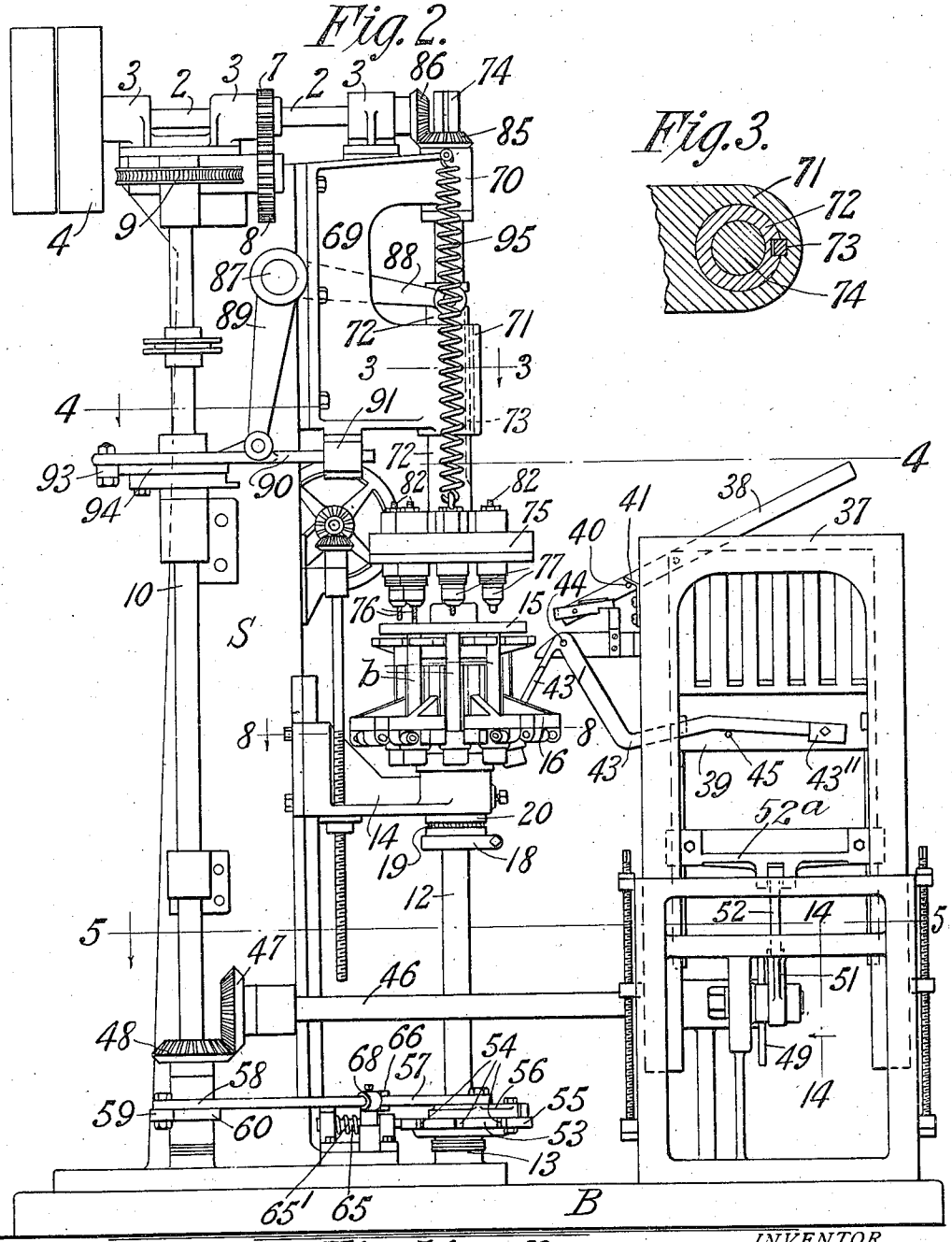
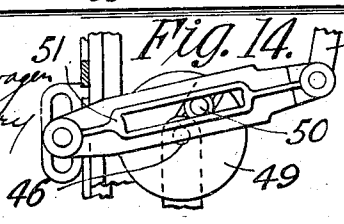


Fig. 3.

Fig. 14.



