Nov. 3, 1931. H. C. MOULTON 1,830,404

PIERCING MACHINE

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Fig. 1.

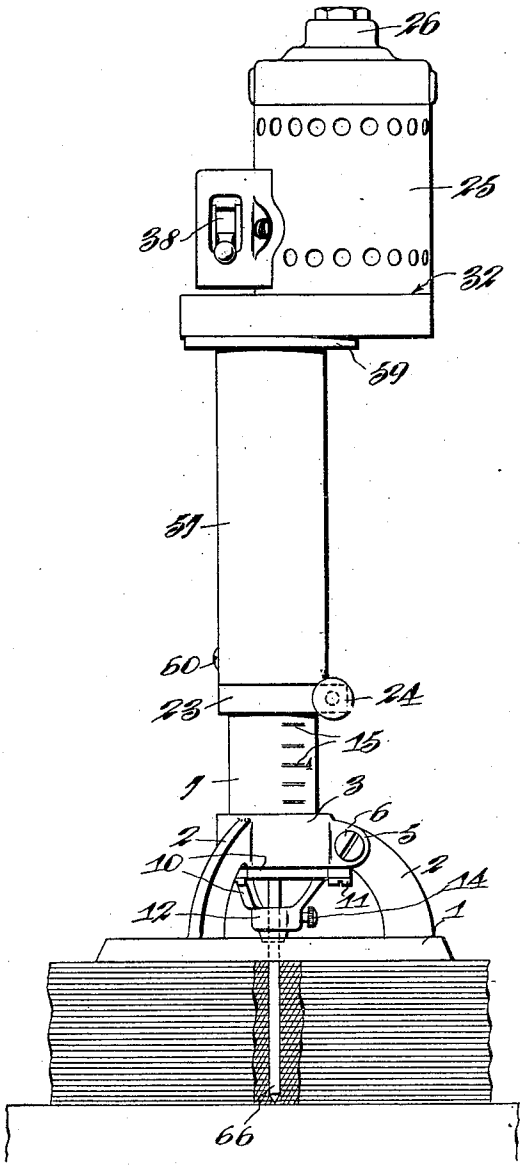

Fig. 2.

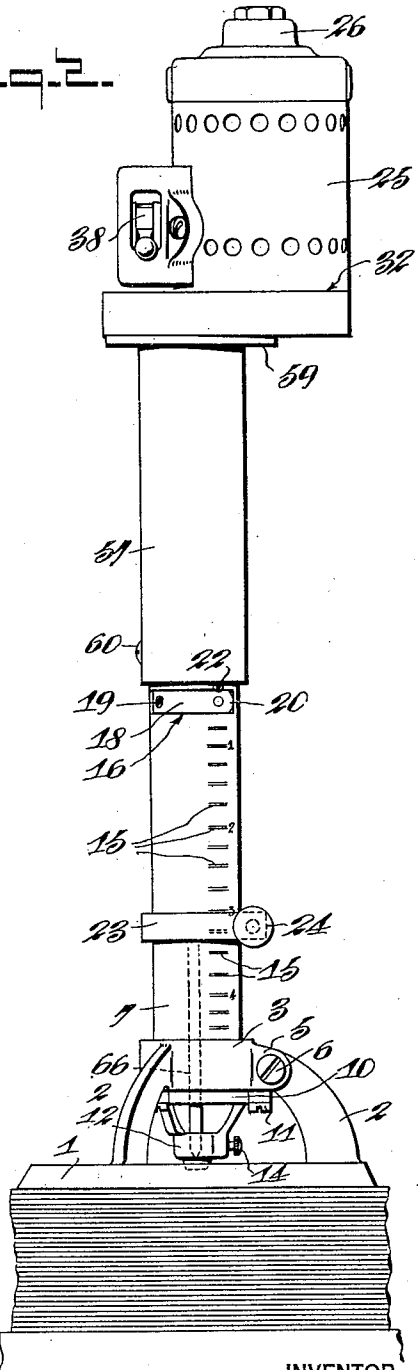

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Fig. 8.

