No. 849,987. PATENTED APR. 9, 1907.

J. W. EISENHUTH.

ROTARY VALVE.

APPLICATION FILED JULY 20, 1905.

Fig. 1.

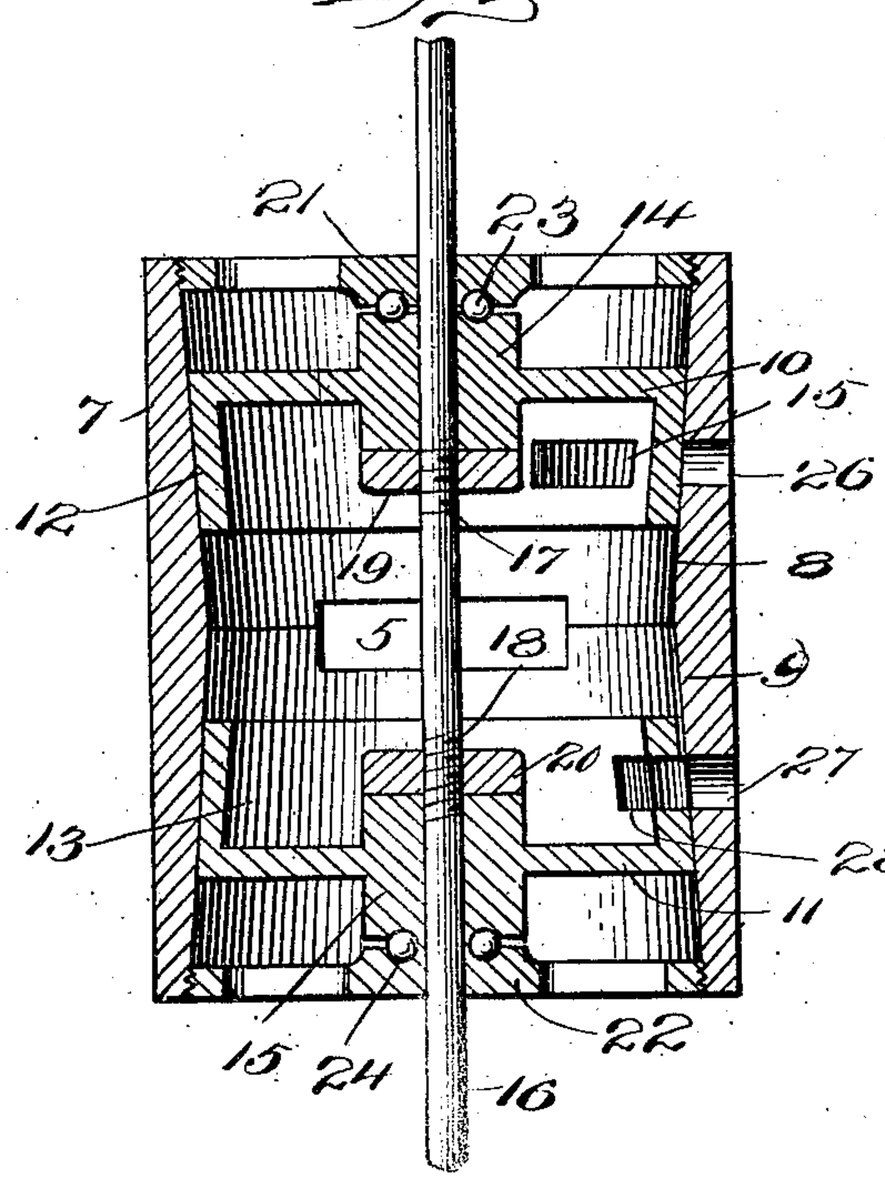


Fig. 2.

