W. F. LAUTENSCHLAGER.

PERFORATING MACHINE.

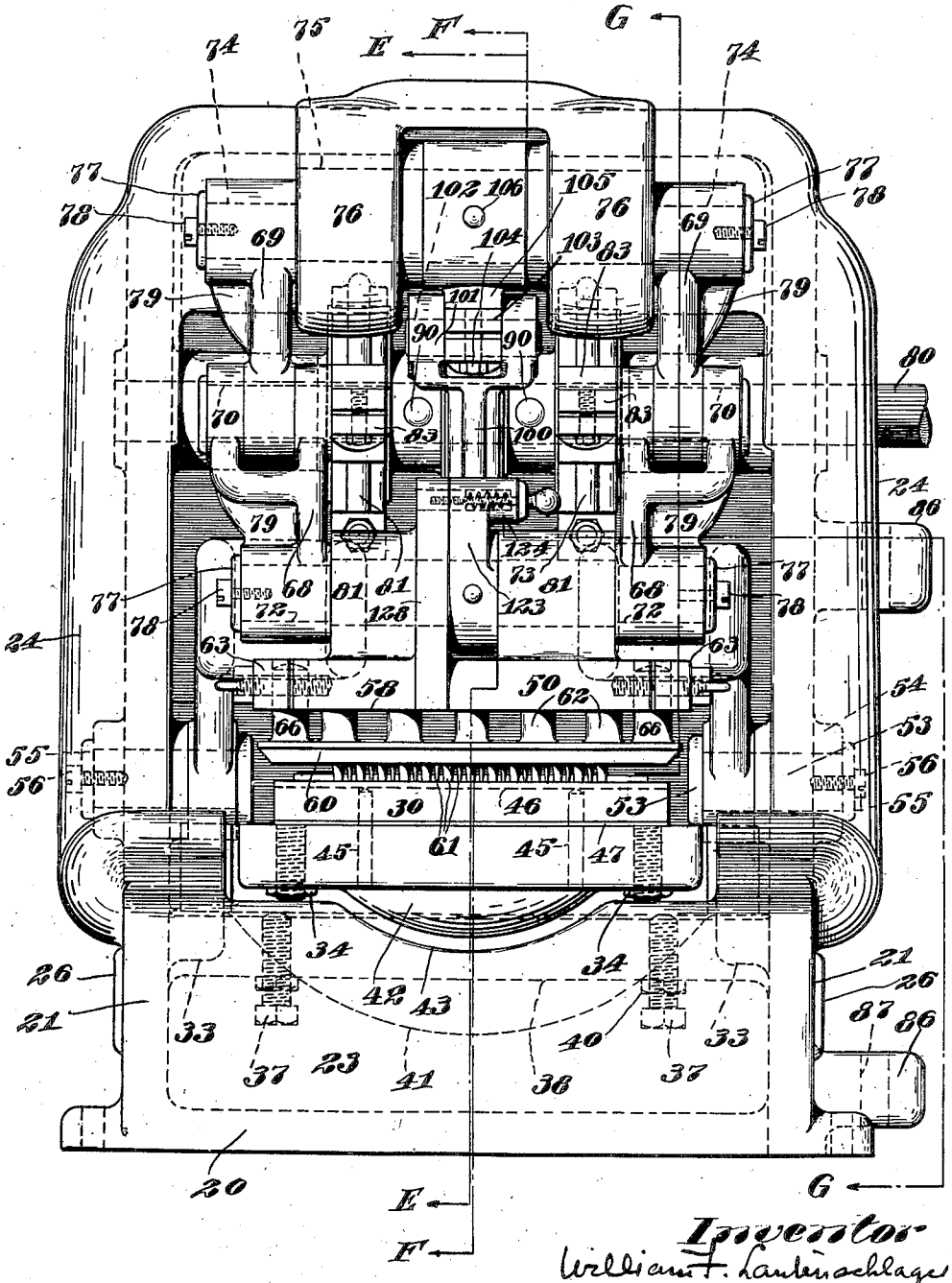
APPLICATION FILED NOV. 3, 1921.

1,434,060.

Patented Oct. 31, 1922.

7 SHEETS—SHEET 1.

Fig. 1.



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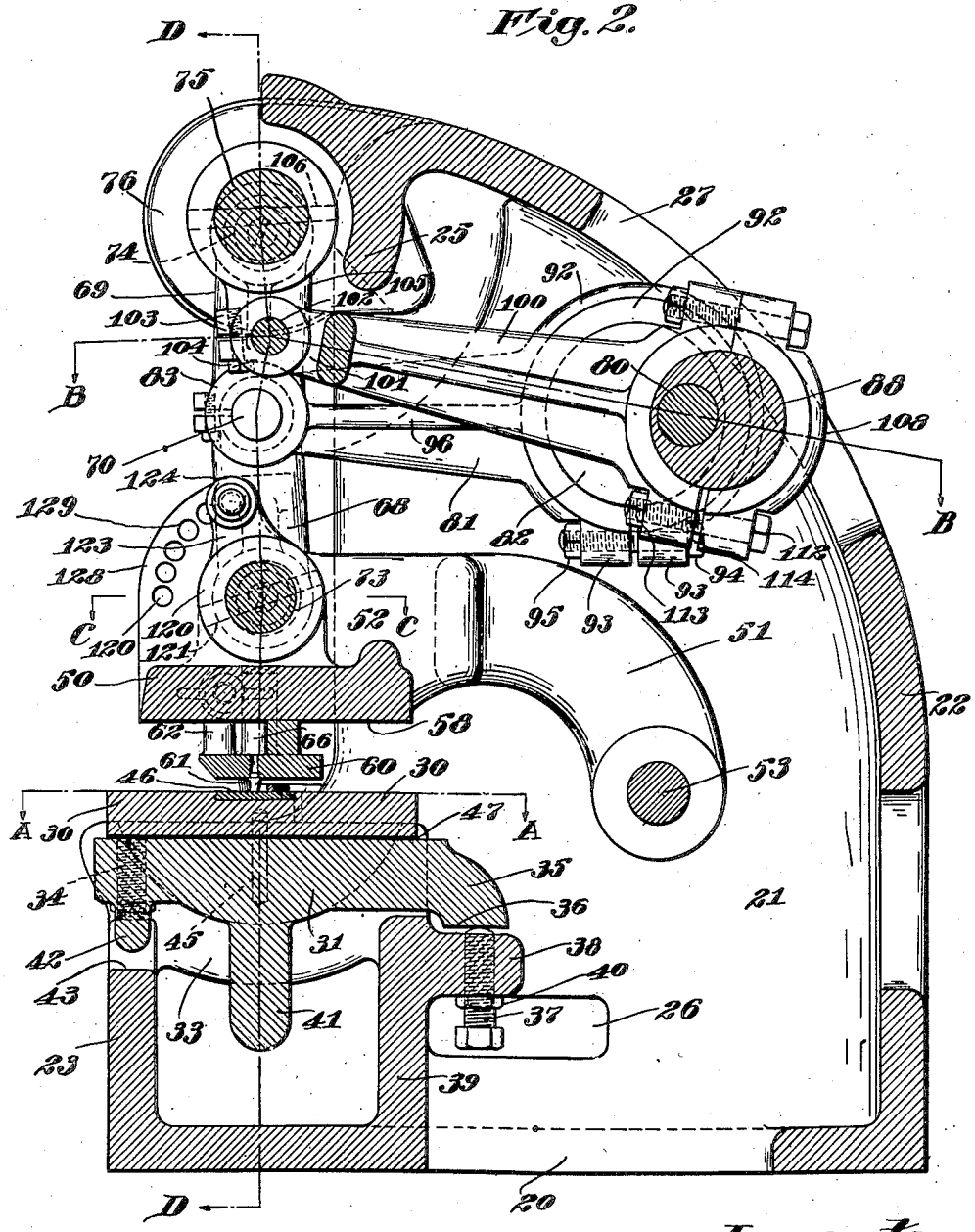
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7 SHEETS—SHEET 2.

