Aug. 19, 1930. E. F. DELÉRY 1,773,522

MACHINE FOR PUNCHING AND FORMING INWARDLY DEPRESSED ORIFICES IN TUBES AND PIPES

Filed June 5, 1925 4 Sheets-Sheet 1

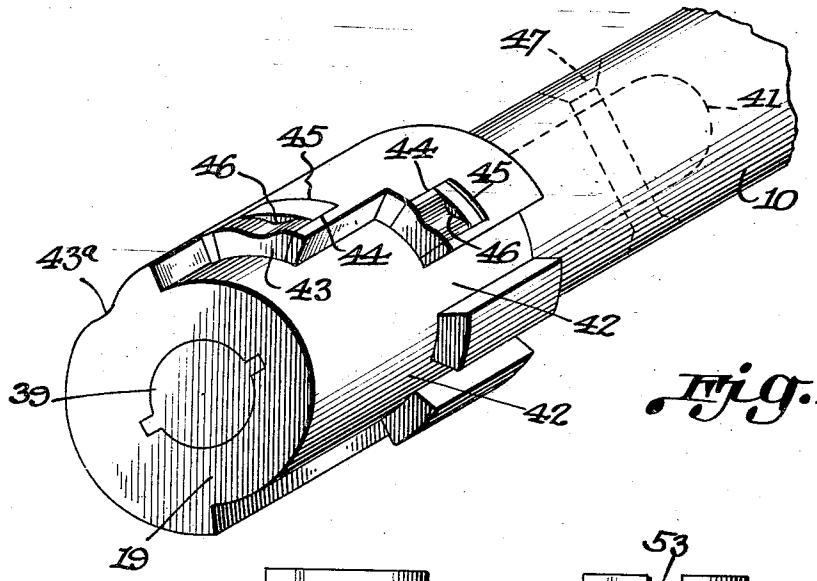


Fig. 1.

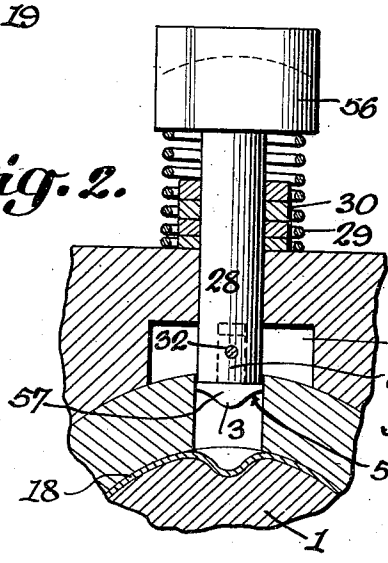


Fig. 2.

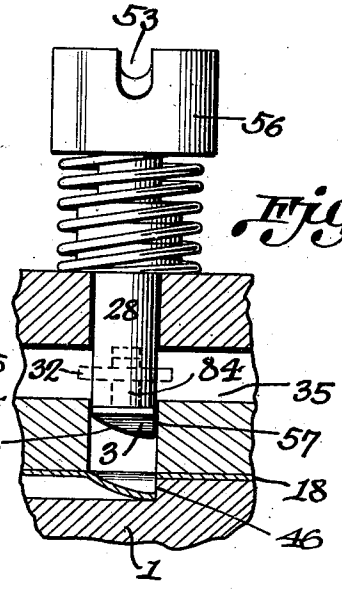


Fig. 3.

Fig. 4.

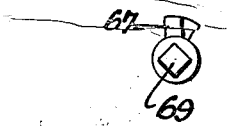
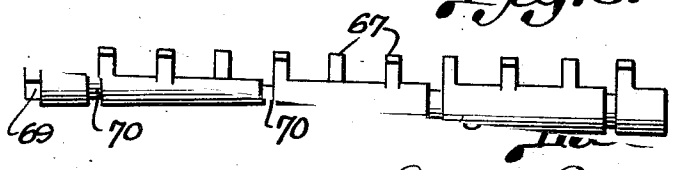


Fig. 5.



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Aug. 19, 1930. E. F. DELÉRY 1,773,522

MACHINE FOR PUNCHING AND FORMING INWARDLY DEPRESSED ORIFICES IN TUBES AND PIPES

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Fig. 6.

