(No Model.)

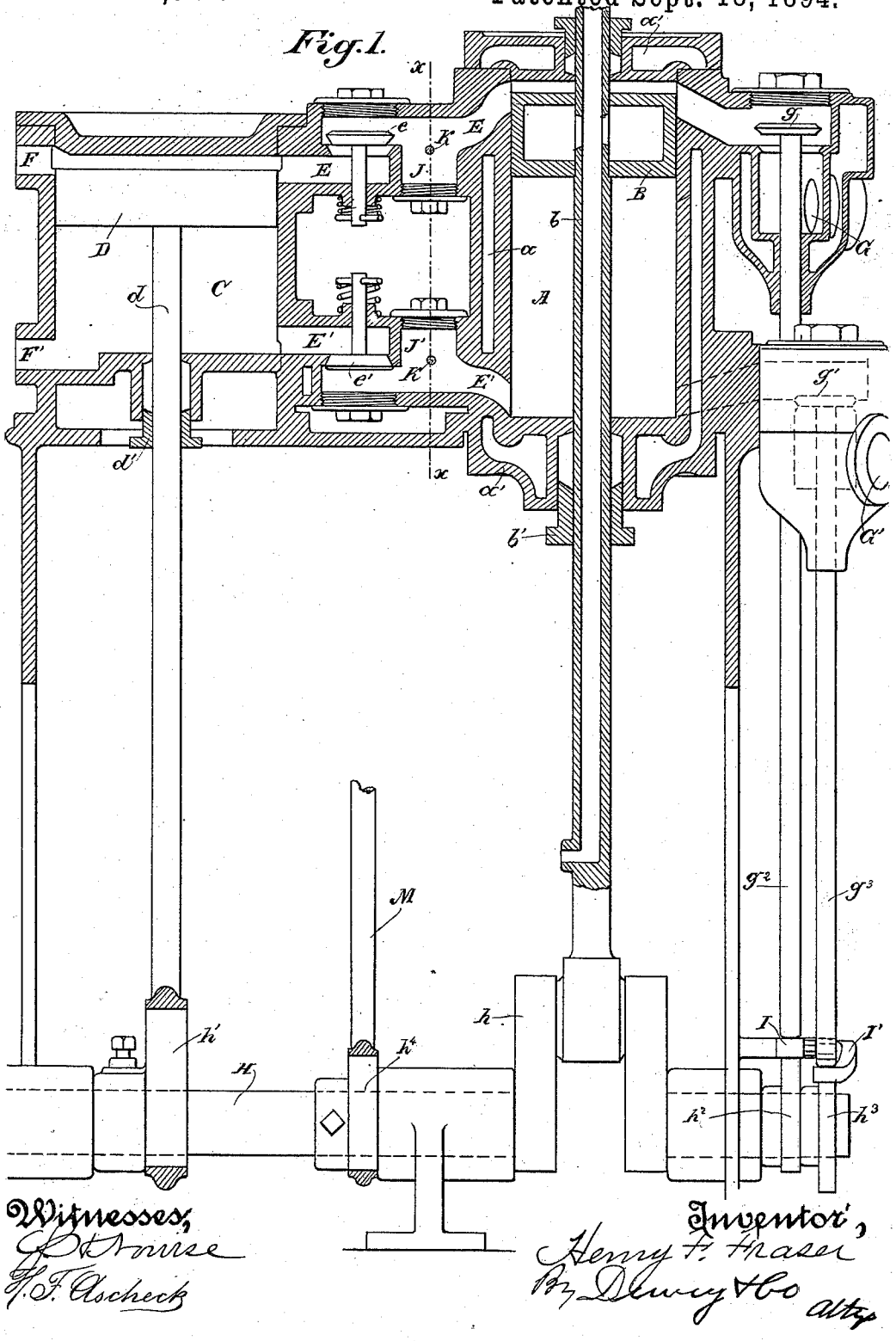
2 Sheets—Sheet 1.

H. F. FRASER.

EXPLOSIVE ENGINE.

No. 526,348. Patented Sept. 18, 1894.

Fig. 1.



Witnesses,
P. Drane
F. F. Ascheck

Inventor,
Henry F. Fraser
By Dewey & Co Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.)

