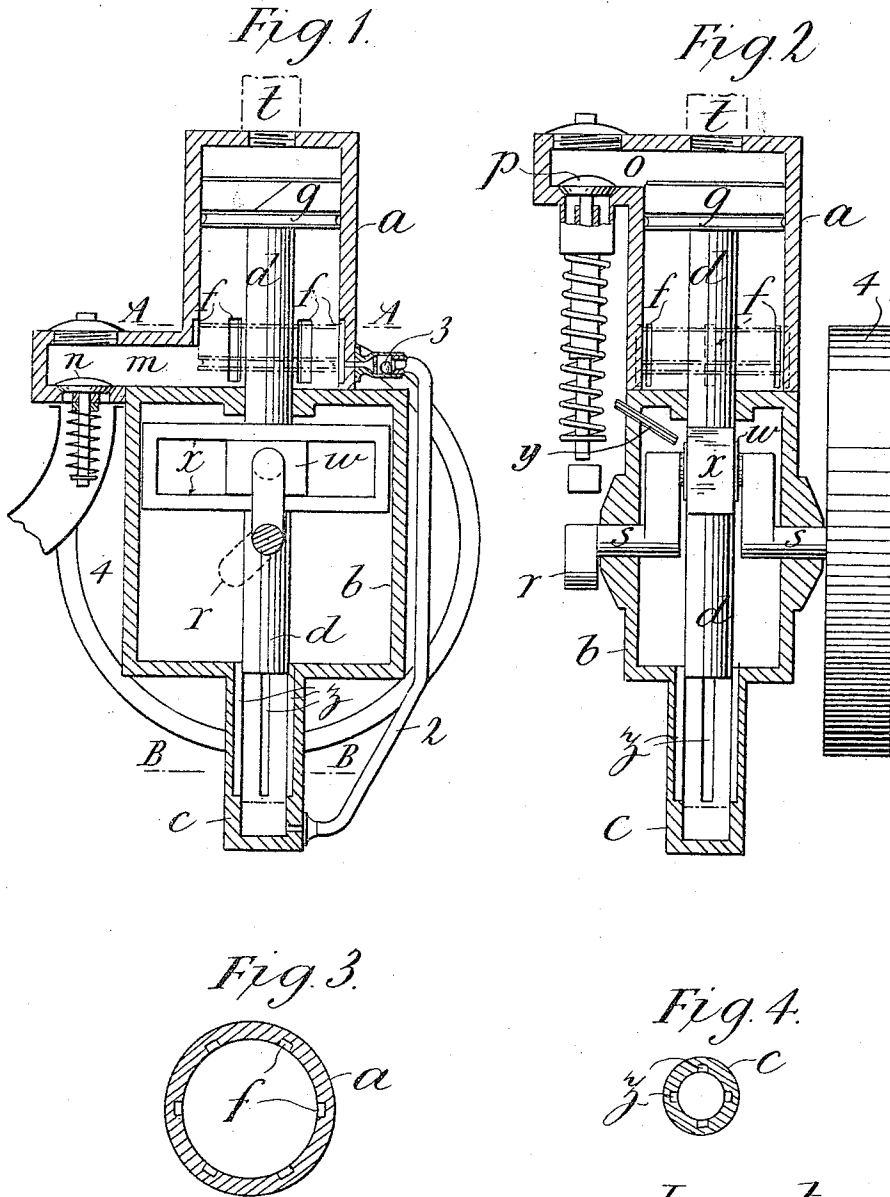


A. R. BROUGHAM.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED OCT. 7, 1915.

1,229,217.

Patented June 12, 1917.



Inventor
Arthur Robert Brougham
By *Sowell & Sowell*
his attorneys.

UNITED STATES PATENT OFFICE.

ARTHUR ROBERT BROUGHAM, OF WEST HAMPSTEAD, LONDON, ENGLAND.

INTERNAL-COMBUSTION ENGINE.