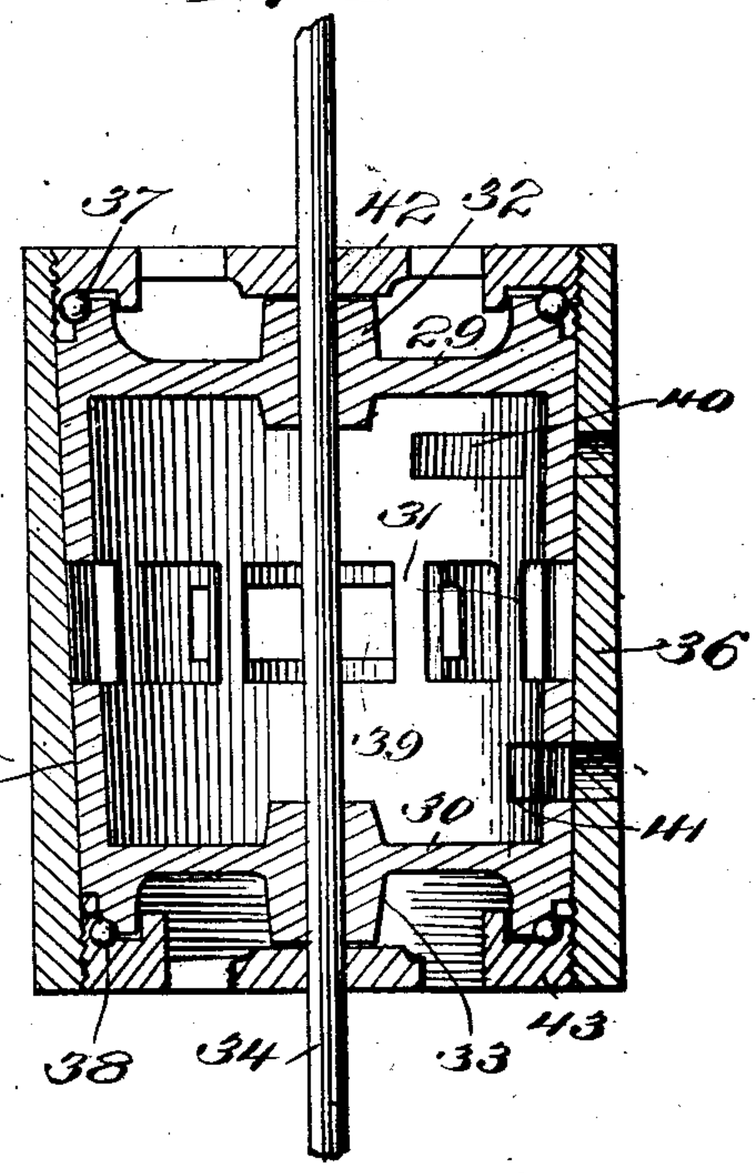


Fig. 3.

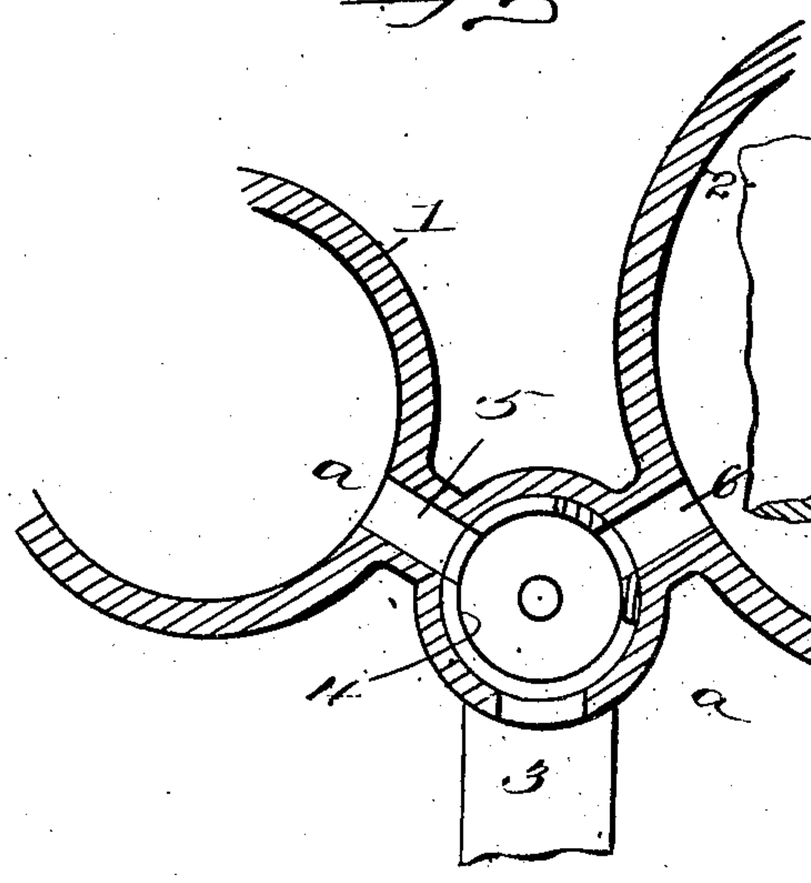
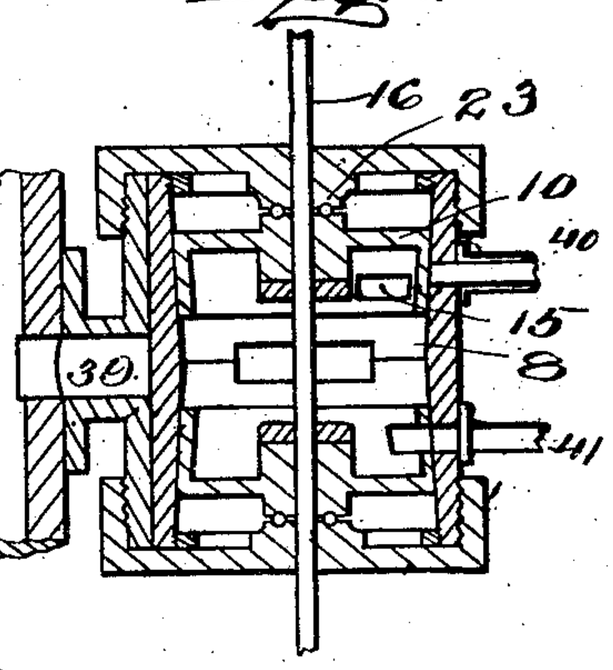


