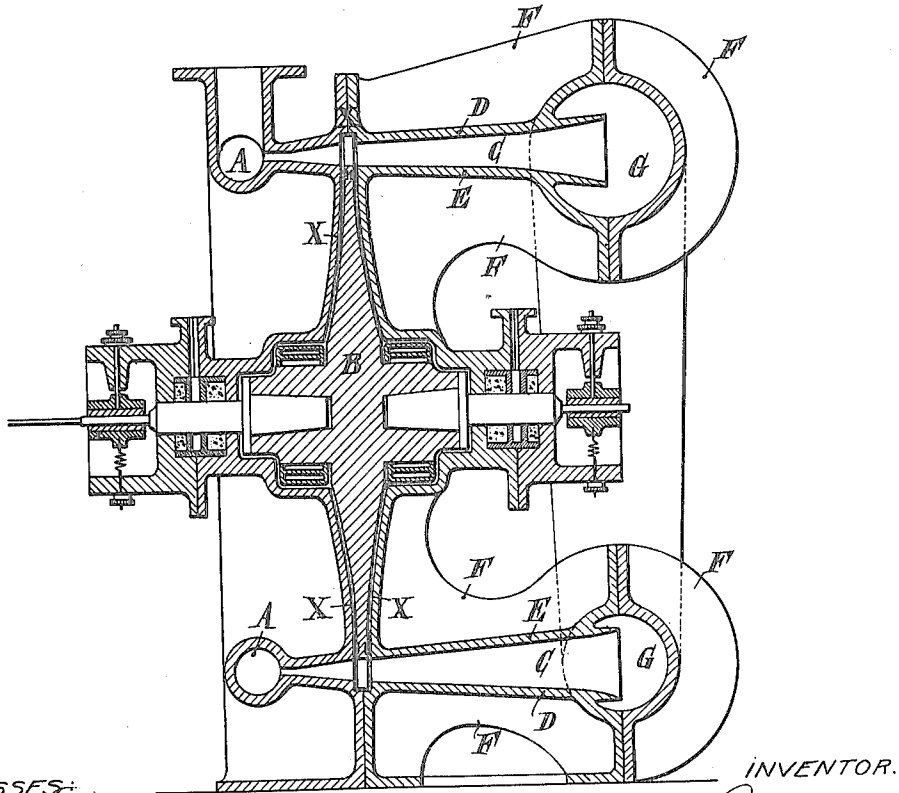
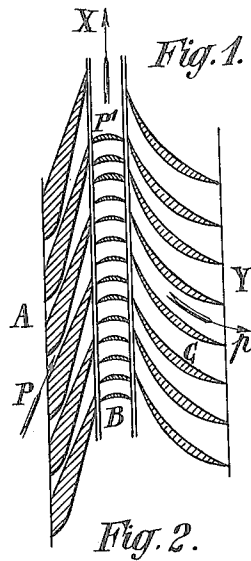


M. LEBLANC.
STEAM OR GAS TURBINE.
APPLICATION FILED FEB. 20, 1914.

1,180,403.

Patented Apr. 25, 1916.
2 SHEETS—SHEET 1.



WITNESSES:

D. M. Fero.
Emm. Calista.

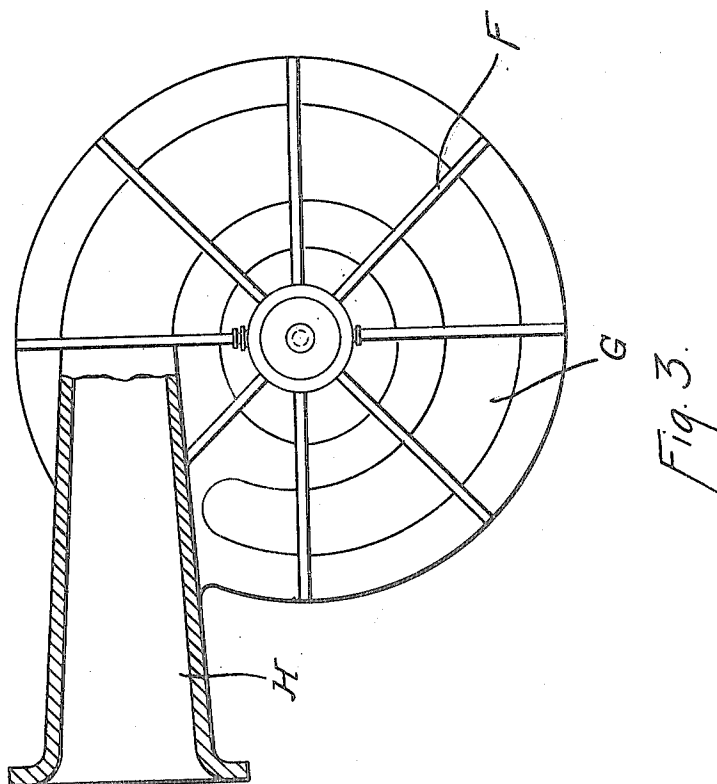
INVENTOR.

