

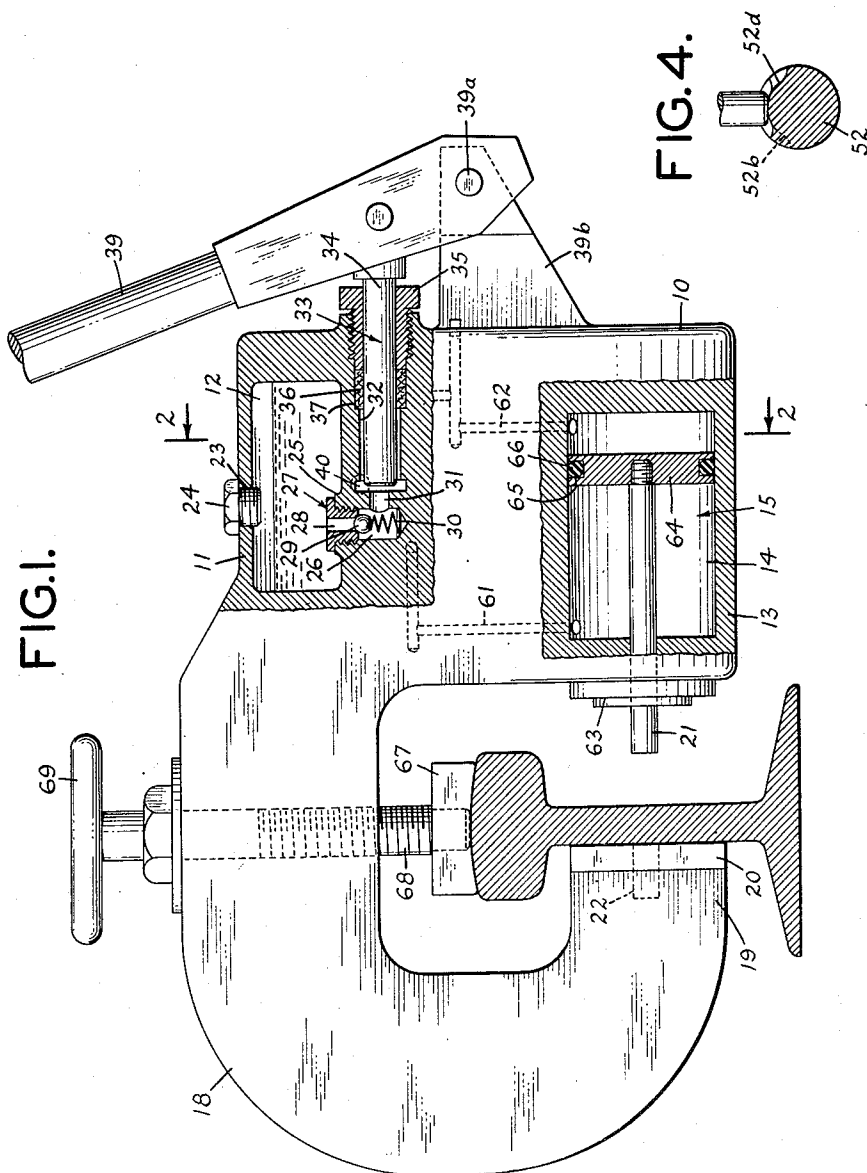
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B. N. ASHTON ET AL
PORTABLE HYDRAULIC PRESS

