J. GARVIE.

VALVE.

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943,824. Patented Dec. 21, 1909.

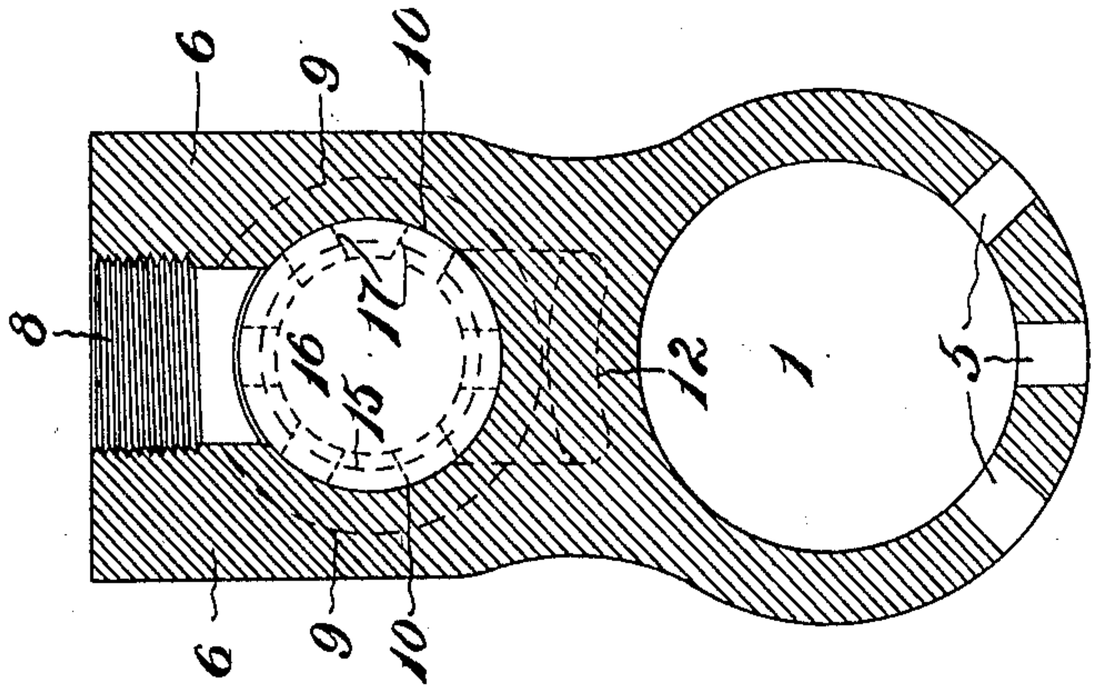

Fig. 2.

