No. 651,966. Patented June 19, 1900.

# G. A. FLEURY.

## EXPLOSION ENGINE.

(Application filed June 27, 1899.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

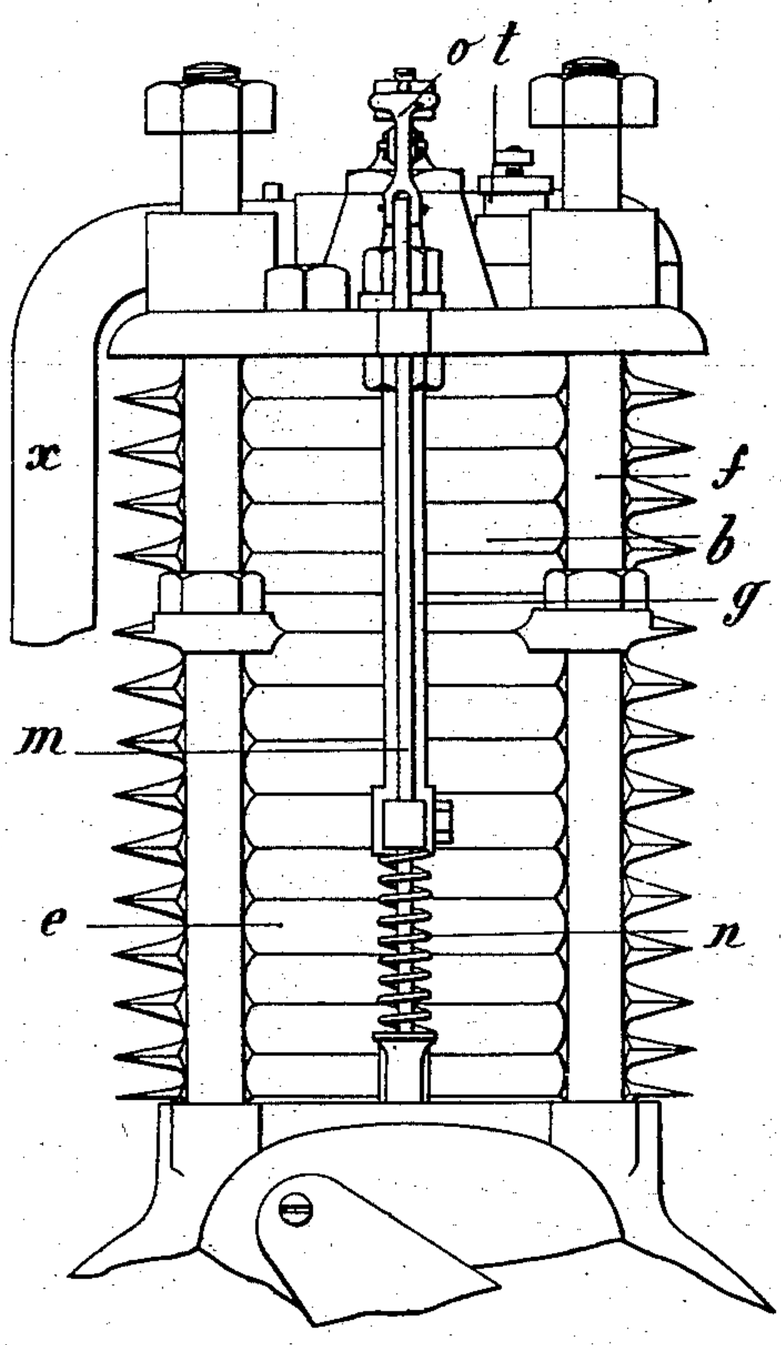



FIG. 10.