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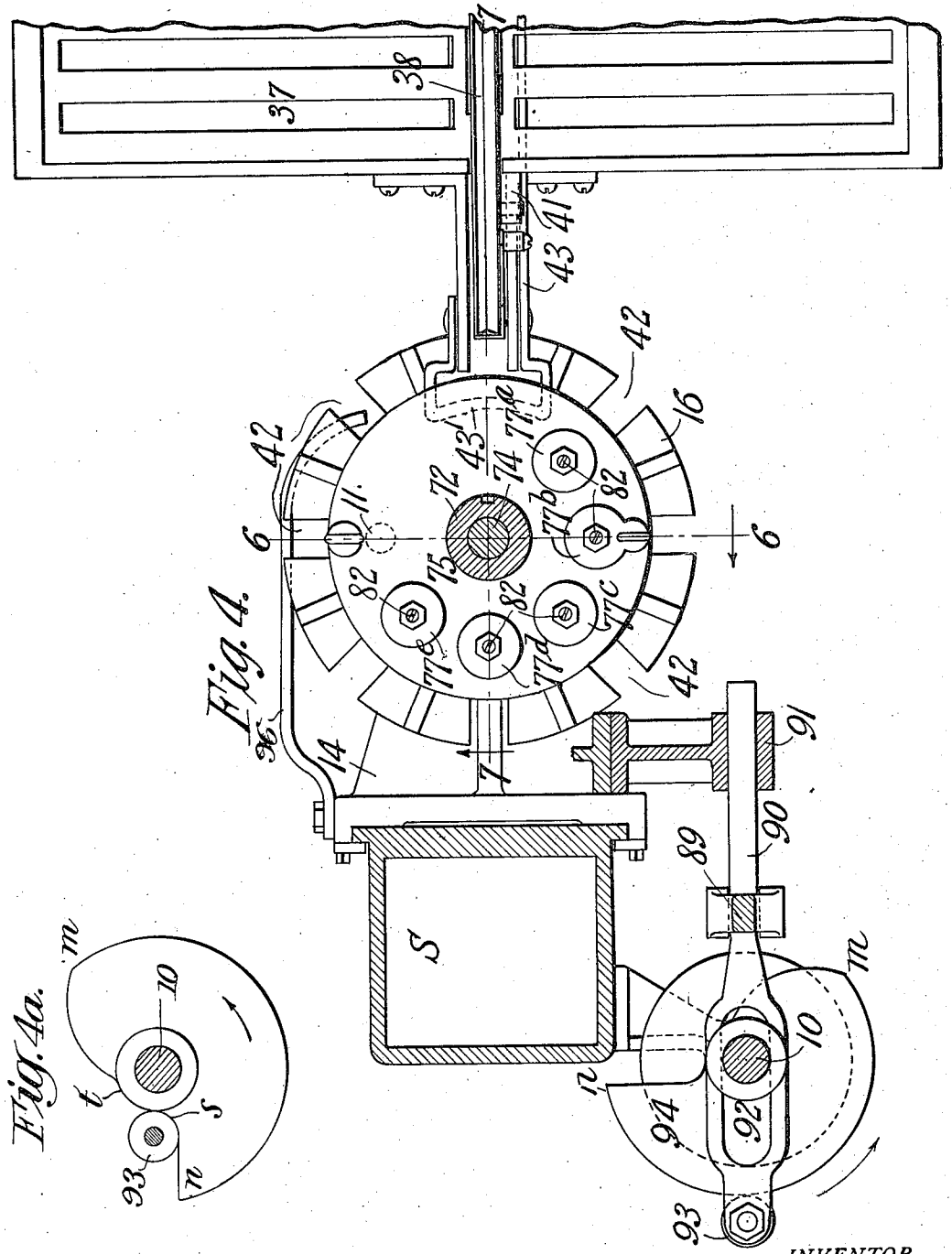

Fig. 4.

Fig. 4a.

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5 SHEETS—SHEET 4.

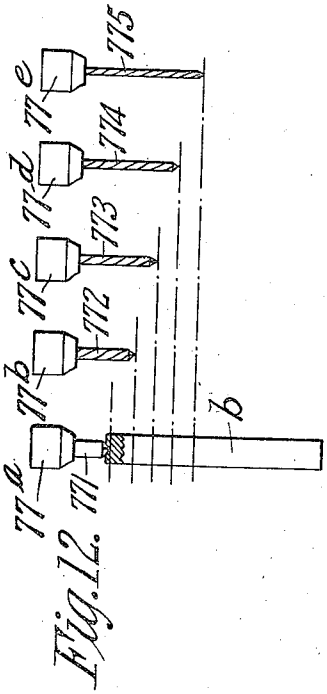

Fig. 12.