Fig. 2.



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7 SHEETS—SHEET 3.

Fig. 4.

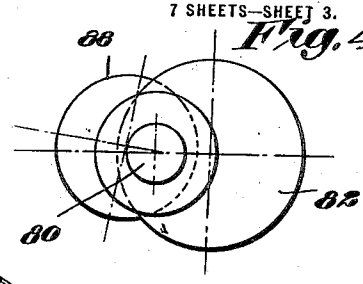


Fig. 3.

Fig. 5.

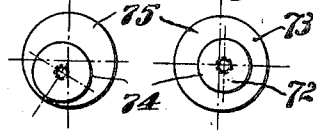


Fig. 6.

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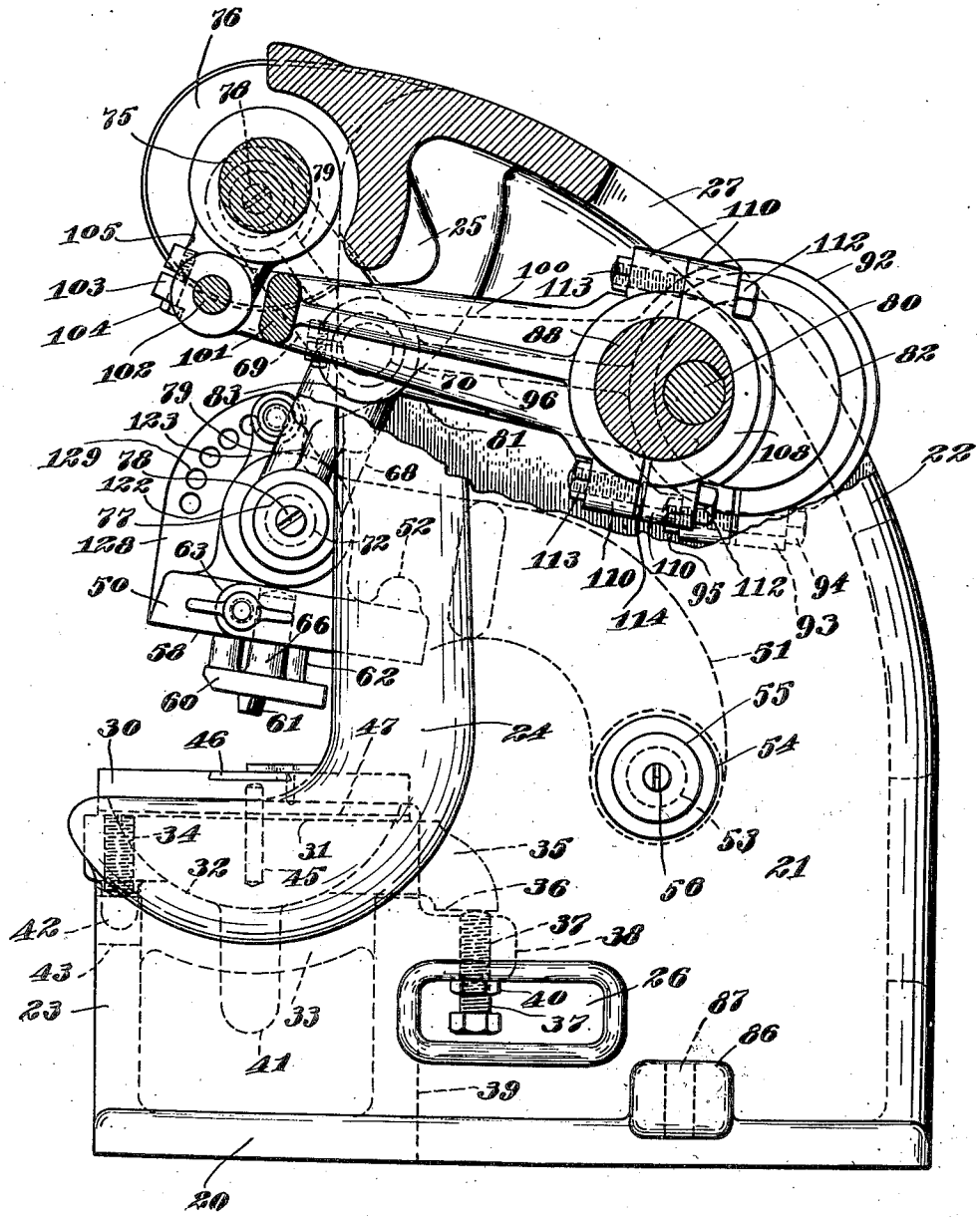
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7 SHEETS—SHEET 4.

Fig. 7.



