No. 703,758. Patented July 1, 1902.

J. W. BIRKENSTOCK & R. W. FUNK.

PNEUMATIC RIVETING TOOL.

(Application filed Dec. 14, 1901.)

(No Model.) 2 Sheets—Sheet 1.

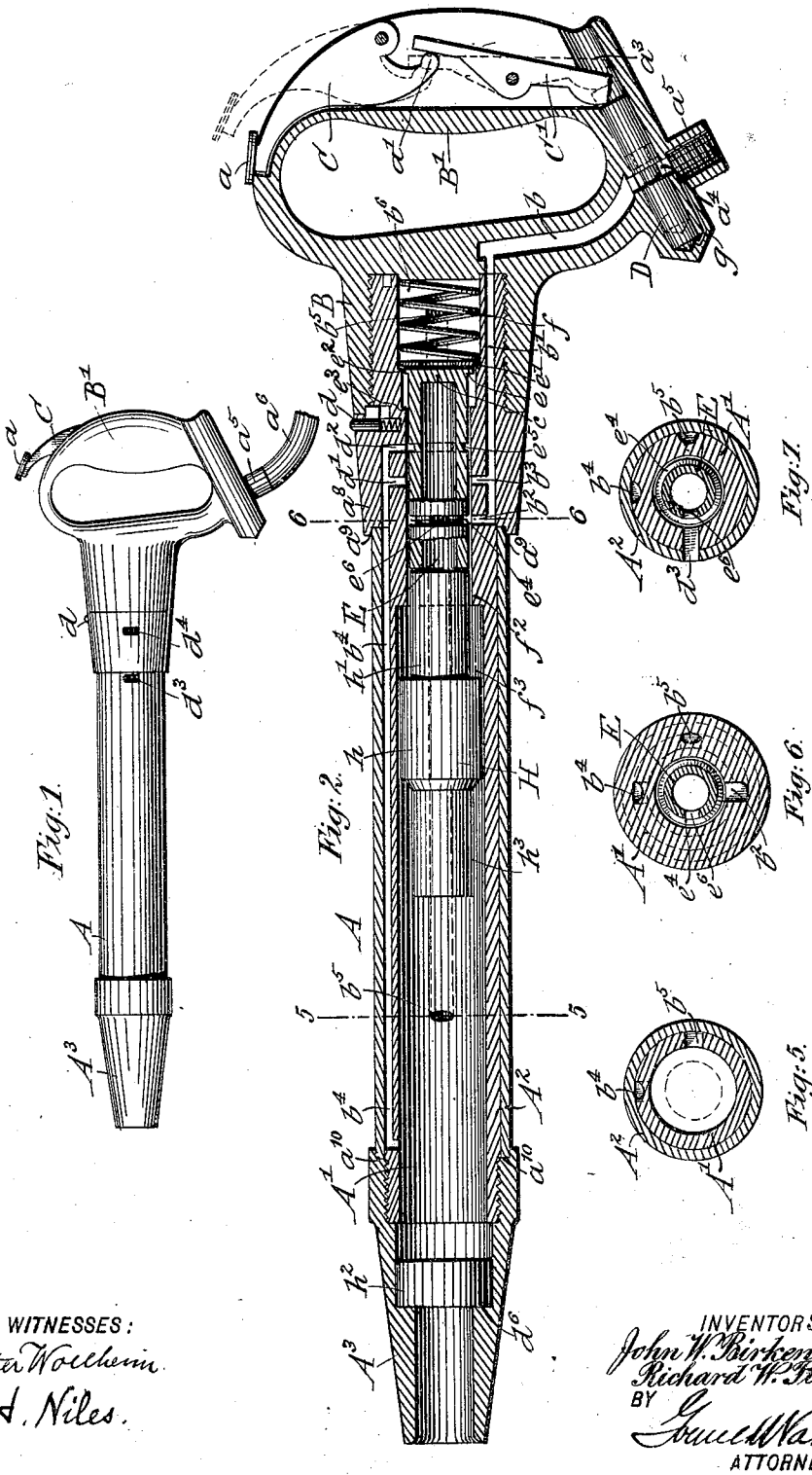


Fig. 1.

