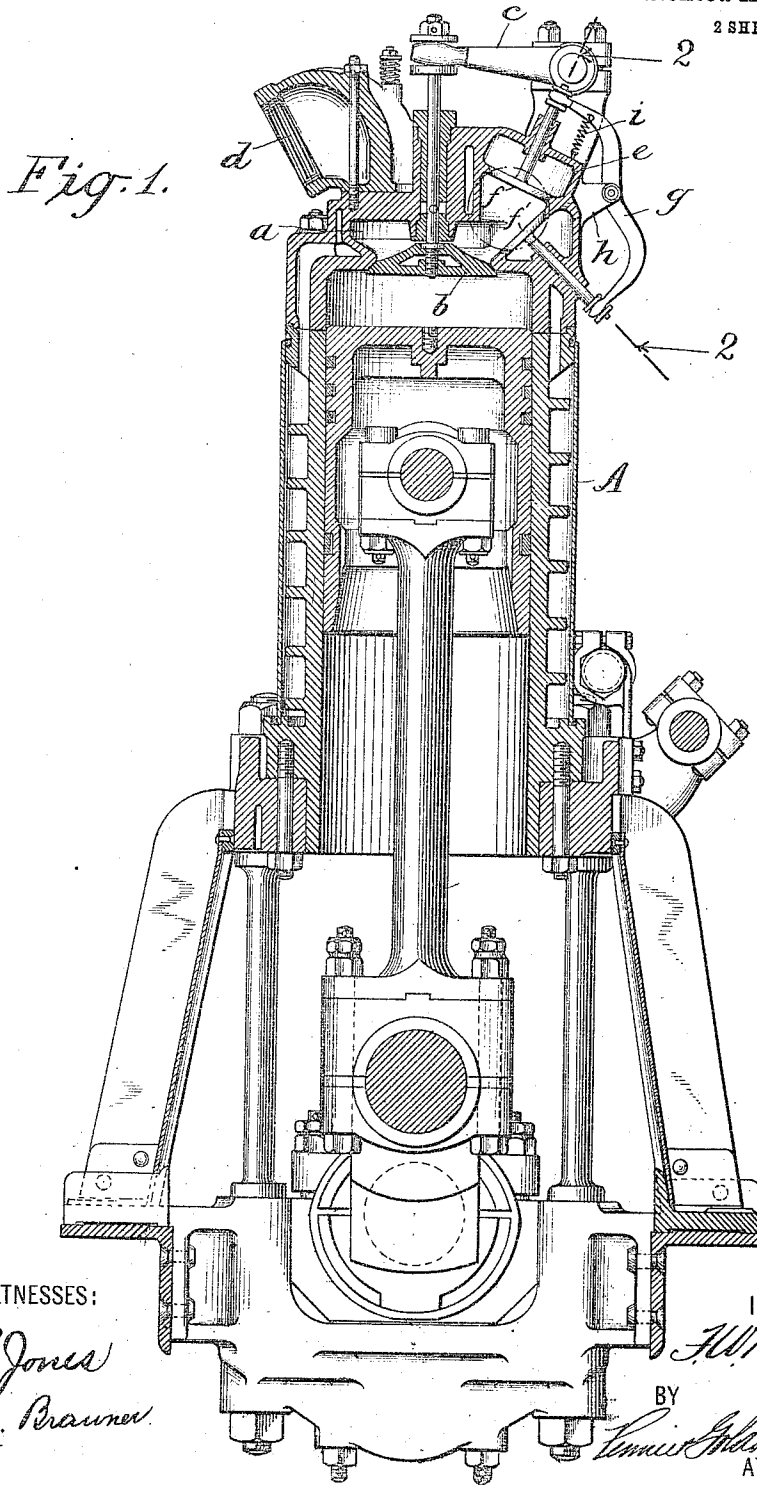


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APPLICATION FILED JULY 8, 1907.

957,730.

Patented May 10, 1910.

2 SHEETS—SHEET 1.



WITNESSES:

L. L. Jones
M. C. Brauner

INVENTOR,

F. W. Brady

BY

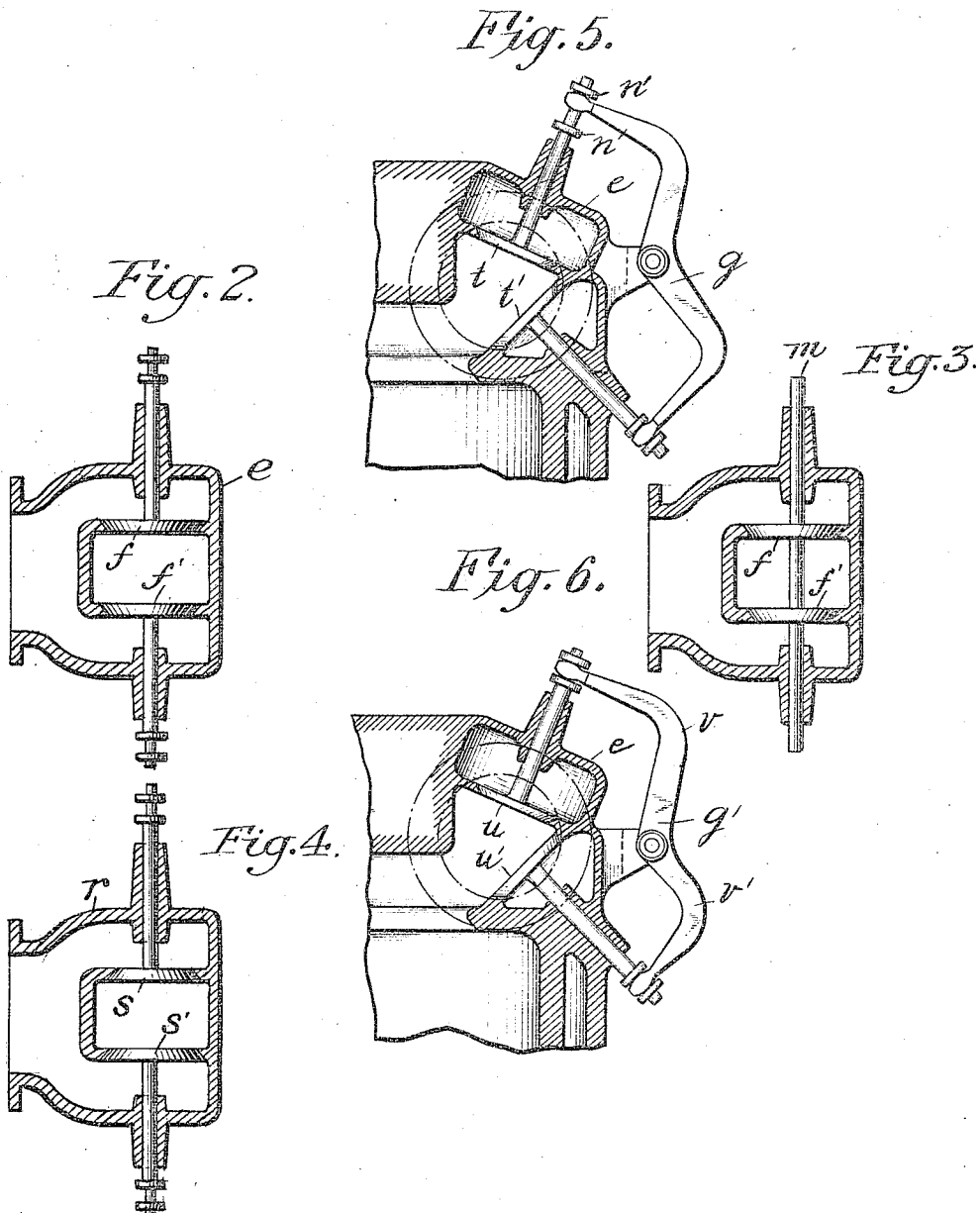
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UNITED STATES PATENT OFFICE.

FRANCIS W. BRADY, OF NEW YORK, N. Y.

VALVE FOR INTERNAL-COMBUSTION ENGINES.

957,730.

Specification of Letters Patent.

Patented May 10, 1910.

Application filed July 8, 1907. Serial No. 382,701.

To all whom it may concern:

Be it known that I, FRANCIS W. BRADY, a citizen of the United States, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Valves for Internal-Combustion Engines; 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.

In the construction of internal combustion engines, where I have attempted to use an exhaust valve which is not operated mechanically from the engine shaft, but is operated automatically by the pressure of the exhaust gases themselves, I have encountered difficulties, particularly where the engine is designed for great power, or to run at high speed, arising from the fact that the throw of the valve, resulting from the pressure of the outgoing gases, is very violent and so destroys the spring or cushion against which the valve works in its outward movement. The construction forming the subject matter of this application has been designed to overcome these difficulties, and it is generally applicable to the construction of valves operating automatically by the pressure of the moving gases.

The construction and mode of operation of my improved valve will be understood from a consideration of the accompanying drawings and this specification.

In the drawings, Figure 1 illustrates an exhaust valve embodying my invention applied to an internal combustion engine; Fig. 2 is a cross-section on the line 2—2 of Fig. 1; Fig. 3 is a modified form of exhaust valve, shown in cross-section; Fig. 4 is a showing, in cross-section, of an inlet valve embodying my invention; and Figs. 5 and 6 illustrate further modified forms.