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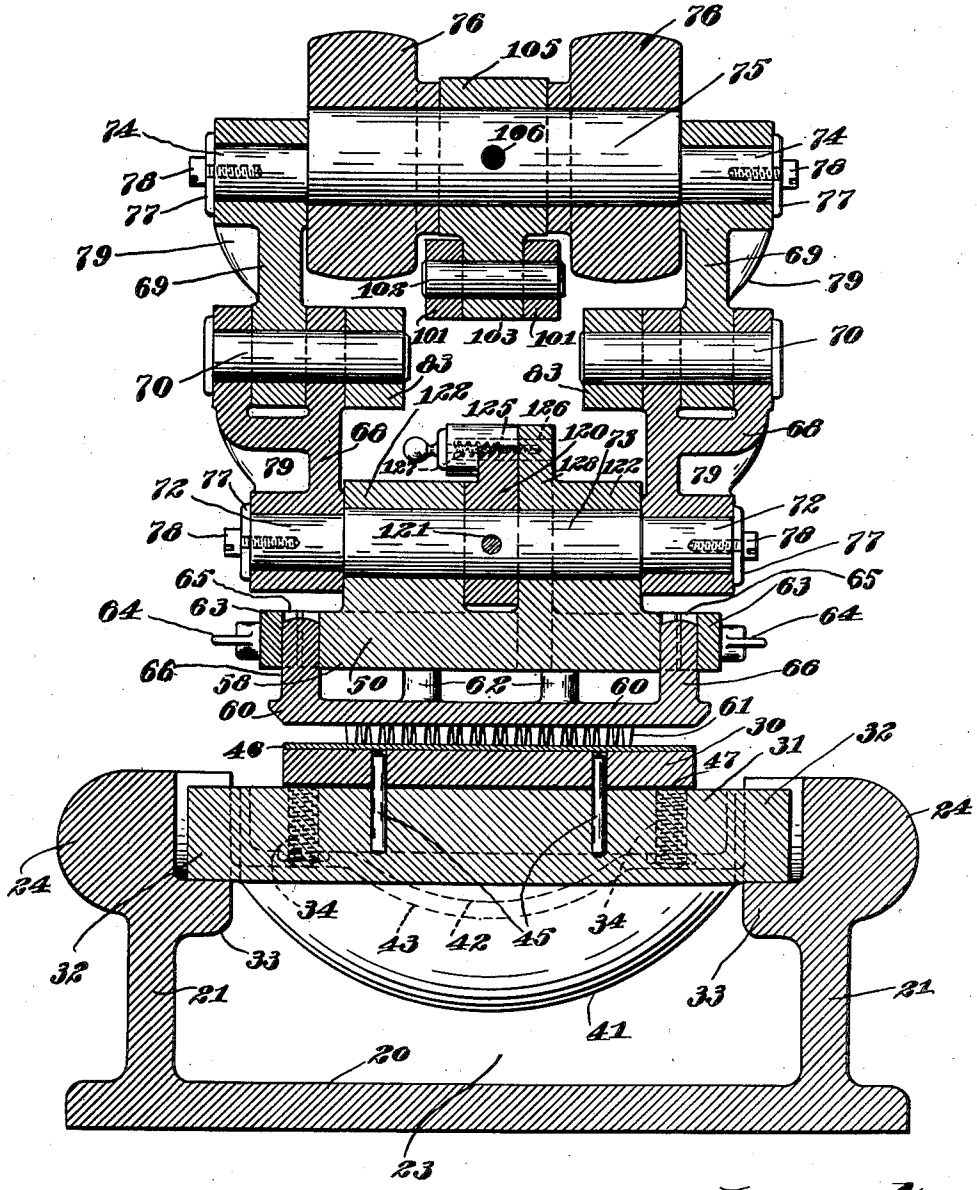
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7 SHEETS—SHEET 5.

Fig. 6.



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7 SHEETS—SHEET 6.

Fig. 9.

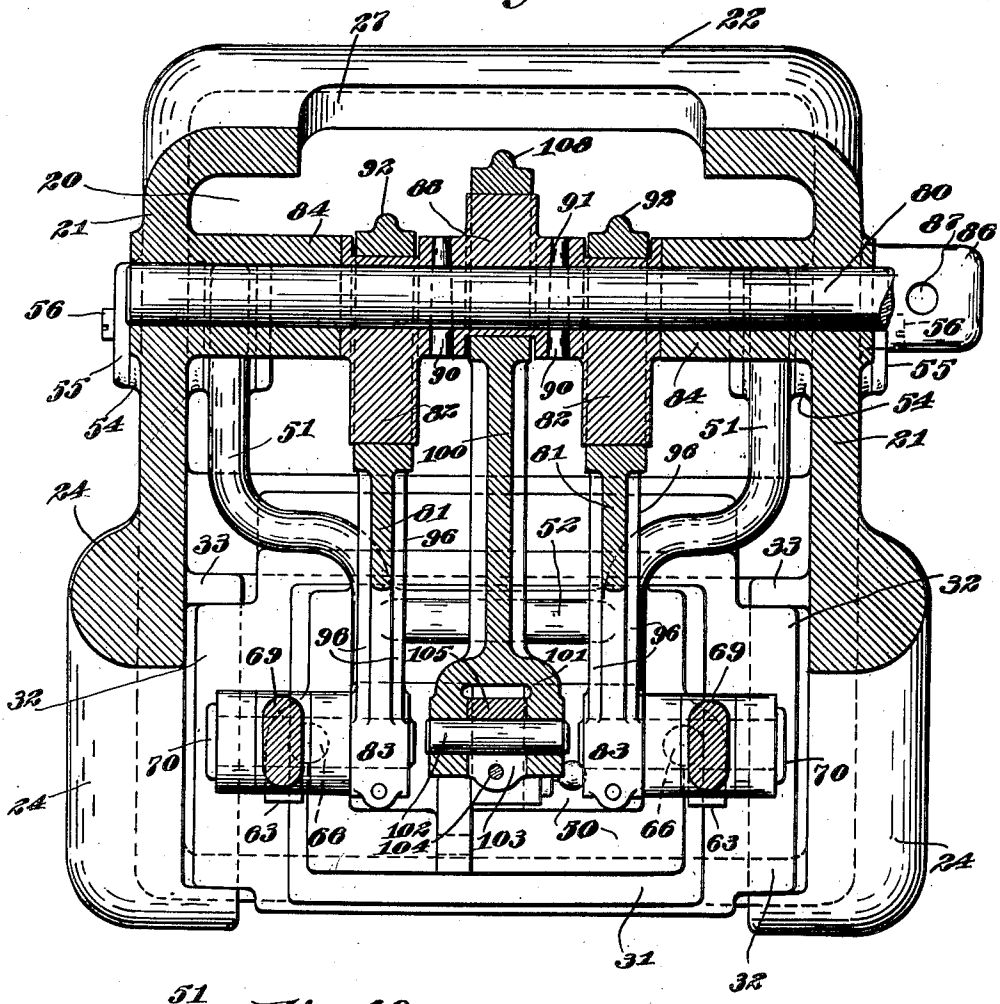
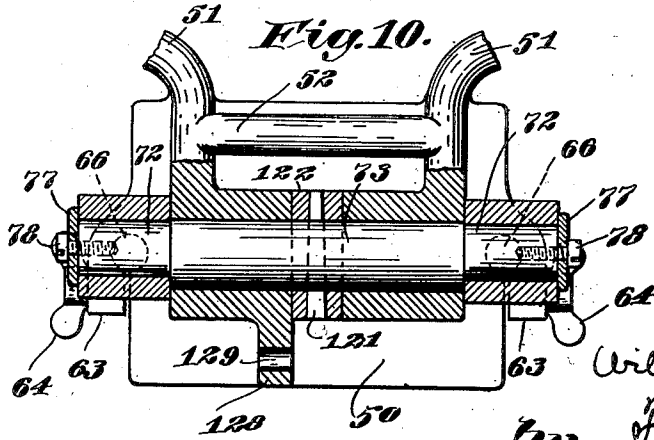


Fig. 10.



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1,434,060.

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7 SHEETS—SHEET 7.

Fig. 11.