Fig. 2.

Fig. 7.

Fig. 6.

Fig. 5.

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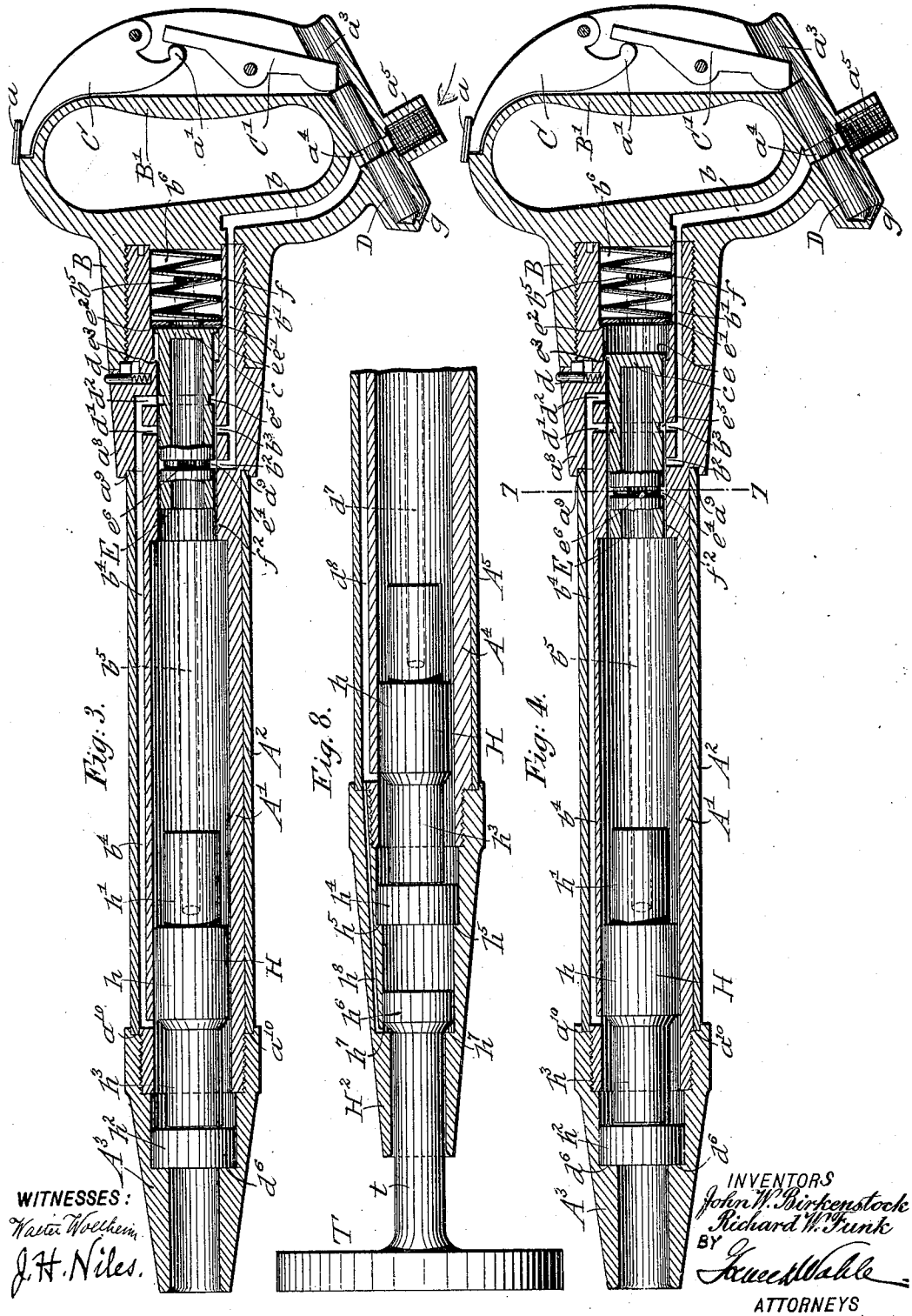


Fig. 3.

