No. 734,827. PATENTED JULY 28, 1903.

R. CUMMING.

ROTARY EXPLOSIVE ENGINE.

APPLICATION FILED AUG. 27, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

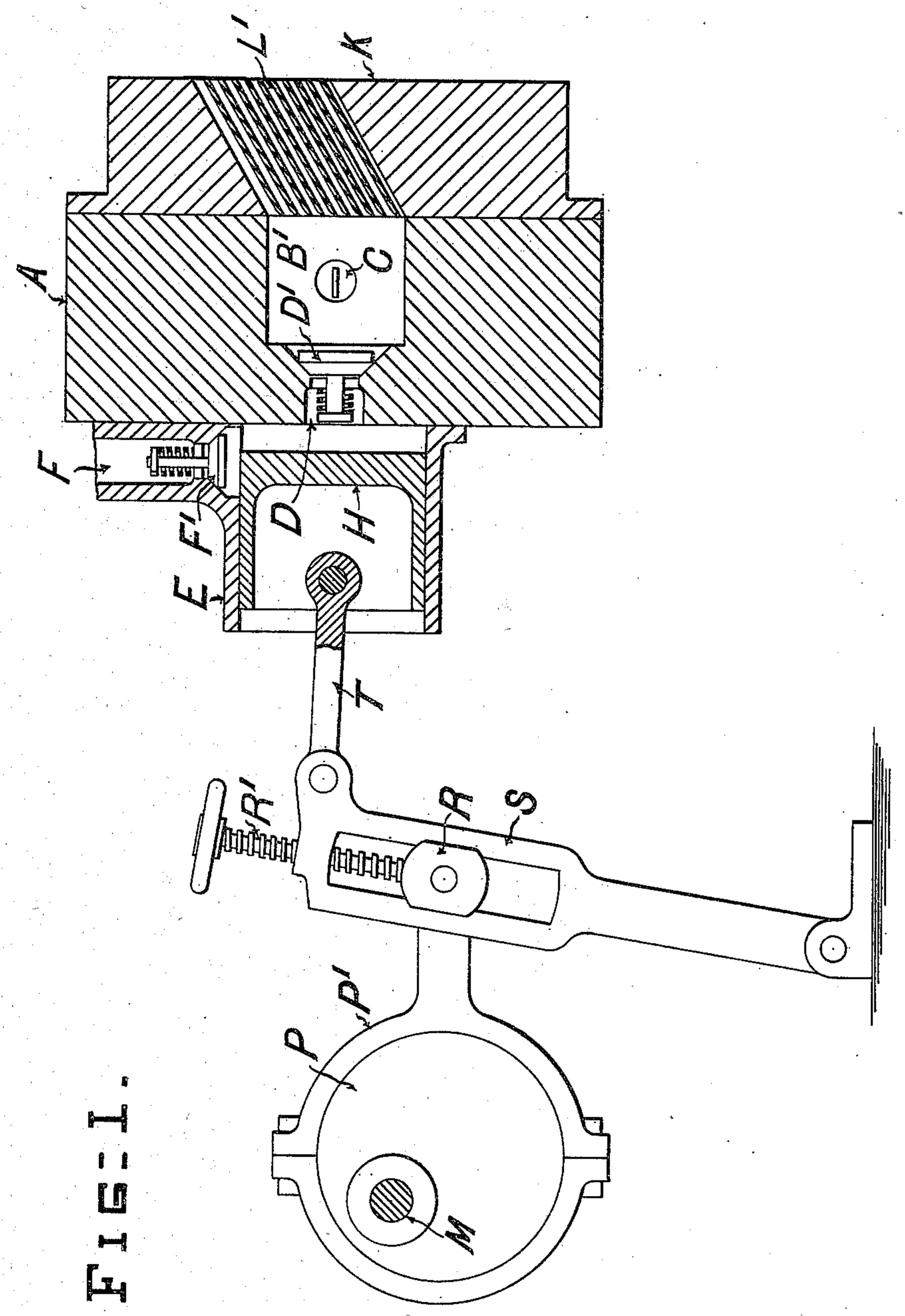


FIG. 1.

Witnesses
Chas. N. Smith
J. Stair

Inventor
Robert Cumming
per L. N. Terrell & Son
attys

No. 734,827. PATENTED JULY 28, 1903.