1,229,217.

Specification of Letters Patent. Patented June 12, 1917.

Application filed October 7, 1915. Serial No. 54,604.

To all whom it may concern:

Be it known that I, ARTHUR ROBERT BROUGHAM, a subject of the King of Great Britain and Ireland, residing at West Hampstead, in the county of London, England, have invented Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention has for object to provide a simple and efficient two-stroke cycle internal combustion engine, the parts or members of which are compactly composed so that an engine of considerable power constructed according to the invention possesses relatively small bulk and the running parts not being of complex construction, are not liable to get out of order readily.

For this purpose, according to the invention, the cylinder or each cylinder if more than one, is closed at both ends, instead of at the outer end only as heretofore usual, and the explosive charge is compressed at the inner end of the cylinder or each cylinder upon the inward stroke of the piston. Toward the end of the compression stroke the compressed gas and air mixture flows through ports or passages formed in the cylinder wall to the other or explosion side of the piston. The crank of the engine shaft is located in a chamber fixed to the inner end of the cylinder or cylinders and mounted on the crank is a block adapted to slide in a link or embrasure formed in one with or fixed to the piston rod and working in the crank chamber.

Figures 1 and 2 of the accompanying illustrative drawings show, in central vertical transverse section in planes at right angles to each other, one construction of single cylinder two-stroke cycle internal combustion engine embodying the invention.

Figs. 3 and 4 are horizontal sections corresponding to the line A A and B B respectively of Fig. 1.

The cylinder *a* is fixed vertically to a crank casing or chamber *b* the lower part of which has fixed to it or is formed in one with a small lubricant pump cylinder *c* into which the lower end of the piston rod *d* extends to act as a pump piston. Near its inner end the interior of the cylinder wall is formed with longitudinal grooves *f* that bridge the piston *g* when the same is at the end of its inward stroke as indicated in dotted lines in Figs. 1 and 2 and allow the compressed mixture to flow from below the

piston to above the same. The explosive mixture is admitted to the inner end of the cylinder *a* through a lateral branch or port *m* controlled by an automatic spring pressed valve *n* and the exhaust gases escape through a lateral branch or port *o* at the upper end of the cylinder controlled by a spring pressed valve *p* that is actuated at the proper times by a timing cam *r* fixed on the crank shaft *s*. The sparking plug *t* is as usual fixed centrally at the top of the cylinder *a*. Mounted to freely rotate on the crank within the crank casing or chamber *b* is a block *w* adapted to slide in a link or embrasure *x* fixed to or formed in one with the piston rod *d*. Oil from a suitably arranged reservoir is drip fed into the crank casing *b* through a pipe *y* that delivers it on to the sliding crank block *w* and collects in the pump cylinder *c* at the lower part of the crank casing or chamber *b*. The interior of the wall of the pump cylinder *c*, which acts as a guide for the piston rod *d*, is grooved longitudinally for the greater portion of its length at *z* so that it is only toward the end of the inward stroke that the piston rod *d* acts to force the oil through a pipe 2 of small bore which leads from the lower end of the pump cylinder *c* to the lower end of the engine cylinder *a*. A non-return valve 3 is fitted in the lubricant pipe 2 adjacent to its connection with the cylinder *a*. As usual the crank shaft *s* is furnished with a flywheel 4 and the piston *g* is provided with an oil groove or oil grooves. Assuming the compressed charge above the piston *g* to have exploded, the piston is forced down thereby compressing the mixture that had been drawn into the cylinder *a* upon the previous upward stroke. Toward the end of the downward stroke the piston *g* passes the upper end of the slots *f* formed in the cylinder wall and the compressed mixture flows into the upper part of the cylinder *a* forcing before it the burnt gases which pass away through the exhaust valve *p* which is then opened. At the end of the next upward stroke of the piston *g* the mixture is exploded and the operations are repeated as usual in two-stroke cycle engines.