Fig. 8.

Fig. 4.

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UNITED STATES PATENT OFFICE.

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PNEUMATIC RIVETING-TOOL.

SPECIFICATION forming part of Letters Patent No. 703,758, dated July 1, 1902.

Application filed December 14, 1901. Serial No. 85,911. (No model.)

To all whom it may concern:

Be it known that we, JOHN W. BIRKENSTOCK and RICHARD W. FUNK, citizens of the United States, residing in New York, in the State of New York, have invented certain new and useful Improvements in Pneumatic Riveting-Tools, of which the following is a specification.

This invention relates to an improved pneumatic tool intended for use as a tool for riveting, ramming, and similar purposes, in which tool the action of a reciprocating hammer is used for accomplishing the riveting or ramming action, the operation of the tool being controlled by a suitable lever-operated valve by which compressed air is admitted to or shut off from the same; and the invention consists in the combination, with a casing provided with supply channels and ports, of a handle at one end of the same, a tool guided in the opposite end of the casing, a piston-valve located at the interior of the casing, said piston-valve being hollow and provided with circumferential grooves and an opening in one of said grooves, a return-channel connecting the rear end of the casing with the front end of the same, a sliding hammer in the casing, a cushioning-spring located between the piston-valve and handle, a channel connecting the interior of the casing with the space behind the valve, and shoulders at the rear end of the casing for arresting the spring and the piston-valve in their forward motion.

In the accompanying drawings, Figure 1 is a side elevation of our improved pneumatic tool. Fig. 2 is a vertical longitudinal section of the same on a larger scale, showing the piston-valve and piston in initial position. Figs. 3 and 4 are also vertical longitudinal sections showing the position of the piston and piston-valve, respectively, after the blow has been given and preparatory to returning to initial position. Figs. 5, 6, and 7 are vertical transverse sections, respectively, on lines 5 5 and 6 6, Fig. 2, and line 7 7, Fig. 4; and Fig. 8 is a vertical longitudinal section of a portion of the tool, showing a modified construction.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A represents a cylindrical casing closed at its rear end by a head B, which is provided with a handle B′, made bow-shaped and provided at its outer portion with a longitudinal recess in which are located, pivoted to the handle, two levers C C′, the upper lever C being provided at its upper end with a thumb-piece a and at its lower end with a knuckle a', that engages the upper end of the lower lever C′. In the lower part of the handle B′ is located an inclined bore a^3, in which is guided a reciprocating inlet-valve D of cylindrical shape, one end of the valve being engaged by the fulcrumed lever C′, so that when the upper lever C is pressed by the thumb of the user the valve D is pushed forward in the bore a^3, so as to place an annular recess a^4 of the valve D in line with a nipple a^5, to which the pipe a^6 for supplying air under pressure is screwed. When in this position, the recess a^4 permits communication between the nipple and a supply-channel b, arranged in the handle. The channel b communicates with a longitudinal channel b' in the cylindrical casing A. The socket or head B, by which the handle B′ is connected with the cylindrical casing or barrel A, is provided with an interior screw-thread that screws over the threaded end of the casing A and is locked in position by a winged key d, that is located in a recess at the rear end of the casing A and engaged by the socket or head B of the handle, so as to prevent any unscrewing action between the handle and the casing by the vibrations to which the tool is subjected when in operation. The socket or head B is preferably made slightly tapering; also, the adjacent portion a^8 of the rear end of the casing, as shown. The casing or barrel A is formed of an interior tubular main portion or stock A′ and an exterior portion or shell A^2, which is retained between the enlarged portion a^8 of the stock adjacent the handle and a preferably tapering nose A^3, screwed upon the outer end of the stock. The stock and nose are preferably recessed circumferentially at a^9 a^{10}, so as to

make tight joints with the shell A^2. By making the casing of two parts, an interior stock and an exterior shell, channels or air-ducts can be conveniently arranged by cutting grooves in the same, so as to dispense largely with the boring of channels, which is a more difficult and expensive operation.