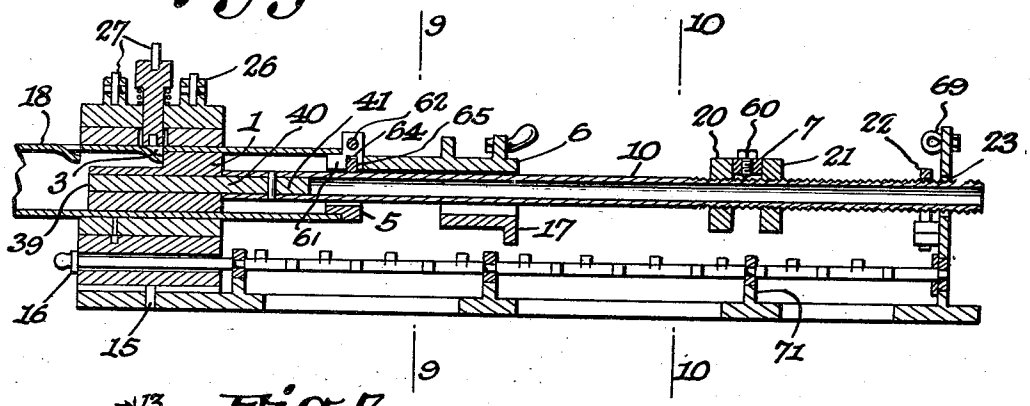


Fig. 7.

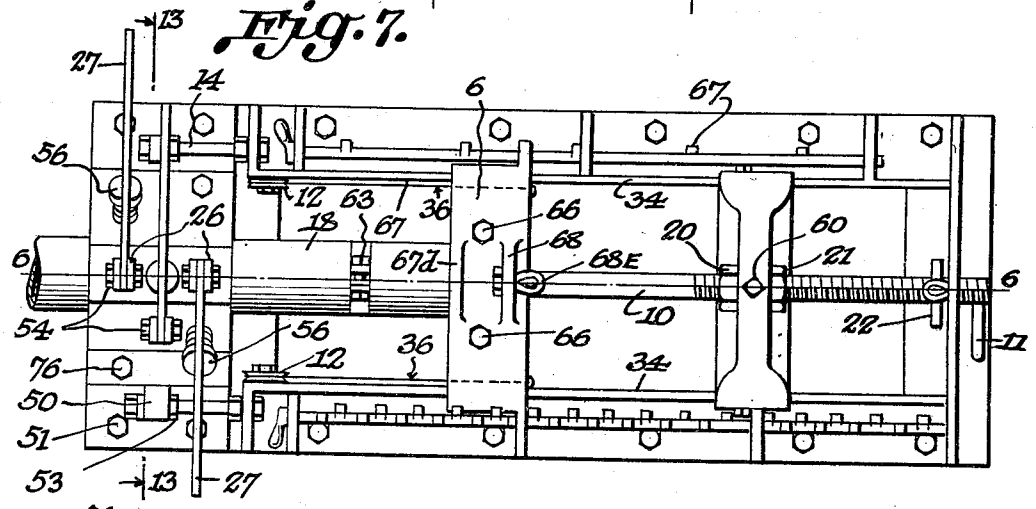
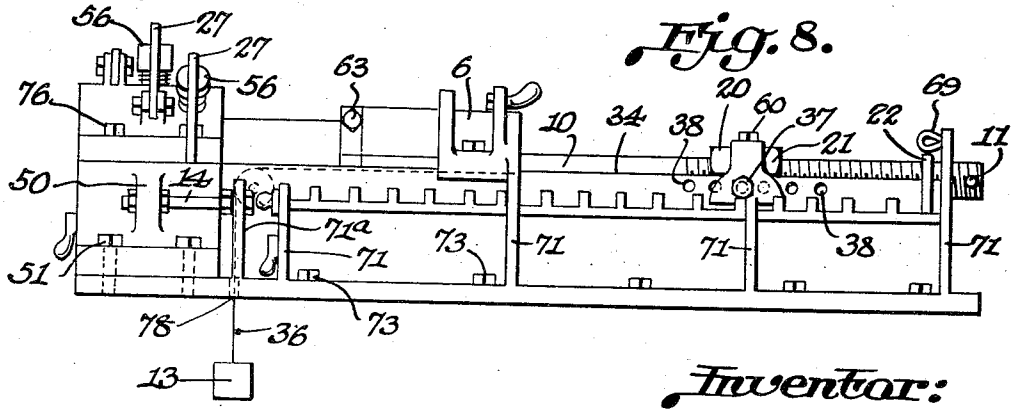


Fig. 8.