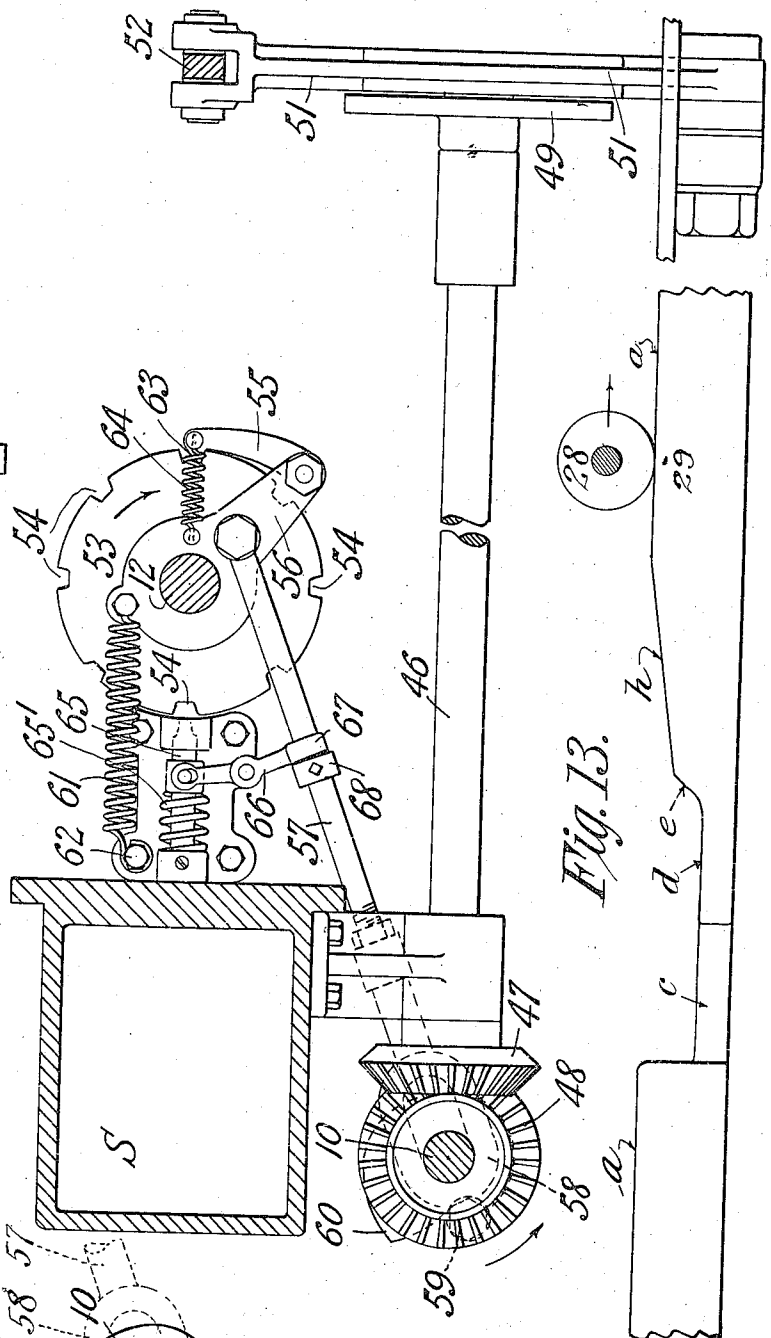

Fig. 5.

Fig. 13.

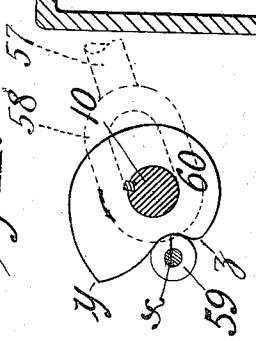

Fig. 11.

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5 SHEETS—SHEET 5.

Fig. 7.

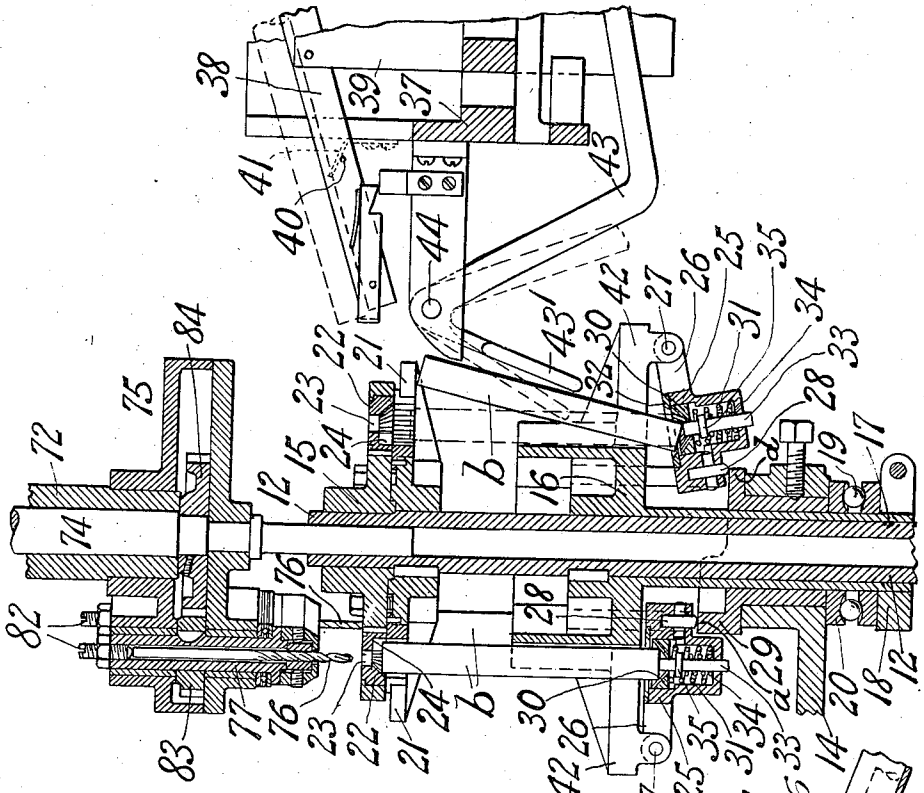


Fig. 6.

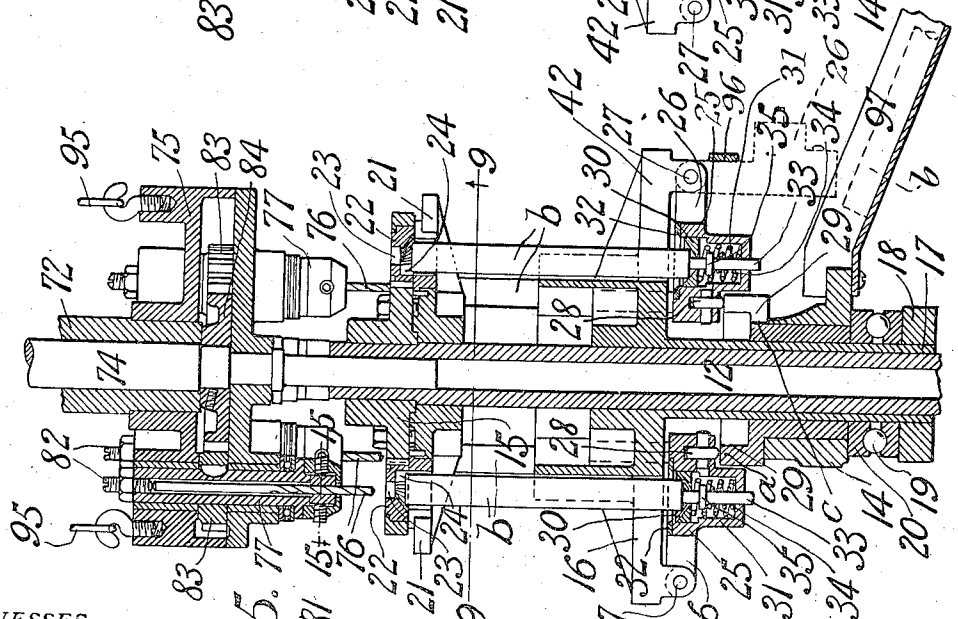
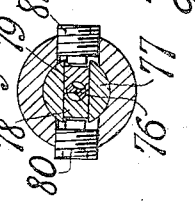


