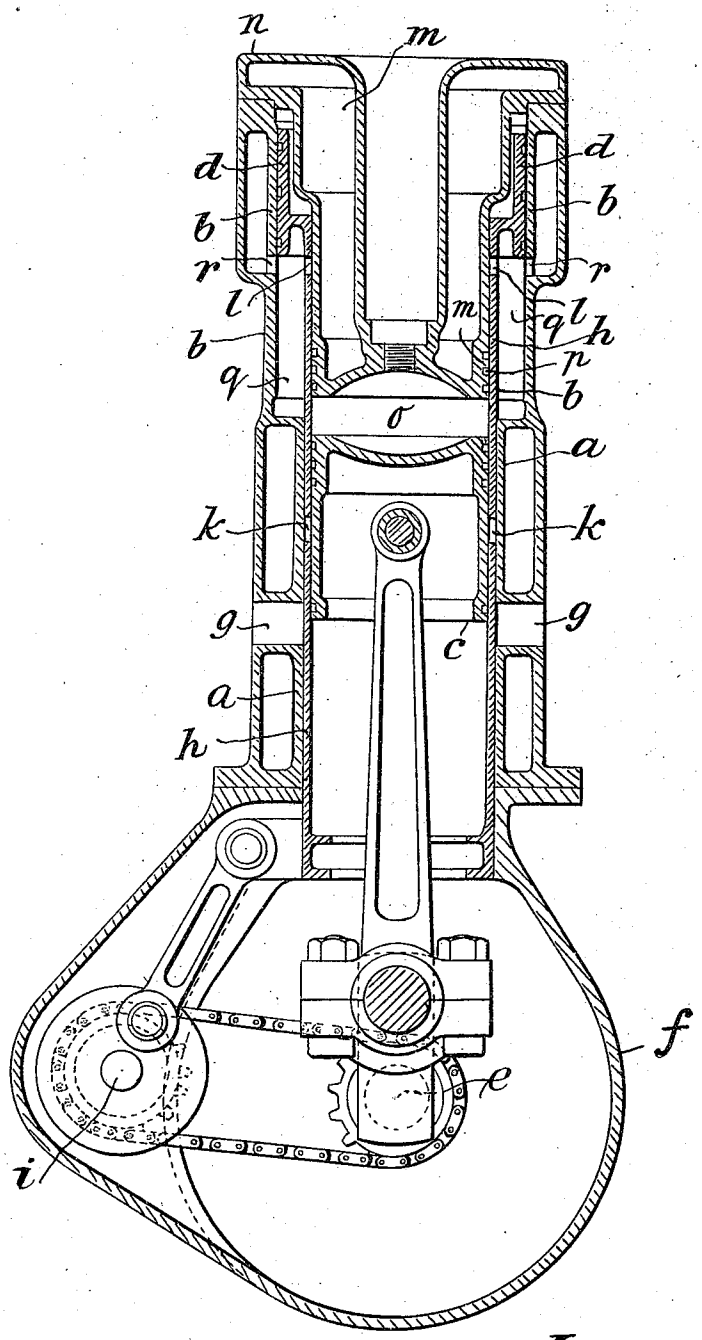
J. DAVIDSON.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED NOV. 22, 1919.

1,414,072. Patented Apr. 25, 1922.



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JOHN DAVIDSON, OF MANCHESTER, ENGLAND.

INTERNAL-COMBUSTION ENGINE.

1,414,072. Specification of Letters Patent. Patented Apr. 25, 1922.

Application filed November 22, 1919. Serial No. 339,950.

(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

To all whom it may concern:

Be it known that I, JOHN DAVIDSON, a subject of the King of Great Britain, residing at Manchester, in the county of Lancaster, England, have invented certain useful Improvements in and Connected with Internal-Combustion Engines, of which the following is a specification.

This invention relates to that type of single acting internal combustion engines which comprise a charging cylinder at the rear of the working cylinder and a reciprocating sleeve around the working piston having a charging piston working in the charging cylinder and means for closing the end of said sleeve.

In this type of engine it has previously been proposed to provide a mixture chamber which separated the charging cylinder from the working cylinder and communicated through valve controlled ports with the charging cylinder, ports being provided in the reciprocating sleeve adapted to open the mixture chamber to the working chamber, whereby the mixture was first admitted through the valve controlled ports to the mixture chamber before it was admitted to the working cylinder by the ports in said sleeve.

This invention has for its object to render said type of engines more compact, efficient and silent in operation and specially applicable for small power.