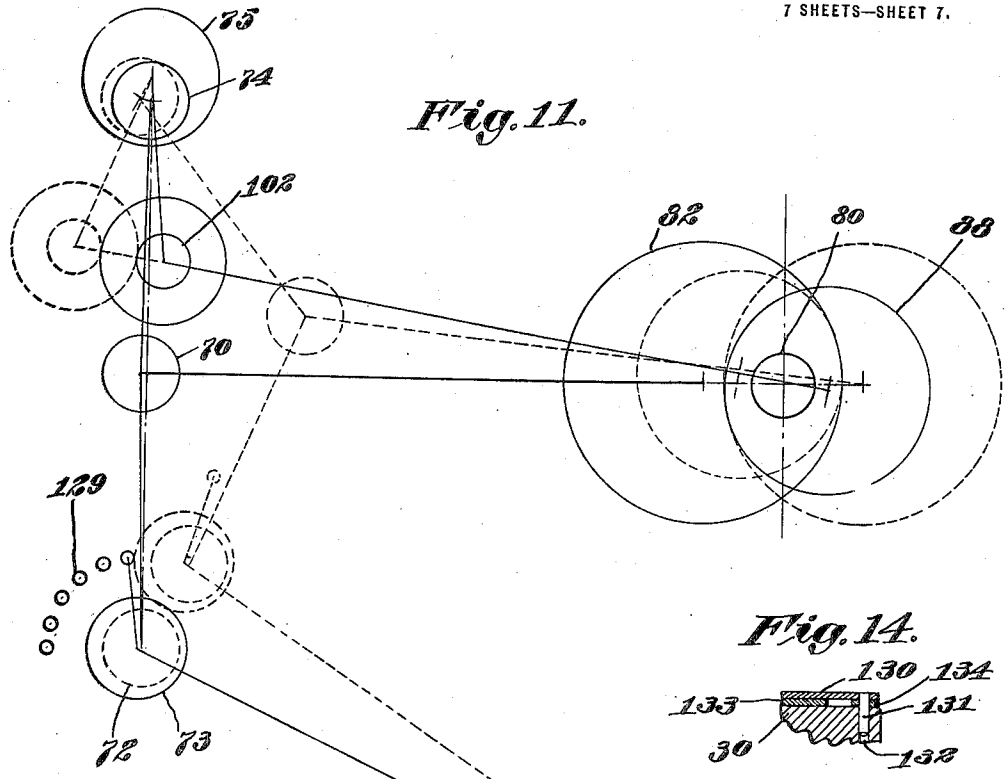


Fig. 14.

Fig. 12.

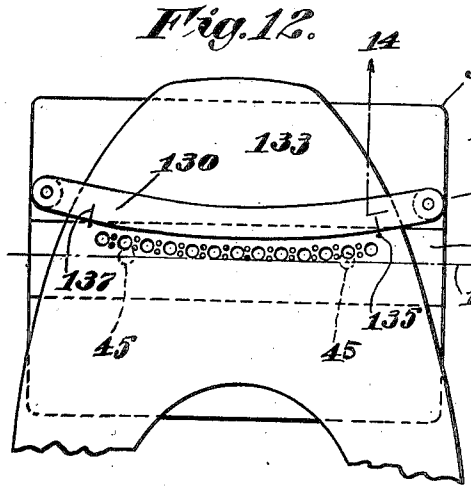
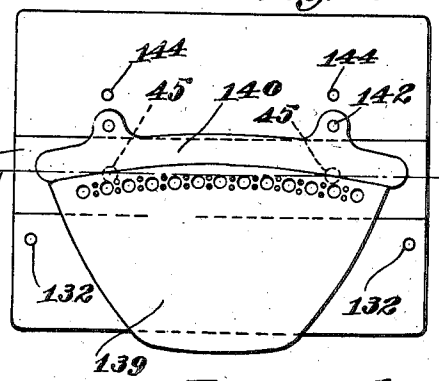


Fig. 13.



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Patented Oct. 31, 1922. 1,434,060

UNITED STATES PATENT OFFICE.

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PERFORATING MACHINE.

Application filed November 3, 1921. Serial No. 512,609.

To all whom it may concern:

Be it known that I, WILLIAM F. LAUTENSCHLAGER, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Improvement in Perforating Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to perforating machines and more particularly to a machine of that class in which a die carrying plunger is employed for perforating a complete pattern or design upon each operation.

Heretofore, most of the machines of the above character have been open to a serious objection, namely, that the operator is unable, at any time, to have an unobstructed view of the work-support. This has been due to the fact that in these machines the plunger moves vertically through a very short stroke and even when in a raised position, the plunger is so close to the work-support that the latter cannot be seen by the operator. In the use of such machines the operator is obliged to place the work upon the work-support and in engagement with the gauge through the sense of touch alone, in consequence of which it is difficult to secure the proper placing of the perforations on the shoe part. Frequently, because of this inability to see the work-support, the perforated design is misplaced, rendering the shoe parts worthless and involving a serious loss of time and material. At the same time, the inability of the operator to see the work and the desire to prevent mistakes, has the effect of slowing down the perforating operation of the machines of this character, thereby increasing the cost of operation.

The main object of my invention is the provision of a perforating machine employing a die carrying plunger in which the work can be seen by the operator when placed in position upon the work-support, and I accomplish this end by having the plunger pivotally mounted and means for operating the plunger so arranged that not only is the length of the stroke of the plunger increased but the forward side of the plunger is turned upwardly at an angle to the work-support in order to permit a full view of the entire work-support when the plunger is in a raised position.

Another object of the invention is the provision of a machine which is simple and efficient both in construction and operation and which may be operated with comparative rapidity.

A further object is the provision of a machine in which clear and distinct perforating may be obtained even though the perforating edges of the die may be slightly dull, and to accomplish this result I provide means whereby a heavy pressure is exerted in a downward direction upon the plunger at the end of its downward stroke.

An additional object of the invention is the provision of a machine capable of being used for all kinds of pattern perforating, and to this end I provide dies so mounted that they are capable of being reversed upon the plunger in order to enlarge the scope of the work done by the machine.

Another object is the provision of means carrying the work-support so constructed as to be capable of accurate adjustment and which requires no further adjustment after the initial one.

Other objects of the invention will be more specifically set forth and described hereinafter.

One of the important features of my invention consists in so mounting the die carrying plunger that a clear and unobstructed view of the work-plate is afforded the operator when the plunger is in its normal raised position. Preferably, I accomplish this result by pivotally mounting the plunger on a centre which is in the rear of the work-support and away from the operator, but in the same plane as the upper face of the work-support. The raising of the plunger around its pivot line thereby tilts the forward edge of the plunger upwardly, thereby exposing the entire work-support to the view of the operator. At the same time, this construction permits the plunger to be given a longer stroke. The advantages of this feature are important; it insures absolute correctness in the positioning of the work upon the work-support and against the gauge, thereby preventing the damage now common in machines where the operator is unable to see the work and also increases the speed at which the operator can adjust the work in position and operate the machine.

Another important feature of my invention resides in the means provided for giv-

ing the final pressure to the plunger to accomplish the perforating operation. The use of a pivotally mounted die carrying plunger makes it difficult, as a mechanical proposition, to exert sufficient final pressure upon the plunger without constructing the means for operating the plunger of extreme size. This is especially true where the movement of the plunger is accomplished by the use of eccentrics or equivalent means. In order to avoid this complication I provide means by which the final pressure upon the plunger is exerted in a downward direction upon its end, said means being so arranged as to be capable of a fine adjustment in order to regulate this final pressure, and the final movement of the plunger, due to this pressure. This construction insures a clean cutting of the perforations even although the dies may be somewhat dull, and the fine adjustment enables the dies to be used for a long period without excessive wear.

