

1,056,339.

W. JOHNSON.
ENGINE VALVE.
APPLICATION FILED DEC. 15, 1911.

Patented Mar. 18, 1913
3 SHEETS—SHEET 1.

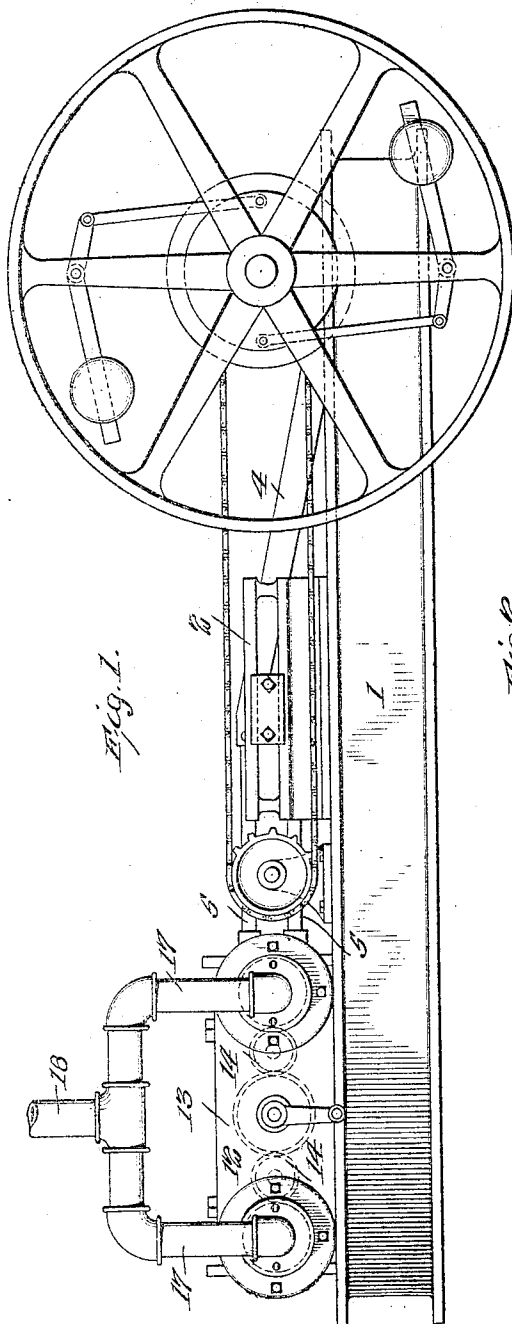


Fig. 1.

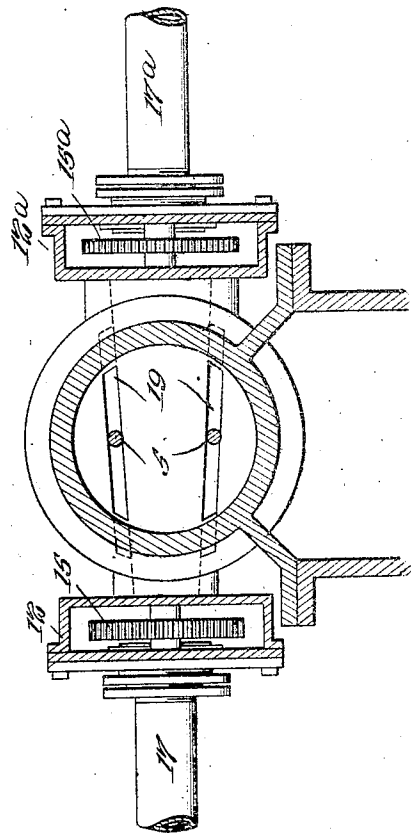


Fig. 2.