Fig. 15.



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UNITED STATES PATENT OFFICE.

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DRILLING-MACHINE.

Specification of Letters Patent. Patented Jan. 4, 1916.

1,166,514.

Application filed May 27, 1914. Serial No. 841,220.

To all whom it may concern:

Be it known that I, JAMES A. EDEN, Jr., a citizen of the United States, residing in Springfield, Massachusetts, have invented certain new and useful Improvements in Drilling-Machines, of which the following is a specification.

This invention relates to machines for automatically forming holes or sockets in bolts and similar articles, by the process of having a series of the blanks engaged successively by a set of drills or similar tools, whereby the desired form of hole or opening is formed by a sequence of operations; which results are produced by the machine without attention on the part of an operator, further than to present the blanks at a certain place in the proper stage in the operation; or to provide means whereby the blanks are automatically fed to the machine, and removed from the same after they have been operated upon.

A further object of the invention is to provide means whereby in the operation of the machine, each blank receives a series of operations upon its bore, by a series of tools or drills, that will produce a form of bore or hole in the finished blank whose diameter decreases progressively or by steps from the upper portion to the bottom of the hole.

Another object of the invention is to provide improved means for receiving and clamping the blanks on a carrier member, for presenting them successively to the several drills or tools in the proper position, and for releasing the finished blanks after engagement with the several tools, for the removal of the blank and the insertion of the fresh blanks.

For these purposes the invention comprises various combinations and sub-combinations of mechanism as hereinafter claimed.

In the accompanying drawings, showing one embodiment of my invention: Figure 1 is a plan view of the machine; Fig. 2 is a side elevation; Fig. 3 is a section enlarged on the line 3—3 of Fig. 2; Fig. 4 is a broken section enlarged on the line 4—4 of Fig. 2; Fig. 4ª is a plan of the cam in the initial position; Fig. 5 is a section enlarged on the line 5—5 of Fig. 2; Fig. 6 is a partial vertical section on the line 6—6 of Fig. 4; Fig. 7 is a similar view on the line 7—7 of Fig. 4; Fig. 8 is a cross section, enlarged, on the line 8—8 of Fig. 2; Fig. 9 is a section on the line 9—9 of Fig. 6; Fig. 10 is a plan view of the cam member, and its supporting parts; Fig. 11 shows the head indexing cam; Fig. 12 is a view showing diagrammatically the several drills or tools and the blank, indicating the relative size and positions of these parts; Fig. 13 is a view showing a development in a plane of the cam for the blank holder; Fig. 14 is a cross section on line 14—14 of Fig. 2; Fig. 15 is a cross section on line 15—15 of Fig. 6.

In the several views, the machine is shown as having a base B and an upright frame or standard S, that at the upper portion carries a main operating shaft 2 in bearings 3, 3, that is driven by a pulley 4; and a worm 5 on a short shaft 6 driven by gears 7 and 8 from the shaft 2, engages a worm wheel 9 fast on an upright cam shaft 10 supported in suitable bearings in the standard S, as shown in Figs. 1 and 2.

A hollow vertical shaft 12 is mounted in a step bearing 13 and supported by a bearing arm 14 at its upper portion, which arm is secured to the standard S; the purpose of this shaft being to support a head that receives and grips the blanks to be operated upon by the set of tools. This head is shown, particularly in Figs. 2, 6 and 7, as formed by an upper disk 15, and a lower disk 16 both keyed on the hollow shaft 12 as shown in Fig. 7, and rotated therewith. The disk 16 is provided with a sleeve extension 17 extending downwardly around the shaft 12 to which shaft both of the disks are secured for rotation therewith; which extension 17 has adjustably secured thereto a bearing member 18 for a thrust bearing of a ball type, the balls 19 engaging a race ring 20 that presses against the bearing arm 14, by reason of a thrust that will be hereinafter set forth. The said disk 15 is provided with a series of radial slots 21, 8 of which are shown equally spaced apart, for receiving the upper end portions of the blanks *b*; and above each of these slotted portions is secured in the disk a stationary cup member 22, of annular form having a central opening 23 of sufficient size to receive the largest drill or tool, that passes through such open-

ing at the proper stage to engage the upper end of the blank; such cup members being substantially of conical shape with radial ribs to tightly grip the upper end of the blank, but at the inner portion 24 nearest the axis of the supporting shaft, the cup member is substantially cylindrical, for the purpose of properly centering the blank in the cup member to bring the central opening for the drill at the axis of the blank.

