No. 867,713. PATENTED OCT. 8, 1907.

J. S. ELVERSON.

VALVE FOR EXPLOSIVE ENGINES.

APPLICATION FILED FEB. 6, 1907.

2 SHEETS—SHEET 1.

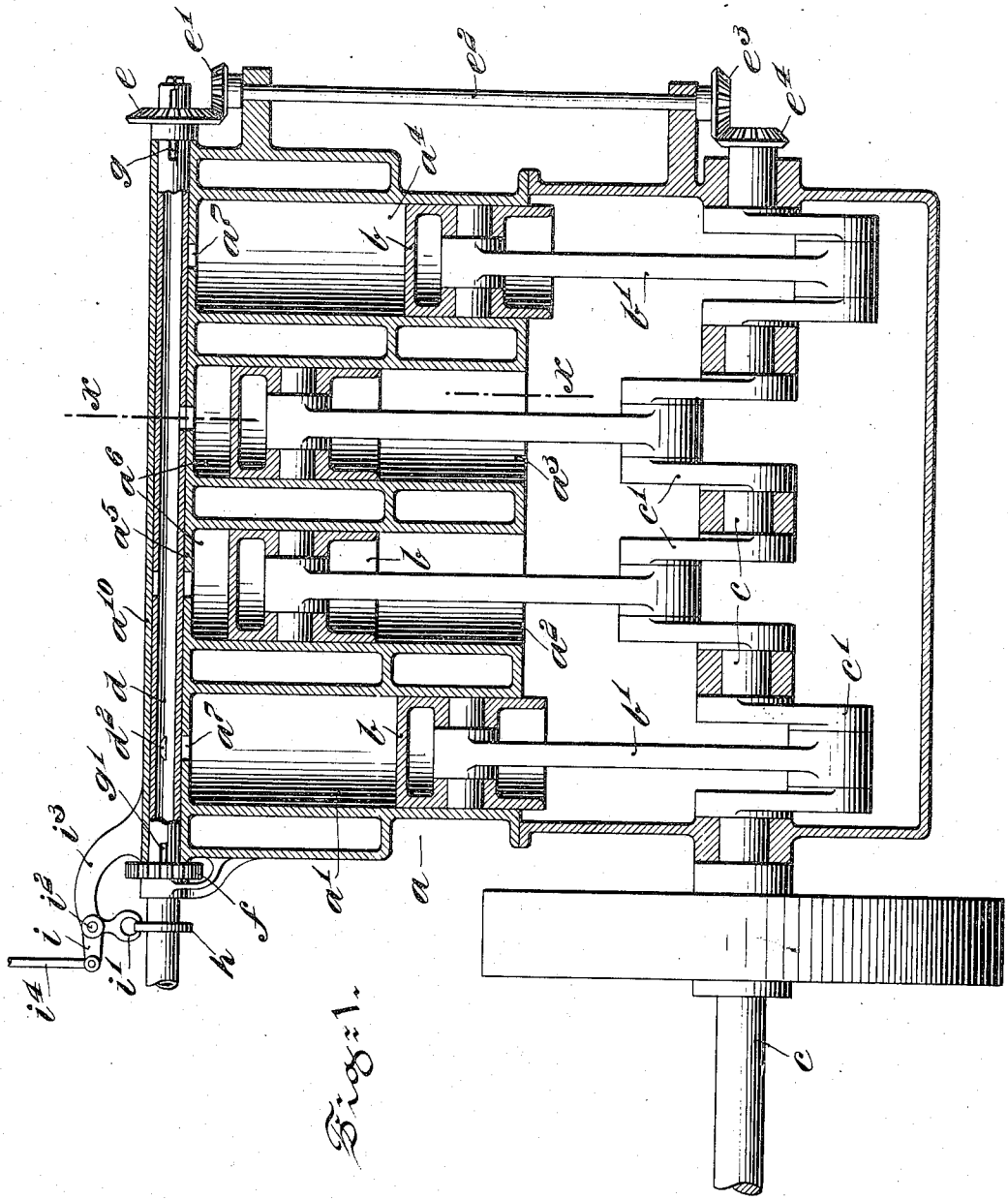


Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

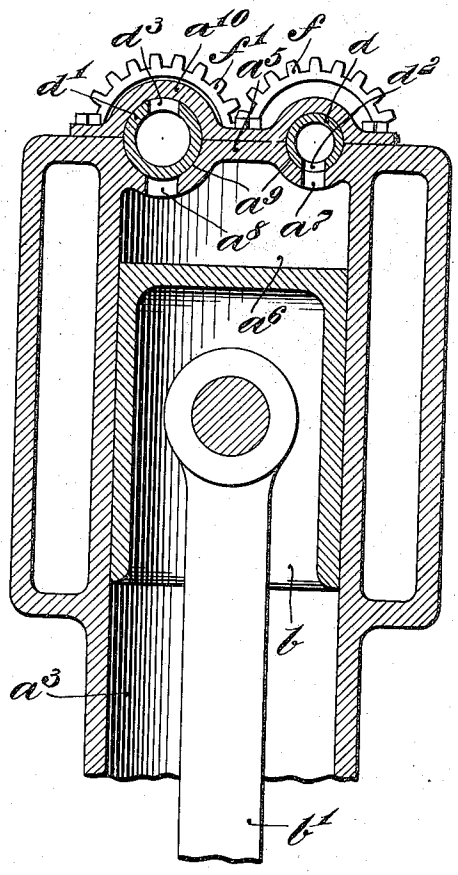


Fig. 3.

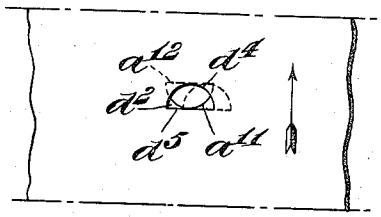
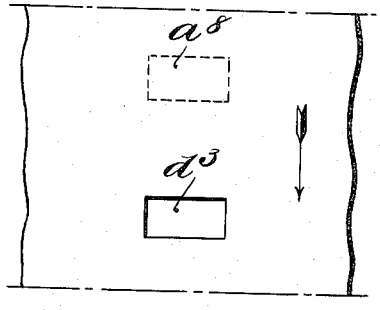


Fig. 4.



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VALVE FOR EXPLOSIVE-ENGINES.

No. 867,713. Specification of Letters Patent. Patented Oct. 8, 1907.

Application filed February 6, 1907. Serial No. 355,977.

To all whom it may concern:

Be it known that I, JOSEPH S. ELVERSON, a citizen of the United States, residing at Catasauqua, in the county of Lehigh and State of Pennsylvania, have invented certain new and useful Improvements in Valves for Explosive-Engines, of which the following is a specification.

My invention has relation to valves for explosive engines; and in such connection it relates more particularly to the construction and arrangement of tubular valves and manner of controlling entrance of the charge into the explosion chambers of the engine.

The principal objects of my present invention are first, to so arrange the openings in the inlet valve of an explosive engine of the four cycle type as to insure a gradual entrance of the charge and sudden cut-off of the same; and second, to provide the inlet valve of the engine with means adapted to permit of the sliding of said valve so as to control the charge entering the explosive chamber or to cut off such charge from said chamber of the engine.

The nature and scope of my present invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof, in which

Figure 1, is a view illustrating partly in longitudinal section and partly in elevation a four cylinder explosive engine, a tubular inlet valve arranged in the head of the engine and having openings arranged to be brought successively into alinement with openings communicating with the explosion chamber of the engine, means for rotating the tubular valves and means for sliding one of the valves in the head of the engine, embracing in their embodiment, as defined, main features of my said invention. Fig. 2, is a sectional view, enlarged, on the line x—x of Fig. 1, illustrating the inlet valve in a position to permit of the entrance of a charge into the cylinder, and of the outlet valve closed, to prevent exit of the charge from the same. Fig. 3, is a detail view, illustrating a flat development of the contacting surfaces of the inlet valve and of the cylinder head and also showing openings of semi-circular outline, but in a reversed position with respect to each other, arranged therein; and Fig. 4, is a similar view of the outlet valve and cylinder with the openings provided therein.