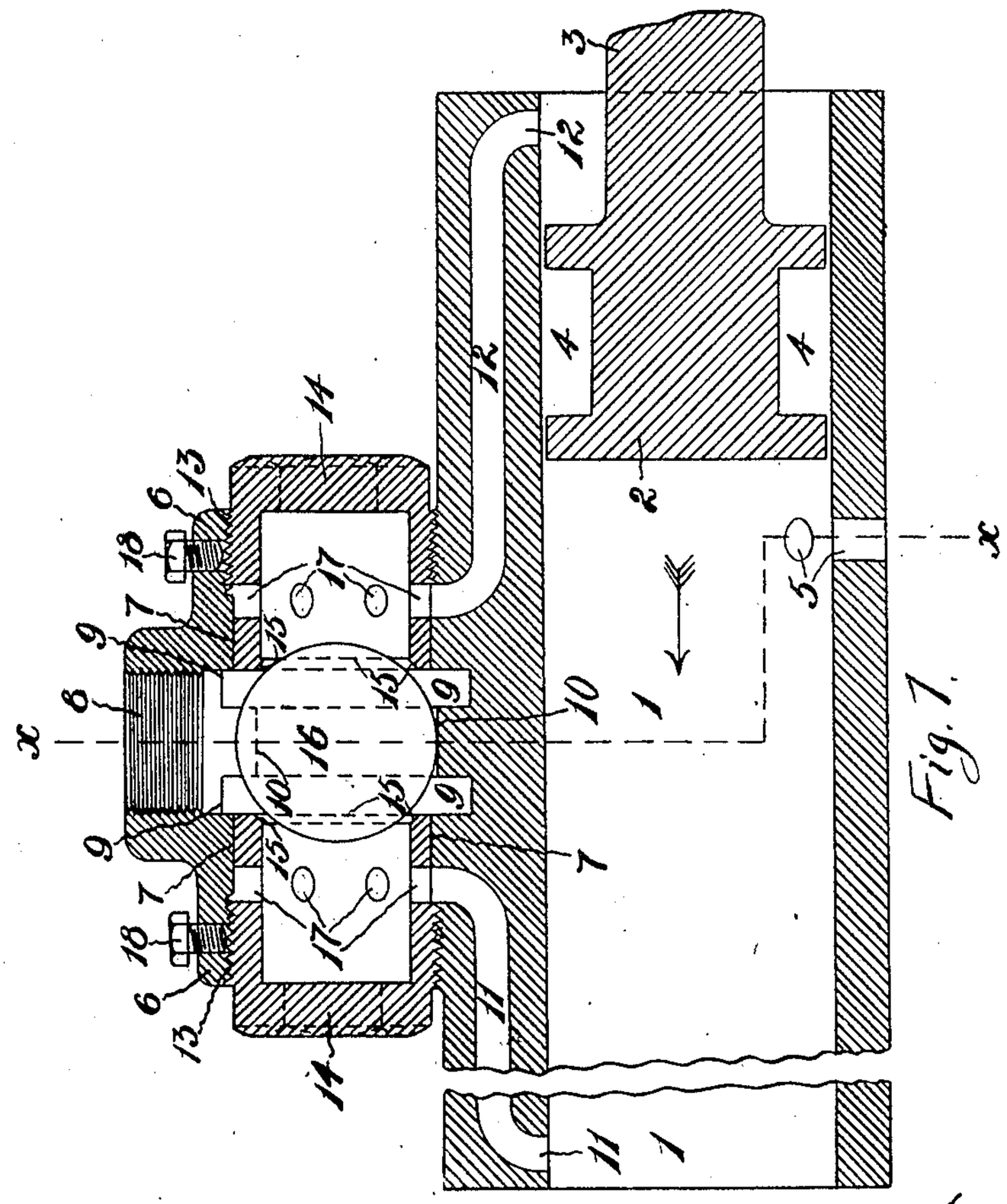

Fig. 1.

Witnesses:

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UNITED STATES PATENT OFFICE.

JAMES GARVIE, OF CLEVELAND, TRANSVAAL.

VALVE

943,824. Specification of Letters Patent. **Patented Dec. 21, 1909.**

Application filed April 19, 1909. Serial No. 490,737.

To all whom it may concern:

Be it known that I, JAMES GARVIE, a subject of the King of Great Britain, and resident of Cleveland, Transvaal, have invented certain new and useful Improvements in Valves, of which the following is a specification.

This invention relates to a valve primarily intended for rock-drills or rock-drilling machines, although it is applicable to other types of reciprocating engines. It may be adopted in either the hammer piston type, or the reciprocating bit type of rock-drilling machines.

The object of the invention is to so construct and arrange the valve, valve seats and distribution ports as to obtain a high speed or quick running machine or engine, and one in which the wear and tear on the aforementioned parts will be reduced to a minimum.

The valve is simple in construction, and the arrangement thereof provides for ready access to its several parts for examination, renewal or repair; it is easily and simply adjusted; it is economical in consumption of the motive fluid, for the reason that the cut off is very quick being practically instantaneous; it can be arranged and worked in a very small space, and is suitable for either steam, compressed air or other gaseous motive fluid under suitable pressure.

