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C. H. RICHWOOD.
FLUID ACTUATED VIBRATOR.
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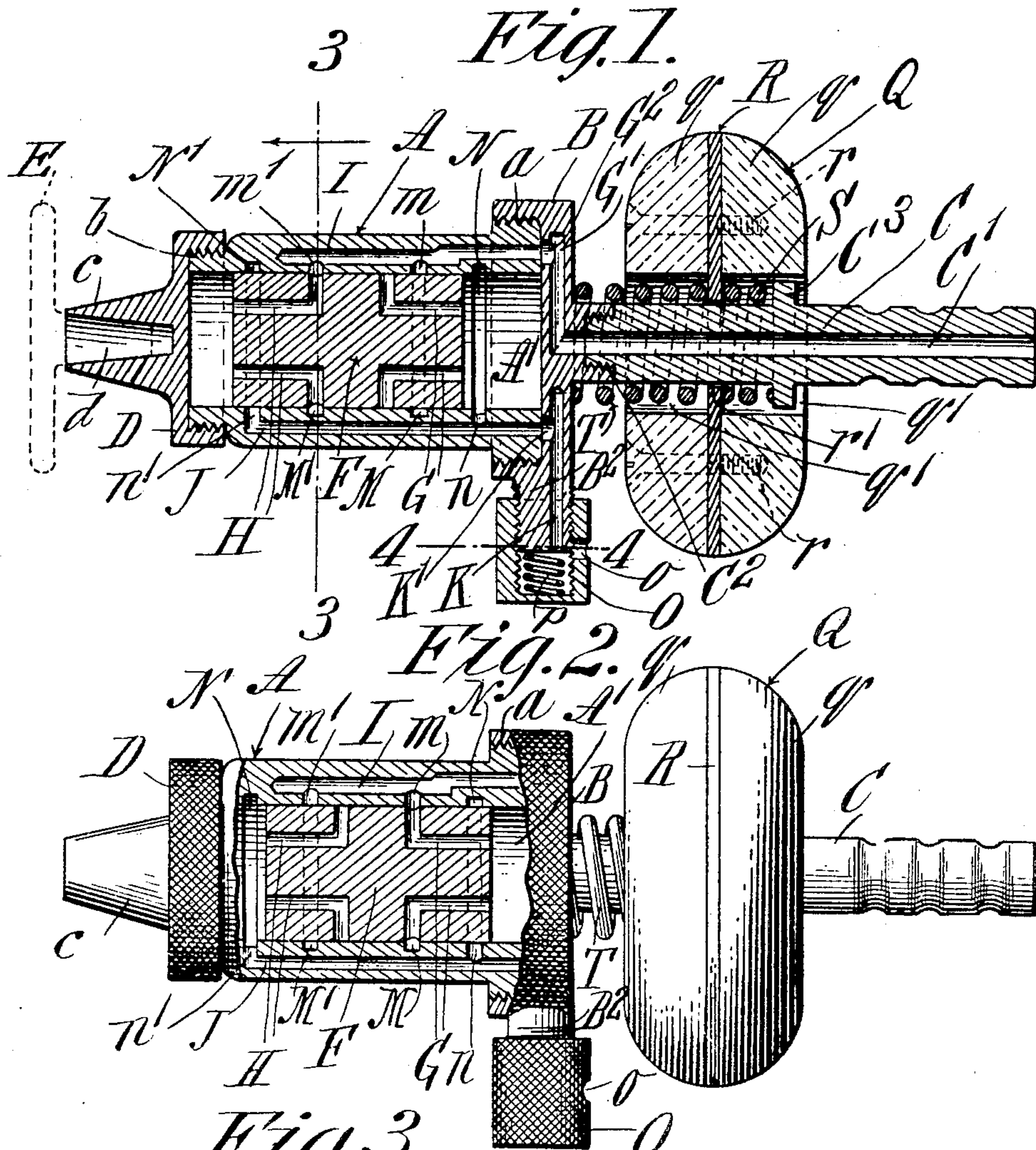


Fig. 3.