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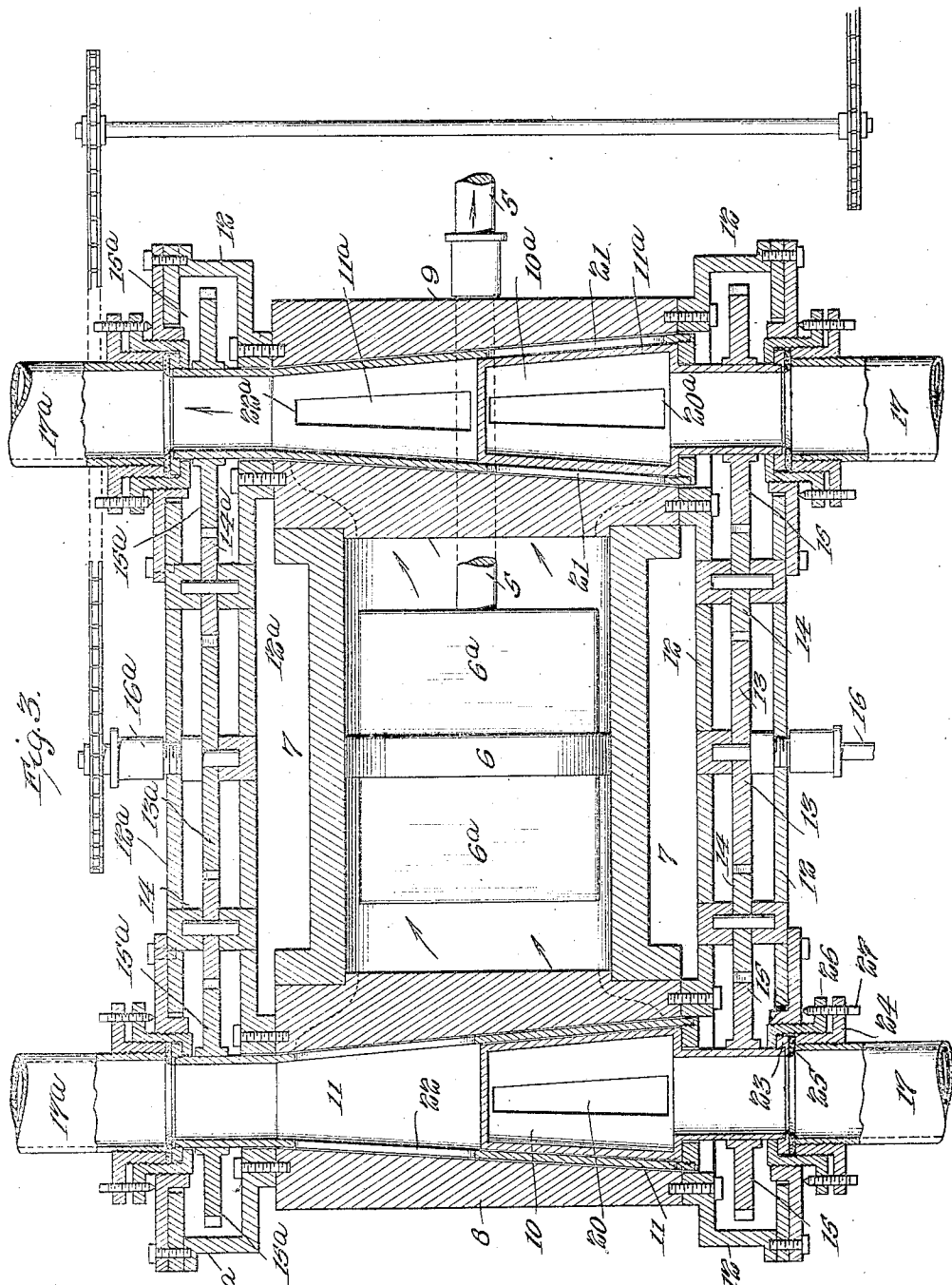
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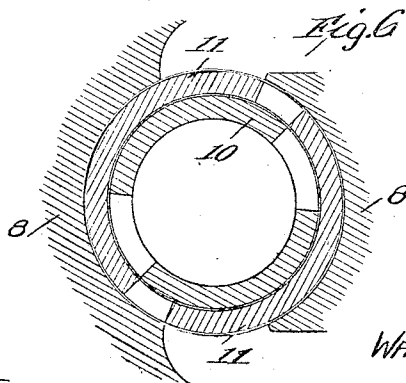
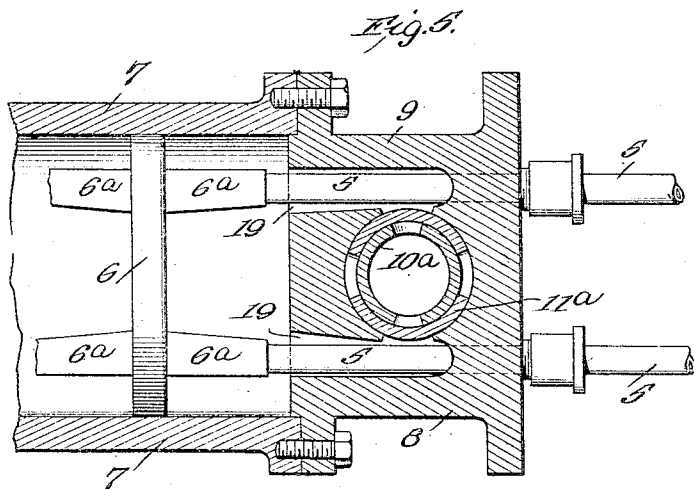
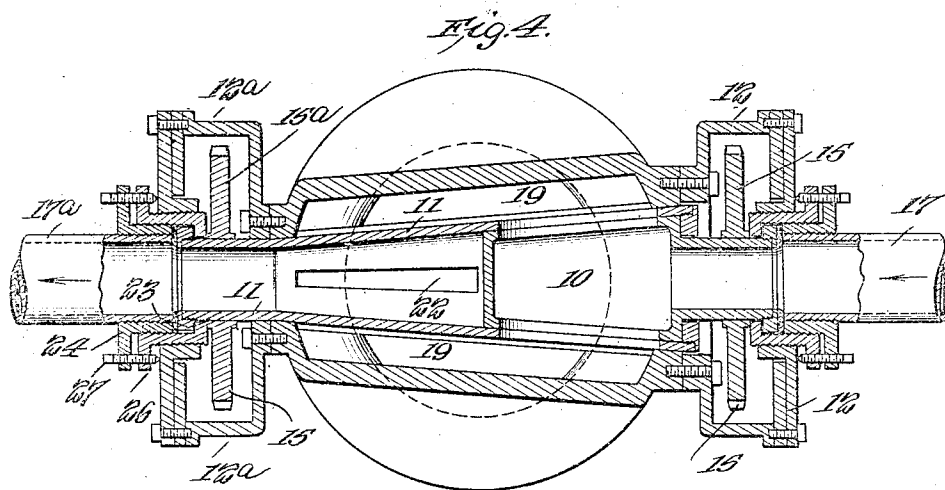
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UNITED STATES PATENT OFFICE.