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2 Sheets-Sheet 1



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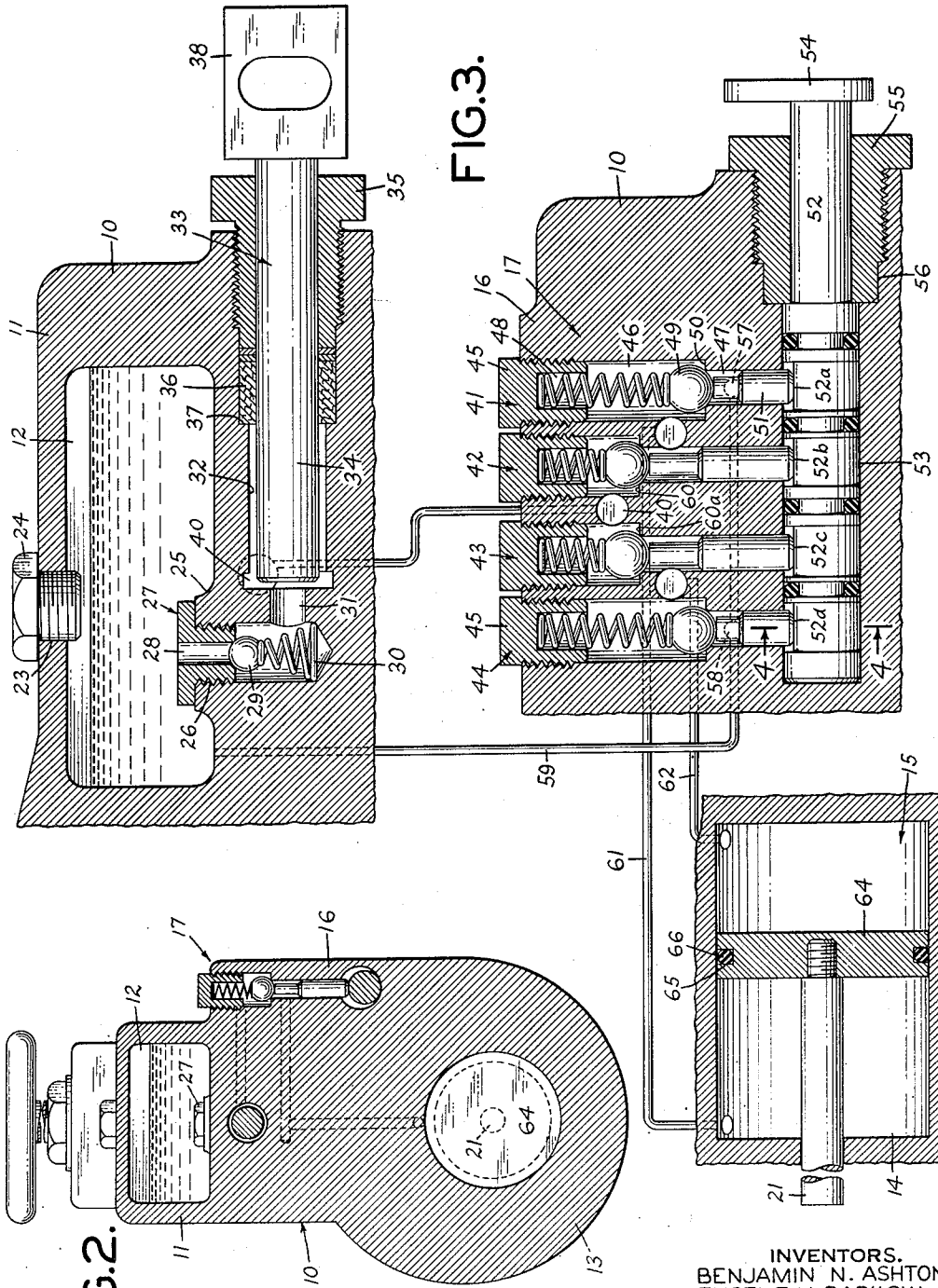


FIG. 2.

FIG. 3.

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PORTABLE HYDRAULIC PRESS

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2 Claims. (Cl. 164-95)

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This invention relates to improvements in devices for punching holes in metal. It relates particularly to an improved form of portable hydraulic punch which may be used for punching holes in light or heavy metal sheets or articles, such as for example, in the webs of railroad rails and the like.

The hydraulic punch embodying the present invention is characterized by the provision of a strong casing in which are housed the reservoir for the hydraulic fluid, a manually operated pump preferably of the reciprocating type, a hydraulic ram of which the punch forms the piston rod and a selector valve whereby the fluid may be directed to either end of the hydraulic ram to advance or retract the punch. The casing is provided with a heavy C-shaped arm which is directed outwardly from one end of the casing and has its free end facing the casing in alignment with the punch to provide an anvil for supporting the article being punched. The C-shaped arm is so designed that it will easily receive a railroad iron with the web thereof properly positioned for perforation by the punch. In order to regulate the position of the punch with respect to the web of the rail, the C-shaped arm may be provided with a gauging element which rests upon the top of the rail, and, being adjustable, permits a hole to be punched at any desired height in the web of the rail.

Punches of the type embodying the invention, while capable of exerting extremely high pressures nevertheless are so compact as to render them readily portable and are particularly suitable for use in the field during track laying operations and for many other purposes.

For a better understanding of the present invention, reference may be had to the accompanying drawings, in which:

Fig. 1 is a view in side elevation of a typical form of punch embodying the present invention, the punch being illustrated in use for punching holes in the web of a railroad rail and being partly broken away to disclose details thereof;

Fig. 2 is a view in section taken on line 2-2 of Fig. 1;

Fig. 3 is a diagrammatic layout of the hydraulic circuit for the punch with the pump and the selector valve mechanism shown in section; and

Fig. 4 is a view in section taken on line 4-4 of Fig. 3.