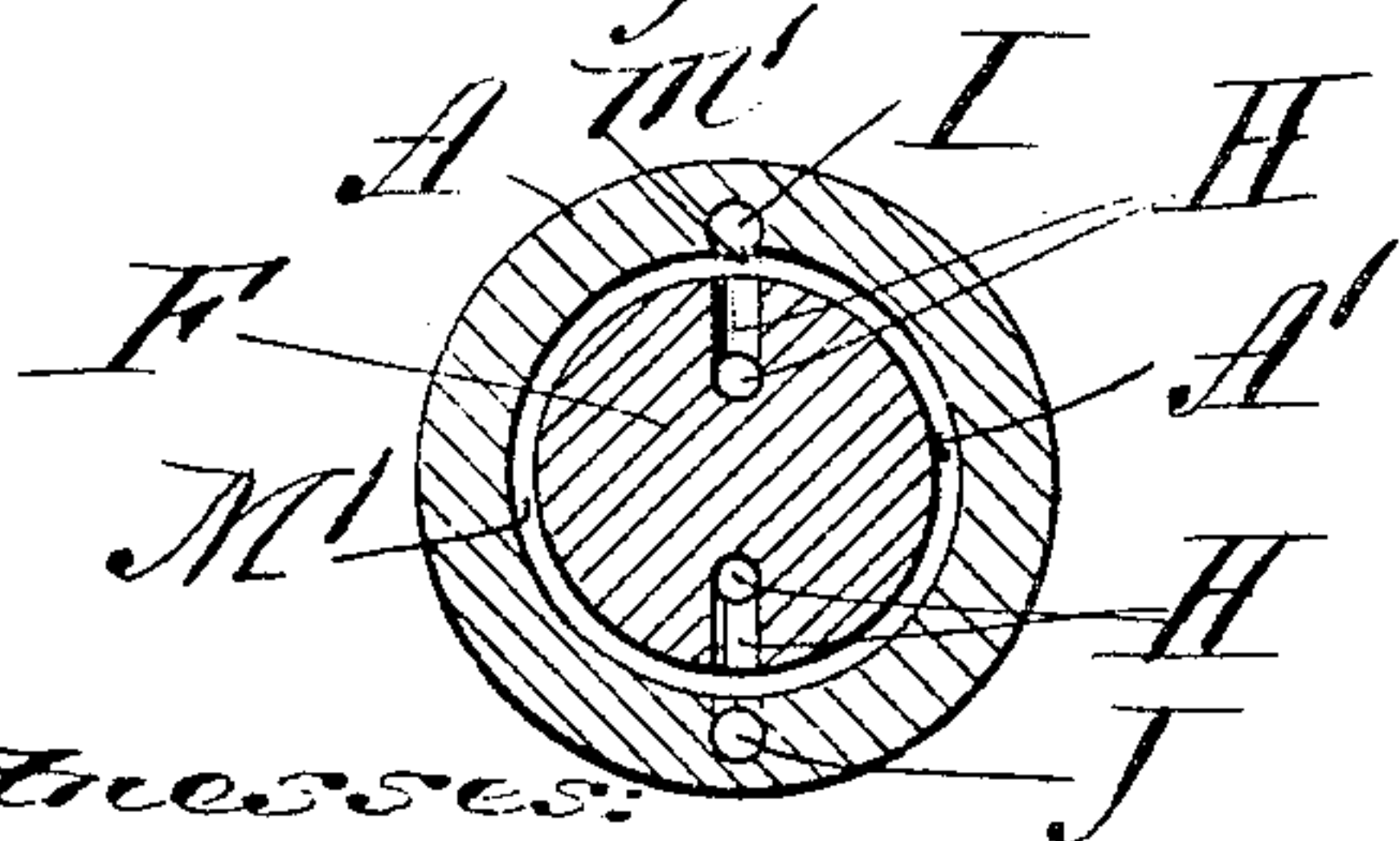
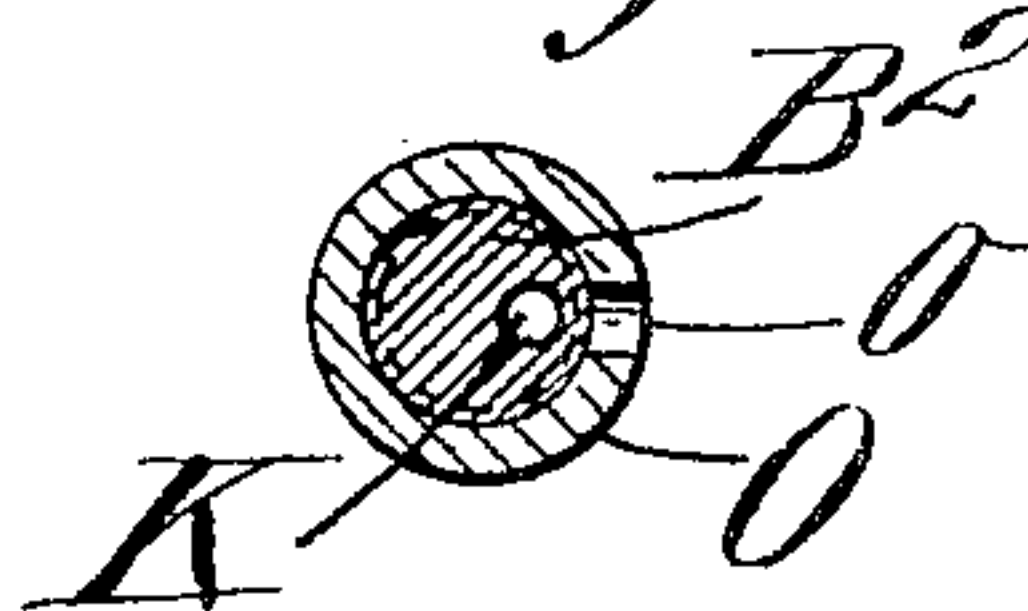