In Fig. 1 the valve construction, embodying my invention, is shown as applied to an internal combustion engine A. This engine forms no part of my present invention and its general construction will be understood from the drawing without detailed description. In the head of the cylinder body of the engine is a valve chamber *a* separated from the combustion chamber of the engine by the valve *b* which is operated, through the rocking-arm *c*, from the engine shaft. In the valve chamber *a* the inlet pipe *d* terminates, and on the other side of the cham-

ber *a* is formed the outlet or exhaust valve chamber *e*. This chamber is separated from the chamber *a* by suitable partitions carrying the seated valves *f* and *f'*, the stems of which are rigidly connected together by the lever *g* pivoted on the bracket *h* projecting from the cylinder body. It will be observed that the surface of the valve *f* which opens outwardly is greater than the surface of the valve *f'* which opens inwardly, and that the valves are held in the position shown in Fig. 1 by the spring *i*.

In operation the exhaust gases pass from the engine cylinder across the valve *b* into the chamber *a* and against the surfaces of the valves *f* and *f'*. The preponderance of pressure upon the greater surface of the valve *f* throws open this valve against the action of the spring *i*, and the movement of the valve is transmitted through the lever *g* to the valve *f'*, which, in opening against the pressure of the exhaust gases, cushions the valve *f*. The relative extent of the surfaces of the two valves *f* and *f'* may be regulated to suit the circumstances governing any particular design, so that the exhaust valve may be made to open with the desired force and speed.

In the construction shown in Fig. 3, the valve surfaces *f* and *f'*, instead of being connected through their stems by the lever *g* are mounted on a single stem *m*. The designer may, in particular cases, use a spring to seat the valves, but ordinarily the weight of the valve structure is sufficient for that purpose.

In Fig. 4, *r* is an inlet chamber adapted to communicate through the valves *s* *s'* with an engine cylinder. In this case the valve stems are intended to be connected together in the same manner as the valve stems of Fig. 1, but the larger valve *s* is opened inwardly by the pressure of the gases and the smaller valve *s'* opens outwardly against that pressure.

In the construction shown in Fig. 5 the collars *n* and *n'* on the stem of the valve *t*, instead of fitting tightly the end of the lever *g*, are so placed as to give a limited play to the valve, thus constituting a lost motion device. In this case the valve *t* opens freely under the pressure of the gases until the collar *n'* strikes the end of the lever arm, whereupon the cushioning by the valve *t'* becomes effective. It will be observed that in this construction the valve surface *t* may

be equal to, greater than, or less than the valve surface v' .

In the construction shown in Fig. 6 the arm v of the lever g' is longer than the arm v' , whereby the surface of the valve u may be smaller than the surface of the valve u' .

These several structures have each its own advantage under particular circumstances, but they are all characterized by the fact that the valve opening under the pressure of the gases is cushioned by a surface opening against that pressure to which surface the movement of the opening valve is transmitted.

By means of this invention, I am able to successfully employ in an internal combustion engine of large power and high speed a valve which is automatically actuated by the pressure of the gases, thereby retaining the many advantages and the large factor of safety inherent in such a valve structure.

What I claim is:—

1. In an internal combustion engine, a combustion chamber having a port through which the contents of the combustion chamber as a whole pass during the reciprocation of the piston, a valve opening in the direction of flow of the gases and actuated by the movement thereof and controlling said port, and cushioning mechanism for said valve comprising a surface operatively connected therewith and moving against the pressure of the gases; substantially as described.

2. In an internal combustion engine, a combustion chamber having a port through which the contents of the combustion cham-

ber as a whole pass during the reciprocation of the piston, a valve actuated by the movement of the gases and controlling said port, a second valve opening against the pressure of the gases, and connection mechanism between said valves for transmitting the movement of the first valve to the second, whereby the movement of the first valve is cushioned; substantially as described.

3. In an internal combustion engine, a combustion chamber having a port through which the contents of the combustion chamber as a whole pass during the reciprocation of the piston, a valve actuated by the movement of the gases and controlling said port, a surface arranged to move against the pressure of the gases, and connecting mechanism between the valve and said surface, said connecting mechanism including a lost motion device; substantially as described.

4. An engine having a valve opening outwardly from the combustion chamber and through which the contents of that chamber are exhausted, said valve being actuated by the pressure of the confined gases on the exhaust stroke of the piston, in combination with means for cushioning said valve comprising a plate mechanically connected thereto and moving against the pressure of the said gases; substantially as described.

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

FRANCIS W. BRADY

Witnesses:

BURGESS A. CURDEY,
LEW. C. MOORE.