The engine is preferably provided with only one exhaust port leading directly through the walls of the cylinder, so that there is always a pressure on both ends of the piston, and consequently but a small quantity of live air or actuating fluid at initial pressure is required to do the work.

The invention will now be described by aid of the accompanying drawings in which—

Figure 1 is a longitudinal section of the cylinder and valve chest, and Fig. 2 is a transverse section of Fig. 1 on line *x*—*x*.

In the accompanying drawing I show the invention applied to a rock-drilling machine.

In the drawing 1 represents the working cylinder of the machine or engine, 2 the piston which is adapted to reciprocate in the cylinder 1, and 3 the piston rod to which at the forward end the drill bit or steel is attached in any ordinary or suitable manner. The piston 2 is provided with annular recesses 4 for the reception of any suitable form of packing. Although I do not show them it is well understood that the ends of the cylinder 1 are closed by means of a back cover and front head or their equivalent.

5 represents the exhaust port. It is shown comprising three holes to provide for ready egress of the fluid. The exhaust port 5 is preferably positioned somewhat forward of the center of the stroke of piston 2, so that the actuating fluid at initial pressure is admitted to the rear end of the cylinder on the forward and working stroke of the machine longer than to the forward end of the cylinder on the backward and idle stroke, or so that said port is uncovered by piston 2 earlier in the back and idle stroke than in the forward stroke.

It will be understood that once exhaust port 5 is overrun by the piston 2 in either direction, the fluid contained within the cylinder is compressed during the remaining portion of the stroke. This compression is utilized to reverse the valve.

6 represents the valve chest which may as shown be cast or otherwise constructed integral with cylinder 1. Valve chest 6 is bored out as indicated at 7 in a direction parallel with the longitudinal axis of cylinder 1. It is also constructed with an aperture 8—which may as shown be provided with a screw-thread for making connection in any ordinary or convenient manner with the actuating fluid supply pipe—communicating with the bore 7 at the center.

In the bore 7 are formed two annular recesses 9 which form between them a circular projection 10. 11 and 12 represent the back and front induction ports communicating at the one end with the bore 7 and with opposite ends of the bore of working cylinder 1 at the other end. The outer ends of the bore 7 of the valve chest 6 are provided with internal screw-threads 13.

Into the interiorly threaded outer ends of the bore 7 are screwed plugs or hollow cylindrical pieces 14 which are open at their inner ends and closed at their outer ends. The outer ends of plugs 14 are preferably constructed with hexagonal or other suitable polygonal heads for screwing them into or out of the valve chest 6. The inner ends of plugs 14 are beveled off on the inside as indicated at 15 to form the valve seats.

16 is the valve which is in the form of a ball or sphere. It moves between the valve seats 15 in the projection 10 which consti-

tutes a guide for it and maintains it central between the seats 15.

The motive fluid is free to pass through aperture 8 to the recesses 9 around the valve 16, so that it can pass between valve 16 and seats 15 all around the valve.

In each of the plugs 14 is formed a ring of holes 17 which serve for placing the interior of the plug in communication with its induction port. According to the position into which the plug 14 is screwed one or more of the holes 17 coincide with its induction port.

The fluid which passes between the valve 16 and seats 15 and enters the interior of plugs 14 is free to pass by way of holes 17 and induction ports 11, 12, to opposite ends of working cylinder 1.

18 are small setscrews screwed through holes in valve casing 6 to retain or lock plug 14 in correct position after adjustment of the valve seats 15.

It will be noted that the travel or movement of the valve 16 between the valve seats 15 is very short.

