L. SAMOJE.

GAS TURBINE.

APPLICATION FILED FEB. 16, 1910.

966,363.

Patented Aug. 2, 1910.

Fig. 1.

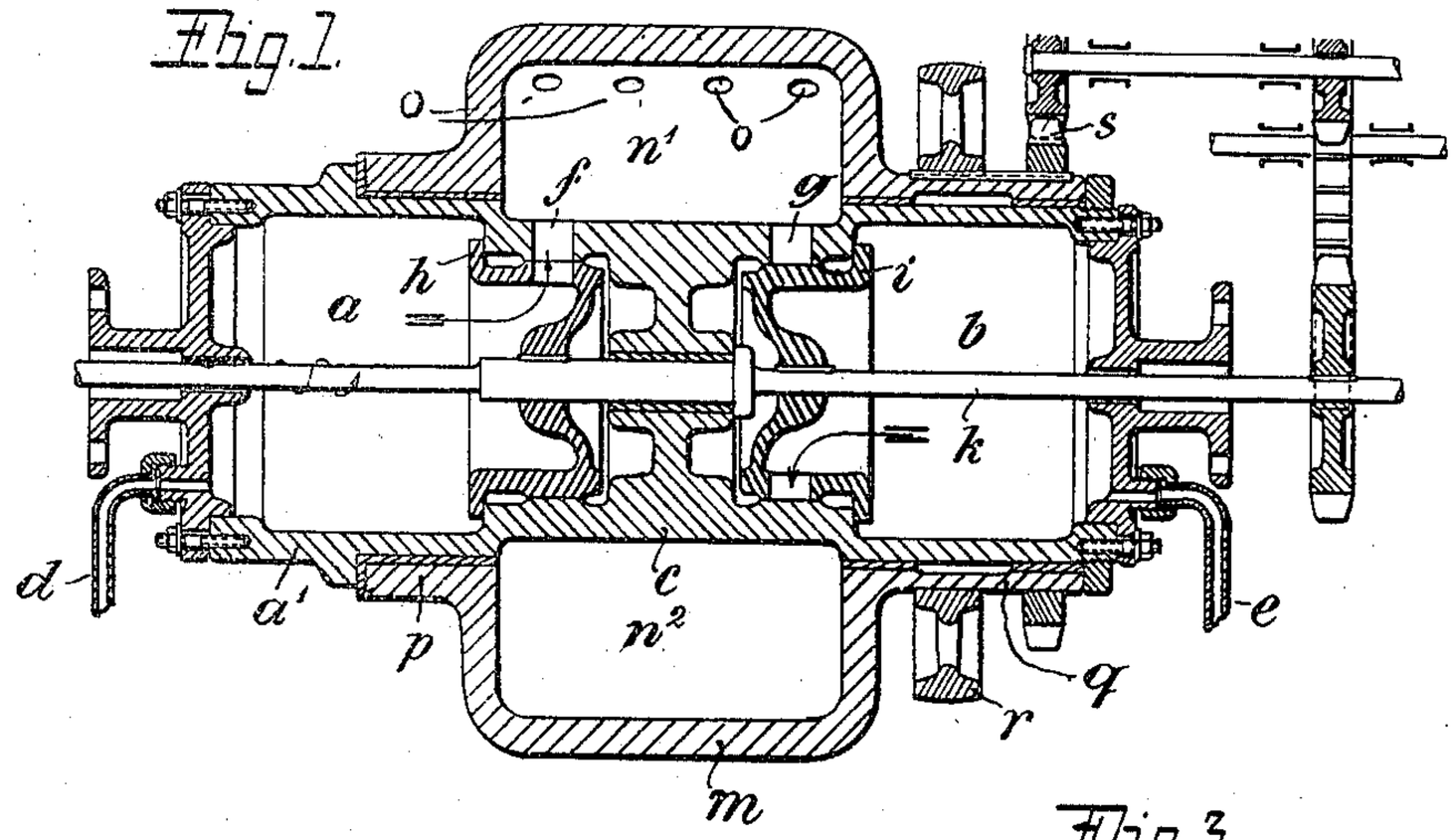

Fig. 2.