The lower disk member 16 is provided with a circular series of movable cup members, arranged in alinement vertically with the eight cup members 22 of the upper member of the head; and these cup members 25 comprise a frame having an outer forked portion 26 that swings on pivots 27, so that the inner free end of the member can swing up and down, and which end portion of each member is provided with a bearing roller 28, all of which ride on a cam 29 of crown type; this cam shown in plan in Fig. 10 and in development in a plane in Fig. 13 has its major portion *a* flat so as to hold the blank clamped in one position through the several stations which it occupies while being drilled. At the rear end of the portion *a* of the cam it is cut away as indicated at *c* to permit the dropping of the lower cup member and discharge of the drill as hereinafter described. The cup member is then lifted on the next portion *d* of the cam and passes thence up an abrupt rise *e* onto a small rise *h* which carries it up to the level of the main portion *a* of the cam. These swinging cup members 25 are shown as each provided with an annular socket portion 30 vertically slidable in a bore in the frame and normally pressed upward by a spring 31 against a stop flange 32 at the top of the bore. The socket portion 30 has its upper face coneshaped and provided with radial ribs to grip the end of a cylindrical blank *b;* and at the bore of the annular socket portion is arranged a plunger 33 pressed upward by a spring 34 that engages a flange 35 on the plunger and causes the plunger to be lifted a short distance above the socket when first fed into the cup member, the plunger retreating when the cup member is swung upwardly by the described cam, that will cause the upper end of the blank *b* to enter the upper cup member 22, whereby the blank will be gripped between the pair of coöperating cup members when the roller on the swinging cup member reaches the highest portion or dwell *a* of the cam, as indicated at the left hand portion of Figs. 6 and 7. The blanks *b* are fed to the head at a point where the cam portion *d* is engaged by the roller of one of the lower cup members, as indicated at the right hand portion in Figs. 1, 2 and 7, and which corresponds to the position 36 of the cam as indicated in Fig. 10. Any desired form of blank feeding means can be arranged to feed the blanks *b* at this place, a hopper 37 being shown at this feeding position, that is provided with a swinging carrier 38 that will select a single blank and when the slide 39 is elevated, the carrier 38 that is pivoted on the slide brings a stop 40 thereon to engage a lug 41 to tilt the carrier and cause a blank thereon to slide downward as indicated in Fig. 7, whereby the blank will enter the slotted portion 42 of the lower head 16 and striking the inner vertical wall of such slot will be directed into the cup member, now in its depressed position. For the purpose of bringing the now inclined blank *b* as indicated in Fig. 7, to the erect position in line with the upper cup member for engagement by the latter, I provide a swinging arm 43 pivoted at 44, which in its full line position, as indicated in Fig. 7, will act as a support and guide for the blank *b;* and which when swung to the position indicated by broken lines in this figure will shift the blank to the erect position as shown in broken lines in this view, and retain the blank in such position until the advance of the head and cup members will cause the roller 28 to mount the incline *e* of the cam, thereby raising the blank to bring its upper end portion into the socket or cup member 22 of the upper disk; the end portion 43′ being laterally extended in a curve (Fig. 4) concentric with the movement of the head to retain the blank in this position of alinement until it starts to enter the upper cup member. The arm 43 is normally held in the position indicated in broken lines in Fig. 7, and in full lines in Fig. 2, by a weight 43″ on its free rear extremity that is elongated and overbalances the portion 43′ (see Fig. 2); the arm 43 normally resting on a pin 45 on the hopper slide 39, and when the slide is in its normal depressed position the weighted arm will hold the portion 43′ in the broken line position of Fig. 7; but when the slide 39 is elevated, this portion of the arm will be raised, and the blank engaging portion 43 will be moved slightly away from the head to the position indicated in full lines in Fig. 7, which is done to permit the blank *b* to be fed from the carrier 38; and when the slide 39 is again lowered the weighted arm will fall, advancing the blank supporting portion 43 now engaged by the blank, to shift the blank to the erect position alining with the opposed cup members. Means are provided for reciprocating the slide 39 that operates this blank engaging arm 43, in timed relation to the indexing of the head. A cross shaft 46 is mounted at the lower part of the machine rotated from the vertical shaft 10 by gears 47 and 48 to revolve at the same speed as the vertical shaft; the shaft 46 carrying a crank 49 (Figs. 5 and 14) whose pin 50 rides in a slotted lever 51, and a link

52 connects the lever 51 with the slide 39, at a yoke 52^a on the bottom of the slide; by which means the slide 39 will be elevated to raise the carrier 38 having a blank therein, and the latter will be tilted to discharge the blank *b* into the holders on the head as indicated in Fig. 7, at the proper stage in the indexing around of the head. As soon as this blank is discharged as shown in this figure, the slide is depressed, which will permit the weighted arm to fall, causing the portion 43 to shift the blank to the upright position, and retain the blank in this position as the head is moved around, and the cam raises the lower cup member to grip the blank.