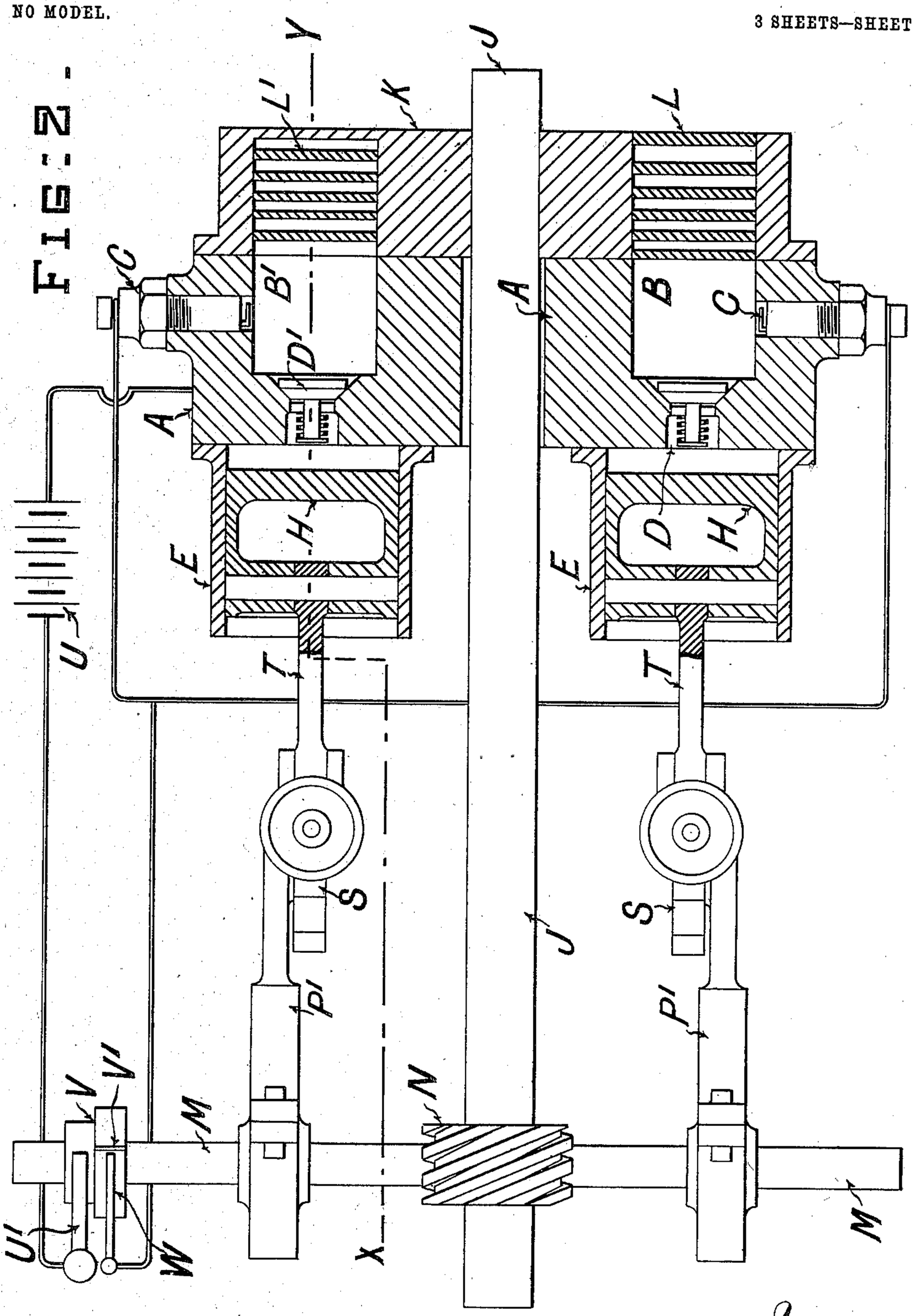
R. CUMMING.

ROTARY EXPLOSIVE ENGINE.

APPLICATION FILED AUG. 27, 1902.

NO MODEL. 3 SHEETS—SHEET 2.

FIG. 2.



Witnesses
Chas. A. Smith
J. Staib.

Inventor
Robert Cumming.
per L. W. Serrell & Son
Attys

No. 734,827. PATENTED JULY 28, 1903.

R. CUMMING.

ROTARY EXPLOSIVE ENGINE.

APPLICATION FILED AUG. 27, 1902.

NO MODEL. 3 SHEETS—SHEET 3.

FIG: 4.

