No. 741,559. PATENTED OCT. 13, 1903.

F. H. SMITH.

EXPLOSION ENGINE.

APPLICATION FILED FEB. 4, 1903.

NO MODEL.

Fig. 1.

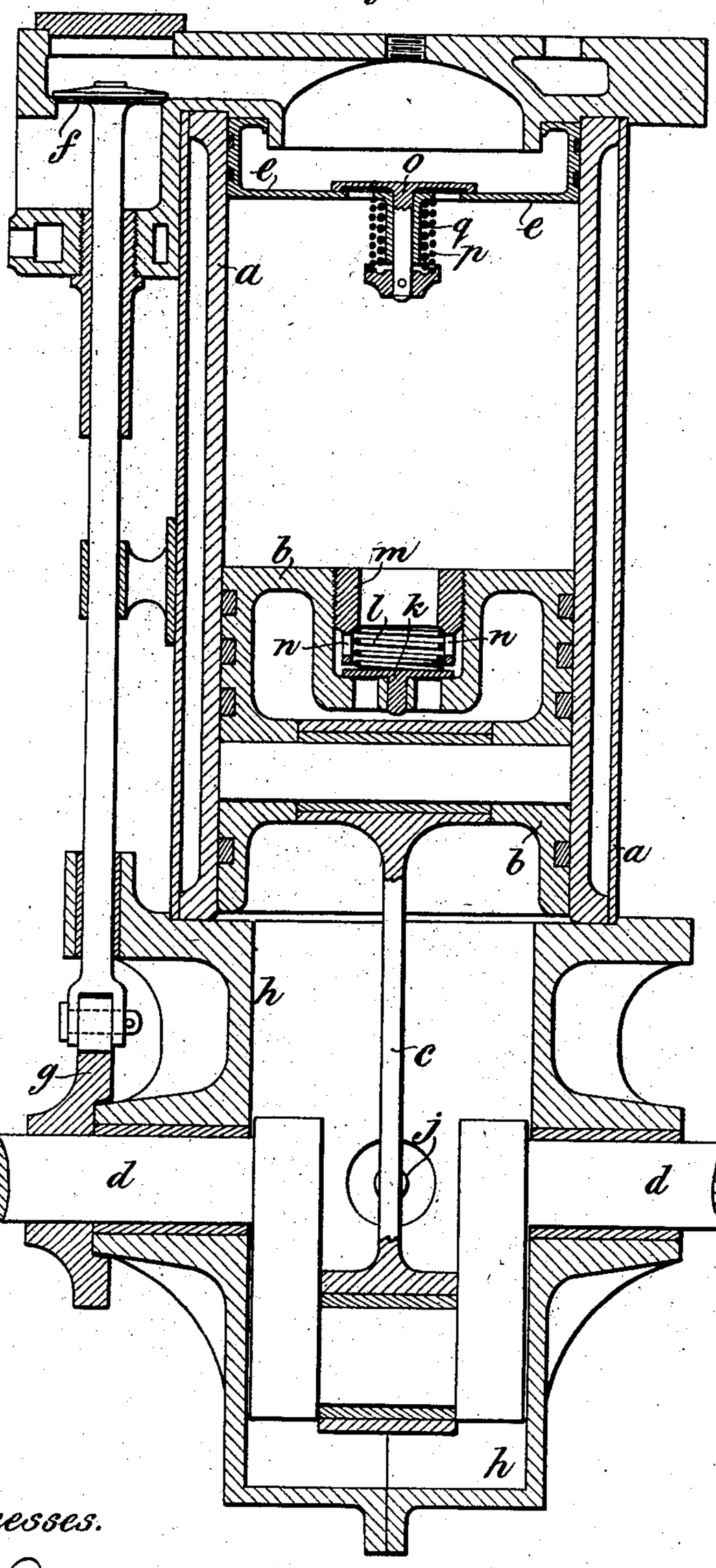
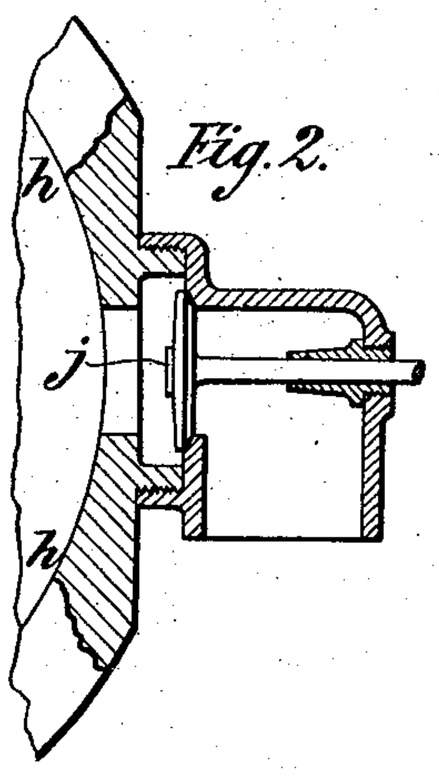


Fig. 2.