Referring to the drawings a, represents an explosive engine of the multiple-cylinder type, provided in the present instance with four cylinders a^1, a^2, a^3, and a^4, in each of which reciprocates a piston b. The pistons b, by means of piston-rods b^1, are connected with the crank-shaft c, the cranks c^1, of which are set at an angle of 180° apart. The cylinders a^1, a^2, a^3, and a^4, although separate and distinct from each other, are arranged in one casting and are closed at their upper ends by a head a^5, preferably formed integral therewith. In the head a^5, and communicating with each of the explosion chambers a^6, of the cylinders b, are arranged openings a^7, and a^8, of varying outline and size, the smaller one of which forms the inlet for the charge into the explosion chamber, while the larger opening a^8, serves to permit of the discharge of the products of combustion from the same. These openings a^7 and a^8, are controlled by tubes d and d^1, arranged parallel to each other, in semi-circular depressions a^9, formed in the head a^5, and held in position therein, by brackets a^{10}, forming in conjunction with the head a^5, a receptacle in which the tubes d and d^1, are rotatably and slidably as well as removably arranged. As shown in Fig. 2, the tubes d and d^1, are of varying diameter and form inlet and outlet valves for the engine a, for which purpose the same are provided with openings d^2 and d^3, likewise of different diameters, which, by the rotation of the valves d and d^1, are brought into and out of alinement with the openings a^7 and a^8, arranged in each of the explosion chambers a^6. As shown in Fig. 1, the openings in each of the valves d and d^1, are set at an angle of 90° apart, so that the same will be brought successively into alinement with the respective openings a^7 and a^8, formed in the head a^5. The openings d^2, of the inlet valve d, and the openings a^7, of the head a^5, are preferably semi-circular in outline, but are reversed in their position with respect to each other, as shown in Fig. 3. By this arrangement of the openings d^2 and a^7, the curved portions d^4 and a^{11}, of the same, will first register with each other, thus forming an opening of substantially oval outline and of gradually increasing and decreasing size, which, however, instantly cuts off the further entrance of the charge as soon as the straight portions d^5 and a^{12}, are brought opposite each other. By this arrangement of the openings the gradual increasing size thereof is proportional to the distance of travel of the piston b, through the suction action of which, the charge is drawn into the respective cylinders a^1, a^2, a^3, and a^4. Thus the suction action of the respective pistons are rendered uniform, and hence a predetermined amount of explosive mixture will be drawn into each of the cylinders. If, however, it becomes necessary to decrease the charge, this can be readily accomplished by sliding the inlet valve d, in the head a^5, in which instance the openings d^2 and a^7, will change their position with respect to each other, and a corresponding smaller opening will be formed as shown in dotted lines in Fig. 3. By this decrease in the openings d^2 and a^7, respectively, the amount of charge entering the cylinder b, can be regulated to a nicety or can be cut off entirely by merely sliding the inlet valve d, sufficiently far to prevent registering of its opening d^2, with the opening a^7, of the head a^5. In order to permit of a quick discharge of the products of combustion the openings d^3, of the outlet

valve, are preferably made oblong in outline, and comparatively large in size, which, when registering with the similar shaped openings a^8, in the head a^5, permit of the admission of the products of combustion into the valve d, and through the open end of the said valve, into a muffler, not shown. The inlet valve d, is rotated by a bevel-gear e, meshing with a bevel-gear e^1, which by means of a shaft e^2, and bevel-gears e^3 and e^4, is rotated by a crank-shaft e, of the engine.. The rotary movement of the inlet valve d, is transmitted to the outlet valve d^1, by a gear-wheel f, meshing with a gear-wheel f^1, secured to the inlet valve d^1, as shown in Fig. 2. In order to permit of a shifting of the inlet valve d, in the head a^5, the bevel-gear e, and the gear-wheel f, are slidably secured thereto by keys g and g^1, respectively. The preferred means for shifting the inlet valve d, consists of a disk h, rigidly secured thereto, which is engaged by the forked end i^1, of a bell-crank lever i, pivotally secured in the point i^2, to an arm i^3, carried by the head a^5, of the engine. The bell crank lever i, is actuated by a rod i^4, preferably terminating about the seat of the driver, in case the engine be used in an automobile.

In the present instance the tubular inlet valve d, and outlet valve d^1, have been shown in conjunction with a four-cylinder type of engine. However, these valves may be used with equally good results in a one-cylinder engine. The material of which these valves are constructed effectually resists heat and friction.

Having thus described the nature and objects of my said invention, what I claim as new and desire to secure by Letters Patent is:—

1. In an explosive engine, a cylinder, a head for closing the cylinder at one end and having a semi-circular opening, a valve having a semi-circular opening, reversed in respect to the opening of said head, said openings arranged when brought with their curved portions into alinement with each other to form combined, an opening of gradually increasing size.

2. In an explosive engine, a cylinder, a head for closing the cylinder at one end and having a semi-circular opening, a valve having a semi-circular opening reversed in respect to the opening of said head, said openings arranged when brought with their curved portions into alinement with each other to form combined an opening of gradually increasing size and when brought with their straight portions into alinement with each other to suddenly close the opening formed..

3. In an explosive engine, a cylinder, a head for closing the cylinder at one end and having a semi-circular opening, a valve having a semi-circular opening, reversed in respect to the opening of said head, said openings arranged when brought with their curved portions into alinement with each other to form combined an opening of gradually increasing size, and means for sliding the valve in the head, said valve arranged, when shifted, to permit a portion only of the opening to register with the opening of the head, or to prevent such registering.

In testimony whereof, I have hereunto set my signature in the presence of two subscribing witnesses.

JOSEPH S. ELVERSON.

Witnesses:
ALEX. N. ULRICH,
J. WALTER DOUGLAS.