Fig. 4.



Witnesses:

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UNITED STATES PATENT OFFICE.

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FLUID-ACTUATED VIBRATOR.

No. 835,290.

Specification of Letters Patent.

Patented Nov. 6, 1906.

Application filed December 7, 1905. Serial No. 290,782.

To all whom it may concern:

Be it known that I, CLARENCE H. RICHWOOD, a citizen of the United States of America, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Fluid-Actuated Vibrators, of which the following is a full, clear, and exact description.

This invention relates to mechanically-operated massaging-vibrators of the class in which a suitable plate or pad, commonly called an "applicator," is employed to transmit vibratory pulsations to the skin or otherwise to the person in exceeding rapid succession; and the present invention pertains more particularly to the construction and operation of the automatic and manually-applied devices for producing in rapid succession such blows or vibrations.

One object of the invention is to provide in a hand instrument of the class indicated an improved automatic pneumatically-operated comparatively heavy piston, the rapid reciprocations of which within its cylindrical casing imparts thereto, by reason of the considerable weight of said piston, correspondingly-rapid longitudinal vibrations of the casing and the applicator attached thereto.

Another object is the provision in an air-operated vibrator of the class indicated of improved means for regulating the vibrations in connection with the air-exhaust opening, and a still further object attained in conjunction with those above described is the cushioning of the holding knob or handle, whereby a minimum reactionary effect of the vibrator while running at high speed is perceptible at the hand of the operator.

To these ends the invention consists in the combination or arrangement of parts and the constructions of certain of the parts, all substantially as hereinafter described, and set forth in the claims.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is a sectional view taken longitudinally through the vibrator. Fig. 2 is a side elevation, a considerable portion of the vibrator being broken out in section and showing the piston at the opposite end of its stroke from that shown in Fig. 1. Fig. 3 is a transverse section taken on line 3 3, Fig. 1;

and Fig. 4 is a section taken horizontally on the line 4 4, Fig. 1.

Similar characters of reference indicate corresponding parts in all of the views.

In the drawings, A represents the cylindrical casing of the vibrator, having the centrally-located piston-bore A' extending longitudinally from end to end therethrough. The right-hand end portion of the casing (as viewed in Fig. 1) for a short portion of its length is of increased diameter and is screw-threaded at *a* and receives on said screw-threaded end portion the internally-screw-threaded and knurled head B. This head B has centrally attached thereon and extending in a direction longitudinally of the casing A the handle-stud C, having the air-supply passage C', formed therein, and a corrugated end portion for the hose attachment with the air-compressor or other source of air-supply, the manner of attachment of this handle-stud C to head B being by the screw-threaded joint C², Fig. 1.

The left-hand end portion of casing A is of reduced diameter and is screw-threaded at *b* and receives thereon the applicator-supporting head D, a conical-shaped stud *c*, which projects longitudinally therefrom, being provided with the tapering hole *d* therein for the engagement of a tapered stud portion of a suitable pad or applicator E, (shown in dotted lines in Fig. 1,) or the vibrator may be in any suitable manner adapted for the reception of interchangeable applicators.