Yet another important feature of my invention resides in the provision of a tube die and a work-support of such form as to be capable of reversal in the machine in order to extend the scope of the work handled by the machine. In the use of a machine of this character in the shoe industry, it is necessary in perforating shoe tips to place the work in the machine with the toe portion of the tip toward the operator and in perforating vamps with what is termed imitation tip perforating, because no shoe tip is used on the shoe, the vamp is placed in the machine with the toe portion away from the operator. Heretofore, in order to take care of these two kinds of work, it has been necessary to provide either two machines or two dies. In some cases it has been possible to do both of these kinds of work on a single machine, yet that has required the use of two tube dies which involves a very large expense because tube dies for this purpose are extremely expensive. In my machine, however, I am enabled to use one die for doing both kinds of work by merely reversing the die and work-support in the machine without requiring any other adjustment. My method of doing this requires a few additional gauges only, but as these gauges are of simple construction, it involves a comparatively small expense.

In the drawings illustrating one embodiment of my invention, Figure 1 is a front elevation of a machine constructed and adapted to be operated in accordance therewith, showing the plunger in perforating position at the end of its downward stroke; Fig. 2 is a vertical sectional view on line E—E in Fig. 1; Fig. 3 is a vertical sectional view on line F—F in Fig. 1, but showing the plunger in a raised position; Fig. 4 is a diagrammatic view of the eccentrics on the main shaft for operating the toggle joints in the position shown in Fig. 3; Figs. 5 and 6 are similar views of the eccentrics at the upper and lower ends respectively of the toggle joints in the positions shown in Fig. 3; Fig. 7 is a side elevation of the machine partly in section on line G—G in Fig. 1; Fig. 8 is a vertical sectional view on line D—D in Fig. 2; Fig. 9 is a cross sectional view on line B—B in Fig. 2; Fig. 10 is a cross-sectional view on line C—C in Fig. 2; Fig. 11 is a diagrammatic view showing in dash lines the positions of the various parts of the machine in its normal position of rest with the plunger raised and in full lines the positions of the various parts when the plunger is in operative, that is, perforating position; Fig. 12 is a plan view of the work-support on line A—A in Fig. 2 showing a shoe vamp in position to receive imitation perforating; Fig. 13 is a similar view of the work-support showing a shoe tip in position to be perforated, the die being reversed; and Fig. 14 is a sectional view on line 14—14 in Figure 12.

In the drawings illustrating the preferred embodiment of my invention, there is shown a frame which may be of any suitable form, but preferably comprises a base 20, two sides 21 and a back 22 curving upwardly and toward the front which is open with the exception of a front plate 23 extending a short distance upwardly from the base 20. The frame is of substantial construction adapted to withstand the operation of the machine and may be strengthened by rounded projecting ribs 24 on the sides 21, and a depending cross rib or flange 25 at the top. Openings 26 may be provided in the side plates to permit access to adjusting screws and an opening 27 in the back 22 is required for the main shaft eccentrics.

For supporting the work in the machine, a work-support 30 is mounted on a bed-plate 31, which is provided with ends 32 adapted to rest on flanges 33 formed on the inner faces of the sides 21 of the frame. The engaging faces of the ends 32 and flanges 33 are cut on a circle whereby the bed-plate may be turned laterally in one direction or the other upon said flanges as bearings in order to secure proper lateral adjustment, and for this purpose headed adjusting screws 34 are threaded into the front portion of the bed-plate. The heads of the screws 34 engage the top of the front plate or web 23 of the frame, and by turning the screws in one direction or the other, the front side of the bed-plate may be raised or lowered as desired. The rear side 35 of the bed-plate is turned downwardly and provided with a face 36 adapted to engage screws 37 threaded through a flange 38 formed on an upright web 39 constituting a part of the frame. The screws 37 may be secured in adjusted position by lock-

washers 40 and preferably the adjusting of the bed-plate is done by the manipulation of the screws 37 alone. To increase the strength of the bed-plate which is subjected to considerable pressure during the perforating operation, it may be provided with a central flange 41 and a smaller parallel flange 42 on its front side. The front plate or web 23 of the frame is cut away on a curved line at 43 to correspond to the flange 42.

For holding the work-support upon the bed-plate, the latter may be provided with two upwardly projecting dowels 45 and the former with two holes to receive the said dowels. A thin strip 46 of soft brass or other suitable material may be inset in the top surface of the work-support 30 to receive the perforating edges of the tube die to avoid injury thereto, and, if desired, the edge of the recess may be undercut and the longitudinal edges of the strip 46 may be bevelled to hold the latter within the former.

Between the work-support and the bed-plate a thin sheet of resilient material 47, such, for instance, as sheet rubber, may be interposed for taking up the final shock of the impact of the die upon the work-support. I have found that the use of such means diminishes the shock on the die and thereby greatly increases its life without at all lessening its perforating action. In fact, the interposition of a resilient material between the work-support and bed-plate permits of such adjustment of the movement of the die-carrying plunger that sharp and clean perforations are assured without noticeable wear upon the cutting edges of the die.

Pivotally mounted within the frame is a die-carrying plunger comprising a plunger-head 50 carried by two arms 51 connected together by a cross-piece 52, (see Figs. 2 and 9), all being preferably integral. Each arm 51 is pivotally mounted at its rear end upon a headed shaft 53 in a bearing 54 formed in one side 21 of the frame and held therein by the head of the shaft on the inner side and by a washer 55 and a screw 56 threaded into the end of the shaft on the outer side. The shafts 53 are so located that their centers lie in the same plane as the top surface of the work-support 30. The lower face 58 of the plunger head 50 is finished smooth to form an abutment surface for the perforating die and this face lies in a plane parallel to the plane of the work-support when the plunger is in a lowermost position.

The die comprises a plate 60 provided with a plurality of tube dies 61 of ordinary construction, set in the plate and arranged in a design and to permit the material cut out by the tube dies to pass up through the dies and the plate 60 and then to escape, the latter is provided with a series of lugs 62 adapted to engage the face 58 of the plunger head when the die is arranged in position and to hold the plate away from the plunger head. Any suitable means may be provided for holding the die in position on the plunger head and one such means is shown comprising two ears 63, one on each end of the plunger head; each ear being adapted to be forced toward the end of the plunger head by a butterfly headed screw 64 threaded therethrough and into said end in order to contract a dowel hole 65 at the base of the ear to grip a dowel 66 formed on the back face of the die-plate 60. By the manipulation of the two screws 64, the die may be mounted on or removed from the plunger head without appreciable effect and in an inappreciable period of time.

For lowering and raising the plunger, I provide two toggle joints adapted to be straightened and broken by the operation of the main shaft of the machine. Each toggle joint is made up of a lower arm 68 and an upper arm 69, pivotally connected together by a shaft 70; the upper end of the lower arm 68 being preferably bifurcated to receive the lower end of the upper arm 69, and thereby prevent lateral motion during the operation of the machine. The two lower arms 68 at their lower ends are suitably formed to each receive one end 72 of a shaft 73 which is rotatably mounted in the upper part of the plunger head 50 and the upper arms 69 are similarly formed at their upper ends to each receive one end 74 of a shaft 75 rotatably mounted in two suitable bearings 76 integral with the frame of the machine. (See Fig. 8.) The arms 68 and 69 may be locked on their respective shafts 73 and 75 by any suitable means such as a washer 77 and screw 78 threaded into the end of the shaft in each case. The arms 68 and 69 may be re-enforced by webs 79.