The form of punch chosen for purposes of illustration is of a size suitable for punching holes in the webs of railroad rails, and, as indicated above, is especially suitable for this purpose because

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of the extremely high punching pressures developed by the device.

The punch includes, as shown in Figs. 1 and 2, a casing portion 10, which, in side elevation, is of generally rectangular shape and may be a casting of iron, steel or other suitable metal. In end view, as shown in Fig. 2, the top 11 of the casing 10 is generally rectangular and forms the outer walls and top of a reservoir 12 for receiving hydraulic fluid. The lower portion 13 of the casing is generally semi-cylindrical forming the walls of the cylinder 14 of the hydraulic jack or ram 15. The right-hand portion 16 of the casing is offset slightly from the top portion 11 to form a space for reception of a selector valve unit 17.

The upper left-hand corner of the casing 10, as shown in Fig. 1, is provided with a generally C-shaped rigid arm 18 which is curved outwardly and downwardly so that its free end 19 is opposed to the lower end of the casing generally in alignment with and opposing the ram or jack 15. The end of the arm 19 may be provided with a hardened face plate 20 forming the anvil for the punch 21 which is actuated by the ram 15. A central recess 22 is provided in the anvil 20 and the end 19 of the arm for receiving the end of the punch 21.

As shown in Figs. 1 and 3, the reservoir 12 is of generally rectangular shape and may be filled with hydraulic fluid through the opening 23 in the top of the casing which is closed by means of a suitable threaded plug 24. The bottom of the reservoir 12 is provided with a raised boss 25 which surrounds a bore 26 in which is received an exteriorly threaded flanged sleeve member 27 having a central opening 28. The sleeve member 27 forms the seat for a ball valve 29 which is located in the bore 26 and is normally urged upwardly against the sleeve 27 by means of the spring 30 seated against the bottom of the bore 26.

A laterally directed port 31 connects the bore 26 with a horizontal bore 32 which forms the cylinder of the pump 33 for supplying liquid under pressure to the ram or jack 15. The pump 33 includes a generally cylindrical piston member 34 of less diameter than the cylinder 32. The piston rod is reciprocable in a sleeve 35 threaded into the end of the bore or cylinder 32, the sleeve also being used to compress a suitable packing 36 against a shoulder 37 in the bore to prevent leakage around the piston 34.

The piston 34 is provided with an apertured enlargement 38 on its outer end which is slidably pivotally connected to a pump handle 39. The lower end of the handle 39 is connected by

means of a pivot 39a to an arm or bracket 39b projecting from the right-hand end of the casing 10.

As the piston 34 is moved to the right, it withdraws liquid from the reservoir through the sleeve 27 and past the ball valve into the cylinder 32. Upon movement of the piston 34 to the left, it forces the liquid out through the passage 40 at the left-hand end of the cylinder 32 to the selector valve 17 which is best shown in Fig. 3. The selector valve 17 includes four ball valve units 41, 42, 43 and 44, all of which are similar. The ball valve unit 41 includes a closure cap 45 which is threaded into the upper end of a bore 46 extending downwardly through the shoulder portion 16 of the casing and communicating with a bore portion 47 of reduced diameter. The threaded closure cap 45 is provided with an internal recess 48 for receiving the upper end of a coil spring which urges a ball valve member 49 downwardly against the shoulder 50 at the junction of the bore portions 46 and 47. The ball 49 may be lifted upwardly by means of a plunger member 51 slidable in the bore 47. The plunger 51 is actuated by an actuating cam member 52 which is rotatably mounted in a circular bore 53 extending inwardly from the right-hand end of the casing 10, as viewed in Fig. 1. The cam member is provided with an actuating lever or handle 54 by means of which the cam member 52 can be rotated in the bore 53. The cam member is retained in the bore by means of a threaded sleeve member 55 which is threaded into an enlarged portion 56 at the right-hand end of the bore 53. A port or passage 57 is formed in the casing below the seat 50 of the check valve unit and is connected to the reservoir. The check valve unit 44 is exactly like the check valve unit 41 and its lower port 58 is also connected by the passage 59 to the reservoir.

The check valve units 42 and 43 are similar to the check valve units 41 and 44 but the seats 60 and 60a of these valves are disposed at a higher level and intermediate the passage 40 which communicates with the bores above these valves and the passages 61 and 62 which are connected to opposite ends of the cylinder of the jack or ram 15. The passages 61 and 62 also communicate with the check valve units 41 and 44, respectively, above the seats and balls of these valves.

The check valve balls of the selector valve 17 are so arranged that the valve units 41 and 43 open simultaneously and the valve units 42 and 44 remain closed. Also, the selector valve may be actuated to open the valve units 42 and 44 while the valve units 41 and 43 are closed. The selector valve 17 may be placed in a neutral position with all of the check valves closed.