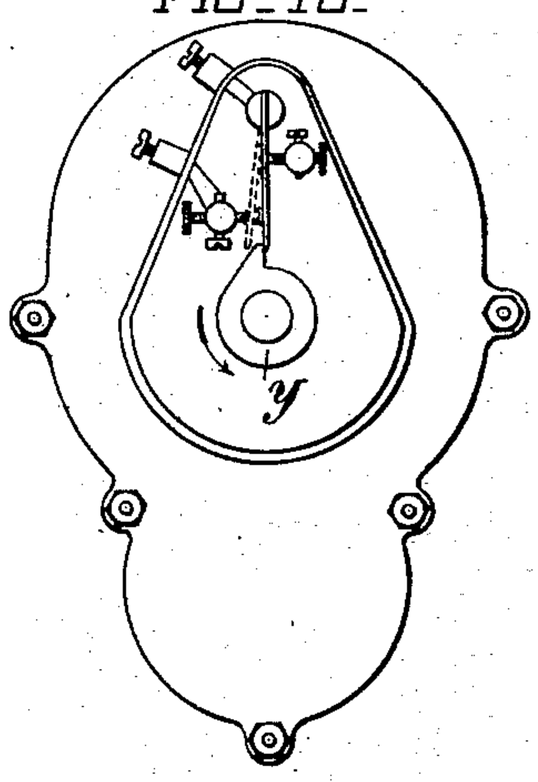
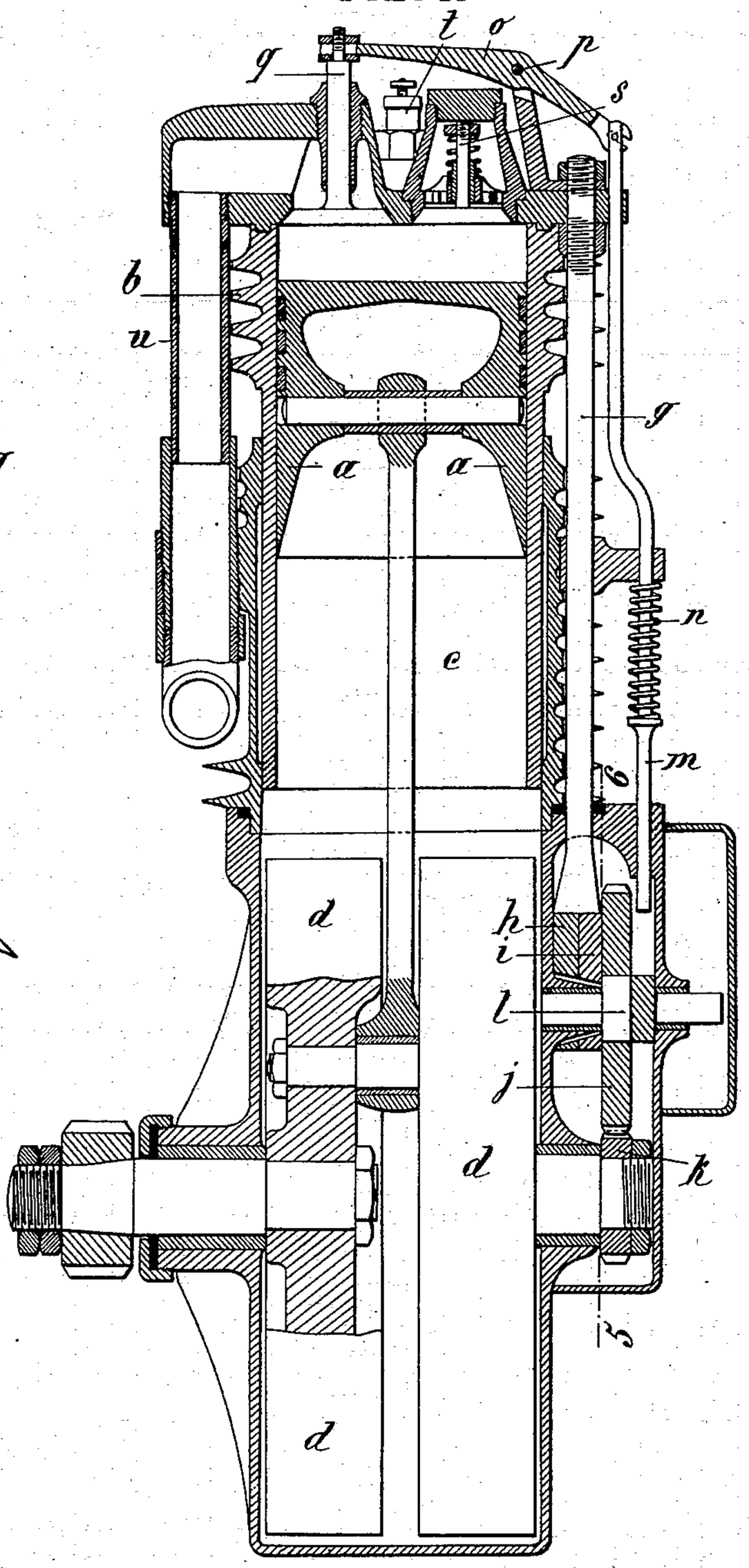



FIG. 4.




Witnesses

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## EXPLOSION ENGINE.

(Application filed June 27, 1899.)

(No Model.) 2 Sheets—Sheet 2.

FIG. 3.

