F. H. BOGART.

FLUID OPERATED DEVICE.

APPLICATION FILED AUG. 10, 1917.

1,284,225.

Patented Nov. 12, 1918.

2 SHEETS—SHEET 1.

Fig. 1.

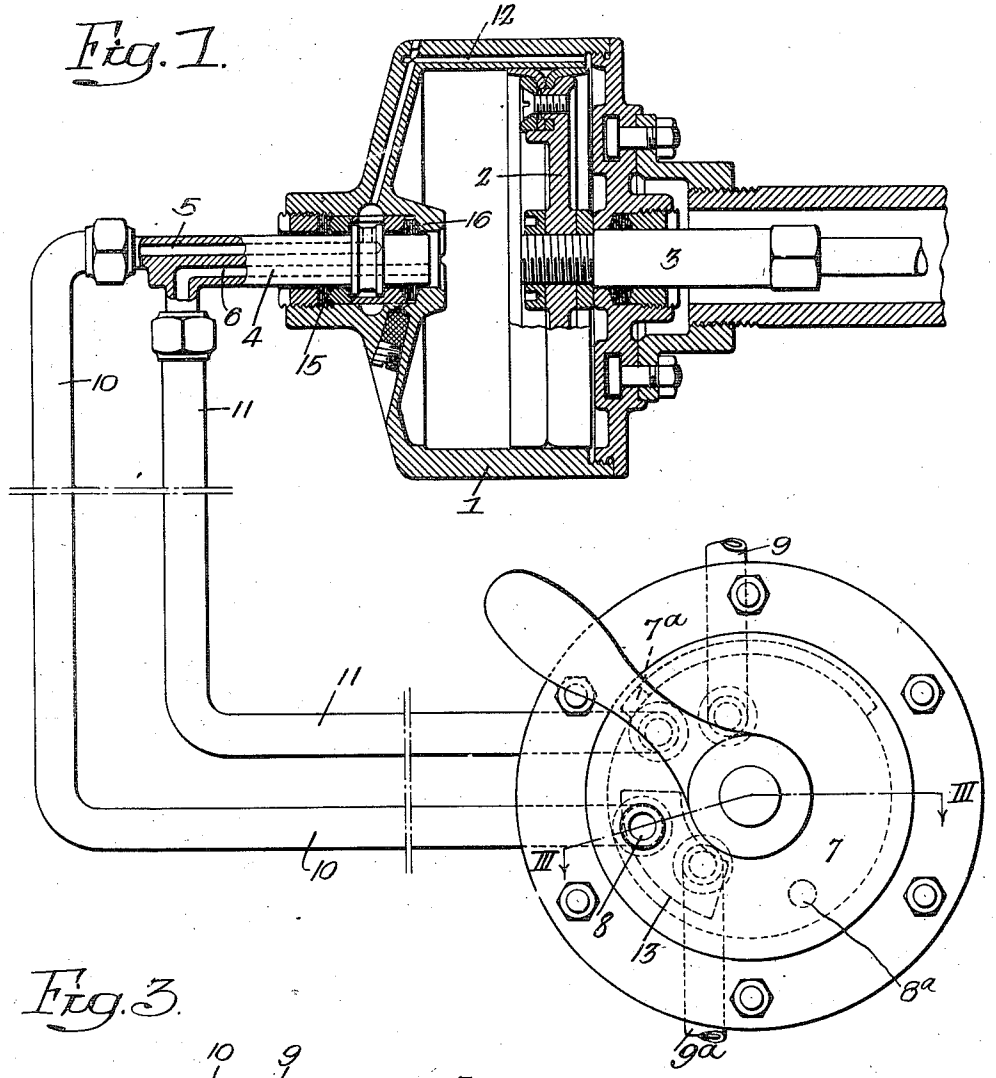
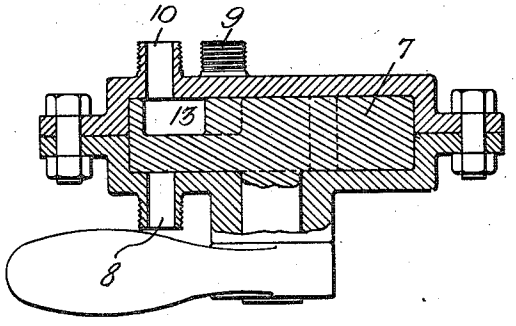


