No. 731,286. PATENTED JUNE 16, 1903.

R. CUMMING.

ROTARY EXPLOSIVE ENGINE.

APPLICATION FILED FEB. 6, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

FIG. 3.

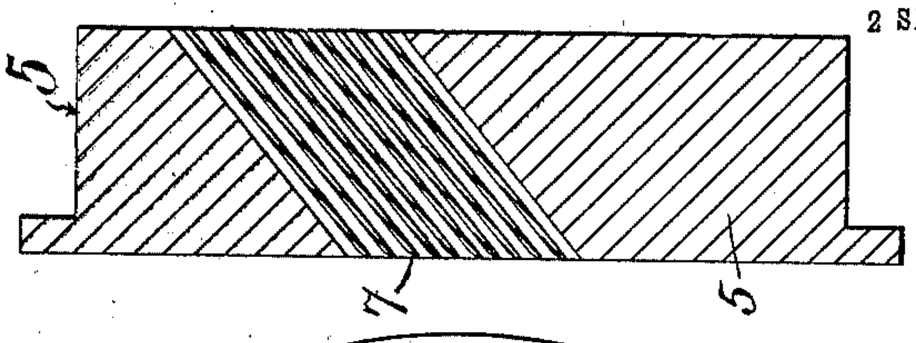


FIG. 2.