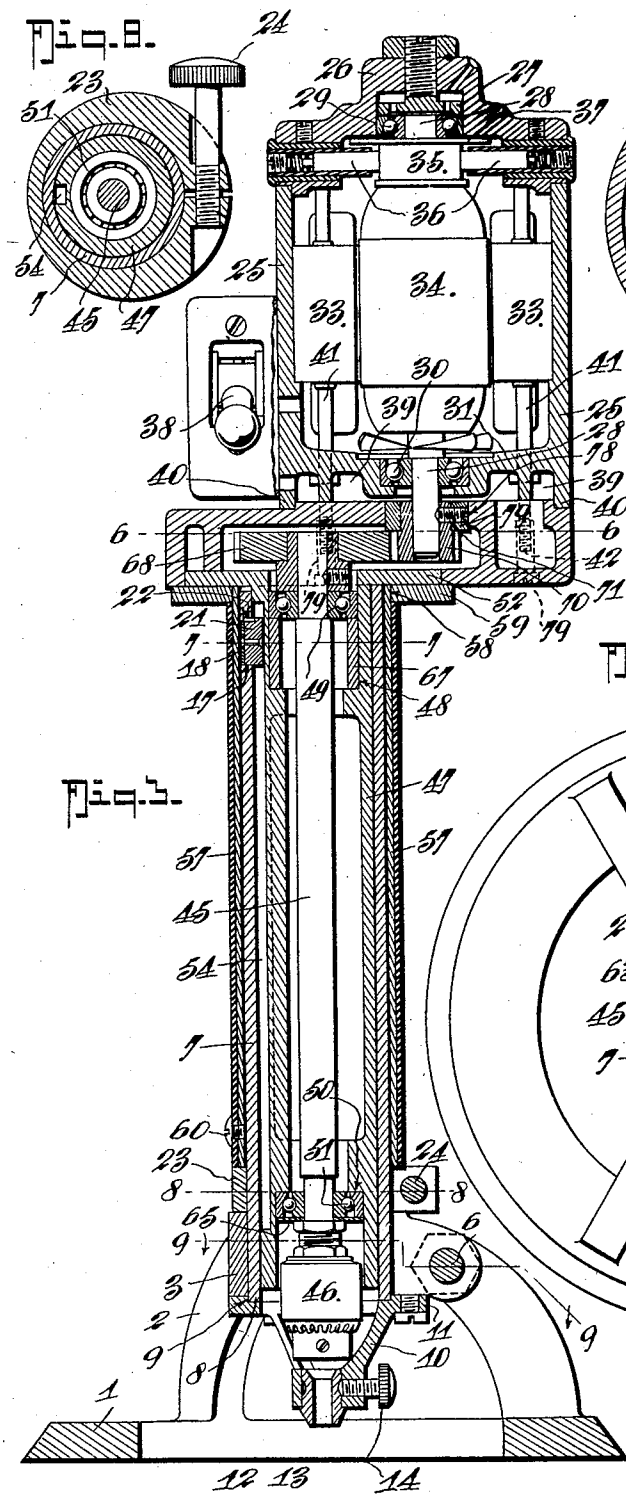

Fig. 5.

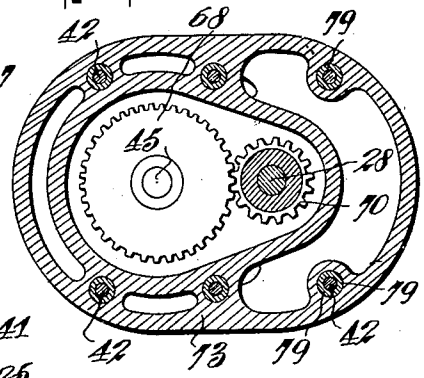

Fig. 7.

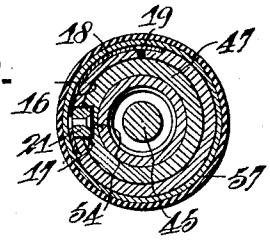

Fig. 9.

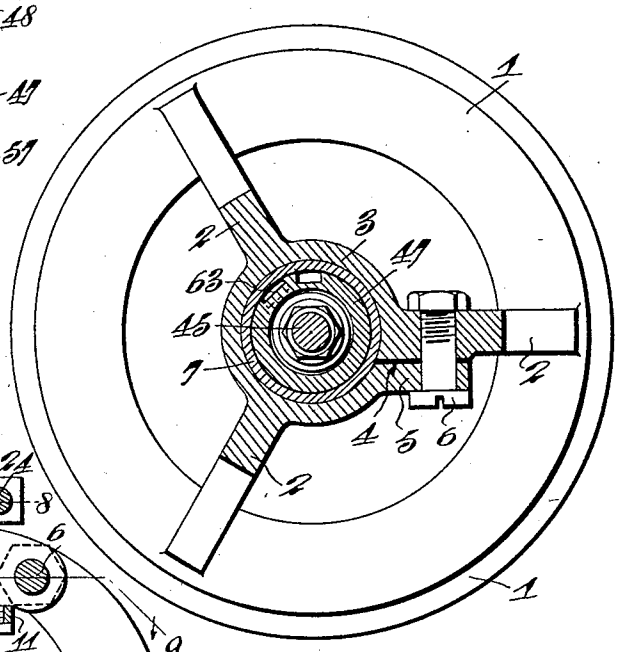

Fig. 3.