The channel b' in the stock A' is provided with two ports b^2 b^3, through which pressure is supplied to the interior of the casing. A second longitudinal channel b^4 is arranged in the casing diametrically opposite the supply-channel b', said channel b^4 being likewise provided with two ports d' d^2. The interior of the rear end of the casing is provided with two shoulders e^2 e^3, serving, respectively, as a support for a washer e' and as a means for arresting the piston-valve E, which is guided at the interior of the casing and provided at its rear end c with a shoulder or rim e, that engages with the shoulder e^3 when the valve is moved in forward direction. The piston-valve E is made tubular and closed at the rear end adjacent the washer e', but open at the opposite end, so as to communicate with the interior of the casing. Between the washer and the handle is interposed a strong helical cushioning-spring f, which retains the washer normally against the shoulder e^2. The piston-valve is provided with two circumferential grooves e^4 e^5, corresponding, respectively, to the forward inlet-port b^2 and with the rearmost outlet-port d^2. The groove or annular recess e^4 communicates by an opening e^6 with the cavity of the piston-valve and thence with the interior of the casing. In front of the piston-valve E is located in the casing a sliding hammer H, the diameter of the middle portion h of which corresponds to the inside diameter of the casing, while the ends are somewhat reduced, the rear end corresponding in diameter to the contracted rear portion f^2 of the casing, in which the piston-valve E is guided. The shank of the tool is guided in the nose A^3, forming the forward end of the casing and acted upon by a cylindrical block h^2, which is acted upon by the forward end h^3 of the hammer H.

In addition to the channels b' b^4 the casing is provided with an additional channel b^5 in the side wall, said channel communicating with the interior of the casing at a point opposite the reduced rear end h' when in forward position and with the space b^6 in the handle end of the stock, which is behind—*i. e.*, at the rear of the shouldered end of the valve E. Two exhaust-ports d^3 d^4, arranged in the casing, communicate, respectively, with the groove e^4 of the valve E when the latter is in forward position, as in Fig. 4, and with the groove e^5 when in rearmost position, as in Fig. 2, thereby permitting, respectively, escape of the air behind the hammer on the return and escape of the air in front of the hammer on the forward stroke.

When the outlet-valve D is opened by pressing the handle C in the position shown in Fig. 2, compressed air is conducted through the channels b b' and the groove e^4 and opening e^6 to the interior of the valve E and thence to the interior of the casing. By the compressed air the piston or hammer H is driven forward, thereby exerting a blow on the block h^2 and thereby on the tool. As soon as the portion h of the hammer has moved beyond the end of the channel b^5 the compressed air in the casing passes through said channel into the space b^6. The rear end c of the valve E has a slightly-larger area, owing to its shoulder e, than the opposite end of the valve or, in other words, than the surface opposed thereto. Both surfaces being under equal pressure per unit of area, but of unequal area, the air forces the valve E forward until the rim e abuts against shoulder e^3, as shown in Fig. 4. This action takes place immediately after the blow is struck or at such time about the time of the blow that the force of the same is not affected, and immediately thereafter by passage of the air under pressure through the channel b', port b^3, groove e^5, port d', and the return-channel b^4 into the space between the block h^2 and the body h of the hammer the latter is immediately returned to its position at the rear end of the casing, where it abuts against the valve E, and the latter through washer e' against the cushioning-spring f. When the reduced rear end h' of the hammer enters the reduced portion f^2 of the casing, escape of air between the same and the body h of the piston is thereby cut off and the air inclosed in the annular space f^3 acts, in addition to the spring f, to cushion the hammer on its rearward stroke. As soon as the valve E is shifted into position shown in Fig. 4 the groove e^4 is placed in line with the exhaust-port d^3, so that the air under pressure at the interior of the casing behind the hammer is allowed to escape as the hammer returns. The spring f after compression immediately expands to its original condition, thereby placing the valve E in position for admitting air for another forward stroke of the hammer, Fig. 2. During the forward movement of the hammer the air in front of the same passes through channel b^4, port d^2, groove e^5, and port d^4 to the outside atmosphere. Back-and-forth movement of the block h^2 is limited at one side by the smaller outer end of the stock A' and at the other by a shoulder d^5 of the nose or end piece A^3.

