

PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Valve Gear with Equilibrated Rotary and like Distributing Valves.

I, MARCEL ECHARD, a citizen of the French Republic, of 9, rue Montrosier Neuilly-sur-Seine, France, Manufacturer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to motors operating by internal combustion, by superheated steam, or to motors of the combination type which in addition to explosion or combustion are adapted to make use of the addition of water in any suitable state such as in the mixed or atomized state, as steam, or as supplied by jet.

The improvements relate more particularly to such motors in which the rotary valve is pressed on its seat by the fluid under pressure and is combined with a compensating piston on which the same fluid exercises a pressure in opposite direction to the aforesaid pressure and substantially equal in value thereto.

The object of the invention is to provide means which are applicable to flat or conical rotary valves in order to obviate all undue friction of the valve member upon its seat while under the pressure arising from explosion or expansion. This result is obtained by rigidly connecting the said valve and compensating piston the one to the other, so that they turn in the interior of the motor cylinder head.

The invention also comprises certain details of construction more particularly hereinafter described and claimed.

The accompanying drawing represents by way of example an embodiment of the

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invention as applied to valve gear with conical rotary valves.

Fig. 1 is an axial vertical section through the upper part of a motor cylinder, *i.e.*, on the line 1—1 of Fig. 2, the compensating piston being actuated directly by the motor fluid.

Fig. 2 is a horizontal section on the line 2—2 of Fig. 1.

Figs. 3 and 4 are sections, corresponding to that of Fig. 1 of alternative forms in which the compensating piston is under pressure of a liquid.

In these figures, *a* is the motor cylinder, *b* the piston, *c* the water circulation, *d* the conical rotary valve which is constructed together with the compensating piston *e*, the latter being either secured to this member *d* or constructed in the same piece with the latter, the arms *f* connect the valve member *d* and the piston *e* to the operating shaft *g* for producing the rotation of the valve.

The valve is rotated at one-quarter the speed of the motor and in such manner as to bring its two diametrically opposite ports *d*¹ *d*² in line with the two admission orifices *h* (see Fig. 2) or with the two exhaust orifices *i*, this rotation being effected by means of the worm *j* engaging the worm gear *k* which is keyed upon the driving shaft *g* of the valve member *d*. A spring *l* is adapted to rotate upon the thrust bearing *m* disposed upon the fixed portion *a*¹ of the cylinder and acts upon the lower side of the gear *k* in order to maintain the valve *d* in contact with the walls of the cylinder which constitute the seat for the valve. At *n* is the screw-threaded opening for mounting the ignition device; at *o* are the packing rings

either for the piston *b*, the shaft *g* or for the wall of the cover *a*¹ which is in contact with the compensating piston *e*.

When the ignition takes place, the pressure prevailing in the compression chamber or cylinder head *a*² tends to force the valve member *d* upon its seat, according to the arrow *x*, but the pressure is also exerted according to the arrow *y*, or in the contrary sense, upon the compensating piston *e*, the operative surface of the latter being calculated in such manner as to equilibrate this pressure at each instant and according to the variations of the diagram, thus reducing the friction to a minimum.

Fig. 3 shows the same valve gear, but in this case a liquid such as oil or the like is disposed between the cover *a*¹ of the cylinder and the working surface of the compensating piston *e*, in order to obviate heat losses through the walls and the sinuosities formed by the chamber of the compensating piston. A small piston *p*, or a flexible diaphragm is employed to transmit the motor fluid pressures prevailing in the motor cylinder to the liquid contained in the chamber *q* between this piston *p*, the cover *a*¹ and the compensating piston *e*, thus compressing this liquid. The pressure exerted by the liquid according to the arrow *y* is distributed uniformly upon the compensating piston *e* and causes a reaction upon the valve member *d* forced upon its seat according to the arrow *x*, thus suppressing the friction of this member upon its seat.