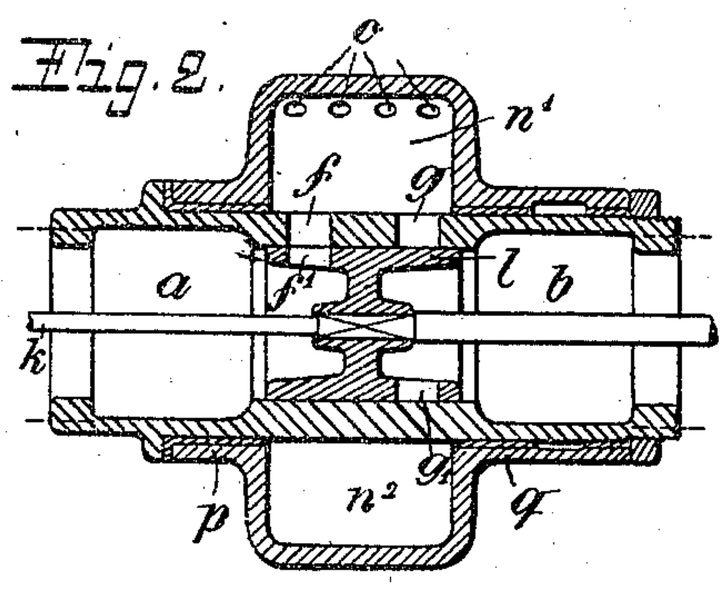

Fig. 3.

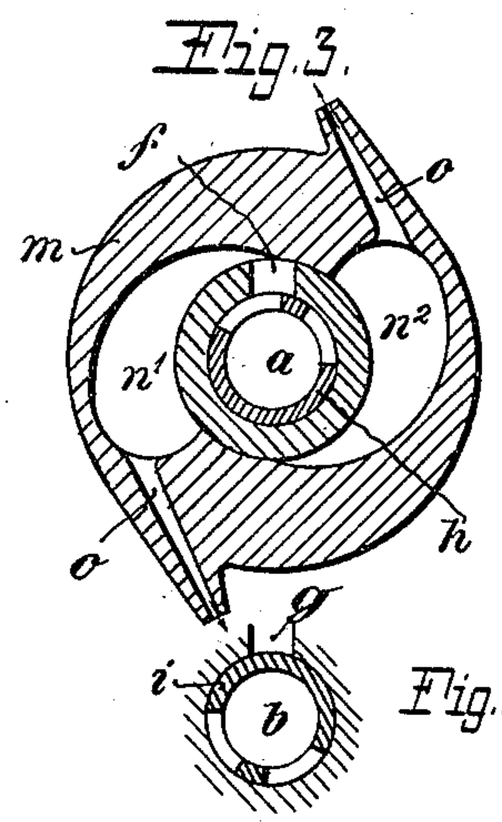

Fig. 3a.

Fig. 4.

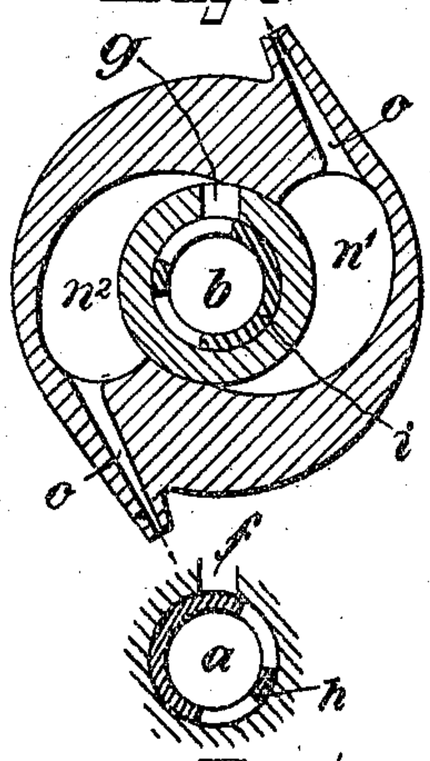

Fig. 4a.