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Fig. 13.

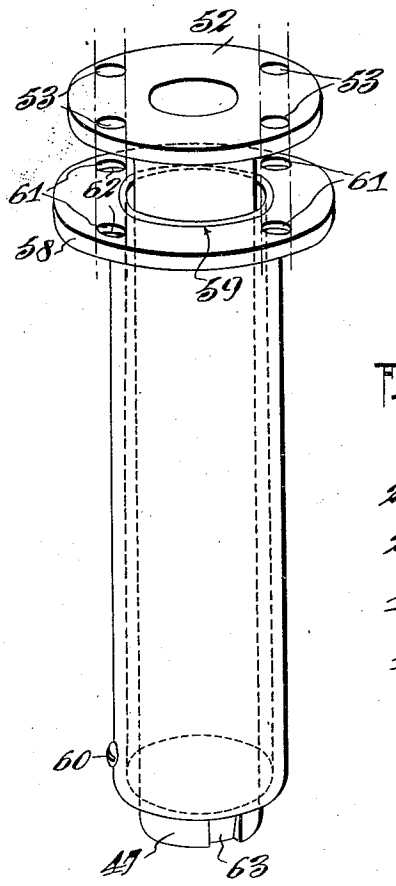


Fig. 4.

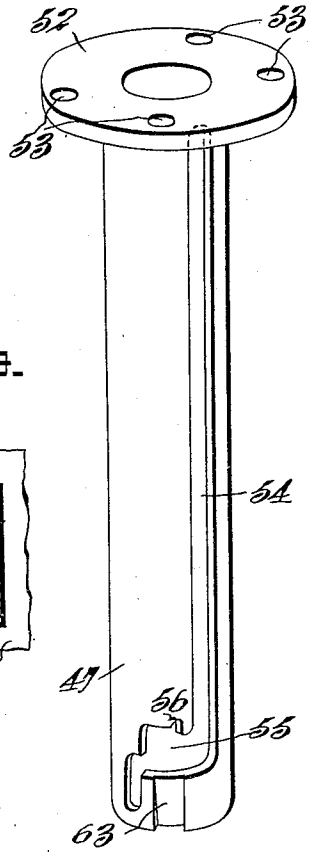


Fig. 19.

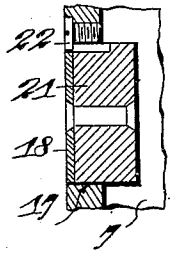
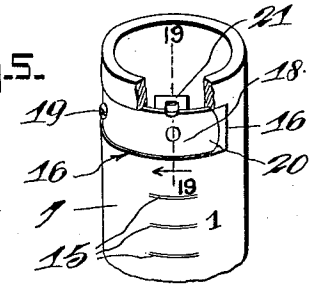


Fig. 5.



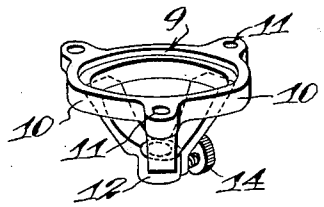


Fig. 10.

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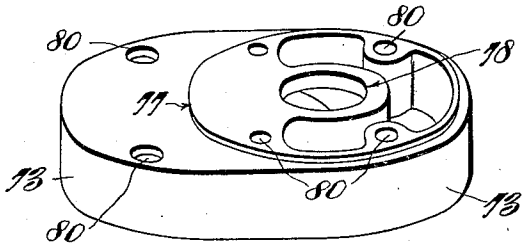

Fig. 11.

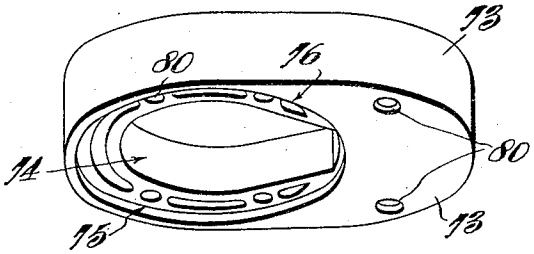

Fig. 12.