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ROTARY VALVE.

No. 849,987. Specification of Letters Patent. Patented April 9, 1907.

Application filed July 20, 1905. Serial No. 270,568.

To all whom it may concern:

Be it known that I, JOHN WASHINGTON EISENHUTH, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Rotary Valves; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in valves, and particularly to that class of valves which are adapted for use in controlling the admission of pressure-exerting agents to engines of various kinds and also controlling the exhausts from such engines.

The principal object of the invention is to provide a valve which is of the rotating type and so construct it as to be perfectly balanced in its action.

It is also the object of the invention to provide such a valve which may be capable of use in connection with explosive-engines and will withstand the pressure exerted in the cylinders by the explosion of mixtures of various kinds without rendering the movement of the valve difficult or accompanied with friction of any appreciable degree.

With these and other objects in view the invention comprises certain novel constructions, combinations, and arrangements of parts, as will be hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 is a central sectional view through a valve mechanism constructed in accordance with the present invention, the plane of the section passing through the axis of the valve movement. Fig. 2 is a similar sectional view through a slightly-different form of valve. Fig. 3 is a horizontal sectional view through the adjacent portions of a gas-engine cylinder, showing the connecting-ports thereof and a valve for controlling them. Fig. 4 is a detail sectional view taken upon the line *a a* of Fig. 3.

The valve forming the subject-matter of the present invention is adapted for use in connection with any engine, pump, or other machine in which it is necessary to control the admission of pressure-producing gases or fluids to the cylinder or the exhaust or discharges therefrom. The said valve mechanism is, however, well adapted for use in connection with explosive-gas engines in which the valve mechanism may be subjected to the pressure produced in a cylinder by the explosion of certain mixtures therein. Since the mechanism is particularly well adapted for use in connection with an explosive-gas engine, I will describe the same as constructed for use in connection with such engine.

In Fig. 3 I have illustrated portions of two cylinders of an engine, one of said cylinders, as 1, being preferably a high-pressure cylinder, while the other one, as 2, is a low-pressure cylinder. The high-pressure cylinder receives its charges of explosive materials from a supply-pipe 3, which charges are directed by a valve 4 through a port 5 and into the cylinder 1. After the explosive charges have been ignited and expanded in the cylinder 1 to accomplish the desired work in said cylinder the exhaust charges may be then led through the port 5 and the valve 4 to a port 6 and thence into the low-pressure cylinder 2 for further work. It will be apparent of course that the port thence might lead into the outer atmosphere or any other desired point without changing in the least the spirit of the invention or the application of the valve mechanism to the controlling of certain materials or mixtures.