WALTER JOHNSON, OF SOUTH OMAHA, NEBRASKA.

ENGINE-VALVE.

1,056,339.

Specification of Letters Patent.

Patented Mar. 18, 1913.

Application filed December 15, 1911. Serial No. 665,952.

To all whom it may concern:

Be it known that I, WALTER JOHNSON, a citizen of the United States, and a resident of South Omaha, in the county of Douglas and State of Nebraska, have invented an Improvement in Engine-Valves, of which the following is a specification.

The object of my invention is an improvement in rotary and oscillating engine valves, air compressor valves, ammonia compressor valves, throttle valves, cut off valves, admission and releasing valves.

I employ a casing and cone valves having diametrically opposite ports, gearing for rotating the valves in a particular manner, and boxing adapted to adjust the valves endwise.

The following figures and descriptions relate more particularly to steam and explosive engines, for the purpose of showing the true action or operation of the valve. The term "engine valves" is used in a general sense.

These and other objects and advantages are attained by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the engine of which my improved valve mechanism forms a part. Fig. 2 is a vertical cross section of the valve mechanism taken through the cylinder and showing the angles of the steam ports in one of the cylinder heads or valve seats. Fig. 3 is another vertical cross section of the same taken through the longitudinal center of one of the valves. Fig. 4 is a vertical section of the valve mechanism taken through one of the valves. Fig. 5 is a vertical section of a portion of the cylinder, an adjacent cylinder head and a valve seated therein, the piston and piston rods being shown in full lines. Fig. 6 is a vertical cross section of one of the tapered valves and the surrounding portion of the cylinder head having steam ports.