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 2

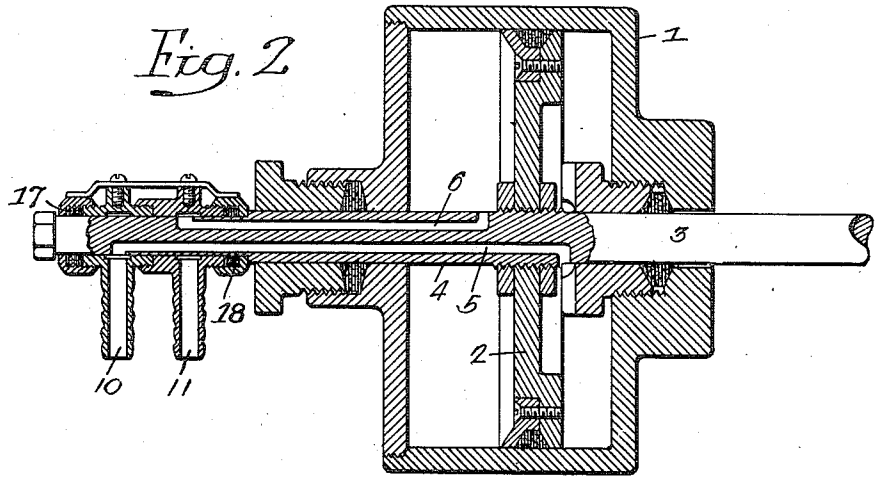


Fig. 4.

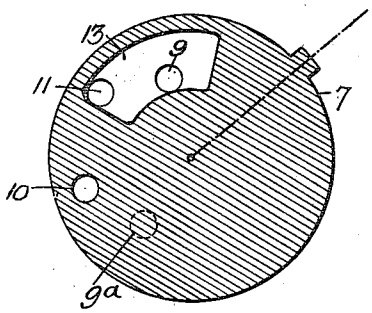


Fig. 5.

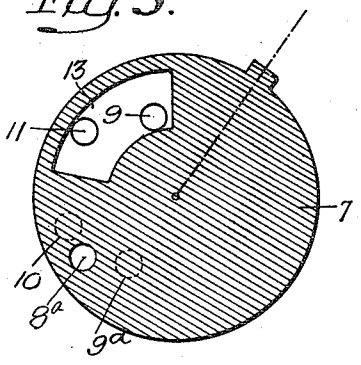


Fig. 6.

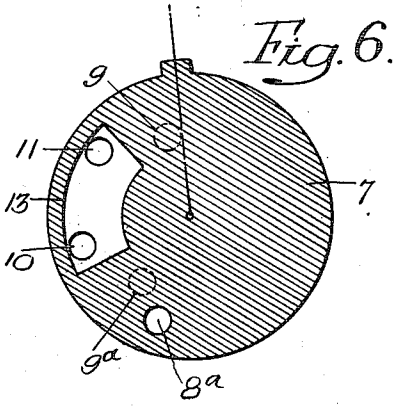
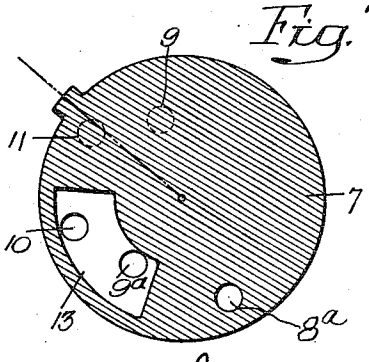


Fig. 7.



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UNITED STATES PATENT OFFICE.

FRED H. BOGART, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE BOGART COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

FLUID-OPERATED DEVICE.

1,284,225. Specification of Letters Patent. Patented Nov. 12, 1918.

Application filed August 10, 1917. Serial No. 185,443.

To all whom it may concern:

Be it known that I, FRED H. BOGART, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Fluid-Operated Devices, of which the following is a specification.

My invention relates to that form of structures known as "pneumatic holding devices", usually employed for holding chucks in engagement with work to be operated upon in lathes or similar metal working machines; and the object of my invention is to provide means for quickly releasing the chuck when any particular operation upon a part supported by the chuck has been completed and it is desired to reset the chuck for the reception of another part, or to shift the position of the part previously operated upon with relation to said chuck.

My invention comprises a double-acting cylinder, having within the same a piston suitably connected with the chuck, or with means for operating the same; such cylinder being arranged to move the piston to the holding position by live pressure introduced on one face of the same, with means for cutting off such live pressure from the source of supply, and means for bypassing the pressure within the cylinder and previously employed for moving the piston to the holding position, to the other side of the piston; thereby balancing the pressures, and means for subsequently opening that side of the cylinder originally receiving the live pressure to exhaust, so that the pressure at the other end of the same and on the opposite side of the piston may act upon the latter to move it to the desired position to open the chuck.