A piston F of a diameter to closely fit the casing-bore A' and of a length, for instance, about two-thirds that of the casing A has formed at each end portion thereof the angular-shaped conduits H and G. These conduits extend from accurately-positioned openings in the piston sides to discharge-openings in the piston ends, as shown in Figs. 1 and 2, and conduct the supplied fluid-pressure to end portions of the casing-bore A'.

The side walls of the casing A, which are of substantial thickness, have extending longitudinally thereinto from the right-hand end thereof the air-inlet duct I and the oppositely-located air-outlet duct J.

A properly-positioned connecting duct or passage G', provided in the head B and leading from the longitudinally-extending supply-passage C', has an opening G² connecting

it with the inlet-duct I of the casing A. An outlet-passage K, formed in head B in line with the above-described inlet-passage G', has a discharge-opening which is continued beyond the periphery of the head B in the threaded projection B². The opposite end portion of this passage K by means of the opening K' communicates with the outlet-duct J in the casing.

At properly-spaced points in the casing-bore A' are inlet and outlet grooves M and M' and N and N', respectively, the inlet-connecting grooves M and M' communicating with the inlet-duct I by the ports or openings m and m', and the grooves N and N' are connected with the duct for outlet by the openings n and n'.

A screw-threaded cap O is provided on the threaded portion of the projection B² of head B and has the exhaust-opening o formed in the side wall thereof at a point adjacent the outlet end portion of said projection B², whereby a slight screw adjustment of the cap O on the threaded projection B² results in the diminishing or enlarging of the exhaust-opening o more or less, according to the degree of covering of said opening o by the end of the projection B², caused thereby. A helical spring p inside of cap O, which exerts a constant pressure on the engaging screw-threads of the cap and the projection B² constitutes an efficient thread-locking device for the prevention of any disturbance of the exhaust adjustment, as described, by the action of vibration.

A knob or handle Q, loosely located on the handle-stud C between the head B and the portion for hose connection thereon, comprises in its construction means for protecting the hand of the operator from the tremulous jar of the vibrator while in use. To this end the knob-handle Q is made up of two round-edged circular hand-pieces q q, which preferably may be made of hard rubber. These two handpieces, which have a centrally-formed circular opening q' there-through, are attached together and to an interposed guiding-disk R by screws r. The disk R has a centrally-formed circular opening r' of somewhat smaller diameter than the handpiece openings q' and large enough to permit of its being easily slid onto the handle-stud C, as shown in Fig. 1, and the portion of this disk surrounding its central opening forms an internal annular flange within and intermediate of the length of the opening through the handle.

In assembling the various parts constituting this non-vibratory handle Q the handle-stud C, being removed from the head B, has first placed thereon the short helical spring S, which abuts against the shoulder C³, formed on handle-stud C. The knob-handle Q is then placed on the handle-stud, being guided thereon by the disk R, against which spring

S abuts. A second spring T, somewhat longer than spring S, is next placed in position on the handle-stud, one end thereof being placed in contact with the opposite side of the flange forming portion of the guiding-disk R from the spring S. The spring S and a portion of the spring T are inclosed by the circular knob-handle openings q', as shown in said Fig. 1 of the drawings. The springs S and T and the interposed knob-handle Q having been positioned, as described, on the handle-stud C, the handle-stud is forced against the combined pressure of these springs into its screw-threaded-joint connection (shown at C²) with the head B. The slight compression of these springs S and T, located on either side of the guide-plate R of the knob-handle, serves to maintain said handle in its normal position and forms a yielding or cushioned support for the vibrator.