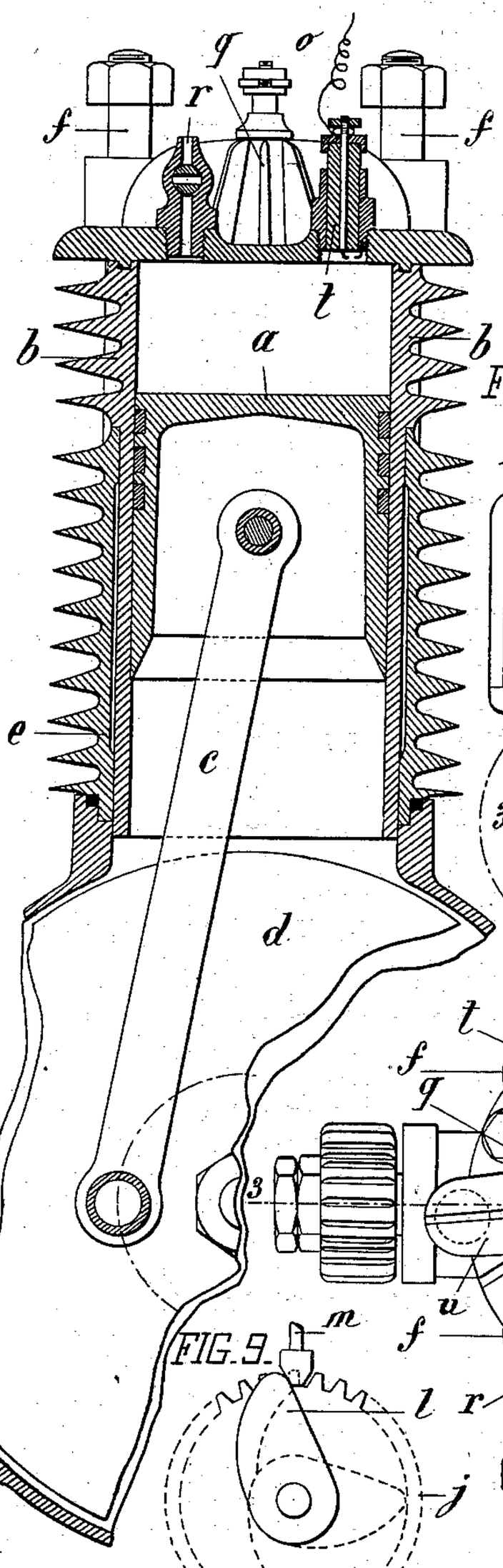


FIG. 5.

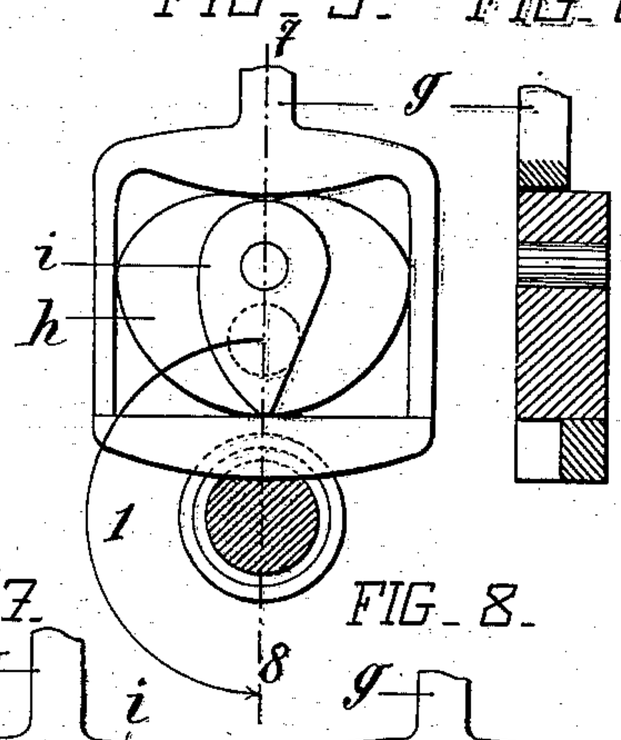


FIG. 6.



FIG. 7.