Fig. 5.

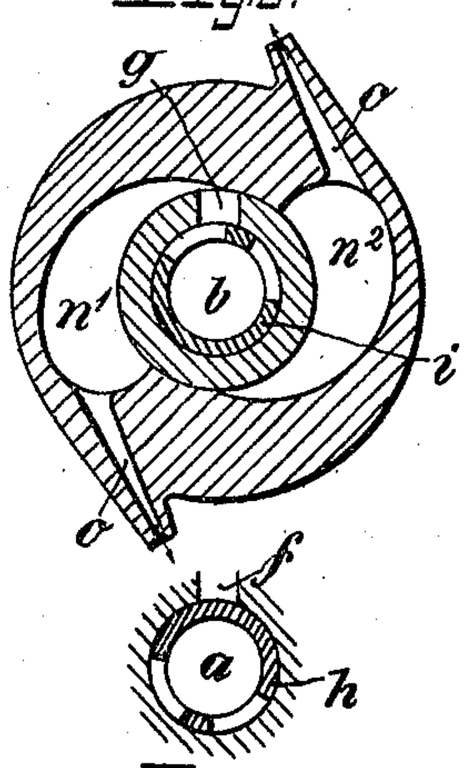

Fig. 5a.

Fig. 6.

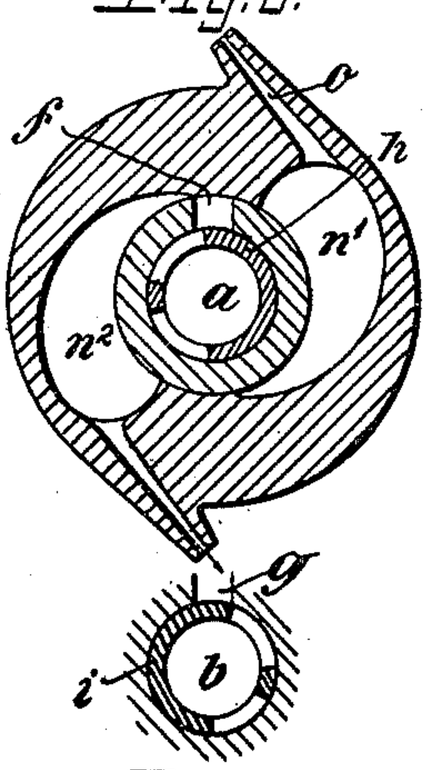

Fig. 6a.

WITNESSES:

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GAS-TURBINE.

966,363. Specification of Letters Patent. Patented Aug. 2, 1910.

Application filed February 16, 1910. Serial No. 544,317.

To all whom it may concern:

Be it known that I, LEO SAMOJE, a subject of the German Emperor, and residing at Antwerp, Belgium, have invented certain new and useful Improvements in Gas-Turbines, of which the following is a specification.

The subject-matter of my invention is a reaction gas turbine having rotating combustion chambers.

According to my invention I provide a drum containing two or more combustion chambers, to which the combustible gaseous mixture and compressed air can be admitted alternately, and I arrange this drum rotatable around a casing whose two chambers, which are separated from one another, serve for storing the gaseous mixture and compressed air, respectively, and are alternately successively connected with each of the combustion chambers.

A further object of my invention is to provide a special form of the valve mechanism.

Two illustrative embodiments of my invention are represented by way of example in the accompanying drawing, wherein:—

Figure 1 is a longitudinal section through one form; Fig. 2 is a like view on a smaller scale of a second form, and Figs. 3 and 3^a, 4 and 4^a, 5 and 5^a, and 6 and 6^a are diagrammatic cross-section through the combustion chambers and one valve, and diagrammatic cross-section through the other valve, respectively, in various positions of the same.