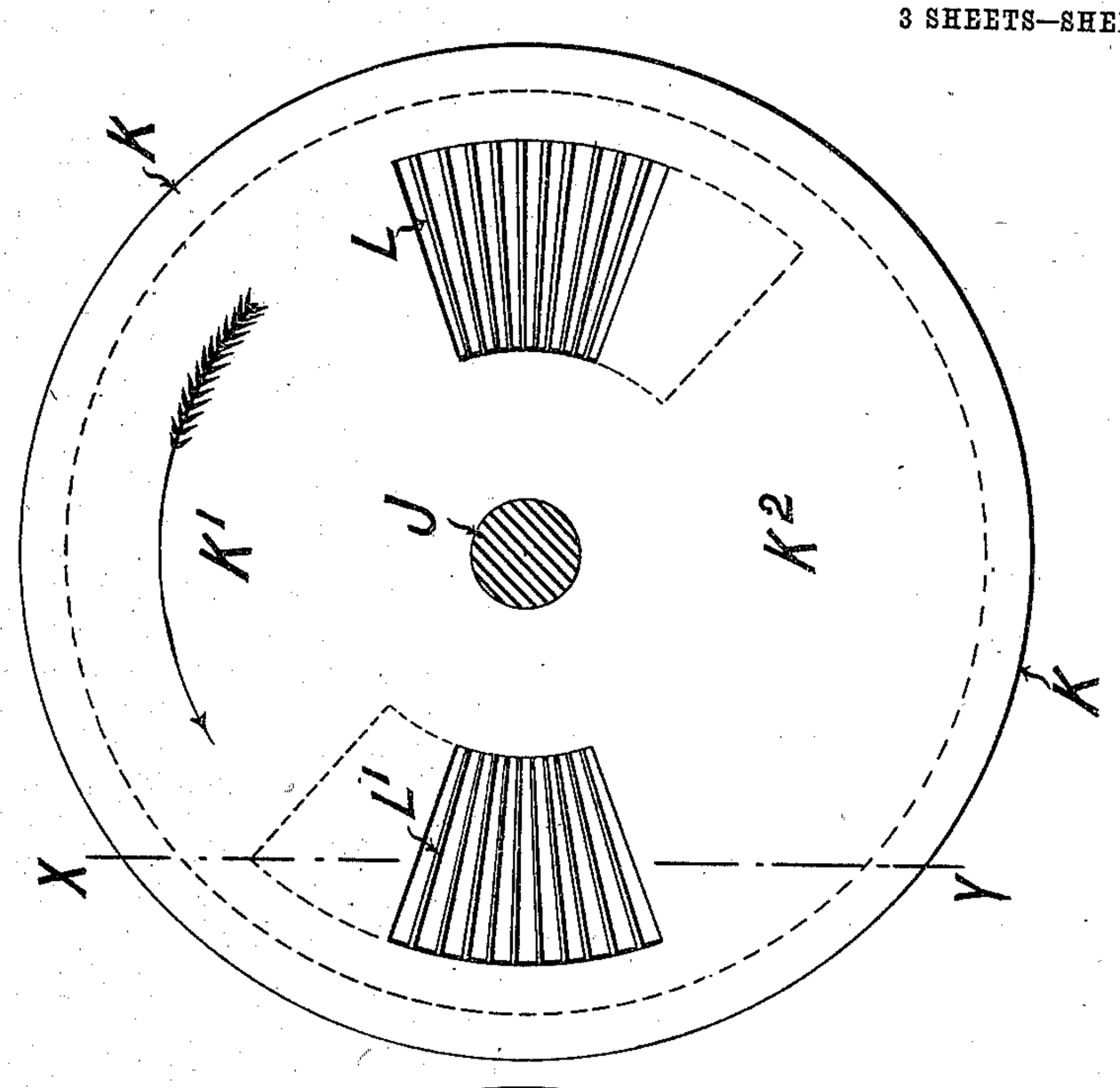