Fig. 4 represents the same valve gear as Fig. 3, but in order to reduce the size of the compensating piston the auxiliary piston is now made of the differential type. The pressure which it exerts upon the liquid in the chamber *q* is proportional to the ratio $\frac{p^1}{p^2}$ between the upper and lower surfaces of the auxiliary piston *p*, and this affords a means for reducing the surface of the compensating piston *e* in the same ratio.

A passage *e*¹ provided in the wall of the compensating piston *e* allows the air to escape during the relative movements of the pistons *e* and *p*.

The chamber *q* is supplied with liquid such as oil or the like in order to compensate for the leakage of oil which occurs in spite of the packing rings, this supply being effected for instance by means of a duct *r* provided in the shaft *g*, and this duct is so disposed that once in four revolutions of the motor and when the cylinder *a* is at the suction period, in which case no pressure is

exerted upon the compensating piston *e*, the said duct will come in line with a duct *s*, provided within the wall of the cylinder surrounding the driving shaft *y* of the distributing member *d*, this duct *s* communicating with a reservoir containing oil or other liquid which is connected with the neck *t*. This liquid supply, instead of being carried out automatically by the effect of the motor suction, can be obtained by means of a pump which in this case is connected with the neck *t*. This liquid feed method can also be applied in the case of the alternative form shown in Fig. 3.

The present invention has been described in the foregoing as applicable to conical rotating valves but it is of course equally applicable to flat rotary valves.

The principle of the invention remains the same in the case of a plurality of valves disposed in any suitable manner upon the same cylinder and actuated either with continuous or alternating circular motion.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. In distributing valves for motors comprising a rotary valve pressed upon its seat by the fluid under pressure and a compensating piston on which the same fluid exercises a pressure in opposite direction to the aforesaid pressure and substantially equal in value thereto, the construction in which the said valve and piston are rigidly attached the one to the other and turn in the interior of the motor cylinder head.

2. Valve gear according to Claim 1, characterized by the fact that the fluid of the motor exerts a pressure upon the compensating piston (*e*) through the medium of an auxiliary piston (*p*) and a liquid.

3. Valve gear according to Claims 1 and 2 characterized by the fact that the auxiliary piston (*p*) contains a portion of large diameter (*p*¹) subjected to the pressure of the motor fluid and a portion of smaller diameter (*p*²) acting upon the liquid, for the purpose of reducing the diameter of the compensating piston (*e*).

4. Valve gear according to Claims 1 and 2 characterized by the fact that the liquid-containing chamber is connected with a liquid reservoir under pressure, by means of a duct (*r*) provided within the spindle of the rotary distributing member and a duct (*s*) provided within the fixed cover member, the duct (*r*)

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being so disposed as to communicate with the duct (s) at the moment of suction in the motor, whereby the said liquid-containing chamber shall be kept automatically filled.

5 5. Valve gear substantially as described with reference to Figs. 1 and 2.

6. Valve gear substantially as described with reference to Figs. 1 and 3.

7. Valve gear substantially as described with reference to Figs. 1 and 4. 10

Dated this 1st day of July, 1920.