2 Sheets—Sheet 2.

H. F. FRASER.

EXPLOSIVE ENGINE.

No. 526,348. Patented Sept. 18, 1894.

Fig. 2.

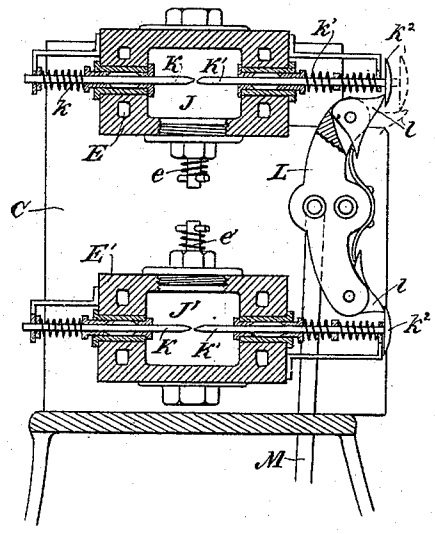
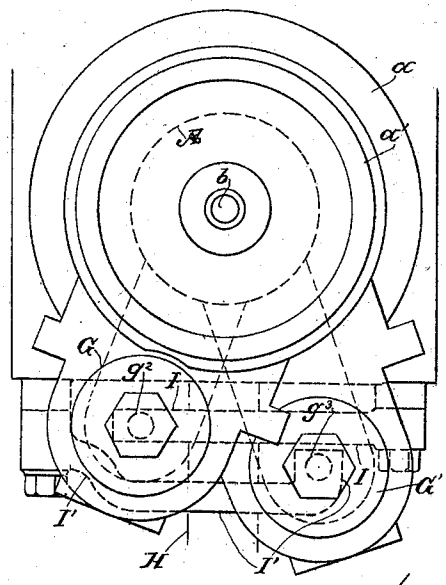


Fig. 3.



Witnesses,
J. A. Druse.
F. F. Ascheck

Inventor,
Henry F. Fraser
By Dewey & Co.
Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HENRY F. FRASER, OF ANTIOCH, CALIFORNIA.

EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 526,348, dated September 18, 1894.

Application filed September 19, 1893. Serial No. 485,875. (No model.)

To all whom it may concern:

Be it known that I, HENRY F. FRASER, a citizen of the United States, residing at Antioch, Contra Costa county, State of California, have invented an Improvement in Explosive-Engines; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the class of explosive engines, and especially to those engines which receive an explosive charge at each end alternately.

It consists in the novel construction and arrangement of the main and compression cylinders, the pistons operating therein and the several passages and controlling valves, together with the igniting or sparking mechanism, all of which I shall hereinafter fully describe and claim.

The object of my invention is to provide a simple and effective double acting explosive engine.

Referring to the accompanying drawings for a more complete explanation of my invention—Figure 1 is a vertical longitudinal section of my engine. Fig. 2 is a section on line x—x of Fig. 1. Fig. 3 is a top view of the main cylinder and exhaust valves.

A is the main cylinder provided with a water-jacket a and with suitable heads a'.

B is the piston working within the cylinder and having a rod b which passes outwardly through a suitable stuffing-box b' in the lower head a' of the cylinder. Both piston and rod are made hollow as shown in Fig. 1, to contain water by which they are kept cool, a requirement very essential in a double acting engine where these parts are liable to quickly become heated.

C is the compression or charge cylinder. This may be connected and arranged with respect to the cylinder A by any suitable means, here shown as being located to one side thereof with the inlet passages intervening.

Within the compression cylinder is mounted the piston D, the rod d of which passes down through its lower head in a suitable stuffing-box d'.

The cylinder C is connected at its upper end with the upper end of the cylinder A by passages E E controlled by a suitable valve e, and said cylinder is connected at its lower end with the lower end of the cylinder A by passages E′ E′ having a suitable controlling valve e'.

F is the inlet for the explosive charge, communicating with the upper end of the compression cylinder C, and provided with a suitable valve, not shown.

F′ is the inlet for the explosive charge communicating with the lower end of the cylinder C, and provided with a suitable valve, not shown.

G is the exhaust from the upper end of cylinder A, having a valve g, and G′ is the exhaust from the lower end of the cylinder, having the valve g'.