Referring to the drawing, the stationary casing a' is divided into chambers a, b, separated in the illustrative embodiment according to Fig. 1 by a partition c. The gas mixture is supplied, preferably under pressure or by suction on the part of the combustion chambers, through pipe d to the chamber a, whereas chamber b serves for receiving compressed air entering through pipe e. Both the gas chamber a and the compressed air chamber b are connected by controllable ports f and g with the combustion chambers in the rotating drum m. The gear operating the valves for closing the ports f and g may be controlled resiliently, positively or automatically, and the distributing members may be formed as lifting valves, rotary valves or as other closure members.

In the illustrative embodiment according to Fig. 1 the distributing members are formed as two continuously rotating valves h and i keyed on the shaft k; the latter is driven by means of suitable wheel-gearing, for example, from the drum m.

In the illustrative embodiment according to Fig. 2 one single valve 1 is arranged whose central vertical wall forms at the same time a partition between the chambers a and b so that the special stationary wall shown in Fig. 1 may be omitted. The rotary valve in the illustrative embodiment according to Fig. 2 is provided with two relatively displaced slots f', g' or rows of slots the distance between which corresponds to that between the ports f and g.

In the illustrative embodiments I provide in the rotating drum m two chambers n^1, n^2, the clear section of which gradually diminishes radially in the direction of rotation, so that the wall of each of the chambers n^1, n^2 recedes from the central fixed casing in the form of a surface, whose contour is approximately a spiral, as shown in Figs. 3 to 6. At the end of each chamber located at the rear with regard to the direction of rotation I provide an exhaust nozzle o directed approximately tangentially. The number of the contiguously arranged exhaust nozzles of each chamber n^1, n^2 may be optional corresponding to the height of the explosion pressure or to the size of the engine. In the illustrative embodiments four exhaust nozzles are shown. These nozzles may be either rectilinear or have such a known curvature that owing to the exhausting gases being guided within them reaction forces occur analogous to the action of blades in known systems of turbines. The chambers n^1, n^2 are open toward the fixed central casing a', so that, according in each instance to the operation of the valve-gear, the explosion chambers can be connected with the gas chamber a or with the compressed air chamber d. The drum m is guided on the fixed central casing substantially by lateral hubs p and q. According to the illustrative embodiment shown in Fig. 1 a belt-pulley r is keyed on hub q which is for transmitting the rotatory motion produced by the force of explosion or the reaction of the issuing gases. Hub q carries also a spur wheel s which meshes with a pinion for driving the valve-gear. The rotating drum m is preferably surrounded by a stationary jacket, not shown, from which the products of combustion pass directly or by way of a silencer into the open air.

The mode of operation of my improved

gas turbine is seen from Figs. 3, 3ª to 6, 6ª, in which the relative positions at various times of the two valves are shown; in Figs. 3 to 6 that valve is shown which is just opening or is keeping open the port in question, while in Figs. 3ª to 6ª that of the two valves is represented which is just closing its port or is keeping it closed. Figs. 3, 3ª to 6, 6ª correspond with the illustrative embodiment according to Fig. 1; they also suit, however, for the form according to Fig. 2 when it is assumed that the ports are arranged displaced relatively to one another in one single valve. In the position of the rotating drum *m* according to Fig. 3 the one chamber, *i. e.* n^1, of the two chambers n^1, n^2 is just beginning its admission period; valve *h* is opening communication between the combustion chamber n^1 and the gas chamber *a*. When the drum rotates farther clockwise, as soon as chamber n^1 has passed out of reach of the port *f* controlled by valve *h*, this port is closed by valve *h*, while simultaneously the gaseous mixture under pressure in chamber n^1 is ignited in known manner, *e. g.* electrically. Under the action of the explosion the products of combustion begin to issue violently through the nozzles *o* in a direction running oppositely to the direction of rotation of the drum, so that the reaction produced hereby can be utilized for rotating the wheel in the former direction of motion. The combustion process or the exhaust of the products of combustion converted into energy lasts almost one complete revolution until chamber n^1 has returned into the position shown in Fig. 3. Valve *i* is now opened, as shown in Fig. 5, whereby compressed air is admitted from chamber *b* into the combustion chamber n^1 for the purpose of scavenging the latter. Valve *i* is closed again as soon as the combustion chamber n^1 has passed out of reach of the compressed air port *g*. The issuing compressed air which carries with it the residues of the products of combustion also performs work by its reaction in like manner as the issuing products of combustion, so that the compressed air not only serves for scavenging the combustion chambers but can be drawn upon directly for performing work, whereby the efficiency of the plant is increased. As soon as the pressure above atmospheric of the compressed air in chamber n^1 ceases, work is neither performed nor consumed in this chamber until the moment when it again reaches the position shown in Fig. 3, so that the chamber n^1 runs idle, as it were, during this period (Fig. 6). The action of the second chamber n^2 is displaced 360° relatively to that of the first chamber. After chamber n^1 has rotated one complete revolution from the position shown in Fig. 3, and has passed out of reach of the slots in the valve (Fig. 6), the admission period for chamber n^2 begins by valve *h* opening. Shortly before chamber n^1 reaches the position shown in Fig. 3 ignition occurs in chamber n^2, chamber n^1 still running idle. As the turbine rotates further (Fig. 3), work is done in the chamber n^2 and the admission period for chamber n^1 begins. Having arrived in the position according to Fig. 4 compressed air begins to be supplied from chamber *b* into combustion chamber n^2 owing to valve *i* opening.