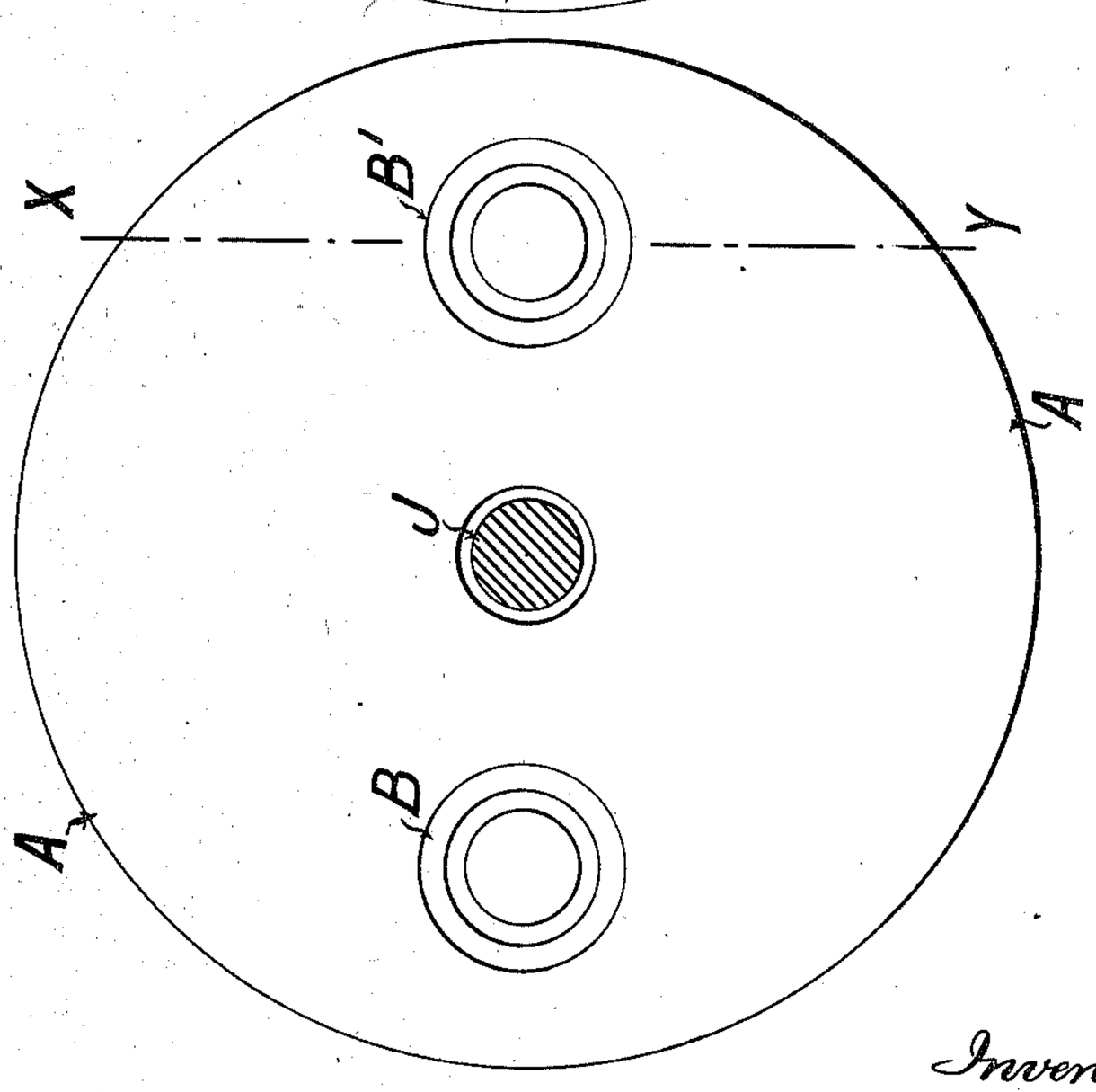