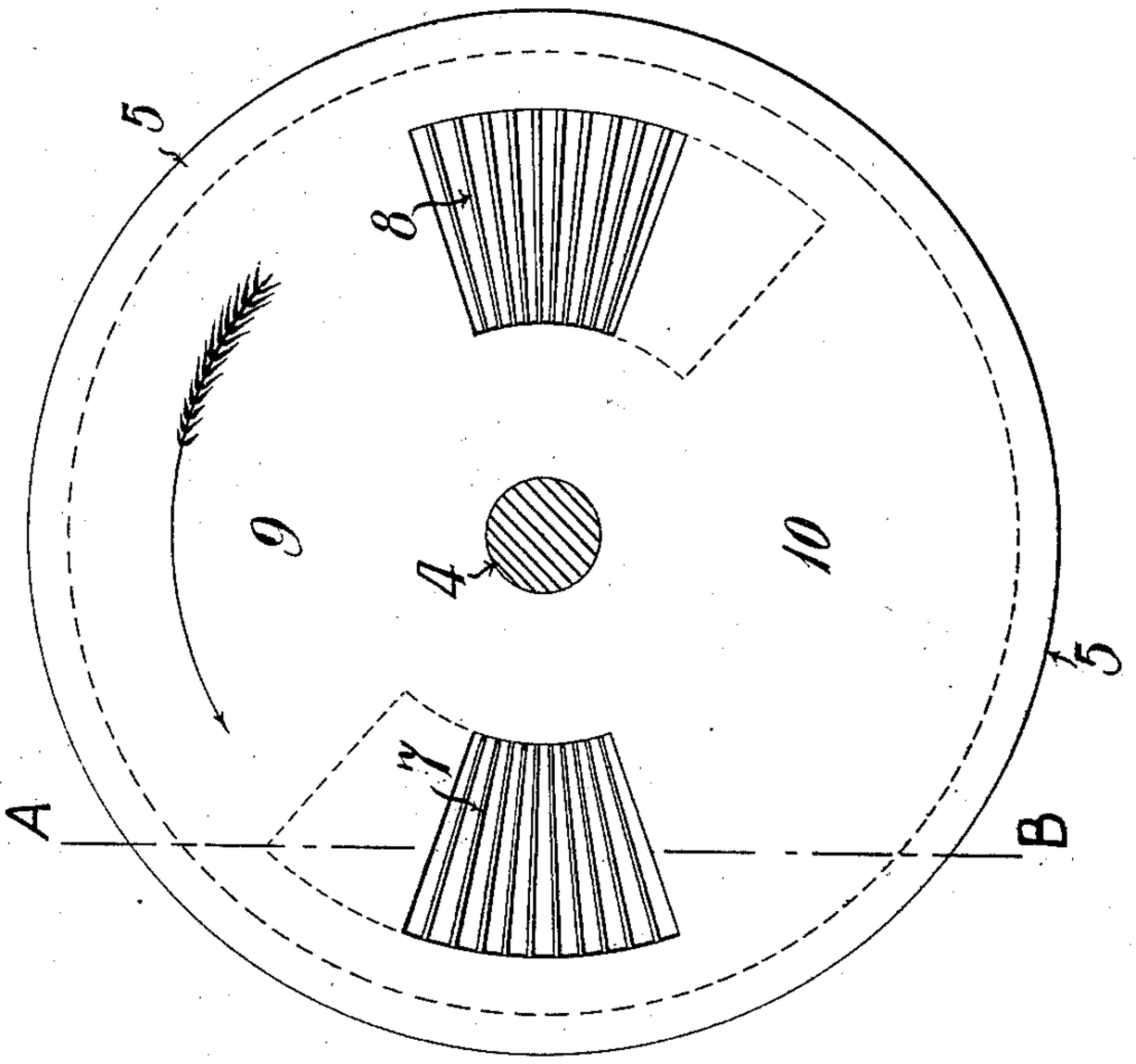