The means for indexing the head around from the main operating shaft 10, are shown as comprising a disk 53 fast on the lower portion of the shaft 12 and provided with eight notches 54 corresponding to the eight pairs of cup members on the shaft; and these notches are successively engaged by a pawl 55 pivoted on the end of an arm 56 that swings loose on the shaft 12 and which is oscillated by a rod 57 pivoted at one end on the arm 56, the other end of the rod 57 having a slotted part 58 embracing the shaft 10 and carrying a roller 59 that is pressed against the periphery of a cam 60 fast on the shaft 10, the roller being held against this cam by means of a spring 61 having one end secured to the arm 56 and its other end fastened to a suitable pin 62 on the base. When this cam draws the arm 56 toward it, the pawl 55 will be moved in the same direction and its extremity 63 will be retained in the engaged notch by spring 64; and this cam will serve to swing the arm 56 the limit of movement caused by this cam; and the cam on further rotation permits the arm 56 to be retracted by the spring 61, when the pawl will ride out of the notch 54 and be moved for a distance corresponding to the distance apart of the notches to engage the next notch 54, so that for each revolution of the shaft 10 the disk 53 is advanced one-eighth of a revolution, which will serve to bring the next pair of cup members on the head to the feeding position, and retain them in such position for a certain period of time. In order to lock the head in these positions of rest, a spring plunger 65 is mounted on the base to engage the notches 54 in the disk, and a lever 66 pivoted to this spring plunger, has its end portion 67 forked over the rod 57 so as to engage a stop 68 on the rod 57, which parts are so positioned that on the advance of the slide to cause the pawl to swing the disk, the stop 68 will swing this lever and shift the spring plunger 65 out of its engaging notch 54, releasing the disk; and as soon as the slide begins its return movement the spring plunger is released to return to former position and engage the next notch, that is brought to registering position with the spring plunger each time the disk is advanced.

Above the head that contains the described eight holders, comprising the opposed pairs of cup members that receive and grip the blank *b*, is arranged a carrier on which is mounted a set of tools or drills arranged to register with the opening or bore of the cup members 22, whereby upon causing rotation of the drills, and bringing the carrier and head together, the drills will penetrate these openings to operate upon the upper ends of the blanks in the holders.

A suitable bracket 69 carried by the standard S at the upper part of the machine, is provided with bearings 70 and 71 in which latter slides a sleeve 72, and is splined as indicated at 73 (Fig. 3) to prevent rotation of the sleeve; and a shaft 74 is rotatable in the bore of the sleeve 72, this shaft also rotating in the bearing 70, and extending down below the sleeve, as shown in Fig. 6, to project into the tubular shaft 12 that carries the head which supports the blanks. The sleeve 72 supports a carrier in the form of a disk 75 that is secured thereto, and on which are arranged a circular series of drill holders 77 that correspond in position to the cup members on the head, and are so arranged that each time the head is indexed and brought to rest, the drills 76 in the holders will register with the openings in the upper cup members 22; the holders being shown as provided with gripping means at their lower portions in the form of blocks 78 and 79 that are pressed against the drills by screws 80 and 81 respectively to lock the drill and prevent its rotation; while the upper end of the drill 76 is positioned and locked by a set screw 82 of the usual form, that will regulate the depth of the opening formed by the drill. Each drill holder is shown as carrying a gear 83 at the intermediate portion, all of which mesh with a gear 84 fast to the interior shaft 74; and this shaft at its upper end is provided with a miter gear 85 loosely splined thereon for driving engagement with this shaft, but permitting endwise movement of the shaft; which gear 85 meshes with a miter gear 86 fast on the end of the driving shaft 2, by which means the drill holders or spindles are continuously driven from the driving shaft, and during endwise movement of the shaft 74 and the carrier 75 thereon.

Means are provided for moving the carrier 75 toward and from the blank carrying head. A bent lever pivoted at 87 has one arm 88 connected to the sleeve 72, while the other arm 89 connects with a slide 90 guided in a bracket 91; which slide has a slotted portion 92 surrounding the operating shaft 10, with a roller 93 on the extremity arranged to engage the periphery of a cam 94

secured on the shaft 10, see Fig. 4. To retain this roller engaging the cam, and to take up all lost movement, one or more springs 95 have one end attached to the carrier 85, with the upper end secured to the frame, the tension of which springs will thus draw the carrier upward, and through the bent lever will press the roller on the slide continually against the edge of the cam 94. As shown in Fig. 4, the cam 94 has an eccentric portion engaging the roller from the point *m* around to the point *n*, during which period of the revolution of the operating shaft 10, the drill carrier is advanced slowly downward, and the drills being in engagement with the blanks respectively will form or enlarge a previously formed opening in the upper end of the blank, and it will be observed that this portion of the cam extends for slightly more than half of its circumference. The continued revolution of the cam 94 will cause the roller to leave this highest portion, and the springs 95 constantly pressing the roller 93 toward the center of the cam, will not move the roller to the position *s* (Fig. 4ª) by a rapid movement or drop on the cam surface; which will swing the bent lever and permit the drill carrier 75 to be quickly elevated, withdrawing the drills from the blanks in the head. From the point *s* around to the point *t* on this cam, the surface is concentric and the drill head will be held stationary, during which time the head that carries the blanks will be indexed around the unit distance; while from this point *t* to the said point *m* is a comparatively quick rise on the cam, that will lower the drill carrier a sufficient distance to bring the drills therein adjacent the several blanks in the holders and, as just described, the drills will be slowly advanced as the roller travels from the point *m* around to the point *n*.

Referring again to Fig. 5, and also Fig. 11, showing the cam 60 that effects the indexing of the head, the turning of this cam in the direction indicated by the arrow will shift the roller 59 from the lowest position by *x* on the cam to its highest position *y* by a rather quick movement, thereby positively advancing the rod 57 and the arm 56, which latter will swing the pawl 55 that engages one of the notches 54, and the pawl being retained in the notch by the spring 64 will carry the disk 53 around in the direction indicated by the arrow, for a unit distance and advance the cup members a distance equal to their distance apart. The continued revolution of the cam 60 in the direction indicated, will cause the roller to travel around from the point *y* to the point *z* that is nearer the axis of the cam than the point *y*, so that the spring 61 will cause the arm 56 and rod 57 to slowly advance or return in the opposite direction to the arrow on the disk 53, and the inclined end face of the lug 63 on the pawl will cause it to move out of the notch 54 that it engaged during the advance of the disk 53, and the pawl will ride along the edge of the now locked disk 53 until it reaches the next notch 54, into which it will be drawn by the spring 64. The drop in the cam 60 between these two points *y* and *z* is comparatively slow so that the return will be a slow movement until this point *z* is engaged by the roller, but from this point to the starting point *x* is a steep incline so that the latter portion of the return movement of the pawl will be accelerated.