FIG: 3.



Witnesses
Chas. H. Smith
J. Stair.

Inventor
Robert Cumming
per L. W. Serrell & Son
Attys

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

No. 734,827. Patented July 28, 1903.

UNITED STATES PATENT OFFICE.

ROBERT CUMMING, OF EDINBURGH, SCOTLAND.

ROTARY EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 734,827, dated July 28, 1903.

Application filed August 27, 1902. Serial No. 121,165. (No model.)

To all whom it may concern:

Be it known that I, ROBERT CUMMING, a subject of the King of Great Britain and Ireland, and a resident of 99 Craiglea Drive, Edinburgh, in the county of Edinburgh, Scotland, have invented certain new and useful Improvements in Rotary Explosive-Engines, (for which I have made application for a patent in Great Britain, No. 11,628, bearing date May 22, 1902,) of which the following is a specification.

This invention relates to the construction of a rotary engine in which the propulsive force is derived from the effects of the explosions of substances, the force of the explosions being directed against blades carried by a rotatable body which are angularly arranged in the directions of explosion.

The object of this invention is to construct a rotary explosive-engine consisting of a stationary frame in which open-ended chambers are formed, means for closing the chambers, and apparatus for delivering charges of an explosive substance thereto, a rotatable body having one or more series of blades which are adapted to travel across the open ends of the chambers, the blades being angularly arranged, so that the force of explosions of charges in the chambers may act upon the surfaces of the blades and tend to impart rotary motion to the body, with means for igniting the charges simultaneously to the passage of the blades across the open ends of the chambers.

An example of the construction of a rotary engine in which an explosive mixture of gas and air is to be employed as the explosive substance will now be described as illustrative of means for carrying this invention into effect.

In the drawings, Figure 1 is a part-sectional elevation of a rotary explosive-engine constructed according to this invention, the section being taken about the lines X Y of Figs. 2, 3, and 4. Fig. 2 is a plan view showing some of the parts in section. Fig. 3 is an elevation of the face of a stationary frame in which the chambers are formed; and Fig. 4 is a face view of a rotatable body, which in this case is a disk.

In the drawings, A indicates a stationary frame, the face of which is flat.

B B′ are chambers formed in the frame and below the surface of its face. Each chamber is fitted with an ignition-plug C and is formed with an inlet-aperture D, normally closed by a check-valve D′. Charging-cylinders E are fitted over the inlet-apertures of the chambers and are provided with supply-ways F, fitted with check-valves F′. The charging-cylinders are fitted with reciprocating pistons H.

Upon a shaft J a rotatable disk K is securely mounted, the disk being formed with a flat face and is mounted so that the face of the disk K and the face of the frame A shall work close to one another. Through the body of the disk K two angularly-directed apertures are cut, arranged diametrically opposite to one another. Series of blades L L′ are fitted in the apertures, angularly arranged. (Best indicated in the part-sectional elevation at Fig. 1.) When the disk is rotated, the series of blades travels in a path coincident with the open ends of the explosion-chambers. The two series of blades are separated by sectors K′ K^2 of the flat face of the disk K.

When the turbine is in operation, the cycle of actions is as follows: Considering the disk K as rotating in the direction indicated by the arrow and the open ends of the chambers B and B′ as being covered by the sectors K′ K^2, respectively, charges of gas are delivered to these chambers, which are now closed, from their respective charging-cylinders E through the action of their pistons H, the operation of charging being completed and the check-valves D′ closed before the series of blades L L′ commence to pass across the faces of the chambers B and B′. As the disk K rotates the series of blades L L′ will pass over the charged chambers B B′, and at the commencement of their passage across the open ends of the chambers the charges are ignited by sparks from the ignition-plugs C, explosions of the two charges taking place and simultaneously acting upon the surfaces of the angularly-arranged series of blades L L′, thereby imparting propulsive force to the rotatable disk K. The products of explosion have a free exhaust at the outer side of the disk. Other diametrical pairs of explosion-chambers may be provided and similar cycles of operations performed in them, the charges

being ignited, so that as the series of blades L L′ pass over the chambers a continued succession of explosions will act upon the blades throughout its path of rotation.

It will be understood that the operation of the pistons and sparking mechanism must be in unison with the rotation of the disk K. Consequently the operation of these parts may conveniently be effected through gearing worked direct from the shaft J. For example, an auxiliary shaft M may be geared by skew-gearing N to the shaft J to run at twice the speed of the latter and the pistons H reciprocated through the medium of eccentrics P, connected to the pistons H by means of straps P′, slippers R, rocking arms S, and connecting-rods T. The slippers R are adjustable by means of screw-shafts R′, whereby the length of travel imparted to the pistons H may be regulated and the force of the explosions controlled by varying the quantity of gas to be delivered as charges to the explosion-chambers. The sparking may be effected by employing a battery U, one terminal of which is connected to a delivery-brush U′, the other terminal being connected to the stationary frame A. A commutator V is fitted upon the auxiliary shaft M and receives its supply of electricity from the brush U′, delivering its charges through a conducting-strip V′ on the periphery of the commutator to a brush W, (adjustably mounted, if required, so as to alter the period of sparking relatively to the passage of the series of blades across the open ends of the explosion-chambers,) connected to the ignition-plugs C.

The rotary explosive-engine above described, and shown in the drawings, illustrates the general principle of this invention; but it must be understood that the invention is capable of considerable extension and that engines may be constructed embodying the principle of this invention in other forms than those of the disk type.