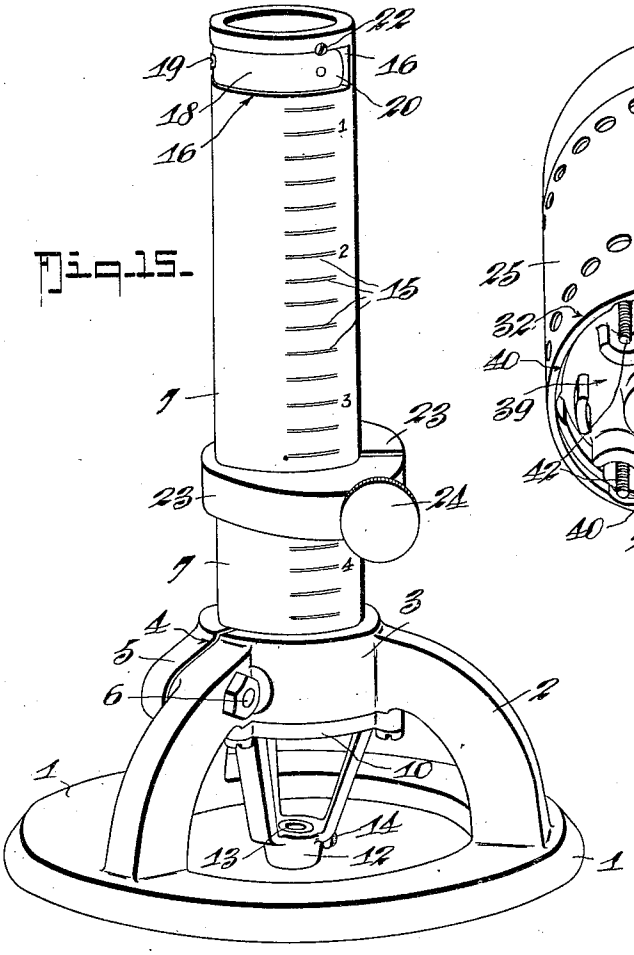

Fig. 15.

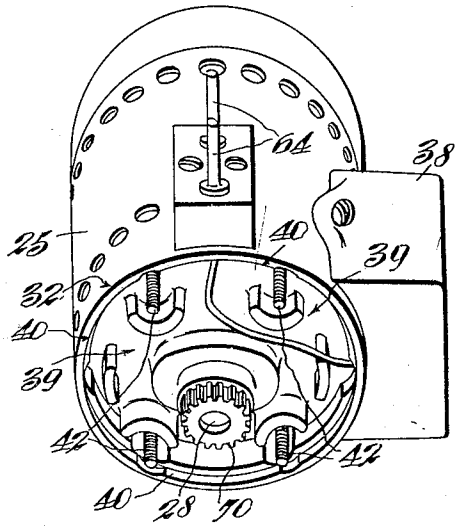

Fig. 14.

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Fig. 17.

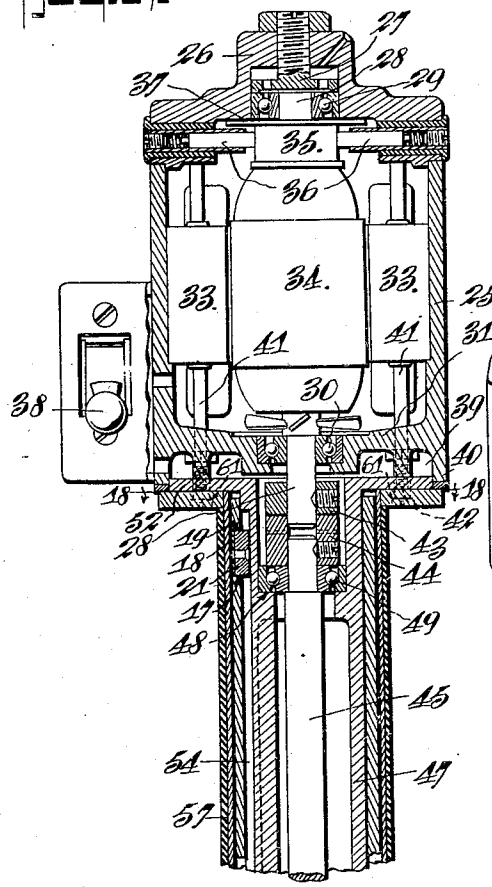


Fig. 16.