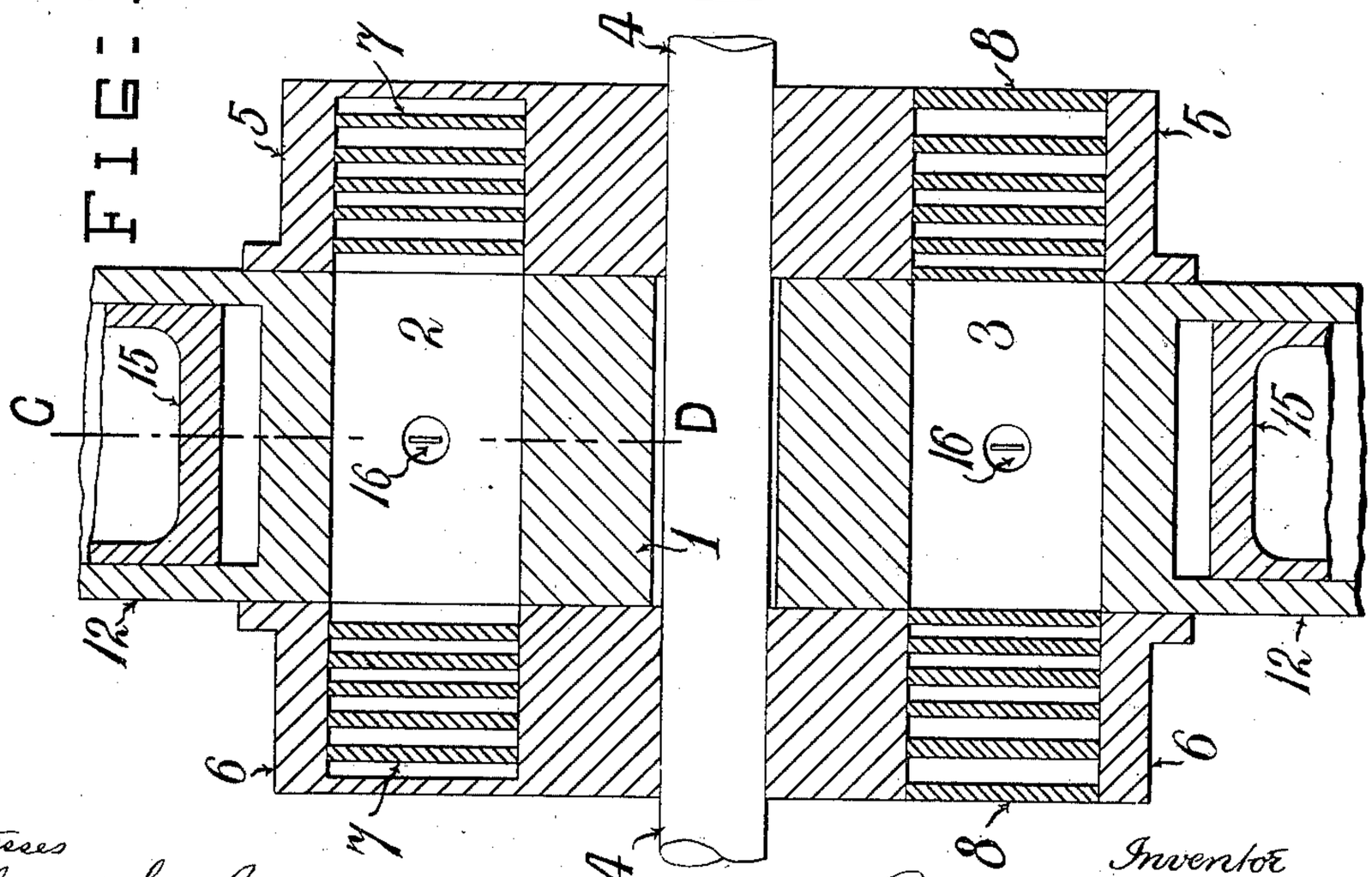