In the drawing valve 16 is shown in its central position. It will however be apparent that, assuming the piston is traveling in the direction indicated by the arrow in Fig. 1, valve 16 would then be on the left hand seat 15 closing induction port 11 to motive fluid supply and opening induction port 12 to said supply to move piston 2 through its rearward stroke. When piston 2 closes exhaust port 5 the fluid at the rear of said piston is bottled up and compressed, and when piston 2 overruns said exhaust port 5 and places cylinder 1 at the front of said piston open to exhaust, the pressure falls in the cylinder at the front of the piston, in induction port 12 and its plug 14. The fluid compressed at the rear of piston 2 then eases the valve off its seat and the motive fluid which is then admitted between the valve and said seat throws the valve over and closes the induction port 12 to motive fluid supply and opens induction port 11 fully to said supply which thereupon impels the piston through its forward and working stroke.

What I claim as my invention and desire to protect by Letters Patent is:—

1. A valve of the class described comprising a ball or sphere and oppositely disposed hollow members providing annular valve seats, and means for adjusting said members relative to one another.

2. A valve of the class described comprising a ball or sphere and oppositely disposed hollow members providing annular valve seats, means for adjusting said members relative to one another and means for securing said members in their adjusted positions.

3. A valve of the class described comprising a valve chest having a bore and an inlet for the motive fluid communicating with said bore, a ball or sphere located in the bore opposite the inlet, two hollow plugs screwed into the bore, said plugs being beveled off on the inside at their inner and open ends to form opposing seatings for the valve and having passages through which the motive fluid can pass from their interiors, and means for securing said plugs in their adjusted positions.

4. A valve of the class described comprising a valve chest having a bore and a central inlet for the motive fluid communicating with said bore and two recesses in the bore, a ball or sphere located in the bore opposite the inlet and in a projection formed between the aforesaid recesses, the said projection forming a guide for it, two hollow plugs open at their inner ends and screwed into the bore, said plugs being beveled off on the inside at their inner ends to form oppositely disposed valve seats, said plugs having passages through which the motive fluid can pass from their interiors and means for securing the plugs in their adjusted positions.

5. A valve of the class described, comprising a valve chest having a longitudinal bore, a transverse inlet for the motive fluid leading into said bore and two annular recesses in the bore at opposite sides of the inlet, a ball or sphere arranged in the bore opposite the inlet and adapted to move in a guiding projection formed between the recesses aforesaid, two hollow plugs open at their inner ends provided with exterior screw threads and having polygonal heads for screwing them into or out of the valve chest, said plugs being beveled off on the inside at their inner and open ends to form oppositely disposed seats for the valve, and having passages through which the motive fluid can pass from their interiors and set screws screwed into the valve chest and engaging the plugs for retaining the latter in position after adjustment.

6. In a valve of the class described, in combination the valve chest (6) having the bore (7) screw threaded at the ends (13), the inlet (8) and the recesses (9) forming the projection (10) the ball or sphere (16) movable in the projection (10) and opposite inlet (8) the plugs (14) screwed into the bore (7) having bevels (15) which constitute seatings for valve (16) and passages (17) which serve as outlets for the fluid, and set screws (18) for retaining plugs (14) in position after adjustment, as set forth.

7. In combination, a working cylinder and a valve chest, the former having induction ports leading from its ends to the valve chest and an exhaust port so positioned that it is uncovered by the piston earlier in the back stroke than in the forward stroke, a piston reciprocally arranged inside the cylinder, the valve chest having a bore parallel with the axis of the cylinder, and a central

fluid inlet communicating with said bore, the bore having at its outer ends internal screw threads, and two annular recesses on opposite sides of the inlet, a ball or sphere positioned in the bore and guided by the projection formed by the recesses in the valve chest bore, two plugs screwed into the ends of the valve chest bore, said plugs being closed at their outer ends and formed with polygonal heads for screwing them into or out of the bore and open inner ends beveled off on the inside to form opposing valve seats, and a plurality of holes for placing the interiors of said plugs in communication with their corresponding induction ports, said plugs being so arranged that the motive fluid is able to pass from the recesses into the interiors of the plugs all around the valve, and set screws screwed into the chest into engagement with the plugs for retaining the latter in position after adjustment, as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES GARVIE.

Witnesses:
CHAS. OVENDALE,
F. A. OVENDALE.