I claim as my invention—

1. A rotary explosive-engine consisting of a stationary frame in which open-ended chambers are formed, a rotatable disk having a flat face, a portion of which, as the disk rotates, passes over and closes the open ends of the chambers, an aperture through the body of the disk, the face-opening of which is adapted to travel across the open ends of the chambers, blades fitted within the aperture, angularly arranged so that the force of explosions of charges in the chambers may act upon the surfaces of the blades and tend to impart rotary motion to the body, apparatus for delivering charges of an explosive substance to the chambers, and means for exploding the charges simultaneously with the passage of the blades across the open ends of the chambers.

2. A rotary explosive-engine, consisting of a stationary frame in which open-ended chambers are formed, a rotatable disk having a flat face, portions of which, as the disk rotates, pass over and close the open ends of the chambers, apertures through the body of the disk, the face-openings of which are adapted to travel across the open ends of the chambers, blades fitted within the aperture, angularly arranged so that the force of explosions of charges in the chambers may act upon the surfaces of the blades and tend to impart rotary motion to the body, apparatus for delivering charges of an explosive substance to the chambers, and means for exploding the charges simultaneously with the passage of the blades across the open ends of the chambers.

3. A rotary explosive-engine, consisting of a stationary frame in which open-ended chambers are formed, in combination with, a rotatable disk having a flat face, a portion of which, as the disk rotates, passes over and closes the open ends of the chambers, an aperture through the body of the disk, the face-opening of which is adapted to travel across the open ends of the chambers, blades fitted within the aperture, angularly arranged so that the force of the explosions of charges in the chambers may act upon the surfaces of the blades and tend to impart rotary motion to the body, together with charging-cylinders fitted over inlet-apertures to each chamber, provided with reciprocating pistons and check-valves, acting substantially as described, for delivering charges of an explosive fluid to the chambers, and means for exploding the charges simultaneously with the passage of the blades across the open ends of the chambers.

4. A rotary explosive-engine, consisting of a stationary frame in which open-ended chambers are formed, in combination with, a rotatable disk having a flat face, portions of which, as the disk rotates, pass over and close the open ends of the chambers, apertures through the body of the disk, the face-openings of which are adapted to travel across the open ends of the chambers, blades fitted within the apertures, angularly arranged so that the force of the explosions of charges in the chambers may act upon the surfaces of the blades and tend to impart rotary motion to the body, together with charging-cylinders fitted over inlet-apertures to each chamber, provided with reciprocating pistons and check-valves, acting substantially as described, for delivering charges of an explosive fluid to the chambers, and means for exploding the charges simultaneously with the passage of the blades across the open ends of the chambers.

5. A rotary explosive-engine, consisting of a stationary frame in which open-ended chambers are formed, in combination with a rotatable disk having a flat face, a portion of which, as the disk rotates, passes over and closes the open ends of the chambers, an aperture through the body of the disk, the face-opening of which is adapted to travel across the open ends of the chambers, blades fitted

within the aperture, angularly arranged so that the force of the explosion of charges in the chambers may act upon the surfaces of the blades and tend to impart rotary motion to the body, together with charging-cylinders fitted over inlet-apertures to each chamber, provided with reciprocating pistons and check-valves, acting substantially as described, for delivering charges of an explosive fluid to the chambers, together with ignition-plugs fitted to the chambers and electrical connections and means for actuating the same, for exploding the charges simultaneously with the passage of the blades across the open ends of the chambers.

6. A rotary explosive-engine consisting of a stationary frame in which open-ended chambers are formed, in combination with a rotatable disk having a flat face, portions of which, as the disk rotates, pass over and cover the open ends of the chambers, apertures through the body of the disk, the face-openings of which are adapted to travel across the open ends of the chambers, blades fitted within the apertures, angularly arranged so that the force of the explosions of charges in the chambers may act upon the surfaces of the blades and tend to impart rotary motion to the body, together with charging-cylinders fitted over inlet-apertures to each chamber, provided with reciprocating pistons and check-valves, acting substantially as described, for delivering charges of an explosive fluid to the chambers, together with ignition-plugs fitted to the chambers and electrical connections and means for actuating the same, for exploding the charges simultaneously with the passage of the blades across the open ends of the chambers.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROBERT CUMMING.

Witnesses:

WILL. SMART,

J. ALFRED BREWER.