FIG. 1.



Witnesses
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NO MODEL. 2 SHEETS—SHEET 2.

FIG. 4.

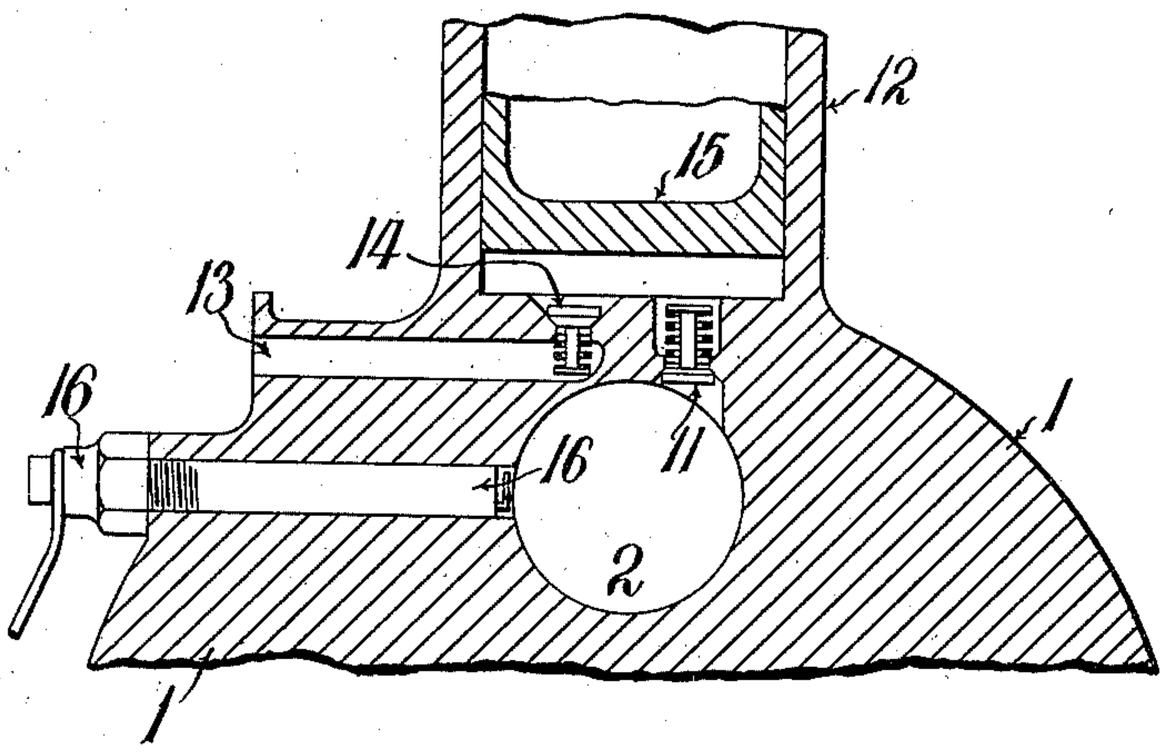
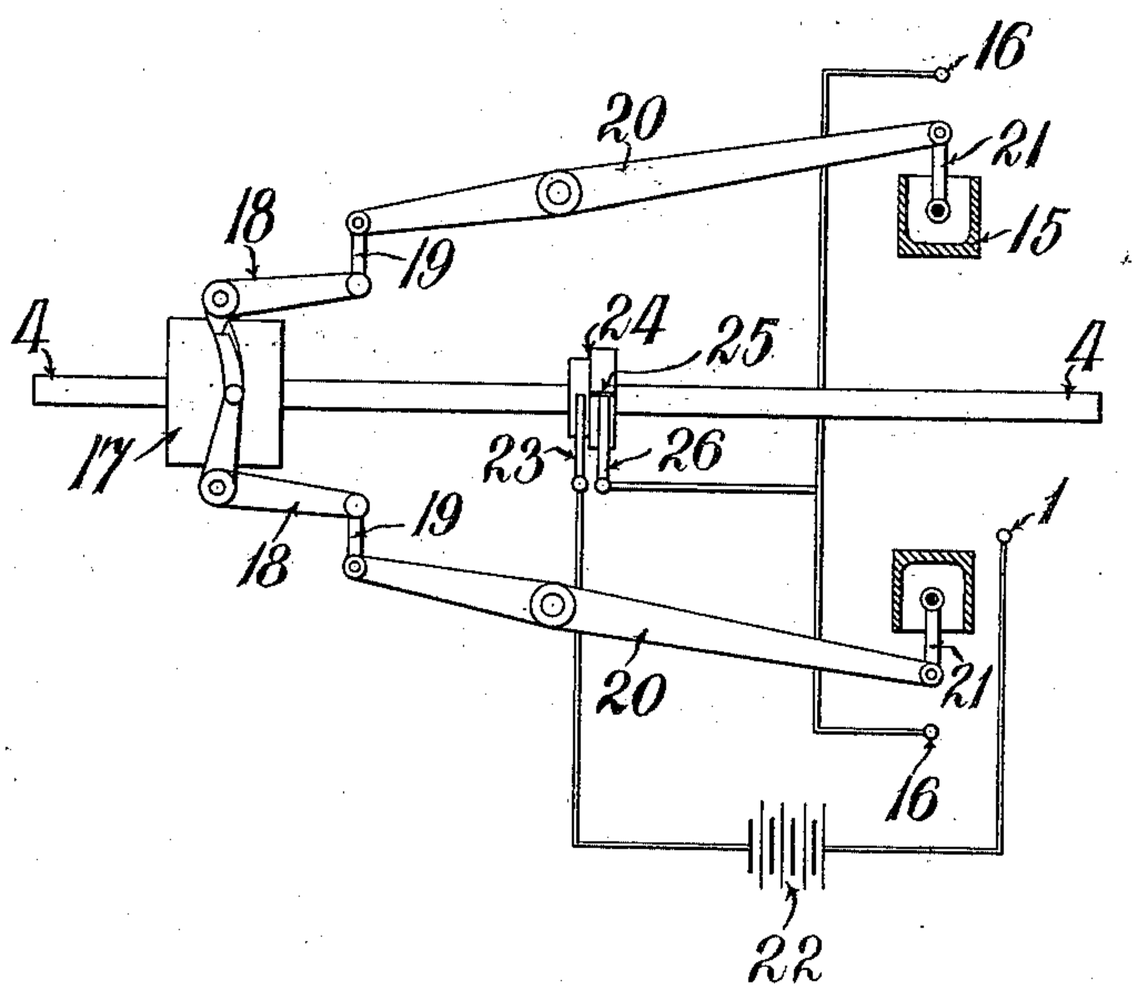


FIG. 5.



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UNITED STATES PATENT OFFICE.

ROBERT CUMMING, OF EDINBURGH, SCOTLAND.