The stop 68 is so placed on the slide 57 that only at the latter portion of the return movement of the arm and slide will the step strike the lever 66 to force the spring plunger 65 out of its engaging notch 54; and which is effected at the time when the pawl lug 63 is forced into the notch 54, so that the disk 53 will be locked during the return movement of the pawl and prevented from displacement; from which arrangement it follows that at the beginning of the stroke of the arm 56 and pawl 55, the plunger 65 will be held out of the registering notch, but the stop 68 will at once release the lever 66 as soon as the notch 54 has passed beyond the registering position and the plunger 65 will return to engage the edge of the disk 53, and will ride on the same until at the latter portion of this movement the next notch 54 will be brought to the plunger, into which the plunger will be forced by its spring 65′.

The cam 94 that moves the drill carrier up and down, is so positioned on the operating shaft 10, relative to the location of the cam 60 also fast on this shaft, whereby the roller 59 will travel from the position *x* to the position *y* that causes a forward step of the head, at the stage of the revolution of this shaft 10 when the roller 93 is traveling from the point *s* to the point *t*, and the drill carrier is retained in its elevated position with the drills entirely free from the head that carries the blanks.

As has been set forth, the blanks *b* are fed to the holders composed of the opposed cup members, at a position indicated by 36 in Fig. 10, when a pair of cup members is opposite the feeding hopper 37, and it will be seen from Fig. 4 that there is no drill spindle adjacent this position on the head, but a drill spindle or holder 77ª is located in vertical alinement with the position of the next pair of cup members in the head, that is, is advanced an angular distance of 45 degrees on the head; and it will also be observed that four other drill holders, 77ᵇ, 77ᶜ, 77ᵈ, 77ᵉ, are located the same distance apart around the drill carrier and alining with the other parts of cup members on the head. When the blank arrives at the point 11 indicated in dotted lines in Fig. 4 it will have been acted upon by the five drill mem-

bers and will be in position for discharge. This position is indicated at the right hand side of Fig. 6. When a cup member arrives at this position the roller comes to the cut away portion *c* of the cam 29 and the arm 26 swings down to the position shown in dotted lines striking against a spring stop 96. The bolt *b* drops into the discharge chute 97. This notch or opening *c* in the cam also provides a convenient way for the discharge of the chips and oil which are caught by the crowned cam. The stop 96 is an arm mounted on the bracket 14 as shown in Figs. 4 and 8 and having its end curved inward to act as a cam to swing the arm 26 inward as the latter is advanced beyond the discharging position. By this means the cup member is lifted to bring its roller in position to rest on the portion *d* of the cam 29 when said cup member passes beyond the end of the stop or cam 96. From the discharging position 11 around to the position 36 (Fig. 10), which is a quadrant's distance, no drill spindles are arranged in the head, for the reason that no blanks will be held in the carriers; but as each carrier arrives at the position 36, it will receive a blank from the described feeding device, or other source at this place.

In Fig. 12 the described five drill holders are shown as arranged in a plane, instead of a circle as they are located on the head, and it will be seen that the holder 77^a that first alines the blank *b*, is provided with a tool 771 that is comparatively short, and more in the form of a counterboring tool; the length of this tool in the holder being such that when the drill carrier is brought down its full distance, this tool will merely form a shallow notch or opening in the end of the blank; and which is for the purpose of properly centering the drill in the succeeding operation. The next drill holder 77^b is provided with a drill 772, that may be of the twist drill type and whose length is somewhat greater than that of the tool 771, but which will form only a short hole or opening in the blank. At the next operation the blank *b* will be engaged by the third drill 773, whose length is slightly greater than the preceding drill, but whose diameter is somewhat less than that of the drill 772; whereby the hole in the blank will be somewhat deepened, but the bore formed by the operation of this drill will be less than that made by the drill 772. The next drill 774 is of greater length than the drill 773, but of less diameter. The fifth drill 775 is still longer than the preceding drill 774, and has its diameter slightly less. It will thus be understood that these four drills 772, 773, 774, 775, will form an opening or bore in the blank *b* of a length or depth equal to that of the drill 775, but such opening will increase in diameter from the lower portion upwardly, and by a series of steps; and it will be also seen that each one of these steps or portions of the bore will be formed by a separate operation, the four drills operating at the same time on different blanks. The machine will thus automatically receive the blanks from a suitable feeding device, or from an operator, will grip the same in the holders, and will automatically cause them to be operated upon in sequence by the drills and will eject the finished blanks from the machine; and a number of the blanks will be simultaneously engaged by as many drills, so that the operation is comparatively rapid, as at each advance of the holders a finished blank is ejected, and at the same time a fresh blank is received.

By having the arrangement of a series of drills increasing in length in the order of their engagement with the blank, and at the same time decreasing in diameter, a bore is formed in the blank of stepped construction.

The feeding device is not separately claimed in this application, but an application for patent for such construction is filed of even date herewith.