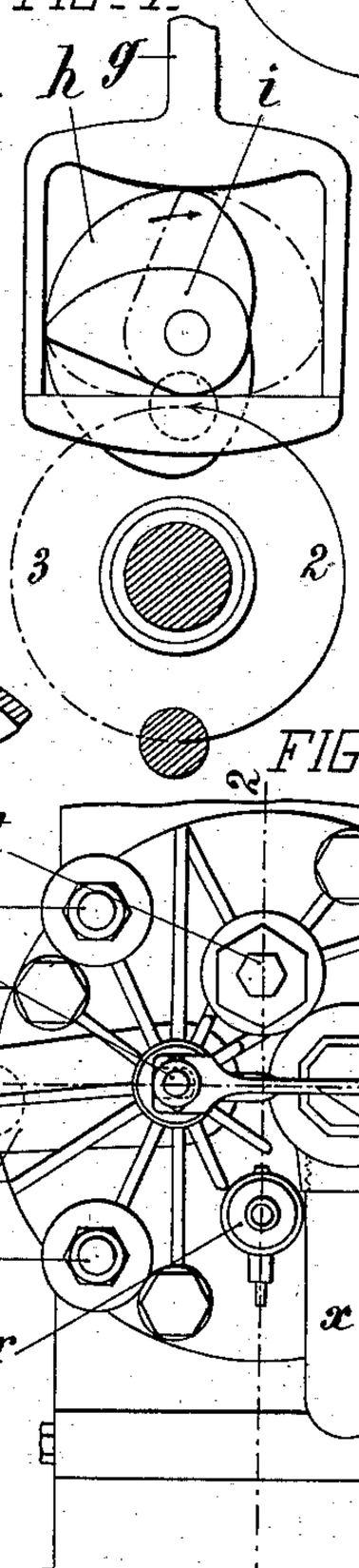


FIG. 8.

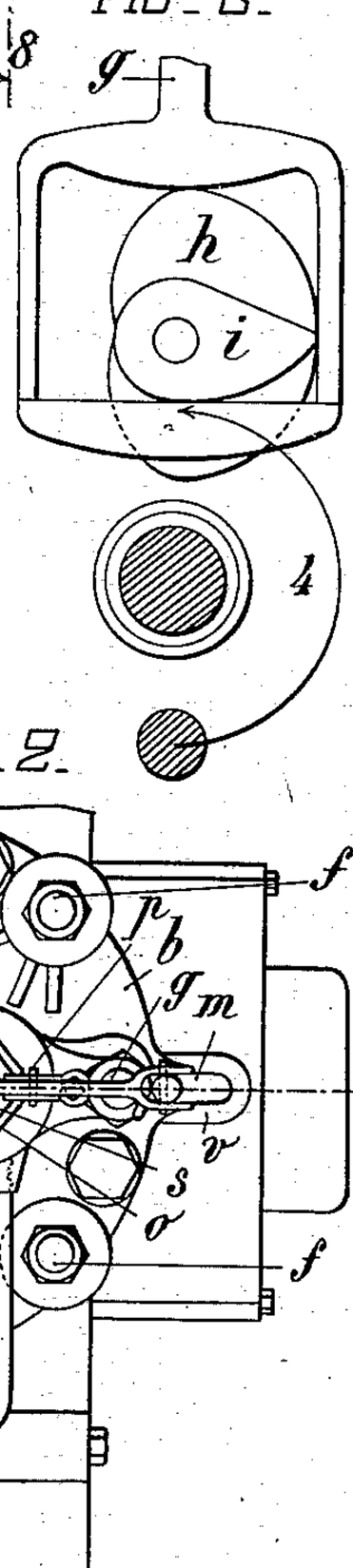


FIG. 2.




FIG. 9.




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# UNITED STATES PATENT OFFICE.

GEORGES ALFRED FLEURY, OF PARIS, FRANCE.

## EXPLOSION-ENGINE.

SPECIFICATION forming part of Letters Patent No. 651,966, dated June 19, 1900.

Application filed June 27, 1899. Serial No. 722,019. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGES ALFRED FLEURY, mechanician, of 76 Rue Chardon Lagache, in the city of Paris, Republic of France, have invented an Improved Explosion-Engine, of which the following is a full, clear, and exact description.

My invention relates to an explosion-engine chiefly characterized by the employment of a movable cylinder, enabling the volume of the explosive mixture in the explosion-chamber to be increased, the complete discharge of the burned gases to be effected, and increased power to be obtained.

Reference is to be had to the accompanying drawings, forming part of this specification, wherein—

Figure 1 is an elevation, and Fig. 2 a plan view, of a sufficient number of parts of an engine to illustrate my invention. Fig. 3 is a vertical sectional view of the same, taken on line 1 2, Fig. 2. Fig. 4 is a vertical section on line 3 4, Fig. 2. Fig. 5 is a vertical detail sectional view of a portion of the engine, which view is taken on line 5 6 of Fig. 4 and shows the position of the cams for acting on the moving cylinder during the first or inhalating phase. Fig. 6 is a vertical sectional view of the same, taken on line 7 8, Fig. 5. Fig. 7 is a view corresponding to Fig. 5, except that the cams are illustrated in the positions they assume during the second or compression phase and also during the third or explosion phase. Fig. 8 is a like view of the same, showing the position of the same cams during the fourth phase, at which the burned gases are exhausted. Fig. 9 is a detail face view of the cam which operates the exhaust-valve through a rod and lever. Fig. 10 is a detail face view of the cam which produces the ignition contact.