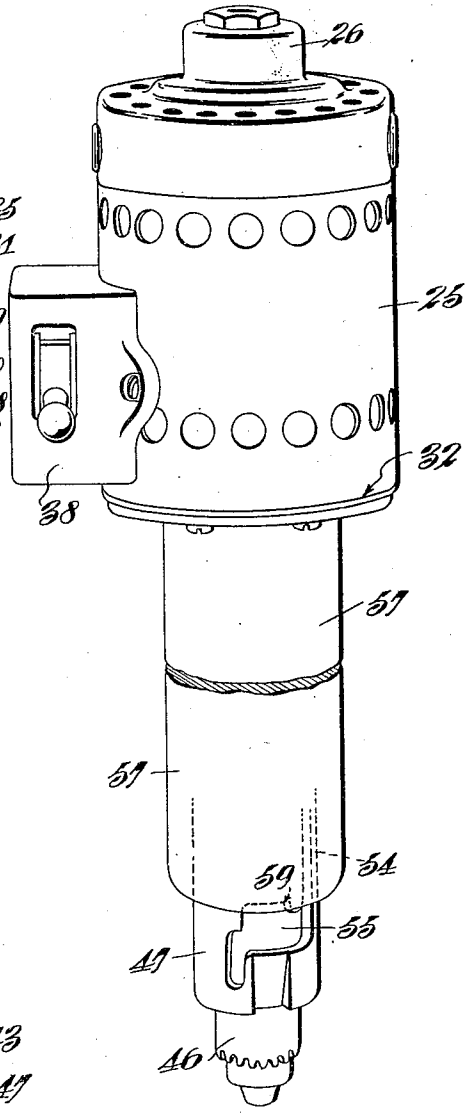
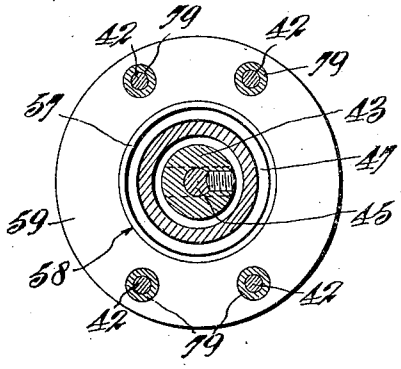


Fig. 18.



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UNITED STATES PATENT OFFICE

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PIERCING MACHINE

Application filed August 4, 1928. Serial No. 297,573.

The invention generally relates to piercing machines having rotatable piercing awls and being adapted for simultaneously piercing numerous superposed layers of cloth to mark the intended positions of button holes, buttons or the like in accordance with a master pattern, and the said invention primarily has for its object to provide certain new and useful improvements over the piercing machine structure disclosed in the patent to Connor 1,398,419, issued November 29, 1921, whereby a more compact and efficiently operable piercing machine is provided, one in which the parts may be more easily assembled and disassembled, and in which is provided a safety device to hold the piercing awl elevated in a manner assuring against inadvertent dropping or lowering of the said awl and the carrying parts.

More specifically, the invention has for its object to provide in a machine of the type stated, novel means to guide the movement of the piercing awl; novel means to mount and center the standard tube on the supporting base; a novel motor head; novel composite telescopic tubes and means to secure them individually and collectively to the motor head in a manner permitting removal of the motor head with or without said composite tubes; novel means to guide and permit relative movement of the telescopic composite and standard tubes, and a novel safety means for securing the telescopic tubes at the elevated position against inadvertent dropping.

Another object of the invention is to provide an indirect gear drive between the motor head and the rotatable awl to impart a more powerful torque to the said awl.

Another object of the invention is to provide a standard base unit, a standard motor head unit and a gear case, whereby the base unit and the head unit may be directly connected to provide a direct drive machine, or indirectly connected, by interposition of the gear case and substantially without change, to provide an indirect or gear drive machine.

With these and other objects in view which will more fully appear, the nature of the invention will be more clearly understood by following the description, the appended claims, and the several views illustrated in the accompanying drawings.

In the accompanying drawings:

Figure 1 is a side elevation of a geared drive machine, the parts being shown at the lower limit of a limited stroke operative condition,

Figure 2 is a view similar to Figure 1, the parts being in the elevated or non-operative position,

Figure 3 is a central longitudinal section of the machine shown in Figure 1,

Figure 4 is a perspective view of the bayonet slot equipped tube,

Figure 5 is a detail sectional perspective view of the upper end of the standard tube,

Figure 6 is a horizontal section taken on the line 6—6 of Figure 3,

Figure 7 is an enlarged horizontal section taken on the line 7—7 of Figure 3,

Figure 8 is a horizontal section taken on the line 8—8 of Figure 3,

Figure 9 is a horizontal section taken on the line 9—9 of Figure 3,

Figure 10 is a detail perspective view of the guide spider,

Figures 11 and 12 are top and bottom perspective views respectively of the gear case,

Figure 13 is a perspective view illustrating the inner and outer tube members separated but in associated relation,

Figure 14 is an inverted perspective view of the standardized motor head,

Figure 15 is a perspective view of a standardized base unit complete,

Figure 16 is a perspective view of a head unit complete, the same being of the direct drive type,

Figure 17 is a central longitudinal section of the upper half of a direct drive machine,

Figure 18 is a horizontal section taken on the line 18—18 of Figure 17, and

Figure 19 is a detail section taken on the line 19—19 of Figure 5.

Like reference numerals designate corresponding parts throughout the several figures of the drawings.