ROTARY EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 731,286, dated June 16, 1903.

Application filed February 6, 1903. Serial No. 142,119. (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. 22,992, bearing date October 22, 1902,) of which the following is a specification.

It has been proposed to construct rotary explosive-engines having a stationary frame in which chambers open at one end are formed and provided with a rotatable body having a flat-surfaced face, portions of the body as it rotates being adapted to pass over and cover the open ends of the chambers, the rotatable body being fitted with series of blades which are arranged to travel across the open ends of the chambers, the blades being angularly arranged, so that the force of explosions of charges of an explosive substance in the chambers may act upon the surfaces of the blades and tend to impart rotary motion to the body, combined with apparatus for delivering charges of an explosive substance to the chambers when their open ends are covered and means for exploding the charges immediately before or simultaneously with the passage of the blades across the open ends of the chambers. In this type of rotary explosive-engines the chambers have been open at one end only, and consequently the force of the explosions has been in a single direction.

This invention relates to improvements in rotary explosive-engines of the above type; and the object of the improvements is to construct such rotary explosive-engines with chambers open at both ends and to provide a rotatable body having two coacting members, the function of each member being similar to that of the rotatable body of a rotary explosive-engine of the aforesaid type, and to arrange means for charging the chambers and igniting the charges.

An example of the construction of a rotary explosive-engine in which an explosive mixture of gas and air may 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 sectional plan of the principal elements of a rotary explosive-engine constructed according to this invention. Fig. 2 is a face view of one of the members of the rotatable body. Fig. 3 is a section taken on about the line A B of Fig. 2. Fig. 4 is a section taken on about the line C D of Fig. 1, and Fig. 5 is a diagraphical plan illustrating an example of mechanism for operating, charging, and sparking means.

In the drawings, 1 designates a stationary frame which has two parallel and opposite flat faces. Chambers 2 and 3 are formed in the frame and extend through it, the chambers being open at both ends. A body is fixed upon a shaft 4, which latter passes through the center of the stationary frame and is rotatably mounted in bearings, which are not shown in the drawings. This rotatable body is composed of two members 5 and 6, each consisting of a disk having a flat-surfaced face and in which two angularly-directed apertures are cut, arranged diametrically opposite to one another. A series of blades 7 and 8 are fitted and arranged within the apertures. The angular arrangement of the series 7 in the member 5 is best seen at Fig. 3. The series of blades in each member are separated by sectors 9 and 10 of the flat-surfaced face of the disks. The angularly-directed apertures, and consequently the series of blades in the two members 5 and 6, are arranged in opposite complementary series, and the construction of the members differ in that the apertures and blades of each complementary series are oppositely but equally inclined to the horizontal plane when in the position shown at Fig. 1. The apertures and blades of the complementary series 7 incline upward from the working faces of the disks, and those of the series 8 incline downward from the working faces. The two members 5 and 6 are mounted and arranged upon the shaft 4, so that their faces work close to the faces of the frame, and when the body is rotated the open ends of the chambers are simultaneously closed by the sectors 9 and 10 passing across the open ends of the chambers, and the series of blades 7 and 8 will travel in a path coincident with the open ends of the explosion-chambers. Means are provided for delivering charges of an explosive substance to the cham-

bers and for effecting their explosions, as will be hereinafter more fully described.

In action and assuming that the bodies are rotating in the direction indicated by the arrow at Fig. 2 and that the open ends of the chambers 3 and 2 at one end are covered by the sectors 9 and 10 of the member 5 and at the other end by the sectors of the member 6, charges of the explosive mixture are now delivered to the chambers, which are closed, and at or immediately before the commencement of the passage of the series of blades across the open ends of the chambers the charges are ignited, and the force of explosion being diversely directed the series of blades at both ends of each chamber will be acted upon, tending to impart rotary motion to the body.