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MACHINE FOR PUNCHING AND FORMING INWARDLY DEPRESSED ORIFICES IN TUBES AND PIPES

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Fig. 9.

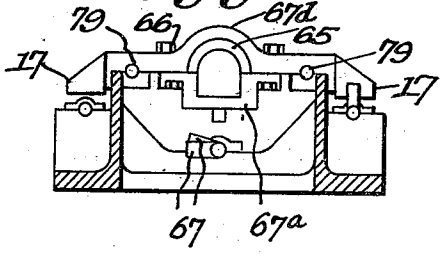


Fig. 10.

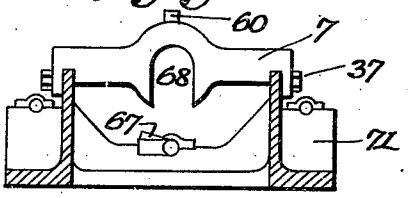


Fig. 11.

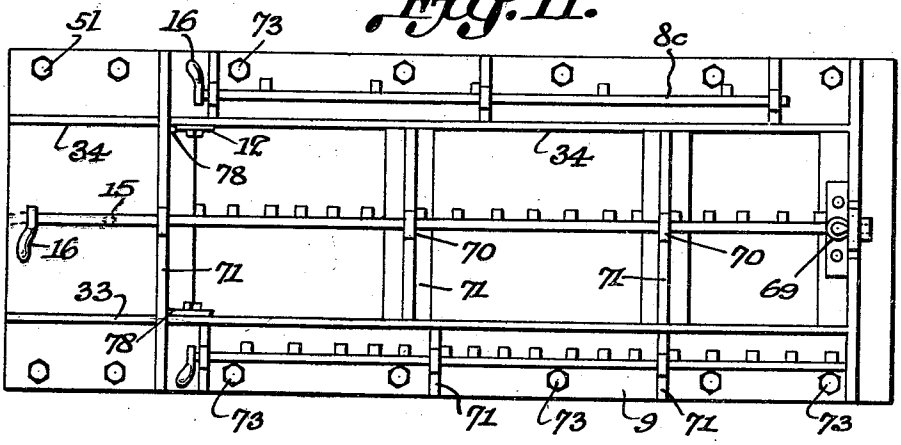


Fig. 21.

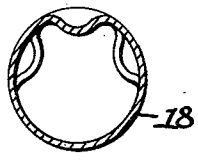
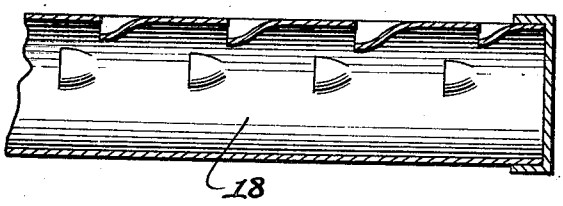


Fig. 22.



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MACHINE FOR PUNCHING AND FORMING INWARDLY DEPRESSED ORIFICES IN TUBES AND PIPES

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Fig. 12.

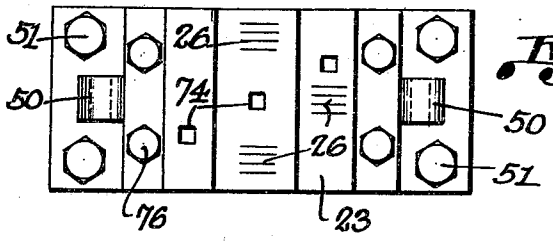


Fig. 15.

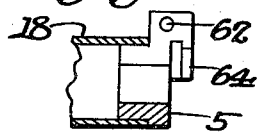


Fig. 13.