For stopping the tool the pressure of the thumb of the operator on the thumb-piece a is released, and the inlet-valve D is returned into closing position and retained in closed position by pressure of air against the outer end of the valve, the compressed air being conducted by a small bore or duct g from the nipple a^5 to the outer end of the bore a^3. The levers C C' are by this operation moved into the positions shown in dotted lines in Fig. 2.

The tool shown in Figs. 1 to 7 is mainly intended as a tool for riveting and similar work. Fig. 8 shows a slight modification rendering the tool more suitable for use as a rammer. In this view A^4 is the stock; A^5, the shell; d^7, a bore corresponding to b^5; d^8, the return-bore, and H the hammer. h^4 is the block, limited in movement by the outer end of the stock and a shoulder h^5 of the nose h^2. The shank t of the rammer T within the nose and forward of the block h^4 is enlarged. Forward movement of the tool is limited by abutment of the enlargement h^6 against a shoulder h^7 of the nose H^2. A duct h^8 of smaller cross-area than the duct d^8 communicates with the same and opens into the interior of the nose H^2 forward of the enlargement, thereby serving to return the tool to striking position when the hammer is returned. The construction of the tool in the parts not shown is identical with the corresponding parts of the tool first described.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. The combination, with a casing provided with supply channels and ports, of a handle at one end of the same, a tool guided in the opposite end of the casing, a piston-valve located at the interior of the casing, said piston-valve being hollow and provided with circumferential grooves and an opening in one of said grooves, a return-channel connecting the rear end of the casing with the front end of the same, a sliding hammer in the casing, a cushioning-spring located between the piston-valve and handle, a channel connecting the interior of the casing with the space behind the valve, and shoulders at the rear end of the casing for arresting the spring and the piston-valve in their forward motion, substantially as set forth.

2. The combination, with a casing, of a bow-shaped handle attached to the rear end of the same, an inlet-valve in the handle, a supply-channel in the handle communicating with the supply-tube, a supply-channel in the rear portion of the casing, provided with ports, a hollow piston-valve in the rear portion of the casing provided with two circumferential grooves and an opening in one of said grooves, a sliding hammer in the casing, a sliding block closing the front end of the casing, a channel in the casing for supplying compressed air for the return of the hammer, a channel connecting the interior of the casing with the space between the piston-valve and the handle, and exhaust-ports for permitting escape of air from the interior of the casing between the slide-block and hammer, and between the hammer and piston-valve, respectively on the forward and return strokes of the hammer, substantially as set forth.

3. The combination, with a casing, of a handle attached to the rear end of the same, an inlet-valve in the handle, a supply-channel in the handle, a supply-channel in the rear portion of the casing provided with ports opening into the interior of the same, a return-channel in the casing provided with ports at the rear portion of the casing, a hollow piston-valve in the rear portion of the casing between the ports of the supply and return channels and provided with two annular grooves and an opening in one of said grooves to the interior of the valve, shoulders at the rear portion of the casing, a spring between the rear shoulder and the handle, a rim on the piston-valve adapted to abut against the other shoulder, the area of the rear end of said valve being slightly larger than that of its front end, a sliding hammer in the casing, a channel connecting the interior of the casing with the space behind the piston-valve, and exhaust-ports communicating with the interior of the casing, substantially as set forth.

In testimony that we claim the foregoing as our invention we have signed our names in presence of two subscribing witnesses.

JOHN W. BIRKENSTOCK.
RICHARD W. FUNK.

Witnesses:
PAUL GOEPEL,
JOSEPH H. NILES.