The toggle joints may be operated from the main shaft 80 by any suitable means and one such is shown in the drawings consisting of two pitmen 81 each mounted on an eccentric 82 on the main shaft 80 and having its other end in the form of a split collar 83 adapted to encircle the inner end of one of the shafts 70, the junction of a toggle joint. The main shaft 80 is rotatably mounted in suitable bearings 84, each formed on the inner face of one of the sides 21 of the frame, and one end of said shaft extends beyond the frame and may be connected to any suitable source of power by a clutch not shown. Each perforating operation of the machine requires one complete revolution of the main shaft and consequently any form of clutch which permits an intermittent operation of this character may be used. Such a form of clutch is shown in a copending application for perforating machine filed by me in the United

States Patent Office on October 18, 1921, Serial No. 508,493, to which reference may be made for a more complete description of its construction and operation. This clutch there shown is adapted to be operated by a foot treadle and in this application the frame is shown provided with a lug 86 having a hole 87 to receive a rod connection between the clutch and treadle.

Preferably, the two eccentrics 82, together with a third eccentric 88, arranged midway, are formed in one piece, as shown in Figure 9, and bored to receive the main shaft 80. By making these three eccentrics in one integral piece and keying this piece upon the main shaft by means of keys 90 adapted to be inserted in keyholes 91 and through the shaft, all adjustments of the eccentrics in relation to each other are avoided and the true relation between them is always maintained. Each pitman 81 may be provided with an integral split strap 92, the ends of the strap being provided with lugs 93 threaded to receive a bolt 94 and nut 95 whereby the strap may be drawn into tight engagement with the eccentric as shown in Figure 3. The strap 92 is in each case of slightly less circumference on its inside face than the circumference of the eccentric which results in a gap between the two ends 93 of the strap, thereby permitting the strap to be tightened up to take up any wear. The pitman 81 may be re-enforced with longitudinal ribs 96.

As stated heretofore, the eccentrics 82 are are employed merely for straightening and breaking the toggle joints in order to lower and raise the plunger and are not of sufficient size to exert a perforating pressure upon the head of the plunger. In order to accomplish the final downward movement of the plunger head with force sufficient to perforate, I provide means for forcing both toggle joints as a unit in a downward direction during the downward movement of the plunger. This result may be accomplished by various means, one of which is the following. The two ends 74 of the shaft 75 are eccentric to the main body 75 of the shaft, so that the rotation of the shaft 75 raises and lowers the upper ends of the arms 69, thereby raising and lowering the toggle joints. To control this movement from the main shaft, the ecectric 88 is arranged on the main shaft, as heretofore explained, between the two eccentrics 82 and upon the eccentric 88 is mounted a pitman 100 having its free end in the form of a yoke 101 connected by a pin 102 to a split collar 103 fastened by a screw 104; said split collar being carried by a short arm 105 mounted on the shaft 75 between the bearings 76 and secured to said shaft by a key 106. The pitman 100 is held upon the eccentric by means of a split strap 108, this strap being split on both sides and each portion of the strap being provided with lugs 110 on its two ends; said lugs being provided with threaded holes to receive bolts 112 and nuts 113 whereby the two portions of the strap may be fastened together around the eccentric 88. The loose portion of said strap is of such dimensions that when tightened on one side there remains a slight gap 114 on the other side to permit of the two portions of the strap being drawn together at that point to take up wear.

It is essential that the eccentric 88 be so positioned on the main shaft 80 in relation to the eccentric 82 that the arm 105 reaches the end of its movement to the right, referring to Fig. 2, at approximately the same time that the toggle joints reach the end of their movement to the left. At this point, illustrated in Fig. 2, the centers of the shaft 102, the main shaft 80 and the eccentric 88 lie in one straight line and the centers of the shaft 70, that is, the junction point of the toggle joints, the main shaft 80 and the eccentrics 82 all lie in another straight line. These two lines determine the relative location on the main shaft of the eccentrics 88 and 82, and since the arm 105 is shorter than the upper arms 69 of the toggle joints, and is eccentrically mounted with respect to the upper mounting of said arms 69, the two lines are at an angle to each other.

In order to secure a fine adjustment of the die with respect to the work-support at the time of perforating, means may be provided for adjusting the plunger head in relation to the toggle joints. The ends 72 of the shaft 73 upon which the lower ends of the lower arms 68 are mounted are arranged eccentrically with respect to the main body 73 of the shaft so that by turning the shaft 73 the plunger head may be moved within certain limits upwardly and downwardly in relation to the toggle joints. For this purpose a collar 120 may be secured by a pin 121 to the shaft 73 between the bearings 122 in the plunger head 50 and is provided with an arm 123 carrying a lug 124 provided with a chamber 125 within which is mounted a pin 126; the pin being maintained in an outward position by a spring 127. One of bearings 122 may be provided with a quadrant 128 adjacent to the lug 124 and may be provided with a series of holes 129 arranged in a quarter circle and adapted to be engaged by said pin 126 so that the shaft 73 may be rotated through a quarter circle to raise or lower the plunger head in relation to the toggle joints by pulling out the pin, then making the adjustments and allowing the pin to engage one of the holes in its adjusted position. This, it will be observed, permits the head of the plunger to be finely adjusted in relation to the toggle

joints, and thereby to secure a final perforating adjustment which will insure proper work without injuring the cutting edges of the die.

In Figures 12 and 13 of the drawings is shown two positions of the work-support 30 illustrating the method of reversing the die 60 and the work-support in the machine for the purpose of doing different kinds of work. In Figure 12 the work-support is shown in position for imitation perforating on a vamp in which the vamp is presented to the machine toe end foremost. This requires the use of a simple gauge 130 mounted on pins 131 adapted to engage corresponding holes 132 in the work-support. (See Fig. 14.) As the toe portion of the vamp 133 is inserted under the gauge, the latter is provided with washers 134 mounted on the pins under the gauge for the purpose of raising it from the top surface of the work-support in order to permit the toe portion of the vamp to be inserted between the gauge and work-support. It is customary in this work to mark the vamp 133 with pin points 135 and when the vamp is inserted in the machine these pin points are aligned against the lines 137 on the gauge. In Figure 13 is illustrated the method of using the machine for perforating tips 139. In this case the die and work-support are reversed from the position shown in Fig. 12, and a gauge 140 of different form is provided with pins 142 adapted to engage similar holes in the work-support. Additional holes 144 may be provided in order to move the gauge further away from the die where a wider margin between the perforations and the edge of the tip 139 is desired. The tip is presented to the machine by holding its edge 145 in engagement with the gauge 140 which rests upon the top surface of the work-support. It will be noticed that the dowel holes in the work-support are centered on a line 150 which just engages one side of the design so that the design in its entirety is located on one side or the other of this straight line. The dowels 62 in the die are positioned in the same manner. By arranging all designs in engagement with said line I am enabled to locate the holes for receiving the gauges absolutely so that both the die and work-support may be reversed in the machine to suit the various kinds of work without requiring anything further than a change in gauges.