In operating a structure of this character, I may employ a four-way valve, which is rotatable to the several positions necessary for the proper operation of the structure; first to admit live air on one side of the piston and move it to a position to hold the chuck in the closed position; second to cut off initial pressure; third to bypass the air from one side of the piston through the valve to the opposite side of the piston; and finally to a position permitting exhaust from the right-hand side of the piston receiving the initial pressure so that the reduced pressure may act upon the piston to move it toward the right, or in the position shown in Figs. 1 and 2, and open the chuck.

These and other features of my invention are more fully described hereinafter, reference being had to the accompanying drawings, in which:

Figure 1, is a sectional elevation of one form of structure within the scope of my invention.

Fig. 2, is a sectional elevation of another form of structure within the scope of my invention.

Fig. 3, is a sectional view on the line III—III, Fig. 1, and

Figs. 4, 5, 6 and 7, are diagrammatic views illustrating various positions of the valve.

In the drawings, 1 represents a cylinder, in which may be mounted a piston 2, connected to a rod 3, the opposite end of which is operatively connected to a chuck (not shown). At the opposite side of the cylinder, (the left side in Fig. 1, of the drawings) I connect a combined air inlet and exhaust pipe 4, having passages 5 and 6, leading from a controlling valve 7; the casing of the latter having a plurality of pipes connected therewith, and the valve having a stop 7^a coacting with stops within the wall of the casing in which it is mounted. Pipe 8 leads from a suitable source of constant pressure; pipes 9 and 9^a lead to the exhaust from opposite ends of the cylinder; pipe 10 leads to the passage 5 in the pipe 4 communicating with the operating side of the piston to close the chuck, and pipe 11 leads to the passage 6 in the pipe 4 communicating with the releasing side of the piston to open the chuck. The piston is shown in each view in the position assumed when the chuck is open.

In the structure illustrated in Fig. 1, pressure is admitted from the source via pipe 8, through port 8^a of the valve block 7 and pipe 10 to the passage 5 in the air inlet pipe 4, passing thence through a passage 12 in the wall of the cylinder to the operating or right-hand side of the piston, and the effect of such pressure on this side of the piston will be to move the piston to the left and actuate the rod 3 connected to the chuck to close the latter. For such action, the valve will be in the position illustrated in Fig. 4, with its handle moved to its extreme position at the right, bringing the pipes 8 and 10 in alinement, and with the

cylinder at the left-hand side of the piston open to exhaust through passage 6, and pipes 11 and 9 which are connected by a space 13 in the valve 7. As long as the valve is in this position, live pressure will be directed to the right-hand side of the piston, as illustrated in the drawing, to hold the chuck in the closed position.

When it is desired to release the chuck, the pressure upon the right-hand side of the piston is to be cut off, and for this purpose the valve is moved to the position shown in Fig. 5, cutting off initial pressure but still keeping the left-hand side open to exhaust, preliminary to bringing the bypass into operative relation. For this latter purpose, the recess 13 of the valve, when the latter is moved to the position shown in Fig. 6, brings the pipe 10 leading to the passage 5 in the pipe 4 into communication with the pipe 11 connected with the passage 6 in the pipe 4, so that the pressure on the right-hand side of the piston may pass through the several pipes and enter the cylinder at the left-hand side of the piston, thereby balancing the pressure on both sides of the piston. Now by moving the valve to the position shown in Fig. 7, the pipe 10 is opened to exhaust via recess 13 and pipe 9^a, and the pressure trapped in the cylinder at the left-hand side of the piston will be sufficient to move the piston to the position shown in Fig. 1, thereby moving the rod 3 to open the chuck. When the valve is in the position shown in Fig. 7, the cylinder at the right-hand side of the piston is open to the complete exhaust.

When it is desired to close the chuck around a piece of work, the valve is moved successively to the positions shown in Figs. 6, 5 and 4, respectively, and when it is in the position illustrated in Fig. 6, there will again be a balancing of the pressures, although at considerable reduction, between the spaces on opposite sides of the piston, and when the valve is in the position shown in Fig. 4, full pressure is flowing to the pipe 10 from the pipe 8, thence to the passages 5 and 12, and to the space of the cylinder on the right-hand side of the piston.

In the structure shown in Fig. 1, the cylinder is suitably fixed against longitudinal movement, but is free to rotate with the chuck. The air inlet pipe 4, however, is fixed against rotation, and packing at 15 and 16 is provided to insure that no leakage at these points can occur.