Fig. 1 shows a complete engine suitably mounted on a horizontal bed 1, a fly wheel and governor being located at one end of the same and my improved valve mechanism at the other end, guides 2 for the sliding cross-head 3 being arranged between the governor and the valve mechanism and a pitman 4 and piston rods 5 being connected with the cross-head in a well known manner.

As shown in Fig. 3, the rods 5 are rigidly attached to a piston 6 arranged to reciprocate in a horizontal cylinder 7 which

is provided with heads 8 and 9, the latter being bored horizontally to provide seats for two sets of hollow conical or tapered rotary valves and each of said heads having ports leading into the adjacent end of the cylinder. Each set of valves is composed of a long and a short member which are constructed alike. The short cones 10 and 10^a are arranged and adapted to rotate in the larger ends of the respective long valves 11 and 11^a. Casings 12 and 12^a are applied at the ends of the cylinder heads and bolted thereto, as shown in Fig. 3. Within these casings are arranged gears for controlling the operation of the valves. In the casing 12 a large gear 13 is arranged in the center and meshes with pinions 14 and these in turn with gears 15 which are mounted and keyed on the hollow extensions or necks of the shorter valves 10 and 10^a. Within the opposite casing 12^a a similar train of gears is arranged, the same being indicated by 13^a, 14^a and 15^a. Rotation is imparted to the gears in the casing 12 through the medium of a shaft 16 which is, in practice, suitably connected with the engine governor and rotation is imparted to the other set of gears in casing 12^a by a similar shaft 16^a which is suitably connected with the engine. It is deemed unnecessary to fully illustrate this means of connection since it will be well understood by those skilled in the art. The longer valves 11 and 11^a are continuously driven in one direction and the shaft 16 turns one revolution to two of the crank arm of the engine, so that the valves 11 and 11^a turn one revolution to two of the crank arm of the engine. In other words, by this movement the valves 11 and 11^a move through an arc of 90° at one stroke of the piston. The members of the gear train in casing 12 do not make a complete rotation but have an oscillating rotary movement, by which the smaller or shorter valves 10 and 10^a are given a partial rotation. Thus, while one set of gears drives the longer cone valves 11 and 11^a, the other set gives an oscillating or reciprocating rotary movement to the short valves 10 and 10^a by which the admission of steam to the cylinder is effected and controlled. The valves 10 and 10^a are normally stationary, except in so far as affected by the governor. Steam is admitted to the valves through the pipes 17 which, as shown in Fig. 1, connect with a supply pipe 18. The exhaust is taken off

at the other ends of the longer valves by means of pipes 17^a which are in practice similarly connected with a third escape pipe, not shown.

5 The piston is shown in Figs. 3 and 5 as provided with projections 6^a which are adapted to enter steam ports 19, this arrangement being adapted for the purpose of reducing the "clearance." The steam
10 ports 19 are located 180° apart.

The steam from the engine is received from the pipe 17 and enters the smaller cones 10 and 10^a which are provided with ports 20 and 20^a which may discharge
15 through ports 21 in the longer valve and thus into the cylinder through ports in the adjacent head. The exhaust takes place through ports 19, Fig. 4 in the cylinder heads and escapes through the ports 22 and
20 22^a in the longer valves 11 and 11^a.

It will be seen that each of the longer valves 11 and 11^a have four ports, two of the ports being in the large end of the valve and these live steam ports are located 180°
25 apart. Two of the ports are in the small end of the valve and are also 180° apart and serve only for exhaust. The exhaust ports are so located as to be 90° from the live steam port; hence a movement of 90° of the
30 valve 11 equals one stroke of the engine. Thus steam is admitted through 90° of a rotation of the valve 11 and as the live steam ports of this valve close to the ports 19 in the cylinder head, there is one revolution of the engine crank to 180° of rotation
35 of the valve 11. The longer valves 11 and 11^a (see Fig. 3) are so adjusted relatively that when one set of ports in one valve communicate with ports in the cylinder head, the corresponding ports of the other
40 valve are closed. Thus in Fig. 3, the live steam port 21 of the right hand valve 11^a is closed and the like port of the left valve 11 is open to the cylinder, while the respective exhaust ports of the longer valves are
45 open and closed, contrariwise. Hence, steam is entering the cylinder through the port in the left valve 10 and is exhausting from the right hand side of the cylinder through the port 22^a in valve 11^a. It will
50 be observed that the shorter valves 10 and 10^a are always so adjusted that their ports alternately coincide with the ports in the surrounding portion of the longer valves,
55 so that steam is admitted and exhausted alternately at opposite ends of the cylinder.