The operation of my machine is as follows: The normal position of the machine is shown in Fig. 3 with the plunger in raised position. The operator sits in front of the machine where she has a full and complete view of the work-support, and places the work upon the said support in suitable relation to the gauge. She then depresses the treadle, throwing in the clutch and the main shaft starts to revolve. The revolution of the main shaft turns the eccentrics 82 advancing the pitman 81 toward the front of the machine and straightening the toggle joints, which moves the plunger pivotally downwardly. At the same time the eccentric 88 moves the pitman 100 from front to rear, thereby gradually lowering the suspension point of the toggle joints and forcing them downwardly to move the plunger in the same direction. In Fig. 11, showing the operation of the machine diagrammatically, the dotted lines indicate the positions of the various parts while the machine is in a normal state of rest and before the power has been applied, and the solid lines indicate the final position of the parts at the completion of the perforating operation. At this latter point it will be observed that the eccentrics 82 are at the extreme of their forward movement and that the center of the joint of the toggle joints has passed beyond a straight line joining the centers of the ends 72 and 74 of the two shafts 73 and 75.

The continued rotation of the main shaft after the perforating operation has been completed then raises the plunger by breaking the toggle joints and at the same time raises the suspension point of said joints and the machine returns to its normal position after one complete revolution of the main shaft. The operator may operate the machine continuously by keeping the treadle depressed, or may operate the machine in a step-by-step manner, each step being one complete revolution of the main shaft, by merely depressing the treadle and then releasing it before the shaft has completed a revolution.

It will be noticed that at the extreme end of their forward movement the junction points of the toggle-joints pass beyond a straight line connecting the two centers of the two ends of each toggle-joint, this being shown in detail in Fig. 11. This result is due to the fact that the two arcs of movement of the upper end of the lower arm and the lower end of the upper arm of each toggle-joint while in theory touching at only one point, in practice coincide for an appreciable distance without effecting the height of the plunger in a vertical direction. The perforating pressure of the tube die is therefore exerted upon the material and the work-support throughout an arc of movement of the junction point of the toggle-joints of a number of degrees, thereby contributing to a clean cutting action of the tube die. By making the work-support resilient, the pressure of the tube dies upon the work-support in excess of the perforating pressure is taken up by the resiliency of the work-support without injuring the cutting edges of the die.

In order to change the machine from tips

to vamps, all that is necessary to do is to reverse the work-support upon the bed-plate and the die in the plunger head and place the proper gauge on the work-support. This is an operation which requires little effort and can be accomplished in a very few moments. To change the machine from vamps to tips is an equally simple operation. By making my machine adapted to these two kinds of work I accomplish in one machine what, up to the present time, has generally required two machines, or two dies if one machine is used.

It is to be understood that my invention may be embodied in other forms of construction than that herein shown and described, and my invention is not to be limited to any specific form of construction.

What I claim is:—

1. A perforating machine having, in combination, a work-support, a plunger pivotally mounted on a fixed axis, a tube die carried by said plunger, a pair of toggle joints connected to said plunger and means for operating said toggle joints to lower and raise said plunger to perforate the material upon the work-support.

2. In a perforating machine, the combination of a pivotally mounted, die-carrying plunger, adapted to move in the arc of a circle and normally held in a raised position permitting a full view of the work, and toggle-jointed means for operating said plunger.

3. In a perforating machine, the combination of a work-support, a die-carrying plunger pivotally mounted at its rear end, adapted to move in the arc of a circle and normally in a raised position, permitting a full view of the work on said support, perforating means carried by said plunger, and toggle-jointed means for operating said plunger to perforate the material upon said work-support.

4. A perforating machine having, in combination, a work-support, a die, die-holding means, said means being normally in a raised position permitting the operator to have a full view of the work upon said work-support, means for operating said die-holding means to perforate the work and means for lowering said operating means in order to impart the final perforating pressure.

5. A perforating machine having, in combination, a work-support, a die, die-holding means, said means being normally in a raised position permitting the operator to have a full view of the work upon said work-support toggle-jointed means for operating said die-holding means to perforate the work and means for lowering said operating means in order to impart the final perforating pressure.

6. A perforating machine having, in combination, a work-support, a die, die-holding means pivotally mounted on a fixed axis, said means being normally in a raised position permitting the operator to have a full view of the work upon said work-support and toggle-jointed means for operating said die-holding means to perforate the work.

7. A perforating machine having, in combination, a work-support, a plunger pivotally mounted and normally in a raised position permitting a full view of the work upon said work-support, a perforating die carried by said plunger, a pair of toggle joints for supporting the free end of said plunger, means for straightening and breaking said joints to lower and raise said plunger and means for forcing said toggle joints downwardly during the straightening movement thereof in order to secure a heavy pressure at the conclusion of the perforating operation.

8. A perforating machine having, in combination, a work-support, a plunger pivotally mounted and normally in a raised position permitting a full view of the work upon said work-support, a perforating die carried by said plunger, a pair of toggle joints connected at the lower ends to said plunger and having their upper ends eccentrically mounted on a rock-shaft, means for operating said toggle joints to lower and raise said plunger and means for rocking said rock-shaft to lower said toggle joints during the downward movement of the plunger.

9. A perforating machine having, in combination, a work-support, a plunger, a perforating die carried by said plunger, a pair of toggle joints for lowering and raising said plunger and means for lowering said toggle joints during the downward movement of the plunger in order to increase the length of its downward stroke.

10. A perforating machine having, in combination, a work-support, a plunger, a perforating die carried by said plunger, a rock-shaft, a pair of toggle joints connected at their upper ends to said rock-shaft and at their lower ends to said plunger means for straightening and breaking said toggle joints to lower and raise said plunger and means for turning said rock-shaft to drop said toggle joints to increase the length of the downward stroke of said plunger.

11. A perforating machine having, in combination, a work-support, a plunger, a perforating die carried by said plunger, a rock-shaft, a pair of toggle joints connected at their upper ends eccentrically to said rock-shaft and at their lower ends to said plunger, means for straightening and breaking said toggle joints to lower and raise said plunger and means for rocking said rock-shaft in order to lower said toggle joints during the downward movement of the plunger.

12. A perforating machine having, in combination, a work-support, a pivoted plunger, a perforating die carried by said plunger, a pair of toggle joints for lowering and raising said plunger, the lower ends of said toggle joints being eccentrically connected to said plunger to permit of relative adjustment of said plunger in relation to said toggle joints and means for operating said toggle joints to lower and raise said plunger.

13. A perforating machine having, in combination, a work-support, a pivoted plunger, a perforating die carried by said plunger, a pair of toggle joints for lowering and raising said plunger, the lower ends of said toggle joints being connected eccentrically to said plunger to permit of adjustment of the plunger in relation to the toggle joints, means for locking said plunger in its adjusted position with relation to said toggle joints and means for operating said toggle joints to lower and raise said plunger.

14. A perforating machine having, in combination, a work-support, a plunger pivotally mounted, a perforating die carried by said plunger, a rock-shaft, a pair of toggle joints connected eccentrically at their upper ends to said rock-shaft and eccentrically at their lower ends to said plunger, means for straightening and breaking said toggle joints to lower and raise said plunger and means for rocking said rock-shaft to lower said toggle joints during the downward movement of said plunger in order to lengthen the effective stroke of said plunger and to exert a perforating pressure thereon.