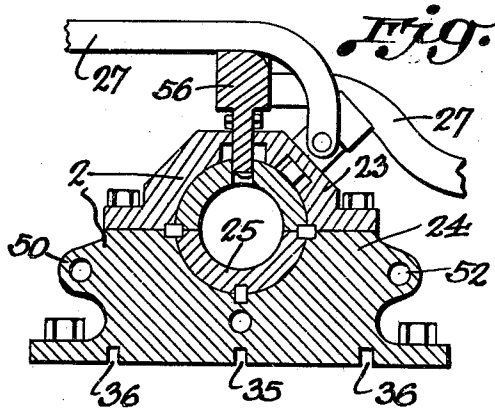


Fig. 16.

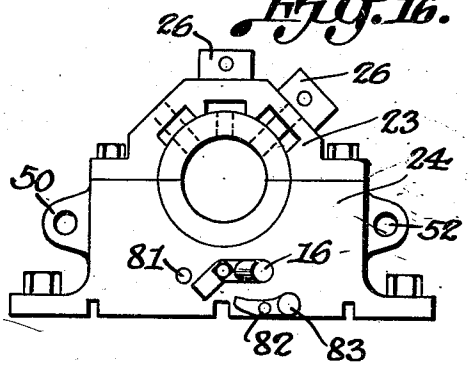


Fig. 14.

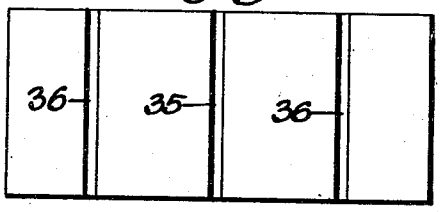


Fig. 17.

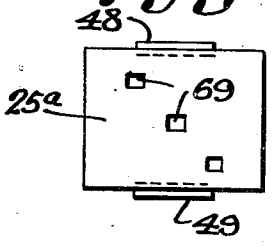


Fig. 18.

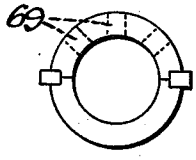


Fig. 19.

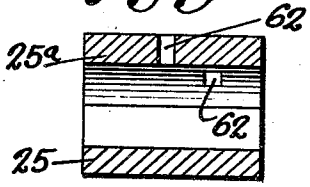
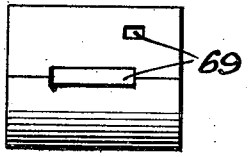


Fig. 20.



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By: Edna Sudlier Delery

Administratrix

Patented Aug. 19, 1930 1,773,522

UNITED STATES PATENT OFFICE

EUGENE FRANK DELÉRY, OF NEW ORLEANS, LOUISIANA; EDNA FUSELIER DELÉRY TUTRIX ADMINISTERING THE ESTATE OF SAID EUGENE FRANK DELÉRY, DECEASED

MACHINE FOR PUNCHING AND FORMING INWARDLY-DEPRESSED ORIFICES IN TUBES AND PIPES

Application filed June 5, 1925. Serial No. 35,220.

This invention relates to machines designed to shear and inwardly depress orifices in tubes, and more particularly to machines intended to shear and inwardly depress impact orifices in the walls of tubes after the manner shown in my application #630,413 of April 8, 1923, and shown in Figures 21, 22.

The principal object of this invention is a machine with which inwardly depressed orifices in parallel rows and in series uniformly spaced can be formed rapidly accurately and cheaply. It also consists in the several combinations and parts defined in the appended claims, particularly set forth in the ensuing description and illustrated in the accompanying drawings.

In the drawings, wherein like reference characters indicate like parts throughout the several views,

Figure 1 is an isometric view of the interior die showing the hubs 39, 41, the interchangeable annular die body 1 with one solid die 43ª and two interchangeable inserted dies 43 and three release grooves 42 and the hub 41.

Figure 2 is a part section (enlarged view) of the head block 2 showing the punch 3, the plunger 28, cap 56, liners 30, springs 29, filler ring 25, tube 18 supporting pin 32 and clearance space 35.

Figure 3 is taken at right angles to Figure 2.

Figure 4 is an end view of a spacer.

Figure 5 is an elevation of a spacer.

Figure 6 is a sectional elevation of the machine on line 6—6 of Fig. 7 with a partly punched tube in place.

Figure 7 is a plan of Figure 6.

Figure 8 is a side elevation of Figure 7.

Figure 9 is a section on line 9—9 of Fig. 6 showing the carriage 6.

Figure 10 is a cross section on line 10—10 of Fig. 6 showing the heel block 7.