The operation of the vibrator is as follows: Assuming that the air or other motive fluid from the air-compressor or other source of supply is about to be admitted to the vibrator with the piston in the position within the casing-bore A', as shown in Fig. 1, the course of said motive fluid is through a flexible connecting pipe or hose (not shown) to and into the handle-stud passage C' and the connecting-passages G' and G² in the head B and thence into the inlet-duct I. From this duct I the motive fluid passes through the opening M', from which it is taken through the angular or port m' into the annular inlet-groove lar-shaped piston-ducts H to the left-hand end portion of the casing-bore A', and there being at this time no outlet therefrom the piston F is forced toward the right and into the second terminal position, as illustrated in Fig. 2 of the drawings. At this time the motive fluid on the left-hand end of the piston F escapes through the now uncovered port-opening n' into the outlet-duct J and the connecting-passage K', K, and o to the outer air. Simultaneously with this above-described piston movement a certain percentage of the unexhausted fluid that was not expelled from the right-hand end of casing-bore A' becomes pocketed therein now by the closing of the outlet opening or port n' (see Fig. 2) and forms an air-cushion which serves to check any further travel of the piston toward the right. The next course the fluid from the inlet-duct I takes, as a further reference to Fig. 2 indicates, is through the opening or port m and the annular casing-groove M and thence through the angular-shaped piston-ducts G to the right-hand end portion of the casing-bore A', which causes the piston F to then move to the left and into the first-described position, as shown in the drawings in Fig. 1.

Repetitions of the above-described cycles of the vibrator-piston are made to occur automatically in the manner specified so long

as the motive fluid is supplied to the vibrator, and the impacts or jars on the cushioned air caused by the checking of the piston in the successive strokes thereof produce the vibrations of the device as desired.

I claim—

1. In a vibrator, the combination of a casing, the wall of which is provided with an inlet-duct communicating with the bore of the casing by way of two annular groove-ports, an exhaust-duct in the casing-wall communicating with the bore of said casing by way of two annular groove-ports, a piston arranged for reciprocation in said casing and provided with pairs of passages formed in the body thereof, leading from the circumference and discharging from the ends of said piston, and adapted alternately to have communication with the annular groove-ports of the inlet-duct, and discharge motive fluid into the ends of the casing, a screw-cap having an exhaust-discharge passage, and means for varying the area of the discharge-passage, substantially as described.

2. In a vibrator of the class described, the combination with a cylinder having closure-heads, annular inlet and exhaust groove-ports formed in the wall of the cylinder-bore, and positioned in pairs longitudinally-extending inlet and exhaust ducts formed in the cylinder-wall and having passages connecting with the annular inlet and exhaust groove ports respectively; inlet and exhaust passages formed in one of the cylinder-heads, having opening-passages therefrom connecting with the inlet and exhaust cylinder-ducts; of a reciprocatory piston endwise slidable in the cylinder-bore and having conduits formed in each end portion thereof, extending from positioned receiving-openings on the sides of the piston, to discharge-openings on the piston ends, whereby motive fluid from the said cylinder-inlet passages and annular inlet-groove ports is conveyed through the piston-conduits at one end of the piston into one end portion of the cylinder-bore, causing the piston to move toward the other end of said bore, and the exhaust fluid from this latter end portion of the cylinder-bore to be simultaneously discharged through the oppositely-

located piston-conduits into the exhaust annular groove ports and passages of the cylinder, whereby reciprocating movements of the said piston are made to repeatedly occur as long as fluid-pressure is supplied thereto, thereby causing endwise jar to the piston-inclosing cylinder.

3. In a vibrator, the combination of a casing, a piston arranged in said casing, and means for admitting motive fluid to reciprocate said piston, a handle-stud detachably screw-connected with said casing and provided with an abutment-shoulder, a handle-knob having an opening therethrough whereby it may be fitted freely over said shoulder of the stud, provided with an annular member between its inner and outer sides forming an internal flange intermediately within the wall of said opening, a spiral spring interposed between said flange and said shoulder at one side of such flange, and another spiral spring between the casing and said internal flange at the other side of the latter.

4. In a vibrator, the combination of a casing, a piston arranged to reciprocate in said casing, a duct to admit motive fluid to said casing to reciprocate the piston, an exhaust-duct, a screw-cap adjustably fitting about the exhaust-discharge, and a spring combined with said screw-cap to prevent disturbance of the adjustment thereof with relation to the exhaust-discharge.

5. In a vibrator, the combination of a casing, a piston arranged to reciprocate in said casing, motor inlet and exhaust ducts, a projection from the casing having a passage communicating with the exhaust-duct and an exhaust-discharge opening, a screw-cap adjustably fitting about said projection to vary the discharge-opening thereof, and a spring combined with said screw-cap to prevent disturbance of the adjustment thereof.

Signed by me at Springfield, Massachusetts, in presence of two subscribing witnesses.

CLARENCE H. RICHWOOD.

Witnesses:

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G. R. DRISCOLL.