When the sections of the ports *f*, *g* and of the combustion chambers are correspondingly dimensioned there is no difficulty in employing four combustion chambers instead of two; the valves *h* and *i* must be controlled correspondingly however. Also, instead of only one rotating drum *m* a plurality thereof may be arranged in series, when it may be arranged that the exhaust gases of the high pressure drum are employed again for doing work in the next drum.

I claim:—

1. In a gas turbine, the combination, with a casing comprising a gas chamber and a separate compressed air chamber, of a drum having a combustion chamber and revoluble on said casing and provided with an exhaust nozzle directed oppositely to the direction of rotation of the drum, and means, controlled by said drum, for connecting the combustion chamber alternately with the gas chamber and with the compressed air chamber.

2. In a gas turbine, the combination, with a casing comprising a gas chamber and a separate compressed air chamber, of a drum comprising a plurality of combustion chambers and revoluble on said casing, said drum having a plurality of exhaust nozzles directed oppositely to the direction of rotation thereof, the wall of said casing having ports for establishing communication between the drum and the former chambers, and means for alternately establishing and closing the communication between the drum and said gas chamber and between the drum and said compressed air chamber.

3. In a gas turbine, the combination, with a casing comprising a gas chamber and a separate compressed air chamber, of a drum revoluble on said casing, and means for intermittently supplying a combustible gaseous mixture from the gas chamber to the drum and for intermittently supplying compressed air from the compressed air chamber to the drum, said drum comprising a plurality of combustion chambers adapted to be connected with said gas and air chambers, each combustion chamber having a section, measured radially, which diminishes continuously in the direction of rotation thereof, and each having an exhaust nozzle directed opposite to the direction of rotation and

opening into the same at the large part thereof.

4. In a gas turbine, the combination, with a casing comprising a gas chamber and a separate compressed air chamber, of a drum comprising a plurality of combustion chambers revoluble on said casing, the wall of said casing having ports for establishing communication between the drum and the former chambers, and rotating valves having relatively displaced ports for alternately establishing and closing the communication between the drum and said gas chamber and between the drum and said compressed air chamber.

5. In a gas turbine, the combination with a casing comprising a gas chamber and a separate compressed air chamber, of a drum comprising a plurality of combustion chambers revoluble on said casing and having a plurality of exhaust nozzles directed oppositely to the direction of rotation thereof, the wall of said casing having ports for establishing communication between the drum and the former chambers, rotating valves having relatively displaced ports for establishing and closing the communication between the drum and said gas chamber and, alternately therewith, between the drum and said compressed air chamber, and a gear connected with said drum for driving the valves.

In testimony whereof, I affix my signature in the presence of two witnesses.

LEO SAMOJE.

Witnesses:

G. DE LERSY,

H. TUCK SHERMAN.