A. PATSCHKE.

EXPLOSIVE GAS TURBINE.

APPLICATION FILED SEPT. 22, 1910.

995,803.

Patented June 20, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

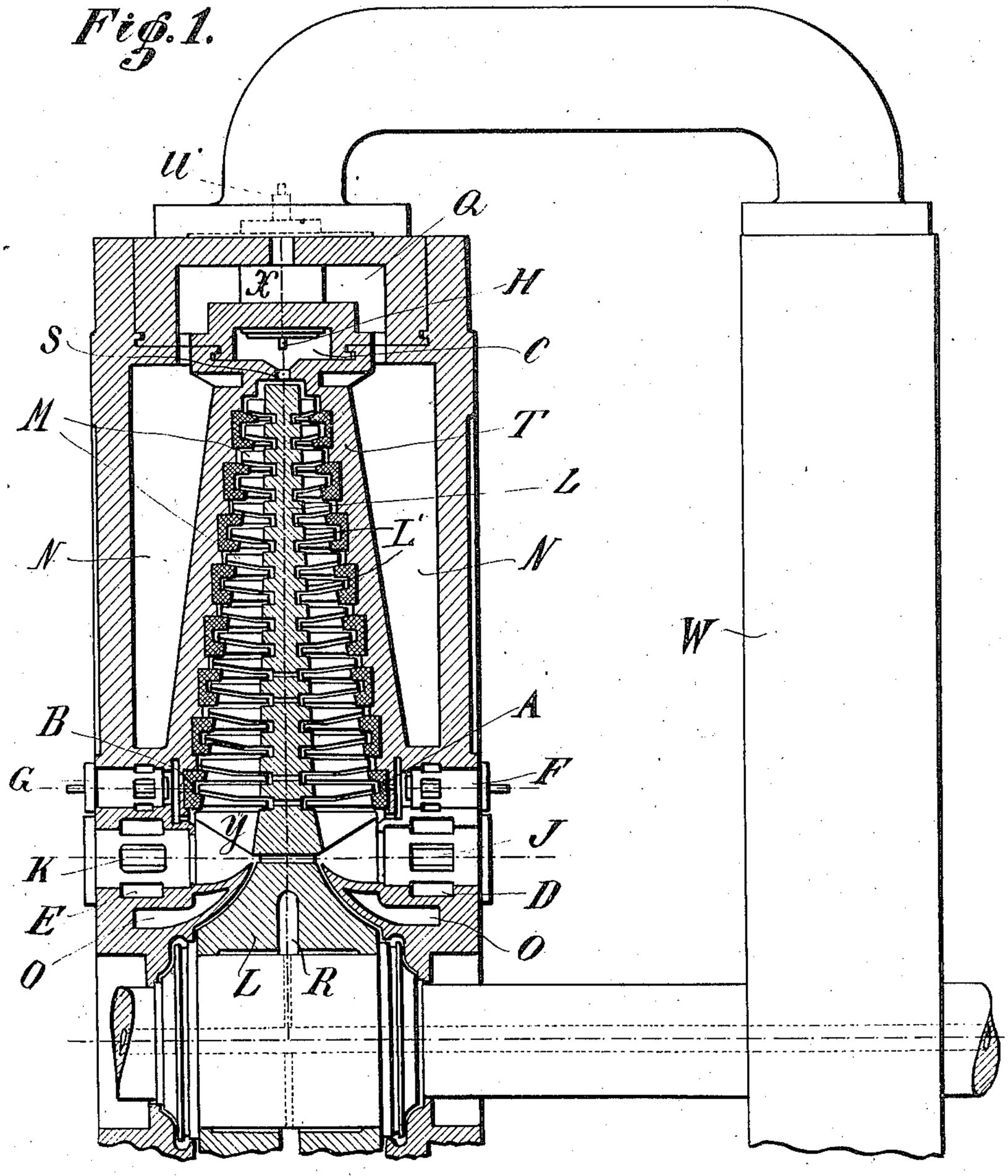
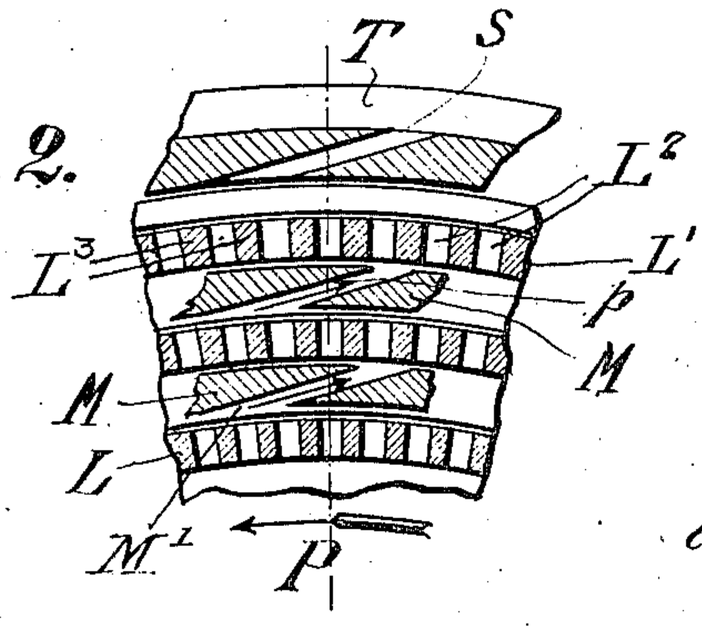