Witnesses.

A. N. Parkins.

L. A. MacDonald.

Inventor.

Frederick Hugh Smith,

By his Attorneys,

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No. 741,559. Patented October 13, 1903.

UNITED STATES PATENT OFFICE.

FREDERICK HUGH SMITH, OF DATCHET, NEAR WINDSOR, ENGLAND.

EXPLOSION-ENGINE.

SPECIFICATION forming part of Letters Patent No. 741,559, dated October 13, 1903.

Application filed February 4, 1903. Serial No. 141,902. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK HUGH SMITH, engineer, a subject of the King of Great Britain, residing at Manor House, Datchet, near Windsor, England, have invented certain new and useful Improvements in Explosion-Engines, of which the following is a specification.

This invention relates to that class of explosion-engine in which there is a supplementary piston behind the main piston, the two pistons moving together during the outstroke, but the supplementary piston returning before the main piston, sweeping out before it the products of combustion while the new charge is supplied between the two pistons, there being a non-return valve in the supplementary piston, through which the charge is forced into the inner end of the cylinder on the return of the main piston. Such engines are described in the specification of my Patent No. 636,298.

According to the present invention I provide a closed chamber, which may be the outer end of the cylinder, combined or not with a crank-chamber, into which the explosive mixture is drawn through a non-return valve by the inward movement of the main piston and in which it is partially compressed by its outward movement. In the main piston also I provide a non-return valve, through which the charge passes when the pressure in the cylinder is reduced by opening the exhaust, so that the charge forces the supplementary piston to the end of the cylinder and causes it to sweep out the products of combustion, as above described. The main piston then comes back and forces the charge through the valve in the supplementary piston and compresses it into the inner end of the cylinder.

Figure 1 is a vertical section of an engine constructed according to this invention, and Fig. 2 shows a detail.

a is the cylinder.

b is the main piston. *c* is the connecting-rod, pivoted to it.

d is the crank-shaft, and *e* is the supplementary piston, working loose in the cylinder.

f is the exhaust-valve, worked in the usual way by a cam *g*, fixed to the crank-shaft *d*.

h is a crank-chamber open to the outer end of the cylinder.

j is a non-return valve admitting the explosive mixture into the chamber *h*.

k is a non-return valve working in a recess in the main piston *b*, and *l* is a spring forcing it against its seat. The travel of the valve *k* is limited by an annular plug *m*, having holes or ports *n* in it, which is screwed into the recess in the piston *b*.

o is a non-return valve in the piston *e*, and *p* is a spring tending to force it onto its seat. *q* is another spring, preferably stronger than *p*, which acts as a buffer for the boss on the valve-stem when the valve is suddenly opened. The length of the spring *q* is such that it does not act on the valve when closed.

When the parts are in the positions shown, the exhaust-valve *f* has just closed and the piston *b* is about to move toward the inner end of the cylinder *a*, and in so doing it will draw explosive mixture through the valve *j* into the chamber *h* and will compress the mixture which is between the pistons and will ultimately force it through the valve *o* to the other side of the piston *e*. When the piston *b* reaches the end of its instroke, the explosion takes place and the pistons *b* and *e* are forced outward together, compressing the mixture in the chamber *h*. Toward the end of the outstroke the exhaust-valve *f* is opened and the pressure in the inner end of the cylinder falls, whereupon the mixture in the chamber *h*, which is at a higher pressure than atmospheric, flows through the valve *k*, forcing the piston *e* toward the inner end of the cylinder, so sweeping out the products of combustion. The valve *f* then closes, and the parts are again in the positions shown, the cycle being complete.

What I claim is—

1. The combination of a cylinder, a chamber in communication with the outer end of the cylinder, a non-return valve admitting explosive mixture to the cylinder, a piston and a loose piston in the cylinder and a non-return valve in each piston.

2. The combination of a cylinder, a loose piston in the cylinder, a non-return valve in the piston, a spring tending to close the valve and a buffer-spring limiting the opening of the valve.

FREDERICK HUGH SMITH.

Witnesses:

WALTER BROMLY,

GEORGE I. BRIDGES.