Figure 11 is a plan view of the machine bed, showing the rails, pivot pin, spacers, spacer bearings and handles and pull eyelet and fastening bolts.

Figure 12 is a top view of the head block with punches removed.

Figure 13 is section of the head block on line 13—13 of Fig. 7.

Figure 14 is a bottom view of the head block.

Figure 15 is a view of the expander collar.

Figure 16 is a front elevation of the head block without punches or levers, but showing spacer 8ᵇ and its operating handle, stop lugs, clip lug with balance weight, and holes for adjustment bolt.

Figures 17, 18, 19, 20 show views of the filler ring 25.

Figures 21 and 22 show the usual type of punching, though the right is reserved to make any other form of punching desired as long as it is depressed within the tube.

In the drawings 1 represents an interior die body, usually annular and mounted on a suitable hub or mandrel 39 and positioned thereto by suitable means such as keys, mounting dies 43 and 43ª, preferably detachable interchangeable and adjustable as at 43 with liners 45 and having clearance along the longitudinal axis of the die in the direction in which the tube is withdrawn, also clearance slots 42 of a length slightly less than the maximum pitch distance between the faces 46 of the dies, of a width equal to the punches, and a circumferential pitch equal to that of the dies. The usual form of die will be as shown in the drawings, of constant section lengthwise the longitudinal axis of the tube and terminating in a shearing face 46 corresponding to the shearing face 57 of the punch 3.

The annular body 19 thrusts against a shoulder of the enlargement 41 of the hub 39, which itself registers in an (usually hollow) extension shaft 10 and fastens thereto by a pin 47, or other usual mechanical device. This extension shaft is threaded on its exterior surface and by means of a nut 20 and jamb nut 21 reacts against an adjustable but normally rigid heel block 7 and can be prevented from turning with reference to 7 by a set screw 60. The extension shaft 10 further extends through a clamp 22 which can be drawn down to correct alignment of 10 in a vertical plane. A further support is furnished by the bearing 23 set in the bed 9, an

actuating lever 11 allows of a rotational movement in setting the dies to their proper position with regard to the punches.

The heel block 7 against which 10 reacts is shown, in Figure 10, to span 10, and to fasten to the rails of the bed by bolts 37, set in holes 38 in the rails 33 and 34. Other views are shown in Figures 6, 7, 8.

The head block 2 is diametrically split in two parts 23 and 24. 23 clamping to 24 by bolts 76 has lugs (fulcrum lugs) 26 with bolt holes 54 for the depressing levers 27, also guide openings 74 for the punch plungers 28 and clearance openings 31. When the outside diameter of the tube is less than the maximum diameter of the circular space within 2, then a filler ring, also horizontally split is used. This has openings corresponding to 74 in 23.

These openings 74 are so placed and inclined that they register over the die blocks 43 of 1.

The plungers 28 are so arranged that they cannot revolve in the guide openings 74 but can travel up and down. As shown in the various figures they are returned to their normal positions by the springs 29 and limited in their depressed travel by liners 30. The punch 3 will usually be formed about as shown in Figures 1 and 2 (though it is not limited to that form) with a shearing face 57 corresponding to the section of the dies 45, after correction for the metal thickness, the forming part of the punch corresponding to a shape somewhat like 58. This punch shoulders against the bottom end of 28, a projection 84 is recessed in 28 and fastened in position by a pin 32 extending through 28 and forming a limiting pin 32 in the upward travel of 28, a recess 53 serves to guide the lever 27 and keep it in position.

24 serves as the other half of the head block, and is provided with two adjustment lugs 50 with holes 52 for the adjustment bolt 14, a guide slot 35 for the pivot 15, two runway slots 36 and an opening for the shaft of the spacer 8^b, and lugs 81 and 82 for 8^b. The expansion collar 5 furnishes a small though important part of this machine. It is shown in Figures 6, 7, 8, and 15 in which 5, a split collar has an interior shoulder 61 of slightly less diameter than the internal diameter of the tube, an expander bolt 63 for expanding 61 within the tube, a semicircular groove 64 fitting over a semicircular collar 65 on 6, and serving to prevent 5 and the tube from turning with respect to 10 and 6.

This collar surrounds 10 and travels free of 10.