As shown in Fig. 1, the valve 4 is mounted within a suitable casing 7, which is usually and preferably beveled from the central portion of the casing outwardly in both directions, as indicated at 8 and 9. The valve is made up of oppositely-facing end sections 10 and 11, formed with peripheral walls 12 and 13, the outer surfaces of which are ground to fit perfectly the inner beveled surfaces 8 and 9 of the valve-casing. The valve-sections are carried by hubs or enlarged central portions 14 and 15, which are adjustably secured to a valve stem or rod 16. The said rods are screw-threaded, as at 17 and 18, so as to receive binding-nuts 19 and 20, which are employed for holding the valve-sections in adjusted positions. The valves move against abutment-bearings carried by cross-heads or spiders 21 and 22, which are adjustably secured in the casing 7. As shown in Fig. 1, ball-bearings or other antifrictional means are interposed between the spiders 21 and 22

and the hubs 14 and 15, as indicated at 23 and 24. Suitable runways are formed in the said spiders 21 nd 22 and the adjacent hubs 14 and 15. The structure thus set forth is capable of a very fine adjustment when securing the balanced valve in position in its casing. The sections of the valve are placed upon the valve-stem 16 and moved inwardly until they fit snugly in the beveled inner portion of the casing. The spiders 21 and 22 are then screwed into place or otherwise adjusted to hold the balls 23 and 24 in contact with the hubs 14 and 15, very slight looseness in the adjustment of the ball-bearings being left. The inner jam-nuts 19 and 20 are then set up against the hubs 14 and 15 upon the threads 17 and 18, so as to just free the valve-sections from the beveled surface of the casing a sufficient degree to permit of their turning. The valve-sections are thus accurately held in position in the casing and yet are free to turn against the ball-bearings upon the imparting of movement to the valve stem or rod 16.

All pressure introduced through the valve mechanism is directed between the valve-sections 10 and 11, so that the pressure against said sections is exactly equalized the one with respect to the other and there is no resulting pressure from the explosion in the engine upon the ball-bearings carried by the spiders. The valve is thus thoroughly a completely-balanced valve.

In applying the valve mechanism to such a structure as that shown in Fig. 3 the port 5 is always open at each end, so that the interior of the valve mechanism is always in communication with the interior of the cylinder 1. The inlet-port is controlled by one of the valve-sections, as 10, in the periphery of which a port 15 is formed. When the valve is slightly turned, the port 15 is moved away from the inlet-port at 26, and said inlet-port will thus be closed. By moving the valve in the other direction the inlet-port will be opened, so as to admit charges through the interior of the valve mechanism and the port 5 to the interior of the cylinder 1. Such charges are usually drawn in by the suction of the piston moving in the cylinder 1. As soon as the charges are well within the cylinder the valve-stem 16 is moved by any suitable mechanism (not shown) for closing the inlet-port and holding the charges within the cylinder and valve-casing. During this time the explosive materials are ignited and their expansive force applied within the cylinder. The said gases or mixtures when exploded cannot escape through the inlet-port or through the exhaust-port 27 because of the peripheral portions of the valve-sections 10 and 11. As soon as the explosion occurs the valve-stem 16 is further turned to bring a port 28 in the walls of the section 11 opposite the exhaust-outlet 27 in the casing 7, and the exhaust-gases may then pass out of the cylinder through the port 5 and the casing 7. At this time the port 15 of the valve-section 10 will not be opposite the inlet-port 26. In this simple manner the balance-valve may be made to control the inlet and outlet of pressure-exerted means to a cylinder. If a second cylinder 2 is connected with the valve-casing, as shown in Fig. 3, the exhaust-gases from the cylinder 1 may be led into the second cylinder for performing work upon a piston in said cylinder.

The valve may be made in a slightly-different manner from that described with respect to Fig. 1 and without departing from the spirit of the invention, and such an altered form of valve is shown in Fig. 2. In this construction the end sections 29 and 30 are connected by bars 31, which extend from one peripheral portion to the other of the valve-heads. In constructing the valve in this manner the two valve-heads are practically integrally connected and their hubs 32 and 33 are preferably rigidly connected with the valve stem or rod 34.

