

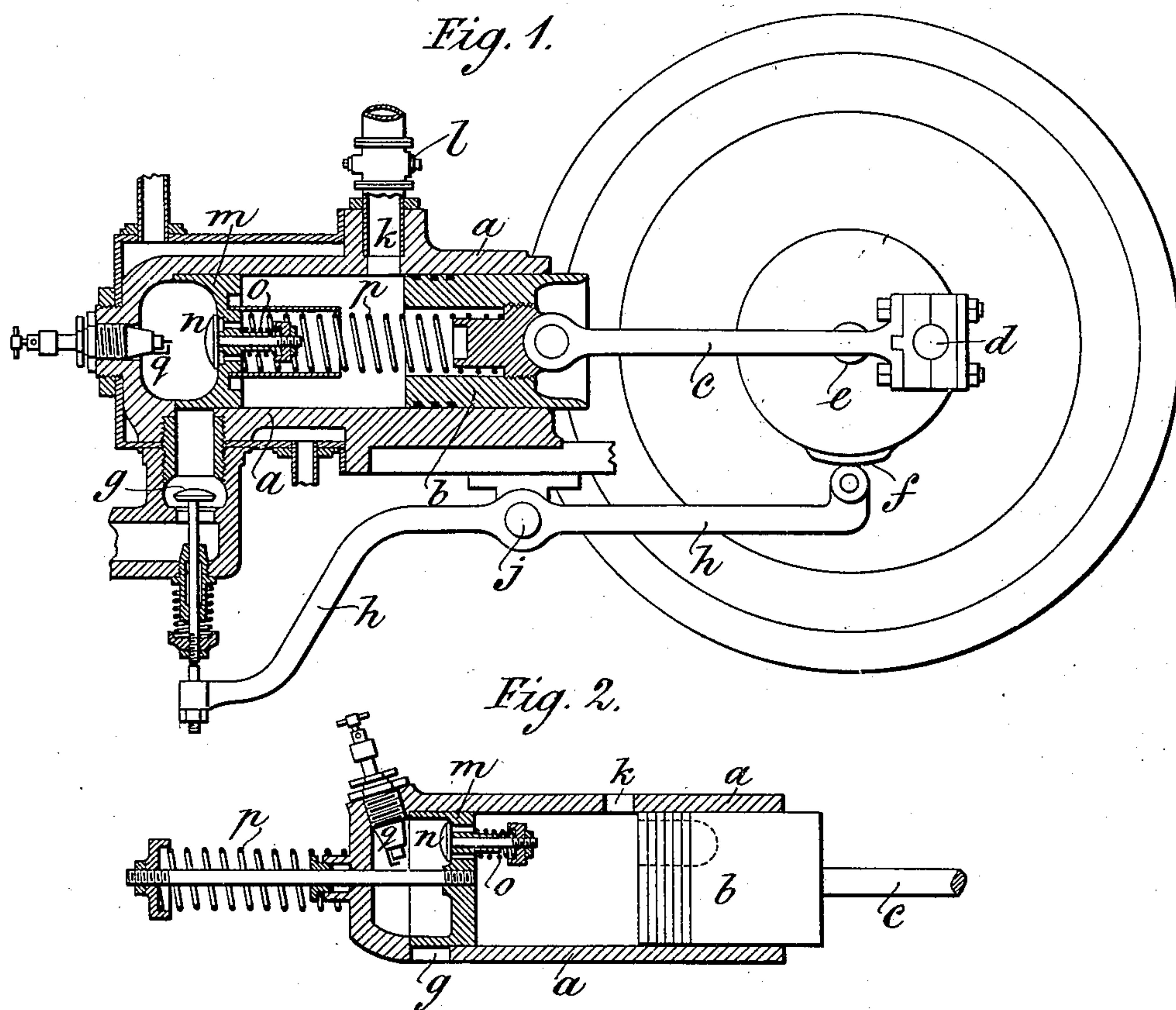
No. 636,298.

Patented Nov. 7, 1899.

F. H. SMITH.
EXPLOSION ENGINE.

(Application filed July 31, 1899.)

(No Model.)



Witnesses.
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FREDERICK HUGH SMITH, OF DUMBLANE, SCOTLAND.

EXPLOSION-ENGINE.

SPECIFICATION forming part of Letters Patent No. 636,298, dated November 7, 1899.

Application filed July 31, 1899. Serial No. 725,567. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK HUGH SMITH, engineer, a subject of the Queen of Great Britain, residing at The Limes, Dumblane, Scotland, have invented certain new and useful Improvements in Explosion-Engines, of which the following is a specification.