The travelling carriage 6 as shown in Figures 7 and 9 spans from rails 33 resting in grooves in 6. As shown in Figure 9 it is arched to travel over 10, trip lugs 17 extend to either side to engage the teeth 67 of either 8^a or 8^b if these are in a position to interfere. Beneath 6, a U shaped piece carrying another tooth 17 for engagement with 8^b is shown. This also subtends 10 and passes free of it and can be removed from 6 by the bolts 66. Cord holes 79 are shown through which the cords 36 pass which draw the carriage forward. A pushing flange 67^d is shown (Fig. 6) and a flange 68 with a draw bolt 68E is also shown. On the forward end of the carriage 6 will be observed a half collar over which 64 slips, at 65 Fig. 6. As shown in 8 and 9, 64 comes against a flange on the carriage 6 thus preventing rotation of 5.

The spacers are shown in Figures 4 and 5 as shafts with equally spaced teeth 67, set at such an angle that the trip lugs in going from one lug to the next cannot pass and thus jump a lug. Bearings 70 are provided and the end of the shaft is squared to take a handle 16.

The shafts of the spacers 8^a, 8^b, 8^c, are mounted in bearings on the webs 71 of the bed 9. As shown in Figure 16 a stop lug 81 is provided to stop rotation of the handle 8 in one direction, and movable stop 82 in the other direction, pivoted so that it may be swung out of the way when it is desired to revolve the spacer out of engagement. It is provided with a counter weight 83 which returns it to position after the handle has passed. While not shown in the drawings these are provided for all the spacers.

Adjustment bolts 14 Fig. 8 allow adjustment of the head block either pivotally or longitudinally with respect to the bed 9.

Cords 36 passing over pulleys 12, mounted on the bed 9, and through openings 79 in the carriage 6 propel the carriage forward a space each time the spacer handle 16 is thrown.

The bed of the machine 9 consists essentially of a frame 9 with longitudinal rails 33 and 34 built as webs and made to act as rails for 6 and 7 to track on, cross vertical webs 71 serve to stiffen the frame and at the same time support the spacers 8 in their bearings 70, openings 78 in the base of 9 allow the cords 36 to pass from the weights 13 to the pulleys 12, a bolt 15 set in the center of 9, as shown, allows 2 to be pivoted by the bolts 14 and the bolts 14 between the web 71^a and the lugs 50 of 2 allow adjustment of 24 both longitudinally and at right angles to 1.

The levers 27 fulcrumed at 28 on the bolts 54 rest on 56, the cap of the plungers 28, in the grooves 57 and complete the machine. The usual method of assembling the machine would be to bolt the bed 9 in place on its foundation with the bolts 73, care being taken to leave room for the weights 13 to work up and down freely. Place the spacers 8^a, 8^b, 8^c, in their bearings 70 on the webs 71 and secure them in place in the disengaged position.

Place part 24 of the head block in approxi-

mate position on the rails 33 and place the bolts loosely in position. As there is plenty of play in the holes in which the bolts 51 fit, 24 can be set as near as desired to position by the adjusting bolts 14 because the slots 36 fit loosely while 35 fits quite neatly over the pivot 15. Next set the lower half of 25 in position in 24, with a semicircular strip of metal, of the same gauge as the tube to be punched, set within 25.

This piece of metal is used in setting 1 at the proper height while setting the die in place.

Next assemble 19, on 39 having keyed it to position and fasten 41 in 10 by a pin 47 or other usual means of fastening, screw 20 and 21 on 10 spaced far apart and set the end of 10 through the support 23 and through the eye 22 rest 1 in 25 and set as nearly as possible in its proper position. Set 7 free in its approximate position between 20 and 21 with 60 free, next place 6 in a position intermediate of 7 and 24 on the rails 33, with 67 removed, drop 5 in position fitting 64 over the collar 65 with the expander screw 63 free. Place 67^a in position on 7 and fasten with the bolts 66. Place 6 at such a distance back that the shoulder on 5 is the desired distance from the face 46 of the last die and the lug 17 is in contact with a tooth of 8^a which has been swung to the position of engagement. Maintaining this position set 7 so that it fastens to the web of 33 by bolts 37 in holes 38 and draw 21 and 20 to position against 7 lightly with 20 resting against the rear of 6. Next having assembled 23 with the plungers and punches and the upper half of 25 set on 24 and clamp down with bolts 76. It will probably be found that the punches do not fit against the die faces 46.

