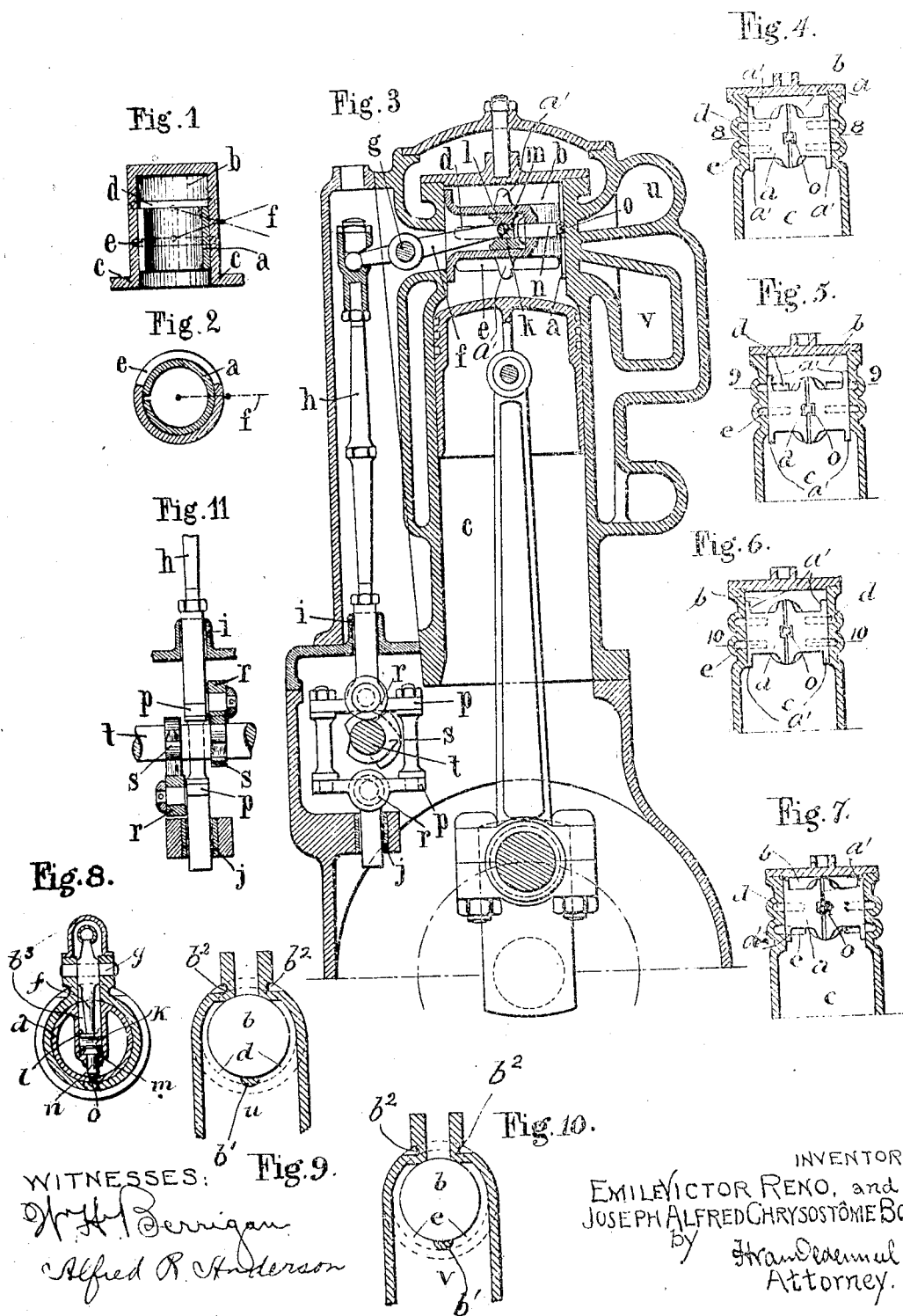


E. V. RENO & J. A. C. BOIS.
INTERNAL COMBUSTION ENGINE.

APPLICATION FILED APR. 14, 1910. RENEWED OCT. 16, 1911.

Patented Aug. 13, 1912.

1,035,234.



WITNESSES:

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UNITED STATES PATENT OFFICE.

EMILE VICTOR RENO AND JOSEPH ALFRED CHRYSOSTÔME BOIS, OF LA GARENNE-COLOMBES, FRANCE, ASSIGNORS, BY MESNE ASSIGNMENTS, TO SPHINX MOTOR COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

INTERNAL-COMBUSTION ENGINE

1,035,234.

Specification of Letters Patent.

Patented Aug. 13, 1912.

Application filed April 14, 1910, Serial No. 555,454; Renewed October 16, 1911. Serial No. 654,801.