Operation of the valves is produced by rotation of the cam member 52, which, as shown in Figs. 3 and 4, is provided with four cam faces 52a, 52b, 52c and 52d formed in part by the outer periphery of the cam member and in part by a curved portion of smaller radius of curvature. Referring to Fig. 4, the shorter radius portion of the cam surface 52d is displaced angularly from the curved portions of shorter radius of the cam surface 52c. The cam surfaces 52b and 52a correspond to the cam surfaces 52d and 52c so that when the cam member 52 is rotated counterclockwise from the position shown in Fig. 4, the check valve units 42 and 44 are open. When the cam is rotated clockwise from the position shown, the valve units 41 and 43 are

open while the other valve units remain closed. In the position shown in Fig. 4, all of the valve units are closed.

The hydraulic ram 15 may be of any desired type and may include the cylinder 14 which is formed by a bore extending inwardly from the left-hand end of the casing and closed by means of a suitable annular threaded closure cap 63 having an opening therethrough through which the punch 31 extends. The punch which may be removed and replaced with a punch of different size is fixed to the piston 64 which may be provided with a peripheral groove 65 receiving an annular rubbery piston ring 66.

In operation, the C-shaped arm may be slipped endwise over the rail and is positioned so as to bring the punch 21 into alignment with the area to be perforated. The punch may be positioned by means of a gauge block 67 which is rotatably mounted on the end of a heavy threaded shaft 68 threaded through the arm 18 and provided at its upper end with a handwheel 69 for adjusting the gauge block 67 vertically. The selector valve is then turned to a position in which the valve units 41 and 43 are open and the valve units 42 and 44 are closed. The pump handle 39 is then rocked back and forth drawing liquid from the reservoir 12 and forcing it through the passage 40 through the check valve unit 43 into the passage 62 and into the right-hand end of the piston, thereby urging the piston and the punch 21 toward the left into punching relation to the railroad rail R shown in Fig. 1. Any fluid to the left of the piston flows through the passage 61 past the open valve 41 into the reservoir 12. By making the piston 34 of the pump and the piston 64 of the ram 15 of suitable relative size, a very high pressure can be exerted at the punch so that steel webbing one-half an inch thick or even thicker can be perforated readily by the apparatus.

The punch 21 may be withdrawn by turning the selector valve so that the valves 42 and 44 are open and the valves 41 and 43 are closed. With the selector valve in this condition, liquid is forced by the pump through the valve 42, the passage 61 into the left-hand end of the jack or ram 15 while the liquid to the right of the piston flows through the passage 62, the open valve 44 and through the passage 59 to the reservoir. In this way, the full power of the unit may be exerted for withdrawing the punch from the perforated metal article.

From the preceding description, it will be apparent that we have provided a very compact and powerful self-contained portable hydraulic press which is capable of punching holes in relatively heavy metal and at the same time is of sufficiently light weight and small size to permit it to be transported readily and to be used in the field or in the shop when heavy metal articles are being handled.

It will be understood that the device is susceptible to considerable modification, for example, different specific forms of pumps and selector valves may be used in the unit and the size and shape of the parts may be varied as required. Therefore, the form of the invention described above should be considered as illustrative and not as limiting the scope of the following claims.

We claim:

1. A hydraulic punch comprising a casing, a hydraulic jack in said casing including a piston provided with a punch extending from one end

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of said casing, an arm extending outwardly from said casing above said punch and curved downwardly and inwardly to provide a free end opposing said punch, a pump in said casing including a reciprocable piston, a pump handle pivotally mounted at the end of the casing opposite from said one end, means connecting said handle to said piston, a reservoir for liquid connected to said pump, passages connecting said pump, jack and reservoir, a four valve, four port selector valve interposed in said passages between said pump, jack and reservoir, a rotary cam member for selectively opening the valves of said selector valve in pairs to selectively connect one end of said jack with said pump and the other end with said reservoir, and an actuating handle on said camshaft at said opposite end of said casing.

2. A hydraulic punch comprising a casing, a hydraulic jack in said casing including a piston provided with a punch extending from one end of said casing, an arm extending outwardly from said casing above said punch and curved downwardly and inwardly to provide a free end opposing said punch, a piston type pump in said casing, a manually actuated means for operating said pump, a reservoir in said casing for supplying liquid to said pump, passages connecting said

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pump, jack and reservoir, a four valve, four port selector valve interposed in said passages between said pump, jack and reservoir, a rotary cam member for selectively opening the valves of said selector valve in pairs to selectively connect one end of said jack with said pump and the other end with said reservoir, and an actuating handle on said camshaft at said opposite end of said casing.

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