Bring the shearing faces 57 of the punches and the faces 46 of the dies against each other by adjusting the bolts 14 and set in place by bolting down bolts 51. Should it develop that the spacing between the punches and dies is unequal put liners 45 behind the dies until the necessary correction is made and the die spacing and punch spacing is equal.

To correct errors of revolution in the die loosen 20 and 21 slightly and revolve 10 to fit the punches by means of the lever 11 then everything being right draw down the set screw 60 to set 10, and draw 20 and 21 snug. If the rear of 6 sets slightly away from 20 place horseshoe shaped liners between 20 and the rear of 6. Next attach cords to the weights 13 pass them through the openings 78 and the openings 79 of the carriage make a knot at the rear of 6.

Mount the levers 27 on the fulcrums 26, with the bolts 54, drop them in the slots 57 and if the liners 30 are the right height we are ready to start operating.

First remove the preilminary liner under 1, and push in the tube shoving it all the way in until it fits over the collar 61 and goes against the shoulder of the expander collar; draw the bolt 63 tight. This will clamp the tube in position on the inside and prevent it from moving with respect to 6 or turning.

Depress the levers 27 and punch one set of punchings, revolve the lever 16 from its position against 81 to 82. The weights draw the carriage forward one space against the next tooth of the spacer, the levers are again depressed and the lever thrown back to 81 the carriage travels forward another space and the process is repeated until the carriage reaches the end of its travel, when the bolt 63 is loosened the finished tube removed, the carriage 6 returned to its position against 20, a new tube is inserted and the process repeated.

I am aware that the idea of a machine to depress holes in a tube is not new, but I believe that the method of shearing and forming orifices is new, especially the idea of a nonexpanding interior stationary recessed die, which clears by the withdrawal of the tube, the die itself being rigidly connected by an extension shaft to an exterior heel block which takes the reaction due to shearing.

I claim—

1. In a machine for inwardly depressing the walls of a tube, to form impact nozzles, a substantially solid and normally stationary interior recessed die, which clears in the direction of removal of the tube, mounted on an extension shaft, an extension shaft reacting against an exterior heel block, a heel block adjustable in position but rigidly attached to the bed of the machine, a head block surrounding the tube and mounting punches which register with the interior recessed die, an expansion collar surrounding the extension shaft but interior to the tube, and a machine bed mounting both head block and interior die.

2. In a machine of the type described, an adjustably mounted head-block of adjustable internal diameter, punches mounted on the head-block, an adjustable interior die registering with the punches on the head-block and mounted on an extension shaft, an extension shaft attached to the interior die and reacting against an exterior heel block, an adjustable exterior heel block mounted on rails on a machine bed with means for clamping the heel block rigidly in place, a machine bed mounting both heel block and head block, and means for adjusting the head block and means for adjusting the heel block on the rails of the machine bed at varying distances relative to each other.

3. In a machine of the class and for the purpose described, a hub, an interior interchangeable recessed die head, mounted on said hub, and mounting adjustable interchangeable depressed dies, dies with clearance slots provided with slots in the direc-

tion in which the tube is removed, a hub mounted on an adjustable extension shaft, an adjustable extension shaft which reacts against an exterior heel block, a heel block, means for removing the sag from the extension shaft, and means for adjusting the position of the heel block.

4. In combination in a machine for operating on a tube, a diametrically split head block of variable diameter, surrounding the tube, and mounting multiple punches, an interior recessed die head mounting multiple adjustable and changeable dies which register with the punches, an extension shaft capable of adjustment vertically and longitudinally, an exterior heel block, a machine bed with rails, and means for adjusting the position of the heel block longitudinally and for varying the distance between the heel block and the head block and means for giving the head block a slight rotational adjustment in a horizontal plane, an expansion collar surrounding the extension shaft and surrounded by the tube.

5. In a machine for punching and inwardly depressing walls of a cylindrical tube to form inwardly depressed openings without removing any part of the walls, an inner immovable nonexpanding die head permitting the withdrawal of the tube horizontally without interfering with the die head, means for supporting the die head, and means for horizontally withdrawing the formed part of the tube after punching.

In testimony whereof I hereby affix my signature.

EUGENE F. DELÉRY.