The structure illustrated in Fig. 2 operates in substantially the same manner as the structure illustrated in Fig. 1, but in this case the cylinder is fixed against longitudinal movement, while the rod 3 with the connections may move with respect to the cylinder to open and close the chuck, and may rotate. In such instance, it is necessary to provide an air inlet connection for the pipes 10 and 11 which, while free to move longitudinally with the rod 3, is held against rotation, so that disarrangement of the parts is avoided. The air inlet connection is shown as provided with packing at 17 and 18.

It will be understood that while I have shown and described an arrangement in which the piston is moved to the left to close the chuck and to the right to open the same, these movements may be reversed without departing from my invention, and that in some instances suitable connections may be made with the chuck opening and closing means so that the cylinder may move and the piston maintain a fixed position with reference thereto.

I claim:

1. In a fluid operated device, the combination of a cylinder, a piston therein; said members being movable with respect to each other and one of said members being adapted for operative connection with an adjacent movable part, means for directing fluid pressure to said cylinder and to one side of said piston for actuating said movable part in one direction, and means for balancing the pressure on both sides of the piston and subsequently opening to exhaust the side receiving initial pressure; said means being constructed and arranged to prevent access of live motive fluid at this time, whereby an initial charge of fluid under pressure directed to one side of the piston may be by-passed to the cylinder on the opposite side of the piston, confined therein, and then permitted to expand and actuate the movable part in a direction opposite to that effected by the initial charge of fluid pressure.

2. In a fluid operated device, the combination of a cylinder, a piston therein; one of said members being movable with respect to the other, means for directing fluid pressure to said cylinder and to one side of said piston for effecting movement of one of said members in one direction, and means for balancing the pressure on both sides of the piston and subsequently opening to exhaust the side reciving initial pressure; said means being constructed and arranged to prevent access of live motive fluid at this time, whereby an initial charge of fluid under pressure directed to one side of the piston may be by-passed to the cylinder on the opposite side of the piston, confined therein, and then permitted to expand and actuate the movable member in a direction opposite to that effected by the initial charge of fluid pressure.

3. In a fluid operated device, the combination of a cylinder, a piston therein movable with respect to the cylinder and adapted for operative connection with an adjacent movable part, means for directing fluid

pressure to said cylinder and to one side of said piston for effecting movement thereof in one direction, and means for balancing the pressure on both sides of the piston and subsequently opening to exhaust the side receiving initial pressure; said means being constructed and arranged to prevent access of live motive fluid at this time, whereby an initial charge of fluid under pressure directed to one side of the piston may be by-passed to the cylinder on the opposite side of the piston, confined therein, and then permitted to expand and effect movement of the piston in a direction opposite to that effected by the initial charge of fluid pressure.

4. In a fluid operated device, the combination of a cylinder, a piston therein; said members being movable with respect to each other and one of said members being adapted to operative connection with an adjacent movable part, a connection with a source of fluid pressure, passages for directing fluid pressure to said cylinder and to both sides of said piston; one side of said piston receiving initial pressure only for actuating said movable part in one direction, and a valve for controlling the pressure admitted to said cylinder having means for cutting off the initial pressure acting upon one side of the piston and by-passing it to the opposite side thereof, thereby balancing the pressure on both sides of the piston and subsequently opening to exhaust the side receiving initial pressure; said means being constructed and arranged to prevent access of live motive fluid at this time, whereby an initial charge of fluid under pressure directed to one side of the piston may be by-passed to the cylinder on the opposite side of the piston, confined therein, and then permitted to expand and actuate the movable part in a direction opposite to that effected by the initial charge of fluid pressure.

5. In a fluid operated device, the combination of a cylinder, a piston therein movable with respect to the cylinder, a connection with a source of fluid pressure, passages for directing fluid pressure to said cylinder and to both sides of said piston; one side of said piston receiving initial pressure only for effecting movement of said piston in one direction, and a valve for controlling the pressure admitted to said cylinder having means for cutting off the initial pressure acting upon one side of the piston and by-passing it to the opposite side thereof, thereby balancing the pressure on both sides of the piston and subsequently opening to exhaust the side receiving initial pressure; said means being constructed and arranged to prevent access of live motive fluid at this time, whereby an initial charge of fluid under pressure directed to one side of the piston may be by-passed to the cylinder on the opposite side of the piston, confined therein, and then permitted to expand and effect movement of the piston in a direction opposite to that effected by the initial charge of fluid pressure.

FRED H. BOGART.