Fig. 2.



Witnesses:
Katherine Koch
Daniel Holmgren

Inventor:
Arthur Patschke
by his attorneys
Bacon & Thompson

A. PATSCHKE.

EXPLOSIVE GAS TURBINE.

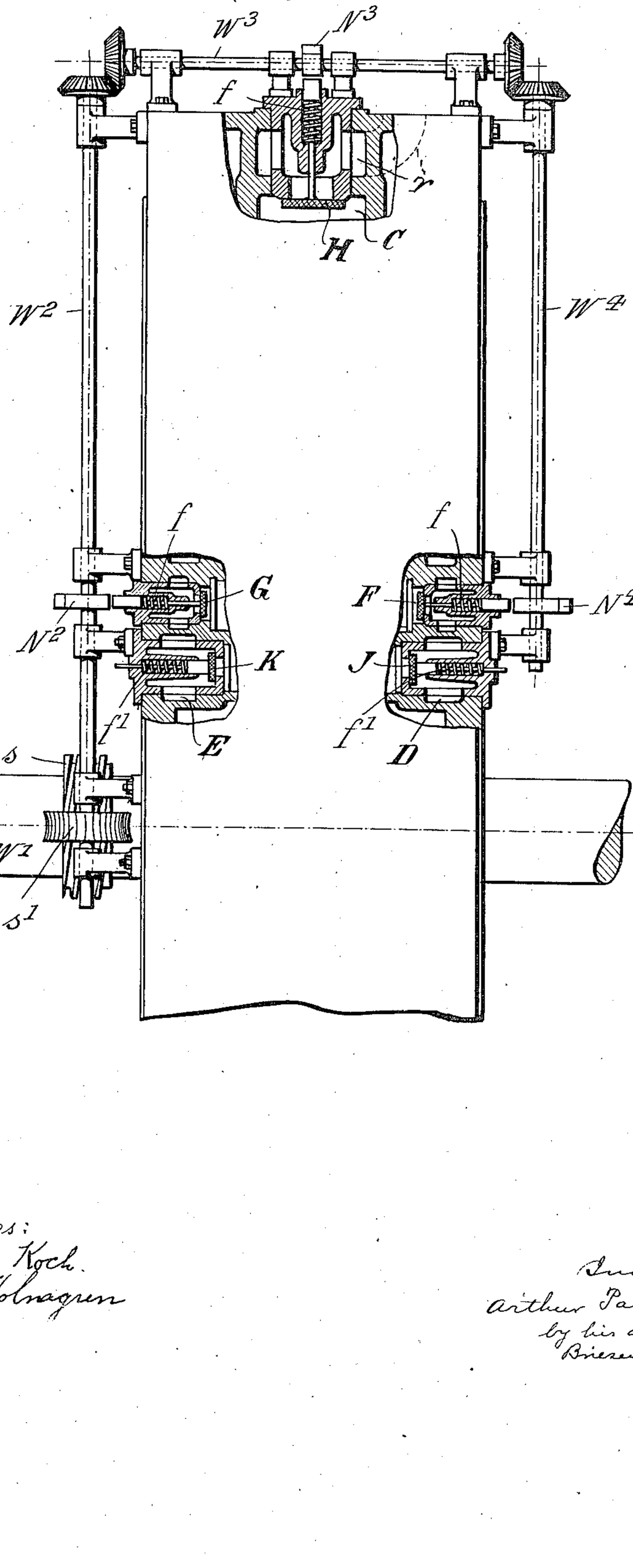
APPLICATION FILED SEPT. 22, 1910.