In Fig. 6, it will be seen that steam is at the point of being admitted to ports 19 and the inner or smaller valve 10 is in such position
60 as required for closing other ports. Upon the valve 10 being rotated, steam is admitted in proportion to such movement. This movement of the valve 10 allows admission of steam from zero or dead center to
65 any position of the piston in the cylinder,

and such movement is effected by the governor through one of the gear trains. The speed of the engine is governed by this rotary movement of the short valves 10 and steam is admitted at boiler pressure under
70 varying loads at all times.

The reversal of the engine is effected by changing the position of valves 11 and 11^a and 10 and 10^a with respect to the position
75 of the piston, the ports being thus advanced or retarded through a special attachment not shown.

It will thus be seen that one of the main objects of the invention is to always allow admission of steam or other motive fluid to
80 the engine cylinder on the dead center at boiler pressure and to effect the cut off at any point from the dead center to the full length of the cylinder. Another object of admitting gas from opposite sides of cones
85 or cylinders is to produce or furnish a perfectly balanced valve; also one capable of operating at high speed and adapted for reversal. It is obvious that various other advantages are attained which it is unnecessary
90 to specify.

As shown in Fig. 3, the necks of the smaller valves 10 and 10^a are provided with a flange 23 against which a sleeve 24 is adapted to bear, an annular packing 25 being
95 interposed. The sleeve 24 is screwed on pipe 17 and another sleeve 26 is threaded on the sleeve 24 and both the sleeves 24 and 26 are provided with lateral flanges through which screws 27 are inserted. Thus, by adjusting
100 the screws 27, the packing may be clamped tightly so as to insure a tight joint and to take up wear. In brief, by this simple means I am enabled to provide for an easy and quick adjustment to make a perfectly steam-
105 or gas-tight joint, and to set valves closer together to take up inevitable wear of cones.

The projections 6^a of the pistons are of slightly less diameter than the ports 19, so that when the projections enter said ports,
110 sufficient space is left for passage of live steam into the cylinder 7. In further explanation of this feature, it may be stated that the projections reduce the cubical capacity of the ports by about three-fourths
115 upon entering them, at the time when steam is admitted, and when exhaust occurs the projections are not in the ports. Thus the ports are entirely open and free for exhaust and have sufficient capacity to allow
120 instant passage of live steam as the piston reciprocates.

What I claim is:—

1. Improved valve mechanism of the type indicated, comprising a cylinder, a piston
125 adapted to reciprocate therein, cylinder heads having transverse bores and ports leading from the same into the cylinder, a set of hollow oscillating and rotatable valves seated in each of said bores and having a
130

cone shape, each set formed of long valves having two or more sets of ports arranged opposite, and shorter valves arranged rotatably in the longer ones and having ports arranged directly opposite, and means for rotating the longer valves continuously and imparting oscillation to the shorter valves, substantially as described.

2. Improved valve mechanism of the type indicated, comprising a cylinder, a piston adapted to reciprocate therein, cylinder heads having transverse bores and ports leading from the same into the cylinder, a set of hollow oscillating and rotatable valves seated in each of said bores and having a cone shape, each set formed of long valves having two or more sets of ports arranged 180° apart, and shorter valves arranged rotatably in the longer ones and having ports arranged directly opposite, and two trains of gears, one train connected with and continuously rotating the longer valves and the

other train connected with and imparting oscillation to the shorter valves simultaneously, and inlet and exhaust pipes connected with the shorter and longer valves, substantially as described.

3. The combination with the piston cylinder having ends provided with ports and heads provided with tapered bores and connected with the cylinder ports, of hollow valves seated in said bores, gear casings secured to the ends of the cylinder heads, and trains of gears arranged in said casings, inlet and exhaust pipes alined with the valves and adjustable boxing applied to said pipes and the adjacent ends of the valves, said boxing being adapted to adjust the valves to take up wear and form gas-tight joints, as shown and described.

WALTER JOHNSON.

Witnesses:

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YALE C. HOLLAND.