In the practical development of the inven-

tion, I employ a base ring 1 providing a central opening to permit passage of the piercing awl or tool and for sighting the material to be pierced to facilitate the positioning of the tool. Integrally formed spider arms 2 extend upwardly from the ring and carry a clamp collar 3 which is split as at 4 and extended to form a clamp ear 5 opposed to one spider arm, the ear and the opposed spider arm being provided with apertures to receive a clamp bolt 6.

A tubular standard 7 is securely clamped in upright position in the collar 3 and with its lower end extending slightly below the said collar as at 8 to seat in the annular centering seat 9 formed in the guide spider 10 which is equipped with ears by which it is screw-secured as at 11 to the collar 3.

The guide spider has a centrally disposed guide collar 12 in which a guide member 13 is removably mounted and secured as at 14.

The provision of the removable guide member enables the substitution of guides to accord with the piercing tool in use at a particular time, and by reason of the provision of the extended end and seat mounting 8 and 9, the positioning of the said standard in true axial alinement with the guide member 13 is assured.

The standard 7 is provided at its outer face with graduations or indicating markings 15 by which the stroke or depth of penetration of the piercing tool may be determined, and adjacent its upper end the said standard is recessed as at 16 and provided with a slot 17 extending through the recessed wall. A leaf spring 18 is positioned in the recess and has one end thereof screw-secured as at 19 to the recessed wall, and the other end free and provided with a finger lift portion 20. The free end of the spring carries a detent 21 which works through the slot 17 and projects into the interior of the tubular standard. The detent may be withdrawn from projection into the hollow of the standard by engaging the free end of the spring with the finger and pulling it outwardly. A stop screw 22 is provided and is positioned to engage the detent and limit outward retraction thereof. A split stop collar 23 is slidable on the standard and has provision at 24 for being clamped at selected positions on the standard, the markings 15 serving to facilitate such positioning. The purpose of the spring detent and of the stop collar will be explained later.

The parts thus far described may be said to constitute a standardized base unit. The head unit, which when mounted on the base unit completes the machine, comprises a standardized motor head, a tool stock and tool driven by the motor of the head, and composite tube members adapted to removably and telescopically fit the base standard and to serve as tool stock supporting and bearing and encasing handle providing means.

The tube members are secured to the motor head to complete the head unit, one of the direct drive types of which is disclosed in Figure 16 of the drawings. A base unit is shown in Figure 15.

I will now proceed to describe the standardized motor head which is shown operatively mounted in Figures 1, 2, 3, 16 and 17, and dismounted and equipped for an indirect or intermediate gear drive mounting in Figure 14.

The head comprises a motor casing 25 having a top hub 26 equipped with a thrust take up head 27 to hold the armature shaft 28 against longitudinal play.

The armature shaft is rotatable in upper bearings 29 mounted in the top hub, and in lower bearings 30 mounted in the lower cross wall 31 with which the casing is provided adjacent its lower end which said casing is cut off short at right angles to the axis of the armature shaft as indicated at 32.

The motor head is equipped with the usual field 33, armature 34 and commutator 35, the latter being engaged in the usual manner by spring pressed brushes 36. A disc 37 is mounted on the armature shaft above the brushes and serves to throw excess lubricant away from contact with the commutator and brushes and thereby assures clean and efficient contact of the said parts.

A suitable attachment means is provided on the head by which cord attachment with a source of electric current supply may conveniently be made, and the supplying of current to the motor is controlled by a switch 38 also carried by the said head.

The cross wall equipped lower end of the motor casing is cored out as at 39 to provide an annular seating flange 40 and abutment shoulders to facilitate mounting of the remaining parts which are attached to the motor head to make up the head unit. For this purpose also, the field mounting bolts 41 are extended a distance through the cross wall and threaded as at 42. The manner of employing the extended bolt ends will be explained later. See Figure 14.

When the motor head is mounted for use, a coupling head 43 is secured on the lower end of the armature shaft to extend below the motor head and interlock with a similar coupling head 44 secured on the upper end of the tool stock 45 which carries the tool clamping chuck 46 at its lower end. By reason of the arrangement of the armature and tool stock shafts 28 and 45 in longitudinal alinement and connecting them by the loose coupling 43—44 to impart the rotation of the shaft 28 to the said shaft 45, it is possible to remove the motor head without disturbing the bearings of either of the shafts 28 or 45, the con-

nection between the shafts being readily broken at the loose coupling.

The tool stock is mounted in an inner tube member 47 equipped with an upper counter bore 48 in which is mounted an anti-friction bearing 49 for the stock 45, and a lower counter bore 50 in which is mounted an anti-friction bearing 51 for the said stock.