When constructing the valve proper in the manner now described, the said valve is preferably tapered continuously from one end toward the other and is ground to fit the tapered inner surface 35 of a valve-casing 36, the said tapered surface being of course continuous in its taper from one end of the casing to the other. Ball or other antifrictional bearings are mounted at the ends of the valve, as in the other construction, for facilitating the movement of the valve without friction. As shown in Fig. 2, the ball-bearings 37 and 38 may be mounted at the outer periphery of the valve instead of engaging the hubs thereof. The action of the ball-bearings is practically the same in this construction as in the construction shown in Fig. 1 and limit the endwise movement of the valve. The pressure entering and escaping from the cylinder is, however, introduced into the central portion of the valve as in the former construction and all passes through a port 39 like the port 5, above described. The port 39 is opposite the spaces formed between the connecting-bars 31. Inlet and outlet controlling ports 40 and 41 are provided in the peripheral portions at each end of the valve and operate, when the valve is moved, to cut off or open inlet or exhaust ports in the valve-casing in exactly the same manner as described with respect to ports 25 and 28. It will be seen that in this construction also the pressure passing through the valve mechanism is always introduced between the end walls of the valve, so that the pressure upon one end of the valve equalizes the pressure upon the opposite end of the valve, making a perfectly-balanced valve. In this latter construction the spiders 42 and 43, which carry the ball-bearings, have their runways near their outer

peripheries instead of at their central portions, and although the two valve structures are slightly different in their central structure and in their engagement with the walls of the inclosing casings it will be evident that their action and effect is practically the same and that the second structure described is clearly within the spirit and scope of the invention.

It should be, of course, understood that other minor changes in the details of construction may be varied without departing from the spirit of the invention. It is also within the contemplation of the invention to use a valve of this character in connection with any engine cylinder or cylinders or with a pumping mechanism for fluids as well as gases where a balance-valve is desired and where the pressure may be introduced centrally of the valve mechanism.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a valve, the combination of a cylindrical valve-casing the interior of which has a tapered formation, a longitudinally-adjustable rod extending through the casing and mounted to have a rotary movement, oppositely-disposed valve-disks mounted upon the rod and engaging the interior of the valve-casing, inwardly-extending peripheral flanges carried by the valve disks and beveled to correspond to the taper of the interior of the casing, the said casing having a port formed therein at a point between the flanges, and also an opening adjacent each flange, the said flanges being provided with corresponding openings, cross-heads adjustably mounted within each end of the cylindrical casing, and antifriction-bearings interposed between the cross-heads and the valve-disks.

2. In a valve, the combination of a cylindrical valve-casing the interior of which is reversely inclined outwardly from the central portion, a longitudinally-adjustable rod extending through the casing and mounted to have a rotary movement, oppositely-disposed valve-disks carried by the rod and engaging the reversely-inclined inner walls of the casing, and inwardly-extending peripheral flanges carried by the valve-disks and beveled in opposite directions to correspond to the reversely-tapered walls of the interior of the valve-casing, the said casing having a port formed therein between the flanges and also an opening adjacent each flange, the said flanges being provided with corresponding openings and in conjunction with the valve-disks defining a space adapted to be brought into communication with either of the before-mentioned openings.

3. In a valve, the combination of a cylindrical valve-casing the interior of which is reversely tapered outwardly from the central portion, a rod extending through the casing, oppositely-disposed valve-disks provided with hubs by means of which they are mounted upon the rod, inwardly-extending peripheral flanges carried by the valve-disks and oppositely beveled to correspond to the reversely-tapered portion of the casing, the said casing being formed with a port between the flanges and also an opening adjacent each flange, the said flanges being formed with corresponding openings, cross-heads closing opposite ends of the casing, and bearings interposed between the cross-heads and the before-mentioned hubs formed in conjunction with the valve-disks.

4. In a valve, the combination of a cylindrical valve-casing the interior of which is reversely tapered outward from an intermediate point, a rod extending through the casing, oppositely-disposed valve-disks provided with hubs by means of which they are mounted upon the rod, inwardly-extending peripheral flanges carried by the valve-disks and beveled to correspond to the reversely-tapered walls of the casing, the said casing being formed with a port at a point between the flanges and also an opening adjacent each flange, the said flanges being provided with corresponding openings, a cross-head closing each end of the valve-casing, bearings interposed between the cross-heads and the before-mentioned hubs, and jam-nuts mounted upon the rod and engaging the hubs, the said jam-nuts and cross-heads coöperating with each other to hold the valve-disks in proper position.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

JOHN WASHINGTON EISENHUTH.

Witnesses:
JOHN L. FLETCHER,
EDWARD T. BUNCH.