15. A perforating machine having, in combination, a work-support, a main shaft, a plunger pivoted on a fixed axis, a perforating die carried by said plunger, a pair of toggle joints for operating said plunger, eccentric means mounted on said main shaft for straightening and breaking said toggle joints to lower and raise said plunger.

16. A perforating machine having, in combination, a main shaft, a work-support, a pivoted plunger, a perforating die carried by said plunger, a rock-shaft, a pair of toggle joints connected eccentrically at their upper ends to said rock-shaft and at their lower ends to said plunger, means mounted eccentrically on said main shaft for operating said toggle joints to lower and raise said plunger and means mounted eccentrically on said main shaft for rocking said rock-shaft to lower said toggle joints during the downward movement of said plunger in order to extend the length of the effective stroke of the plunger and to exert the pressure necessary for the perforating operation.

17. In a perforating machine, the combination with a work-support and a perforating member of toggle-jointed means for operating said perforating member, and rotatable means for adjusting the relation between said member and said means.

18. In a perforating machine, the combination with a work-support, and a perforating member of toggle-jointed means for operating said perforating member and means for adjusting the relation between said member and said toggle-jointed means; said means comprising a shaft rotatably mounted in said perforating member, said shaft having eccentric ends adapted to receive said toggle-jointed means, and means for turning said shaft in either direction.

19. In a perforating machine, the combination with a work-support, a pivoted plunger and means for operating the said plunger of a perforating tube die provided with two dowels adapted to fit and to be secured in suitable holes in the plunger; the tubes on said die being all located on one side of a straight line drawn through the centers of said two dowels in order that the said die may be reversibly mounted on the plunger when desired.

20. In a perforating machine, the combination with a work-support, a pivoted plunger and means for operating the said plunger of a perforating tube die provided with two dowels adapted to fit and to be secured in suitable holes in the plunger; the tubes on said die being arranged to perforate a design which abuts a straight line drawn through the centers of said two dowels and lies entirely on one side of said line in order that the said die may be reversibly mounted on said plunger.

21. In a perforating machine, the combination with a work-support, a plunger and means for operating the said plunger of a perforating tube die provided with two dowels adapted to fit and to be secured in suitable holes in the plunger; the tubes on said die being all located on one side of a straight line drawn through the centers of said two dowels in order that the said die may be reversibly mounted on the plunger when desired.

22. In a perforating machine, the combination with a work-support and a perforating member of toggle-jointed means for operating said perforating member and means operating in a downward direction for applying the final perforating pressure on said perforating member.

23. In a perforating machine, the combination with a work-support and a perforating member of toggle-jointed means for operating said perforating member and rotatable means for adjusting the relation between said perforating member and said toggle-jointed means.

24. In a perforating machine, the combination with a work-support and a perforating member pivotally mounted of

means for operating said perforating member, said means being adjustable in relation to said member.

25. In a perforating machine, the combination with a work-support and a perforating member of operating means therefor; said operating means being eccentrically connected to said perforating member for permitting adjustment of said member in relation to said operating means.

26. In a perforating machine, the combination of a frame, a work-support, a die-carrying member, a rock-shaft mounted in suitable bearings in the top of said frame and having eccentric ends, a pair of toggle joints mounted at their upper ends on said eccentric ends of said rock-shaft and at their lower ends connected to said die-carrying member, means for operating said toggle-joints to lower and raise said member, and means for turning said rock-shaft to lower said toggle joints at the end of the downward stroke of said member.

27. In a perforating machine, the combination of a frame, a work-support, a die-carrying member pivotally mounted and normally in a raised position, a rotatable member mounted in the upper part of said frame, a pair of toggle joints eccentrically mounted at their upper end on said rotatable member and at their lower ends adjustably secured to said die-carrying member, means for operating said toggle joints to lower and raise said die-carrying member, and means for turning said rotatable member to lower said toggle joints during their downward movement.

28. In a perforating machine, the combination of a frame, a work-support, a die-carrying member normally in a raised position, a rotatable member in the top of said frame, toggle-jointed means eccentrically mounted at its upper end on said rotatable member and adjustably secured at its lower end to said member, means for operating said toggle-jointed means, and means for turning said rotatable member to change the position of said toggle-jointed means.

29. A perforating machine having, in combination, a main shaft, a die-carrying member, toggle-jointed means connected to said member, eccentric means mounted on said main shaft for operating said toggle-jointed means to lower and raise said member, and means for lowering said toggle-jointed means during the downward movement of said die-carrying member including eccentric means on the said main shaft; said first mentioned eccentric means and said second mentioned eccentric means being so mounted on said main shaft as to balance each other.

30. In a perforating machine, the combination with a pivotally mounted die-carrying plunger of operating instrumentalities therefore comprising a pair of toggle-joints, a main shaft and two pitmen eccentrically mounted on said shaft and each connected to one of said joints.

31. In a perforating machine, the combination with a pivotally mounted die-carrying plunger of operating instrumentalities therefor comprising a main shaft, two eccentrics formed thereon, two toggle-joints, two pitmen, each mounted on one of said eccentrics and connected at its free end to one of said toggle-joints, whereby said joints are straightened and broken on the revolution of said shaft.

32. In a perforating machine, the combination of a die-carrying plunger pivotally mounted on a fixed axis and toggle-jointed means for operating said plunger.

33. In a perforating machine, the combination of a frame, a die-carrying plunger pivotally mounted at two points in said frame, a rock-shaft mounted in suitable bearings in the top of said frame, a pair of toggle-joints mounted at their upper ends eccentrically on said rock-shaft and at their lower ends connected to said plunger, means for rocking said rock-shaft and means for operating said toggle-joints to lower and raise said plunger.

34. In a perforating machine, the combination of a frame, a bed plate, means for levelling said bedplate, a work-support on said bedplate, a die-carrying plunger pivotally mounted on a fixed axis, and means for operating said plunger.

35. In a perforating machine, the combination of a frame provided with two opposite curved flanges, a bedplate mounted on said flanges, the ends of said bedplate being curved to correspond to the curve of said flanges, means for adjusting said bedplate on said flanges in a transverse direction, a work-support on said bedplate, a die-carrying plunger, and means for operating said plunger.

36. In a perforating machine, the combination of a frame having two oppositely arranged flanges, the upper longitudinal faces of said flanges being cut on a circle, a bedplate mounted on said flanges, its two ends being curved transversely to correspond to the longitudinal curve of said flanges, adjusting screws for levelling said bedplate transversely, dowels set in said bedplate, a work-support mounted on said dowels and in engagement with said bedplate, a die-carrying plunger, and means for operating said plunger.

37. In a perforating machine, the combination of a die-carrying plunger, means for operating said plunger, and an adjustable connection between said plunger and said operating means; said connection comprising a rotatable member mounted on said plunger and having an eccentric portion to

which said operating means is connected, and means for rotating said rotatable member to adjust the relation between said plunger and said operating means.

38. In a perforating machine, the combination of a die-carrying plunger, means for operating said plunger, and an adjustable connection between said plunger and said operating means; said connection comprising a shaft rotatably mounted on said plunger and having eccentric portions adapted to be connected to said operating means, and means for turning said shaft to adjust the relation between said plunger and said operating means.

In witness whereof, I hereunto set my hand this second day of November, 1921.

WILLIAM F. LAUTENSCHLAGER.