The tube 47 is equipped at its upper end with a mounting plate head 52 by which it may be secured to the motor head in a manner soon to be described, and the said head 52 is provided with holes 53 to space-fit over the bolt projections 42.

A longitudinal slot 54 is formed in the outer face of the tube member 47 and terminates at its lower end in a right angled turn or lateral portion 55 which is stepped up over a portion of its upper wall to provide a stop lip 56. The spring detent 21 projects into the slotway 54–55 and the tube member 47 is telescopically mounted in the standard so that it may be raised as indicated in Figure 2 to elevate the piercing tool out of contact with the work. The engagement of the detent in the portion 55 holds the head unit elevated and until the head unit has been lifted slightly to clear the lip 56 and then turned slightly to bring the detent in register with the slotway 54, the said head unit cannot be lowered. Thus the machine is provided with a safety equipment assuring against inadvertent dropping of the head unit from its elevated position.

A composite sleeve member 57 surrounds the standard and acts as a handle for carrying the machine as a whole and for lifting and lowering the head unit. The member 57 comprises an inner tube of metal and an outer covering shell of hard rubber or the like; and to provide for mounting the said member the metal tube has a securing plate head 58 welded or otherwise secured on the upper end thereof as at 59. The metal and hard rubber tube members are secured together as a unit by the screw 60. See Figure 3 and 13.

The plate head 58 is provided with holes 61 which register with the holes 53 of the plate head 52 and are countersunk to receive the socket screws 62 by which the plate heads 52 and 58 are clamped together and to the motor head. It will be observed by reference to Figures 13 and 17 that the head 52 fits within the flange 40 of the motor head and is centered thereby, assuring proper alinement of the armature shaft and tool stock, and by reason of the mounting of the composite tube with the inner tube, that tube too is thus held in proper axial alinement. This manner of mounting the tube also provides for shortening the overall length of the machine and allows for the removal of the motor head individually or collectively with the inner tube and composite sleeve member.

A cam grooveway 63 extends through the lower end of the inner tube and leads into the lateral portion 55 of the bayonet slot. Thus when the head unit has been removed from the base unit and it is again desired to replace it, it is placed with the end of the inner tube over the standard and with the detent 21 in position to enter the grooveway 63 and is then forced down to bring the spring detent into the bayonet slot and cooperatively assemble the parts in position such as is indicated in Figure 2 of the drawings.

The contacts by which the motor may be cord attached to a source of current supply are indicated at 64.

A lubricant retaining disc 65 is mounted beneath the bearing 51 to prevent leakage of lubricant down over the chuck and onto the awl or piercing tool 66 clamped in the chuck.

It will be observed by reference to Figures 1 and 3 of the drawings that the composite tube or sleeve 57 seats on the stop or gage collar 23 and limits downward movement of the head unit in the intended degree.

In the foregoing description, I have disclosed a standardized motor head, a standardized base unit, and standardized intermediate tube members cooperatively assembled as shown in Figures 16, 17 and 18 to provide a machine of the direct drive type wherein the armature shaft and the tool stock are coaxially aligned and directly connected.

It may be desired at times, however, to indirectly drive the tool stock by speed reduction gears to apply a slower speed but more powerful torque to the piercing tool and I have shown such an arrangement in Figures 1, 2, 3 and 6 of the drawings.

In this adaptation of the invention the same standardized parts above described are used, it being necessary only to interpose a gear case between the tube members and the motor head and to mount the small and large gears on the armature shaft and tool stock respectively in place of the direct interlocking couplings. As the standardized parts are constructed in the same manner as in the direct type previously described are given their same reference characters, new characters being applied only to the new parts that are used.

In this form of the invention a spacer sleeve 67 is mounted in the upper counter bore 48 to raise the upper bearing to adapt it for taking a like constructed but slightly longer tool stock 45 having a large gear 68 secured thereon as at 69.

A small gear 70 is secured on the armature shaft by hub and set screw equipment 71 and a bearing collar 72 is carried by the small gear hub.

A gear case 73 is provided and is cored out as at 74 to provide chambers for the gears, a centering bore 75 being also provided through

the lower face of the case to receive the tube plate head 52, and abutment shoulders 76 to abut the said head 52 when it is clamped to position. See Figure 12.

The upper face of the gear case is provided with an upstanding centering hub 77 which will seat within the motor head flange 40 when the parts are assembled, and with a bore 78 to rotatably receive the gear collar 72. See Figures 3 and 11.

In this form of the invention, longer socket screws 79 are employed to secure the gear case to the motor head, and they are fitted through holes 80 in the gear case.

To remove the head unit from the base unit, it is only necessary to elevate the head unit to the position illustrated in Figure 2 when the spring detent equipment may be finger manipulated to release the detent and enable separation of the said units.