995,803.

Patented June 20, 1911.

2 SHEETS—SHEET 2.

Fig. 3.



Witnesses:
Katherine Koch.
Daniel Holmgren

Inventor:
Arthur Patschke
by his attorneys
Bierer & Jumpelt

UNITED STATES PATENT OFFICE.

ARTHUR PATSCHKE, OF BERLIN-WILMERSDORF, GERMANY.

EXPLOSIVE-GAS TURBINE.

995,803. Specification of Letters Patent. Patented June 20, 1911.

Application filed September 22, 1910. Serial No. 583,181.

To all whom it may concern:

Be it known that I, ARTHUR PATSCHKE, a citizen of Germany, residing at Berlin-Wilmersdorf, Germany, have invented new and useful Improvements in Explosive-Gas Turbines, of which the following is a specification.

This invention relates to a novel gas turbine which is durable in construction and reliable in operation.

The invention comprises more particularly novel means for preventing an excessive heating of the rotor blades without impairing the efficiency of the turbine, and for reducing the detrimental effects of gas leakage to a minimum.

In the accompanying drawing: Figure 1 is a radial section partly in side view of a gas turbine embodying my invention; Fig. 2 a cross section through part of the turbine, taken on line *x*—*y*, Fig. 1; and Fig. 3 a side elevation of part of the turbine, showing the valves in section.

The turbine comprises essentially a high pressure turbine wheel or rotor L that is contained within a housing T, the latter being provided with suitable cooling or refrigerating jackets N, O, Q, R. Rotor L is provided with a plurality of concentric flanges L′ slotted as at L^2 so as to form turbine blades L^3. Flanges L′ diminish gradually in height as indicated in Fig. 1 and alternate with stationary rings M extending inwardly from housing T, said rings being provided with inclined ducts or nozzles M′.

In proximity to the wheel hub, housing T is provided with inlets A, B for the explosive charge and outlets D, E, for the gases of combustion which inlets and outlets are controlled by valves F, G and J, K respectively. At its circumference, housing T is provided with inclined ducts or nozzles S which open into an explosion chamber C the outlet of which is controlled by a valve H. The above valves are shown to be operated from the turbine shaft W′ through worm *s*, worm wheel *s′* and intergeared shafts W^2, W^3, W^4, that carry cams or tappets N^2, N^3, N^4 respectively. These tappets are adapted to open valves G, H, F while suitable springs *f* encircling the valve stems are adapted to close said valves upon a receding movement of the tappets. Valves J and K are held in their closed positions by springs *f′*, which, however, permit an automatic opening of the valves upon the return of the exploded charge, said valves constituting an exhaust therefor, as will hereinafter be more fully described.