H is the engine shaft with the crank h of which the piston rod b is connected. Upon this shaft is an eccentric h' which operates the rod d of the compression piston D. This shaft also carries cams h^2 and h^3 which oscillate levers I and I′ respectively, and upon which the stems g^2 and g^3 of the exhaust valves g and g' respectively rest.

Within the passages E and E′ are formed the explosion chambers J and J′ and in these are located the igniting devices or electrodes. One of these electrodes in each chamber is designated by K. Its inner end is beveled as shown, and it is controlled by a spring k which holds it in. The other electrode is K′, the inner end of which is also beveled, and it also is controlled by a spring k' which holds it in. The beveled points of the two electrodes are normally held separated, and they are suitably mounted with respect to proper insulation common in such cases.

The outer end of each electrode K′ has a stop or contact button k^2 against which the ends l of a centrally pivoted rocking lever L, interposed between the pairs of electrodes, alternately come in contact. This rocking lever is actuated by a rod M which is itself operated by an eccentric h^4 on the main shaft H.

The operation of the engine is as follows: As the piston D in the compression cylinder C moves downwardly, it compresses and forces the explosive charge from below it through the passages E′ E′ into the explosion chamber J′, wherein it is ignited, and the expanding gases entering the lower end of cylinder A, the piston B is driven on its up-

ward stroke, the previous products of the explosion being driven out through the exhaust passage G and valve g which is then open. The downward movement of the compression piston D draws in another explosive charge into the compression cylinder C above it, and upon the up stroke of the piston D, this charge is forced through the passage E E, into the upper explosion chamber J, and is there exploded above the now descending piston B which is thereby driven on its downward stroke, the previous products of explosion being exhausted through the lower passage G′, the valve g' of which is at this time opened. Thus a double acting explosive engine is obtained, of simple construction and effective in operation.

The spark is effected by the electrodes as follows: The rocking lever L bearing against the stop button k^2 of the electrode K′, draws said electrode outwardly, and upon being relieved said electrode springs in and is thrown far enough to come in contact with the electrode K, the contact being a yielding one due to the spring control of both. This contact is but momentary and upon the rebound or return of the electrodes to normally separated position, the spark is effected. The beveled ends of the two electrodes insure perfect contact and separation with the minimum of friction and jar, and in addition thereto, tend by a scraping contact to keep their surfaces clean.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a double-acting explosive engine, the combination of a main cylinder with its piston and valve-controlled exhaust from each end, a compression cylinder at one side of the main cylinder, having a compression piston operating therein, an inlet for the explosive charge to each end of the compression cylinder, a valve controlled passage from each end of the compression cylinder, to each end of the main cylinder, an independent centrally separated explosive chamber in each passage intermediate of the compression and main cylinders and exterior to both, and means for igniting the explosive charge therein, comprising electrodes arranged in line in pairs and each connected with a spring, and means for alternately withdrawing one of the electrodes, of each pair whereby upon said electrode being relieved it will spring into contact with the opposing electrode and will be caused to instantly rebound and become normally separated therefrom.

2. In an explosive engine, the normally separated electrodes each controlled by a spring, in combination with a pivoted lever having its free end adapted to contact with and withdraw one of the electrodes whereby upon said electrode being relieved it will spring into contact with the opposing electrode and will be caused to instantly rebound and become normally separated therefrom.

3. In an explosive engine having explosive chambers and passages connecting them with each end of the main and compression cylinders, the electrodes arranged in line and each connected with a spring whereby their inner ends are normally separated, a centrally-pivoted lever interposed between each pair of the electrodes having its free ends adapted to engage the electrodes to withdraw them, and a rod from the engine shaft to operate the lever.

4. In an explosive engine having explosive chambers, electrodes arranged in pairs with the electrodes of each pair in line, a centrally-pivoted rocking-lever interposed between the pairs of electrodes and having its free ends adapted to engage a contact or button on one member of each pair of electrodes for withdrawing said members, and springs connected with the electrodes of each pair whereby the electrodes normally separate after contact, and means for operating the lever.

In witness whereof I have hereunto set my hand.

HENRY F. FRASER.

Witnesses:
S. H. NOURSE,
H. F. ASCHECK.