To all whom it may concern:

Be it known that we, EMILE VICTOR RENO and JOSEPH ALFRED CHRYSOSTÔME BOIS, citizens of the Republic of France, and residents of 81^{bis} Boulevard de la République, La Garenne-Colombes, Seine, France, have invented an Internal-Combustion Engine, of which the following is a specification.

This invention relates to the means for controlling the inlet and exhaust of internal combustion engines.

It has been proposed heretofore to control the inlet and the exhaust by a split, expansible sleeve valve which is reciprocated in a valve chamber axially in line with the engine cylinder, but such an arrangement has not proved practical hitherto because the sleeve valve, and its supporting and actuating devices and other cooperating parts have not been so constructed and combined as to operate properly and secure the best results under practical conditions of use.

It is therefore the object of this invention to improve the construction and relation of such a sleeve valve and its supporting and actuating devices and cooperating parts so that it shall operate properly and with the best results under practical conditions and especially so that its free expansion shall not be interfered with, so that neither the valve nor its actuating means shall be caused to bind in operation and so that a large area of ports may be obtained and in good form for high speed.

Other improvements and desirable results will be pointed out hereinafter.

The invention will be more fully explained hereinafter with reference to the accompanying drawings in which it is illustrated and in which—

Figure 1 is a partial detail view in axial section illustrating the relation of the sleeve valve and the valve chamber, the extreme positions of the supporting and actuating lever being indicated by dotted lines. Fig. 2 is a view in transverse section of the parts shown in Fig. 1, the supporting and actuating lever being indicated by a dotted line. Fig. 3 is a view in axial section showing an engine equipped with the improved valve. Figs. 4-7 are detail views in axial section showing the sleeve valve in different positions with respect to the valve chamber. Figs. 8, 9 and 10 are detail views in section

on the planes indicated by the lines 8-8, 55 9-9, and 10-10 respectively of Figs. 4, 5 and 6 respectively. Fig. 11 is a detail view of the valve-actuating cam.

The valve *a* is sleeve-like, and resilient or freely expansible, being preferably split or slotted longitudinally, open from end to end and having relatively thin walls, so that it may adapt itself to the wall of the valve chamber *b* in which it moves longitudinally, fitting freely within said chamber in the absence of great internal pressure, and fitting closely against the wall thereof when expanded by internal pressure, so as to prevent leakage between the valve and the wall of the chamber and so also as to compensate for wear. The valve chamber *b* is preferably coaxial with the cylinder *c* and, being closed at one end and communicating directly with the cylinder at the other end, is provided in its lateral wall with an inlet port or inlet ports *d* and an exhaust port or exhaust ports *e*. The inlet port is more remote from the cylinder than the exhaust port and the inlet and exhaust ports respectively are uncovered by the valve as it moves toward and from the cylinder, so that the incoming fresh gases, on their way into the cylinder, pass through the valve and cool it. Both ports are also continued circumferentially (more than 200° as shown), as grooves in the wall of the valve chamber, so as to secure large area without undue width, such grooves being interrupted or blocked, as at *b*¹, to form a seal opposite the split or slot in the valve, and also as at *b*², to form seals at opposite sides of the opening in the wall of the chamber through which the actuating lever is extended.

The valve may be actuated by any suitable mechanism. As shown in the drawings, the valve is actuated by a lever *f* which is extended through a lateral opening *b*³ in the wall of the valve chamber, is pivoted at *g* and is connected substantially at its axis by a ball joint to a rod *h* mounted in guides *i* and *j*. The other end of the lever *f* is provided with a spindle *k* which preferably engages a slide block *l* movable in an internal box or casing secured to the body of the valve, preferably at a point opposite the longitudinal slot, so that both parts of the split sleeve, adjacent to the end of the internal box or casing *m*, are free to expand

without being impeded in any manner by the supporting and actuating means. In this manner the sleeve is moved in absolute parallelism with the wall of the valve chamber and the possibility of binding or jamming is wholly avoided. For the purpose of steadying the sleeve valve in its movements and preventing any tendency to distortion, a stud *n* is arranged on the inner extremity of the box or casing *m* and engages the sleeve, its extremity *o* being preferably squared and entering a similarly shaped recess in the sleeve formed partly on each side of the longitudinal slot of the valve.

Obviously the valve may be reciprocated by any usual or suitable means. In the arrangement shown in the drawings the rod *h*, before referred to, is provided at its extremity with a frame *p* which carries rollers *r*, *r* to cooperate with cams *s*, *s* on a shaft *t* driven by the engine so as to cause the valve to occupy successively the positions which correspond to the inlet, compression, explosion and exhaust. The explosive charge may be admitted to the inlet port *d* through a suitable channel *u* and the exhaust or the products of combustion may be permitted to pass from the exhaust port *e* through a suitable channel *v*.

It will be understood that various changes may be made in the form and relation of parts to suit different requirements of use, and that the invention, therefore, is not limited to the precise details of construction and arrangement shown.