Owing to the rotation of wheel L, which may be started in any manner desired, the explosive charge is drawn into casing T through open inlets A, B while the residues of the previous explosion are discharged through open outlet H. As wheel L rotates in the direction of the arrow (Fig. 2) the explosive charge will be driven through the inclined nozzles M′ of rings M in the direction of arrows *p*, and will gather in explosion chamber C after valve H has been closed. During this process, the velocity and pressure of the gas mixture will gradually increase as it travels from step to step toward the periphery of the rotor, so that the mixture after passing nozzles S will finally flow into explosion chamber C where it will attain its maximal pressure. This compression of the charge previous to its ignition is more particularly due to the fact that said charge enters first the alined innermost flanges L′ of rotor L to be here subjected to centrifugal action, which will force the charge backward and outward (in the direction of arrows *p*) through the inclined slots M′ of rings M, so that the blades L^3 of the next flanges L will exercise an elastic beating action on said charge. This repeated impinging or beating action is gradually increased while the charge is flowing through succeeding flanges and rings, the cells of which gradually decrease with the increasing speed and pressure of the charge. As furthermore any gas leaking through the slots between flanges and rings is so directed by the inclined ducts M′ that it assists in propelling wheel L, the efficiency of the turbine is considerably augmented. The explosive charge thus compressed is exploded within chamber C by any suitable electric ignition device U after the valves F, G, have been closed by springs *f*. By this explosion a pressure is created which considerably exceeds the previously existing pressure of the compressed charge. Thus if for instance the latter amounts to approximately 3 to 4, 5 atmospheres, as is practically the case with large gas turbines, and if gas and air are mixed in a proportion of 1 to 6 or 1 to 7 volume parts, the pressure of the exploded charge amounts to about 12 to 18 atmospheres. Consequently the over-pres-

sure of the exploded charge of 12—3=9 to 18—4, 5=13, 5 atmospheres readily overcomes the centrifugal action as well as the beating action of turbine wheel L. In this way this charge flows back through the nozzles M′ toward discharge ducts D, E thereby rotating the turbine wheel in the same direction which was necessary for compressing the explosive charge prior to its ignition. After the overpressure in chamber C has thus been spent, valve H is automatically opened whereupon the cycle of operation is repeated. The remaining pressure of the exploded charge which corresponds approximately to the pressure of the compressed charge before ignition, is utilized for propelling a low-pressure turbine W.

It is obvious that in lieu of coupling one high-pressure turbine wheel to a low pressure turbine as illustrated in the drawing, several high pressure wheels may be coupled to a single low pressure wheel, without departing from the spirit of my invention.

After an explosion has taken place in chamber C, wheel L will continue to rotate owing to its momentum, in which movement it is assisted by the low pressure turbine W. During this period the residues of explosion are also discharged through valve H into turbine W until finally valves J, K are automatically closed by the vacuum generated within the high pressure turbine.

The charge explodes partly within inclined ducts S and thus transforms here part of its caloric energy into kinetic energy, so that any overheating of the turbine blades is prevented.

It is obvious that the above described new features of construction may also be embodied in an axial turbine or in a combined radial and axial turbine. So also one of the valves F and G may be employed for admitting gas while the other valve may be used for admitting the necessary air of combustion, so that both ingredients may be mixed in the turbine.

I claim:

1. A gas turbine comprising a housing, an inclosed high-pressure rotor having blades that are adapted to convey an explosive charge to an explosion chamber and to simultaneously compress said charge, means for igniting the compressed charge, and means for returning the exploded charge to the blades thereby rotating said rotor in the same direction in which it is rotated for conveying and compressing the explosive charge.

2. A gas turbine comprising a housing, an inclosed high-pressure rotor having blades that are adapted to convey an explosive charge to an explosion chamber and to simultaneously compress said charge, means for igniting the compressed charge, means for returning part of the exploded charge to the blades thereby rotating said rotor in the same direction in which it is rotated for conveying and compressing the explosive charge, a low pressure turbine, and means for conveying the remainder of the exploded charge to the low pressure turbine.

ARTHUR PATSCHKE.

Witnesses:
HENRY HASPER,
WOLDEMAR HAUPT.