Maurice Leblanc
Jno. Brown
HIS ATTORNEY IN FACT.

M. LEBLANC.
STEAM OR GAS TURBINE.
APPLICATION FILED FEB. 20, 1914.

1,180,403.

Patented Apr. 25, 1916.
2 SHEETS—SHEET 2.



INVENTOR.

Maurice Leblanc

BY

W. D. Smith

HIS ATTORNEY IN FACT.

UNITED STATES PATENT OFFICE.

MAURICE LEBLANC, OF VAL-SUR-SEINE, CROISSY, FRANCE, ASSIGNOR TO SOCIETE ANONYME POUR L'EXPLOITATION DES PROCEDES WESTINGHOUSE LEBLANC, OF PARIS, FRANCE.

STEAM OR GAS TURBINE.

1,180,403.

Specification of Letters Patent.

Patented Apr. 25, 1916.

Application filed February 20, 1914. Serial No. 820,020.

To all whom it may concern:

Be it known that I, MAURICE LEBLANC, a citizen of the Republic of France, residing at Val-sur-Seine, Croissy, Seine-et-Oise, France, have invented a new and useful Improvement in or Relating to Steam or Gas Turbines, of which the following is a specification.

The present invention relates to steam and gas turbines having but a single rotary wheel and has for its object to provide an improved arrangement for producing a vacuum greater than that of the condenser in the chamber in which the wheel rotates. In such a turbine the motive fluid if it is at very high pressure and has a high degree of superheat, may acquire an issuing velocity at the exit of the nozzles greater than 1400 meters per second. If instead of steam it is a question of gases issuing from the combustion chamber of a gas turbine, their speed at the turbine inlet will be still greater.

In order that a turbine shall have good efficiency it is necessary to communicate to the moving blades a tangential speed equal to 0.45 of the speed of the motive fluid. With the steels which are available it is not possible to have a tangential speed above about 450 meters per second.

It follows that if a single wheel turbine is to be constructed it is not possible to rotate it fast enough and the motive fluid has still a considerable absolute velocity at the turbine exit.

The invention consists in utilizing the kinetic energy of the motive fluid to increase the vacuum in the chamber in which the turbine wheel rotates, and render it superior to that which the condenser can produce. With this object in view a diffuser is provided between the turbine wheel chamber and the condenser or the atmosphere.

The invention is illustrated in the accompanying drawings in which—

Figure 1 is a diagram hereinafter explained and Fig. 2 is a sectional elevation of the improved machine.

Referring now to Fig. 1 X indicates the chamber in which the turbine wheel rotates and Y indicates the condenser. This figure

furthermore shows the following developments, namely:—

1. At A a portion of the row of nozzles which may be continued around the whole of the circumference of the turbine.

2. At B a portion of the ring of blades.

3. At C a portion of a ring of fixed blades constituting the diffuser.

The passages defined by the fixed blades C will generally be divergent. However, if the absolute velocity of the motive fluid at the turbine exit is superior to the velocity of sound in this fluid said passages may conveniently be made convergent-divergent. Assuming that the steam enters the nozzles at the pressure P, when it leaves it has, or will have, the pressure P¹ which obtains in the chamber X in which the turbine rotates. Traversing the diffuser its remaining kinetic energy will be transformed into pressure energy and it will finally reach the pressure P of the condenser. The steam will carry with it any fluid which may have entered through leaks into the chamber X in which a vacuum higher than that of the condenser will be thus maintained. The absolute velocity of the steam at the exit of the turbine will generally be between 400 and 500 meters per second. With a simple diverging diffuser this will enable the pressure in the chamber X to be maintained equal to about half the pressure in the condenser. In the case of an internal combustion machine in which the motive fluid has at the turbine exit an absolute speed considerably greater, it will be necessary to use a converging-diverging diffuser and the pressure in the chamber X can nevertheless be made smaller than that of the condenser.

In Fig. 2 is shown a preferred form of diffuser. The ring of fixed nozzles is indicated at A and B is the turbine wheel which rotates in the chamber X.

The diffuser is divided into two portions:—

(1.) Opposite the ring of blades is a passage C which in the drawing is shown as being divergent but which may of course be convergent-divergent. Said passage consists of an annular channel defined by two

surfaces of revolution D and E and is furnished with guide blades. The parts D and E are maintained in position by ribs F.