This invention relates to two-stroke cycle-engines having a supplementary piston to expel the products of combustion. I provide a spring tending to force the supplementary piston toward the inner end of the cylinder and provide a non-return valve preferably in the supplementary piston.

Figure 1 is a longitudinal section of an engine constructed according to this invention. Fig. 2 shows a modification.

a is the cylinder, and *b* is the main piston in it.

c is the connecting-rod, pivoted to the piston *b* and the crank *d* on the crank-shaft *e*.

f is a cam fixed to the crank-shaft *e* and operating the exhaust-valve *g* through the lever *h*, pivoted at *j*.

k is the admission pipe and port, supplying an explosive mixture of air and gas or vapor.

l is a valve which is preferably provided on the pipe *k*.

m is the supplementary piston, having a non-return valve *n* in it, which is normally held onto its seat by the spring *o*.

p is a spring interposed between the pistons *b* and *m* and tending to separate them, as shown in Fig. 1, or it may be placed outside the cylinder, as shown in Fig. 2.

q is the ignition apparatus of any ordinary construction.

The working of the engine is as follows: On the explosion taking place the two pistons *b* and *m* are forced out together; but on opening the exhaust-valve *g* at the inner end of the cylinder the pressure is reduced, and the spring *p* causes the return of the supplementary piston *m* before the other, so expelling the products of combustion. Meanwhile the main piston *b* has uncovered the inlet-passage *k* in the outer end of the cylinder, and a charge is admitted into the space between the pistons. The return of the main piston *b* compresses this charge and forces it through the valve *n* in the supplementary piston *m* into the combustion-chamber.

One great advantage gained by this engine is that it is more or less self-governing, for after the exhaust is opened the spring *p* takes a definite time to carry the piston *m* back to the inner end of the cylinder, and if the engine is running too fast for the piston *m* to complete its travel before the exhaust is closed then the products of combustion are not completely expelled and only a partial charge of the explosive mixture is drawn in, and therefore the faster the engine is running the smaller and more diluted are the charges supplied to it.

The speed of the engine can be regulated either by adjusting the spring *p* or by turning the cock *l*.

I claim—

1. The combination of a cylinder, a main piston, a supplementary piston, a spring tending to force the supplementary piston to the inner end of the cylinder, an inlet at the outer end of the cylinder, an exhaust-valve at the inner end of the cylinder, means for operating it, a passage connecting the space between the pistons and the inner end of the cylinder, and a non-return valve in the passage.

2. The combination of a cylinder, a main piston, a supplementary piston, a spring tending to force the supplementary piston to the inner end of the cylinder, an inlet at the outer end of the cylinder, an exhaust-valve at the inner end of the cylinder, means for operating it, a passage through the supplementary piston, and a non-return valve in the passage.

3. The combination of a cylinder, a main piston, a supplementary piston, a spring between the pistons, an inlet at the outer end of the cylinder, an exhaust-valve at the inner end of the cylinder, means for operating it, a passage connecting the space between the pistons and the inner end of the cylinder, and a non-return valve in the passage.

4. The combination of a cylinder, a main piston, a supplementary piston, a spring between the pistons, an inlet at the outer end of the cylinder, an exhaust-valve at the inner end of the cylinder, means for operating it, a passage through the supplementary piston, and a non-return valve in the passage.

5. The combination of a cylinder, a main piston, a supplementary piston, a spring tending to force the supplementary piston to the

inner end of the cylinder, an inlet at the outer
end of the cylinder, a cock on the inlet, an
exhaust-valve at the inner end of the cylinder,
means for operating it, a passage connecting
5 the space between the pistons and the inner
end of the cylinder, and a non-return valve
in the passage.

6. The combination of a cylinder, a main
piston, a supplementary piston, a spring tend-
10 ing to force the supplementary piston to the
inner end of the cylinder, an inlet at the outer
end of the cylinder, a cock on the inlet, an
exhaust-valve at the inner end of the cylin-
der, means for operating it, a passage through
15 the supplementary piston, and a non-return
valve in the passage.

7. The combination of a cylinder, a main
piston, a supplementary piston, a spring be-
tween the pistons, an inlet at the outer end of

the cylinder, a cock on the inlet, an exhaust- 20
valve at the inner end of the cylinder, means
for operating it, a passage connecting the
space between the pistons and the inner end
of the cylinder, and a non-return valve in the
passage.

8. The combination of a cylinder, a main 25
piston, a supplementary piston, a spring be-
tween the pistons, an inlet at the outer end
of the cylinder, a cock on the inlet, an ex-
haust-valve at the inner end of the cylinder, 30
means for operating it, a passage through the
supplementary piston, and a non-return valve
in the passage.

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Witnesses:

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