We claim as our invention:—

1. In an internal combustion engine, the combination of a valve chamber having in its lateral walls ports and an opening separated from said ports, an expansible sleeve-like valve within the valve chamber, a box or casing secured to the valve and extended into the body thereof and actuating means extending through said opening and entering the box or casing laterally and engaging the same internally.

2. In an internal combustion engine, the combination of a valve chamber having ports in its lateral wall, a split, sleeve-like valve within the valve chamber, a box or casing secured to the valve at a point opposite the split and extended into the body of the valve, and actuating means entering the box or casing laterally and engaging the same at its inner end substantially in the line of the axis of the valve.

3. In an internal combustion engine, the combination of a valve chamber having ports in its lateral wall, a split, sleeve-like valve within the valve chamber, a box or casing secured to the valve at a point opposite the split and extended into the body of the valve, actuating means engaging the box or casing at its inner end substantially in the

line of the axis of the valve, and a stud extended from the inner end of the box or casing and engaging the valve at a point opposite the box or casing.

4. In an internal combustion engine, the combination of a valve chamber having ports in its lateral wall, a split, sleeve-like valve within the valve chamber, a box or casing secured to the valve at a point opposite the split and extended into the body of the valve, a slide block mounted in the inner end of the box or casing substantially in the line of the axis of the valve and an actuating lever engaging said slide block.

5. In an internal combustion engine, the combination of a valve chamber having ports in its lateral walls, an expansible sleeve-like valve within the valve chamber, a box or casing secured to the valve and extended into the body thereof, a slide block mounted in said box or casing and actuating means entering the box or casing laterally and engaging said slide block.

6. In an internal combustion engine, the combination of a valve chamber having in its lateral wall inlet and exhaust ports and an opening for valve actuating means, a sleeve-like valve adapted to be reciprocated longitudinally in said valve chamber and to open and close said valve ports alternately while covering said opening, and valve actuating means extended through said opening and engaging the valve substantially in the line of its axis.

7. In an internal combustion engine, the combination of a cylinder, a valve chamber constituting an open extension from said cylinder and having exhaust and inlet ports, a sleeve-like valve, a box or casing secured to the body of the valve and extended into the body thereof leaving an opening from end to end of the valve on opposite sides of said box or casing, valve actuating means operatively connected with the interior of said box or casing, the inlet port being more remote from the cylinder than the exhaust port and than said box or casing and being uncovered by the valve in its movement toward the cylinder whereby the incoming fresh gases pass said box or casing and cool the same.

8. In an internal combustion engine, the combination of a valve chamber having in its lateral wall an inlet port and an exhaust port and an opening, a sleeve-like valve adapted to be reciprocated longitudinally within the valve chamber, and a valve actuating lever pivoted on the wall of the valve chamber and extended through said opening therein and engaging the valve.

9. In an internal combustion engine, the combination of a valve chamber having in its lateral wall a port extended circumferentially, a split sleeve-like valve within the valve chamber, and actuating means for the

valve, said circumferentially extended port being blocked in the line of the split of the valve to form a seal therefor.

10. In an internal combustion engine, the combination of a valve chamber having in its lateral wall a port extended circumferentially and an opening for the valve actuating means, a sleeve-like valve within the valve chamber, and actuating means extended through said opening and engaging the valve, said circumferentially extended port being blocked at each side of said opening to form a seal therefor.

11. In an internal combustion engine, the combination of a valve chamber having in its lateral wall a port extended circumferentially and an opening for the valve actuating means, a split sleeve-like valve within the valve chamber, and actuating means extended through said opening and engaging the valve, said circumferentially extended port being blocked in the line of the split of the valve to form a seal therefor and being blocked at each side of said opening to form a seal therefor.

12. In an internal combustion engine, in combination, a valve chamber having in its lateral walls inlet and outlet ports extended circumferentially more than 200° and an opposite opening for valve actuating means,

a sleeve-like valve adapted to be reciprocated longitudinally in said valve chamber and valve actuating means extended through said opening and engaging the valve.

13. In an internal combustion engine, in combination, a valve chamber having in its lateral wall a port extended circumferentially and blocked in the line of the split of the valve to form a seal therefor, a split sleeve-like valve within the valve chamber, a box or casing rigidly mounted upon one side of the valve and having an extension extending to said blocked wall and valve actuating means entering said box or casing laterally.

14. In an internal combustion engine, a valve chamber having ports in its lateral wall, a split sleeve-like valve within the valve chamber, a box or casing secured rigidly at one side of the valve, a stud at the extremity of the box or casing to form a bearing for the valve adjacent to said split and valve actuating means entering said box or casing laterally.

In testimony whereof we affix our signatures in presence of two witnesses.

EMILE VICTOR RENO.

JOSEPH ALFRED CHRYSOSTÔME BOIS.

Witnesses:

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