The operation of charging the chambers and exploding the charges must be in unison with the rotation of the body, and as an example of means for effecting these objects the following mechanism might be employed: Each chamber is formed with an inlet-aperture, normally closed by a check-valve 11. Charging-cylinders 12 are constructed or fitted over the inlet-apertures of the chambers, and each is provided with a supply-way 13, fitted with a check-valve 14, which it normally closes. The cylinders are fitted with charging-pistons 15. Each chamber is fitted with an ignition-plug 16.

The operation of the charging-pistons 15 is effected from a cam 17, fixed upon the shaft 4, imparting during each revolution, through the medium of bell-crank levers 18, connecting-links 19, rocking levers 20, and connecting-rods 21, two complete (inward and outward) reciprocations to the charging-pistons 15, which draw supplies of explosive substance through the supply-ways 13 from any convenient source and deliver charges to the chambers by way of the inlet-apertures. The sparking is effected by employing a battery 22, one terminal of which is connected to a delivery-brush 23, the other terminal being connected to the frame. A commutator 24 is fitted upon the shaft and receives a supply of electricity from the brush 23, the charges from the commutator being taken through two conducting-strips 25, fixed diametrically upon opposite sides of its periphery by a brush 26, connected to the ignition-plugs 16. The brush 26 may be adjustably mounted, 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.

The rotary explosive-engines above described and shown in the drawings illustrate the general principle of the invention; but it must be understood that rotary explosive-engines may be constructed in accordance with this invention differing considerably from such construction and arrangement. Various numbers of explosion-chambers and series of blades may be provided instead of two, as given in the example, the numbers being dependent upon the size of engine to be constructed and on other considerations.

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

1. A turbine consisting of a stationary frame in which a chamber is formed adapted to receive charges of an explosive substance, said chamber being open at both ends in combination with a body mounted capable of rotation and fitted with series of blades arranged to pass across the open end of the chamber, the space between the said series of blades in the body mounted capable of rotation being adapted to close the ends of said chamber, with means for delivering charges of an explosive substance to the chamber and for effecting the explosions of charges immediately before and simultaneously with the passage of the blades across the open ends of the chamber.

2. A turbine consisting of a stationary frame in which chambers are formed adapted to receive charges of an explosive substance, said chambers being open on both ends in combination with a body mounted capable of rotation and fitted with series of blades arranged to pass across the open ends of the chambers, the spaces between the said series of blades in the body mounted capable of rotation being adapted to close the ends of said chambers, with means for delivering charges of an explosive substance to the chambers and for effecting the explosions of the charges immediately before and simultaneously with the passage of the blades across the open ends of the chambers.

3. A turbine, consisting of, a stationary frame in which a chamber is formed adapted to receive charges of an explosive substance, such chamber being open at both ends, in combination with a body mounted capable of rotation, the body consisting of, two members, each of which is formed with sectors, arranged to pass over and cover the open ends of the chamber and fitted with series of blades arranged to pass across the open ends of the chamber, with means for delivering charges of an explosive substance to the chamber, and for effecting the explosions of the charges immediately before or simultaneously with the passage of the blades across the open ends of the chamber.

4. A turbine, consisting of, a stationary frame in which chambers are formed adapted to receive charges of an explosive substance, such chambers being open at both ends, in combination with a body mounted capable of rotation, the body consisting of, two members, each of which is formed with sectors arranged to pass over and cover the open ends of the chambers and fitted with series of blades arranged to pass across the open ends of the chambers, with means for delivering charges of an explosive substance to the chambers, and for effecting the explosions of the

charges immediately before or simultaneously with the passage of the blades across the open ends of the chambers.

5. A turbine, consisting of, a stationary frame 1, in which chambers 2, and 3, are formed and adapted to receive charges of an explosive substance, such chambers being open at both ends, in combination with a body mounted capable of rotation, the body consisting of two members 5 and 6, each of which is formed with sectors 9, and 10, arranged to pass over and cover the open ends of the chambers and fitted with series of blades 7, and 8, arranged to pass across the open ends of the chambers, substantially as set forth, with means for delivering charges of an explosive substance to the chambers, and for effecting the explosions of the charges immediately before or 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. [L. S.]

Witnesses:

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J. ALFRED BREWER.