The machine has been primarily designed, constructed and used for the drilling of "tell tale" stay bolts, that is those employed as the fastenings between the inner and outer walls of boilers and which indicate, by leakage therethrough, the breakage of any of such bolts, thereby showing to the boiler inspector or other person concerned where bolt replacements are necessary; but it or material parts of it may be employed with other tools than drills and upon other styles of blanks than the one described and for the producing of various other products. And though I have described with great particularity of detail a specific machine embodying this invention, yet it is not to be understood therefrom that the invention is restricted to the particular apparatus illustrated. Various modifications thereof in detail and in the arrangement of the parts may be made within the scope of the appended claims by those skilled in the art without departing from the invention.

What I claim is—

1. In a machine of the class described a blank carrier including a pair of clamping devices adapted to engage the opposite ends of a blank and to exert a pressure toward each other so as to hold the blank, at least one of said clamping devices having an inner face which is partly cylindrical and partly conical so as to center the blank when the clamping devices are pressed against it.

2. In a machine of the class described a blank carrier including a pair of clamping devices adapted to engage the opposite ends of a blank and to exert a pressure toward each other so as to hold the blank, at least one of said clamping devices being aper-

tured to admit a drill to engage the end of the blank and having an inner face which is partly cylindrical and partly conical so as to center the blank with respect to the drill.

3. In a machine of the class described a head and a series of blank holders carried thereby, each of said blank holders comprising a pair of opposed cup-members, and means for automatically causing approach and recession of the cup-members to engage and release the blanks, one of the cup-members having a spring plunger at the center arranged to press the blank toward the other cup-member.

4. In a machine of the class described a head and a series of blank holders carried thereby, each of said blank holders comprising a pair of opposed cup-members, and means for automatically causing approach and recession of the cup-members to engage and release the blanks, one of the cup-members having a spring plunger at the center arranged to press the blank toward the other cup-member, and having also a spring supported socket portion arranged to press the blank toward the opposed cup-member.

5. In a machine of the class described a vertical shaft having a cam thereon, a head rotatable on a vertical axis, a series of blank holders equally spaced on the head, means connecting said cam with said head to turn the head at each rotation of the cam shaft a distance equal to the distance apart of said holders on the head, a carrier on the machine arranged above the head and movable to and from the head, a set of tools on the carrier positioned corresponding to the arrangement of the holders on the head, a second cam on the said vertical shaft, a slide guided on the machine to reciprocate to and from the latter cam, a lever connecting the slide with the carrier, one or more springs connected with the carrier to retract it from the head and to retain the slide in engagement with said cam, whereby the carrier is reciprocated from the cam shaft between successive turning movements of the head.

6. In a device of the type set forth, the combination with a tool carrier provided with a series of tools and means for operating the same, of a movable head provided with a series of blank holders equally spaced corresponding to the location of the tools for engagement therewith, each blank holder comprising an upper fixed cup-member, and a lower swinging cup-member movable to and from the same to receive and clamp a blank between said members, and a stationary cam member adjacent the lower cup member arranged to engage the same to elevate each cup-member as it passes beyond a predetermined feeding position, to thereupon retain the cup-member closed on the blank during a portion of its movement, and to finally release the cup-member at the latter part of the movement to permit removal of the blank and insertion of another blank.

7. In a device of the type set forth, the combination with a tool carrier provided with a series of tools and means for operating the same, of a movable head provided with a series of blank holders equally spaced corresponding to the location of the tools for engagement therewith, each blank holder comprising an upper fixed cup-member, and a lower swinging cup-member movable to and from the same to receive and clamp a blank between said members, and a stationary cam member adjacent the lower cup-members arranged to engage the same to elevate each cup-member as it passes beyond a predetermined feeding position, to thereupon retain the cup-member closed on the blank during a portion of its movement, and to finally release the cup-member at the latter part of the movement to permit removal of the blank and insertion of another blank, a movable arm arranged intermediate of the two coöperating cup-members as brought to the feeding position with the lower cup-member depressed to receive the blank, and means for shifting said arm to advance the blank to a position alining with said members and to retain it in said position as the lower cup-member is closed on the blank.

8. In a device of the type set forth, the combination with a tool carrier provided with a series of tools and means for operating the same, of a movable head provided with a series of blank holders equally spaced corresponding to the location of the tools for engagement therewith, each blank holder comprising an upper fixed cup-member, and a lower swinging cup-member movable to and from the same to receive and clamp a blank between said members, and a stationary cam member adjacent the lower cup-members arranged to engage the same whereby these members will rise and fall at proper stages, each lower cup-member comprising a spring supported annular seat portion for engaging the margin of the blank, and a spring plunger at the center of the annular portion arranged to engage the center of the blank.

9. In a device of the type set forth, the combination with a tool carrier, provided with a series of tools, and means for operating the same, and means for feeding blanks at certain periods, of a movable head provided with a series of blank holders spaced corresponding to the tools on the carrier, each blank holder comprising an upper fixed member and a lower swinging opposed member, means adjacent the lower swinging member arranged to cause it to rise and fall at certain stages in the movement of

the head whereby the members are lowered as brought opposite the feeding means to receive the blank, and are raised beyond such position to grip the blank, and a movable arm arranged at the feeding position intermediate of the two holder members and provided with means for shifting said arm to advance the blank when received by the lower member, to a position alining with the upper member to be clamped in such position for engagement with the tools.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

JAMES A. EDEN, JR.

Witnesses:
DAVID MCCOMBE,
GEO. V. CURTIS.