(2.) The passage C opens into a snail-shaped collector G which terminates in a truncated diverging pipe shown in Fig. 3 which opens into the condenser.

The absolute velocity W of the steam at its exit from the turbine may be resolved in a component W^1 , parallel with the axis of the machine and a tangential component W^2 . The differences of pressure in the collector G and in the chamber X in which the turbine rotates tend to diminish the component W^1 and the corresponding kinetic energy is transformed into pressure energy while the component W^2 is not altered if the friction against the walls is negligible. Assuming this condition in the snail collector G the steam reaches the truncated conical pipe at the end of the collector with a velocity substantially equal to W^2 . It is along this tube that the corresponding kinetic energy is transformed in its turn into pressure energy. It has been assumed in the above remarks that a turbine having radial blades was under consideration.

In the case in which the axes of the blades are mounted on a cylinder (centrifugal turbine) the annular passage corresponding to the passage C will be defined by two cylindrical plates perpendicular to the axis of the machine. Said passage however opens into a snail-shaped collector as above described. By increasing the vacuum in the chamber X in this manner the velocity of the steam at the exit orifices of the nozzles will be increased with a consequent increase in the output of the turbine. Its efficiency will be similarly increased. On the other hand, the consumption of steam of a given turbine may be decreased to the same extent as the vacuum is increased. The weight of steam which traverses the blades in one second is proportional to the density of the steam. Thus the output of the machine is diminished without influencing its efficiency because the power absorbed by the friction of the disk of the turbine against the surrounding medium is proportional to its density.

To utilize a single wheel turbine to the best advantage it is necessary to be able to connect it directly to a consumption device capable of absorbing the whole of its power and turning at the same speed. The less the output of a turbine rotating at a given speed, the easier is it to provide a consumption device absorbing the whole of such output. The specific utilization of the materials of the turbine remains always very great in spite of the reduction in output thus obtained.

I claim as my invention:

1. In combination with the rotating blades

of a single expansion turbine, a divergent nozzle for delivering motive fluid to said blades, a velocity conversion chamber receiving the fluid discharged from said blades, a volute communicating with said chamber, and a divergent discharge pipe communicating with the volute.

2. In combination in an elastic fluid turbine, divergent nozzles for expanding motive fluid received by the turbine below exhaust pressure, a single blade carrying wheel, moving blades mounted on said wheel for abstracting a portion only of the velocity energy of the fluid delivered by said nozzles, an axially extending, annular, divergent diffuser receiving fluid discharged from said blades, and converting the axial velocity of the fluid into pressure energy, a snail-shaped volute extending at right angles to the diffuser and communicating therewith throughout its length for converting the rotary velocity of the fluid discharged from the blades into pressure energy.

3. In combination in an elastic fluid turbine, a divergent nozzle for expanding the motive fluid received by the turbine below exhaust pressure, a single blade carrying wheel, moving blades mounted on said wheel for abstracting a portion only of the velocity energy of the fluid delivered by said nozzle, a diffuser receiving the expanded fluid issuing from said blades, and a snail shaped volute communicating with the discharge end of said diffuser, said diffuser and volute employing the axial and tangential velocity of the fluid issuing from the blades in recompressing the expanded fluid to the exhaust pressure of the turbine.

4. In combination in an elastic fluid turbine, a divergent nozzle for expanding the motive fluid received by the turbine below the pressure at the exhaust of the turbine, a single row of rotating blades receiving the fluid delivered by said nozzle and for abstracting a portion only of the kinetic energy of the fluid, an annular diffuser and a volute chamber receiving the fluid issuing from the blades and employing the axial and tangential velocity thereof in recompressing the fluid from the pressure to which it was expanded by said nozzle to the pressure at the exhaust of the turbine.

5. In combination in an elastic fluid turbine having a single row of rotating blades, fluid delivery nozzles communicating with the motive fluid inlet of the turbine for expanding the fluid entering the turbine below exhaust pressure and for delivering the expanded fluid to said blades wherein a portion only of the kinetic energy rendered available by the expansion is abstracted, an annular diffuser receiving the expanded fluid issuing from said blades, stationary directing vanes located within said diffuser, and a volute communicating with the discharge end of

said diffuser, said diffuser and volute operating to reconvert the axial and tangential components of the velocity of the fluid issuing from the blades into pressure energy and
5 to thereby recompress the fluid to the exhaust pressure of the turbine.
In testimony whereof I have hereunto sub-

scribed my name this second day of February, 1914.

MAURICE LEBLANC.

Witnesses:

HANSON C. COXE,
GABRIEL BELLIAREL.