The same letters and figures of reference denote like parts in the drawings.

The piston-head *a* works in the longitudinally-moving cylinder *b* and is connected by rod *c* with the crank-pin of the fly-wheels *d*, keyed on the driving-shaft. Upon this shaft is a pinion *k*, Fig. 4, which gears with a speed-reducing wheel *j*, whose axis carries a cam *l*, which operates the exhaust-valve *q* through the medium of a lever *o*, pivoted at *p*, and rod *m*, moving in a guide *v* and pressed toward the cam by a spring *n*. Cams *h* and *i* are operated by wheel *j*, working within a frame attached to a rod *g*, fixed to the moving cylinder *b*. The moving cylinder *b* is fitted to work within a stationary cylinder *e* (see Fig. 3) and is suitably guided by means of rods *f*, terminated by stop-nuts, and upon the upper end of the cylinder *b* are the compression-cock *r*, the automatic inhaling-valve *s*, the ignition device *t*, telescopic exhaust-pipe *u* for the gases, and the suction-pipe *x*, connected to the carbureter by any suitable flexible pipe. The ignition-cam *y* is keyed on the spindle of wheel *j*.

The action is as follows: At the commencement of the first phase the moving cylinder *b* is at the lower end of its stroke and touches piston-head *a*, so that neither air nor gas is contained in cylinder *b*. During this first phase) denoted by the semirevolution 1, Fig. 5) the piston *a* descends, and cylinder *b* is raised by the cam *h*, actuated by wheel *j*. By this movement the inhalation of the gases supplied through pipe *x* from the carbureter is effected, the automatic suction-valve *s* opening to give passage to said gases, which correspond in volume to the stroke of the piston plus that of the moving cylinder. During the second phase 2, Fig. 7, the piston *a* is raised by connecting-rod *c*, and the moving cylinder *b* remains stationary. The cylinder cannot descend by its own weight, since it is maintained by the cam and by the friction of the piston moving in the same direction, thus lessening the force expended in raising the moving cylinder by means of cam *h*, which is partly of semicylindrical contour, thus permitting any required lead of the ignition. During the third phase 3, Fig. 7, expansion and explosion takes place. When the electric spark ignites the explosive mixture, the piston *a* descends under the downward pressure of the explosion of the gas inhaled in volume equal to the stroke of the piston and the inhaling stroke of the moving cylinder. The volume of gas being so much greater in this engine, the motive power developed will thus be correspondingly increased. During the fourth phase 4, Fig. 8, the piston *a* returns to its initial position and the moving cylinder *b* descends under the action of cam *i*. During this movement the exhaust-valve

$q$ is opened by cam $l$, Fig. 9, acting through rod $m$ and lever $o$, and the burned gases are discharged through the telescopic pipe $u$ into the usual exhaust-chamber situated at any suitable point.

This construction of engine may comprise several moving cylinders, and it is to be understood that the form, dimensions, and details of construction of the engine having one or several moving cylinders may be varied without departing from the principle of the invention.

I claim—

1. In an explosion-engine the combination of a movable cylinder, a piston moving therein in a direction opposite to the movement of the cylinder, the space between the piston and cylinder being occupied by the charge which space is enlarged by the opposite movements of the piston and cylinder, a pipe connected to said cylinder and communicating with the space between the piston and cylinder, a valve carried by the cylinder and intermediate mechanical connections between said valve and a moving part of the engine for automatically seating and unseating said valve at predetermined periods in the operation of the engine.

2. In an explosion-engine, the combination of a movable cylinder and a movable piston working therein, the space between the cylinder-head and the piston being utilized for the explosive mixture, means for causing the piston and the cylinder to move in opposite directions to effect the drawing in of the explosive substance into the space between the piston and the cylinder, thereby augmenting the volume of the explosive mixture in the explosive-chamber and for causing the said cylinder and piston to move in directions opposite to the direction of their previous movement to effect the expulsion of the burned explosive substance, and a telescopic pipe connecting the said cylinder with the exhaust.

The foregoing specification of my improved explosive-engine signed by me this 14th day of June, 1899.

GEORGES ALFRED FLEURY.

Witnesses:

EDWARD P. MACLEAN,

MAURICE HENRI PIGNET.