What I claim is:—

1. In a two-stroke cycle internal combustion engine, a piston, a working cylinder for said piston closed at both ends and the wall of which is formed with grooves near one

end adapted to bridge the said piston when at one end of its stroke, a crank casing, a piston rod fixed to said piston and extending into said crank casing, a valve controlling the admission of explosive mixture to the grooved end of said cylinder, an exhaust valve at the other end of said cylinder, a crank within said crank casing, a block mounted on said crank, a link formed in one with said piston rod and within which said block can slide and a lubricant pump cylinder at the lower end of said crank casing, said pump cylinder forming a guide for the lower end of said piston rod which works therein and constitutes a lubricant pump piston.

2. In a two-stroke cycle internal combustion engine, a piston, a working cylinder for said piston closed at both ends and the wall of which is formed with grooves near one end adapted to bridge the said piston when at one end of its stroke, a crank casing, a piston rod fixed to said piston and extending into said crank casing, a valve controlling the admission of explosive mixture to the grooved end of said cylinder, an exhaust valve at the other end of said cylinder, a crank within said crank casing, a block mounted on said crank, a link formed in one with said piston rod and within which said block can slide, a lubricant pump cylinder at the lower end of said casing formed with longitudinal grooves that freely communicate with said crank casing, and a piston working in said pump cylinder connected to said piston rod.

3. In a two-stroke cycle internal combustion engine, a piston, a working cylinder for said piston closed at both ends and the wall of which is formed with grooves near one end adapted to bridge the said piston when at one end of its stroke, a crank casing, a piston rod fixed to said piston and extending into said crank casing, a valve controlling the admission of explosive mixture to the grooved end of said cylinder, an exhaust valve at the other end of said cylinder, a crank within said crank casing, a block mounted on said crank, a link formed in one with said piston rod and within which said block can slide, a lubricant supply pipe adapted to deliver lubricant to the said crank within said casing, and a lubricant pump cylinder at the lower end of said crank casing, said pump cylinder forming a guide for the lower end of said piston rod

which works therein and constitutes a lubricant pump piston.

4. In a two-stroke cycle internal combustion engine, a piston, a working cylinder for said piston closed at both ends and the wall of which is formed with grooves near one end adapted to bridge the said piston when at one end of its stroke, a crank casing, a piston rod fixed to said piston and extending into said crank casing, a valve controlling the admission of explosive mixture to the grooved end of said cylinder, an exhaust valve at the other end of said cylinder, a crank within said crank casing, a block mounted on said crank, a link formed in one with said piston rod and within which said block can slide, a lubricant supply pipe adapted to deliver lubricant to the said crank within said casing, a lubricant pump cylinder at the lower end of said crank casing, said pump cylinder forming a guide for the lower end of said piston rod which works therein and constitutes a lubricant pump piston, and a pipe connecting said pump cylinder to said working cylinder.

5. In a two-stroke cycle internal combustion engine, a piston, a working cylinder for said piston closed at both ends and the wall of which is formed with grooves near one end adapted to bridge the said piston when at one end of its stroke, a crank casing, a piston rod fixed to said piston and extending into said crank casing, a valve controlling the admission of explosive mixture to the grooved end of said cylinder, an exhaust valve at the other end of said cylinder, a crank within said crank casing, a block mounted on said crank, a link formed in one with said piston rod and within which said block can slide, a lubricant supply pipe adapted to deliver lubricant to the said crank within said casing, a lubricant pump cylinder at the lower end of said crank casing, said pump cylinder forming a guide for the lower end of said piston rod which works therein and constitutes a lubricant pump piston, a pipe connecting said pump cylinder to said working cylinder, and a non-return valve in said pipe.

Signed at London, England, this 14th day of September 1915.

ARTHUR ROBERT BROUGHAM.

Witnesses:

AMY BROUGHAM,
MILDRED BROUGHAM.