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Fig. 1

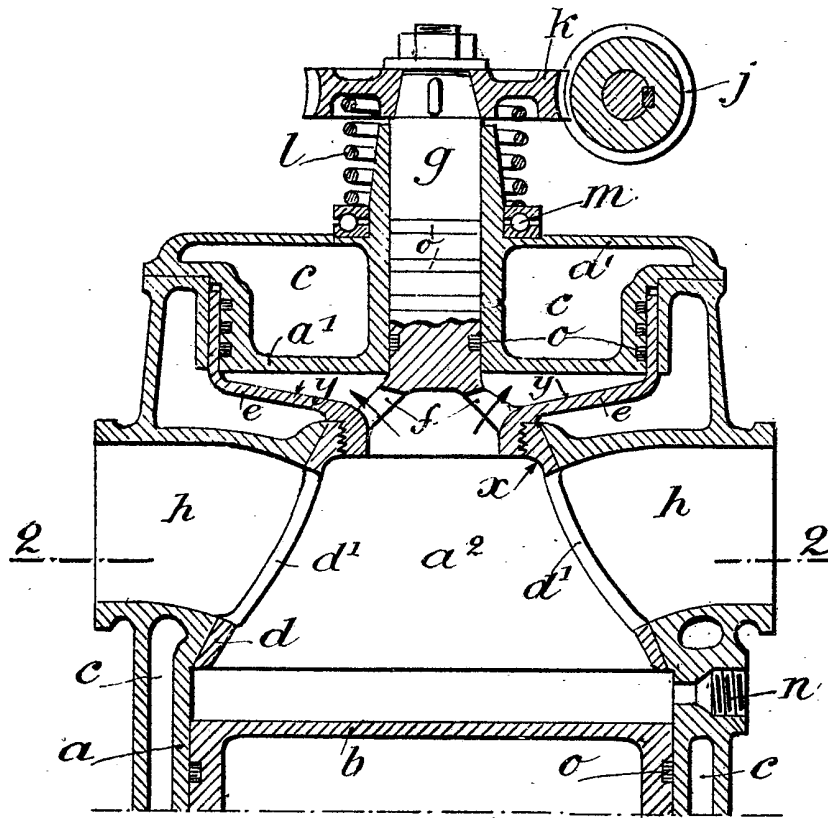
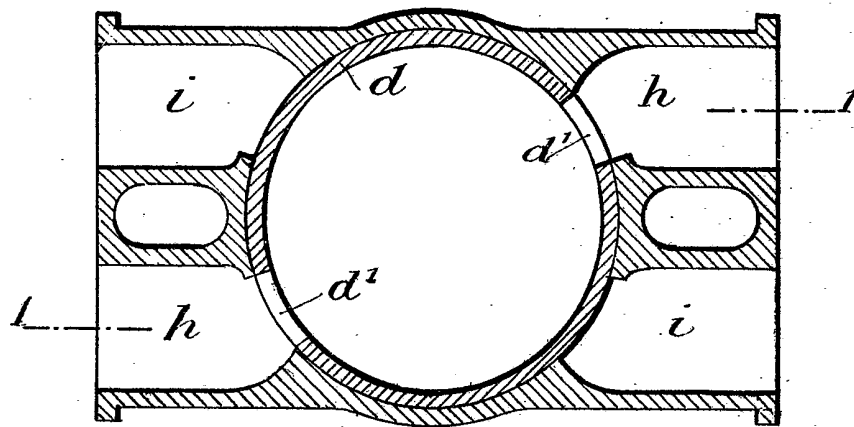


Fig. 2



[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 3

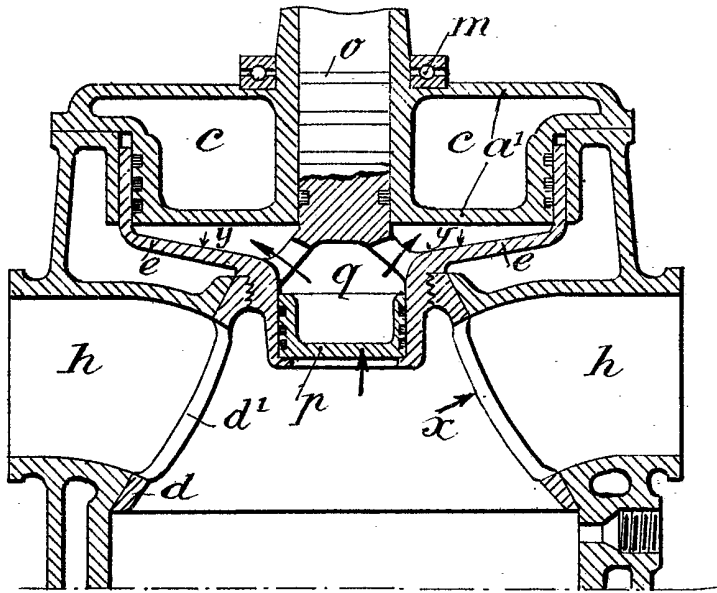


Fig. 4