No screws or other wholly removable elements that might be lost when removed are employed in this connection.

In the foregoing description, I have disclosed an improved piercing machine having advantages of simplicity and compactness of construction and neat in appearance, in which novel means is provided for centering the tubular members relatively to each other and to the piercing tool, novel standardized and interchangeable unit structures, and novel means to cooperatively and compactly assemble the said units.

It is of course to be understood that the details of structure and arrangements of parts may be variously changed and modified without departing from the spirit and scope of my invention.

I claim:

1. In a device of the class described, a support having a sight opening and a central piercing element receiving opening, an electric motor head including an armature shaft, two telescopic members one connected to the support and the other with the motor head, a tool stock adapted to be rotated by the armature shaft and movable with and rotatable within one telescopic member, a piercing tool carried by the stock, one telescopic member having a bayonet slot therein including a longitudinal slot portion and a lateral slot portion, a detent carried by the other telescopic member and projected into the bayonet slot to guide telescopic movement of the telescopic members and to enter the lateral slot portion and hold the members at the tool raised position, and a safety stop lip projecting into the lateral slot portion to be engaged by the detent to lock the parts against inadvertent collapse, said detent being mounted on a finger releasable spring support.

2. In a device of the class described, a support having a sight opening and a central piercing element receiving opening, an electric motor head including an armature shaft, two telescopic members one connected to the support and the other with the motor head, a tool stock adapted to be rotated by the armature shaft and movable with and rotatable within one telescopic member, a piercing tool carried by the stock, one telescopic member having a bayonet slot therein including a longitudinal slot portion and a lateral slot portion, a detent carried by the other telescopic member and projected into the bayonet slot to guide telescopic movement of the telescopic members and to enter the lateral slot portion and hold the members at the tool raised position, and a safety stop lip projecting into the lateral slot portion to be engaged by the detent to lock the parts against inadvertent collapse, said detent being mounted on a finger releasable spring support countersunk into the outer wall of one of the telescopic members and accessible when the tool is fully raised.

3. In a device of the class described, a support having a sight opening and a central piercing element receiving opening, an electric motor head including an armature shaft, two telescopic members one connected to the support and the other with the motor head, a tool stock adapted to be rotated by the armature shaft and movable with and rotatable within one telescopic member, a piercing tool carried by the stock, one telescopic member having a bayonet slot therein including a longitudinal slot portion and a lateral slot portion. a spring detent carried by the other telescopic member and projected into the bayonet slot to guide telescopic movement of the telescopic members and to enter the lateral slot portion and hold the members at the tool raised position, and a safety stop lip projecting into the lateral slot portion to be engaged by the detent to lock the parts against inadvertent collapse, said bayonet slot equipped telescopic member having a cam slotway extending through the end thereof adjacent the lateral slot portion to facilitate movement of the spring detent into the bayonet slot when assembling the telescopic members to coactive relation.

4. In a device of the class described, a support having a sight opening and a central piercing element receiving opening, an electric motor head including an armature shaft, two telescopic members one connected to the support and the other with the motor head, a tool stock adapted to be rotated by the armature shaft and movable with and rotatable within one telescopic member, a piercing tool carried by the stock, one telescopic member having a bayonet slot therein including a longitudinal slot portion and a lateral slot portion, a detent carried by the other telescopic member and projected into the bayonet slot to guide telescopic movement of the telescopic members and to enter the lateral slot portion and hold the members at the tool

raised position, and a safety stop lip projecting into the lateral slot portion to be engaged by the detent to lock the parts against inadvertent collapse, said detent being mounted on a finger releasable spring support countersunk into the outer wall of one of the telescopic members and accessible when the tool is fully raised, and a stop screw to limit releasing movement of the detent.

5. In a device of the class described, a support having a single opening and a central piercing element receiving opening, an electric motor head including an armature shaft, two telescopic members one connected to the support and the other with the motor head, a tool stock movable with and rotatable within one telescopic member, meshing speed change gears on the armature shaft and tool stock adapted to impart rotation from the former to the latter and to offset them, a gear case to house the gears and secured to the motor head and to the said other telescopic member, a piercing tool carried by the stock, one telescopic member having a bayonet slot therein including a longitudinal slot portion and a lateral slot portion, a detent carried by the other telescopic member and projected into the bayonet slot to guide telescopic movement of the telescopic members and to enter the lateral slot portion and hold the members at the tool raised position, and a safety stop lip projecting into the lateral slot portion to be engaged by the detent to lock the parts against inadvertent collapse.

In testimony whereof I hereunto affix my signature.

HARLEY C. MOULTON.