According to my invention, in a single acting internal combustion engine of the specified type, the charging chamber of the charging cylinder opens direct into the combustion chamber of the engine and the sleeve divides the charging chamber from the combustion chamber, ports being formed in said sleeve adapted to open said charging cylinder chamber direct to said combustion chamber when the charge has been compressed by the charging piston on said sleeve.

I attain said objects by the means illustrated in the accompanying drawing which shows a vertical section of a two cycle single acting internal combustion engine constructed in accordance with my invention.

Referring to the drawing, *a* is working cylinder, *b* the charging cylinder, *c* the working piston, *d* the charging piston, *e* the crank shaft and *f* the crank shaft casing.

The working piston *c* is of the well known construction and of suitable length to keep the exhaust ports *g* in the working cylinder *a* covered during the inward stroke and to uncover same at the end of the outward stroke.

Around the working piston *c* is fitted the sleeve *h* arranged to slide in the working cylinder *a* which sleeve is preferably reciprocated directly from the crank shaft *e*, or from a secondary shaft *i*, by means of suitable connections, say, such as shown.

The sleeve *h* has near its outer end ports *k*, through which the exhaust gases can escape into the exhaust ports *g* in the working cylinder *a*. The sleeve *h* has also near its inner end ports *l* to admit the mixture.

The said sleeve extends beyond the working cylinder and fits around the projection *m* of the cylinder cover *n* which extends some distance into the charging cylinder *b*.

o is the combustion chamber of the engine which is surrounded by the sleeve *h* and closed at one end by the cover projection *m* and at the other end by the head of the working piston *c*.

It will thus be seen that said combustion chamber can be made of very efficient form.

The cover projection *m* around which said sleeve reciprocates, is fitted with suitable packing rings *p*.

The charging piston *d* is formed on the inner end of the sleeve *h* and reciprocates in the charging cylinder *b* which latter opens direct into the working cylinder *a* and annular space *q* outside of the sleeve *h* and working cylinder *a*. The mixture passes to the chamber *q* of the charging cylinder *b* through ports *r* which ports admit the mixture to the chamber *q* of the charging cylinder *b* when the inner end of the piston *d* over runs same, and from the charging chamber *q* to the working cylinder *a* through ports *l* formed in sleeve *h* when said ports *l* over run projection *m* formed on cylinder cover.

With a view of reducing the length and weight of the engine and reducing the inertia effect to a minimum, the travel of said sleeve and with it the charging piston may be made considerably less than that of the working piston.

The engine described operates as follows:

During the instroke of the sleeve *h* and charging piston *d*, a partial vacuum is formed in the charging cylinder chamber *q*

and when the edge of the piston *d* over runs the inlet ports *r* a supply of mixture is drawn in.

Upon the out stroke taking place, the mixture is compressed in the charging cylinder chamber *q* by its piston *d* until near the end of the stroke, the inlet ports *l* in the sleeve *h* over run the edge of the cylinder cover projection *m* and allow the mixture to pass into the working cylinder *a*.

Just before this takes place, the working piston *c* has uncovered the exhaust ports *g* and allowed the burnt gases to escape ready for the incoming charge. The sleeve *h* then moves inwards, cutting off the ports *g* and almost at the same time the working piston *c* moves inwards in the sleeve *h* and compresses the charge which is then fired in the well known manner.

It will be readily seen that the inlet to the charging cylinder chamber *q* may be controlled by the charging piston *d* at the end of its stroke over running the ports *r* in the charging cylinder or chamber.

I claim:—

In a single acting internal combustion engine of the hereinbefore specified type, in combination, a combustion chamber; a charging cylinder opening at its inner end direct into the combustion chamber; a working piston; a reciprocatory sleeve around said working piston separating the interior of the charging cylinder from the interior of the working cylinder; mixture inlet ports provided in the wall of the charging cylinder at the outer end of and opening direct into said cylinder; a piston on said sleeve working in the charging cylinder adapted to cut off the mixture inlet ports from the charging cylinder during compression and charging; and compressed mixture inlet ports in the reciprocatory sleeve in front of the charging piston in open communication at all times with the charging cylinder and adapted to place the interior of the charging cylinder into direct communication with the interior of the combustion cylinder when the charging piston reaches the end of its inward stroke.

Signed at Manchester, in the county of Lancaster, this 7th day of November, 1919.

JOHN DAVIDSON.

Witnesses:

ALFRED BOSSHARDT,

MARY I. BOSSHARDT.