J. F. M. PATITZ.

LOW PRESSURE STEAM TURBINE.

APPLICATION FILED MAR. 1, 1909.

961,086. Patented June 7, 1910.

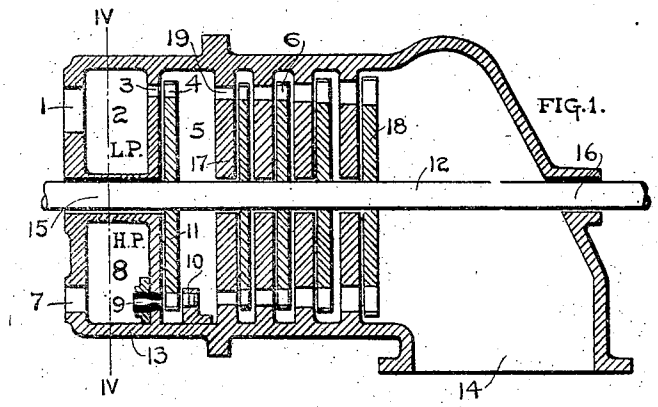

FIG. 1.

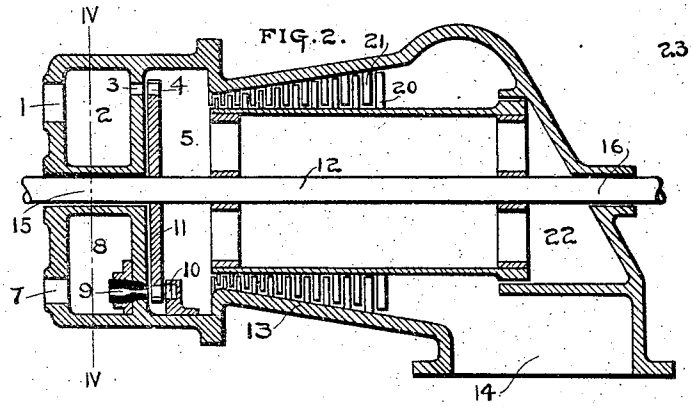

FIG. 2.

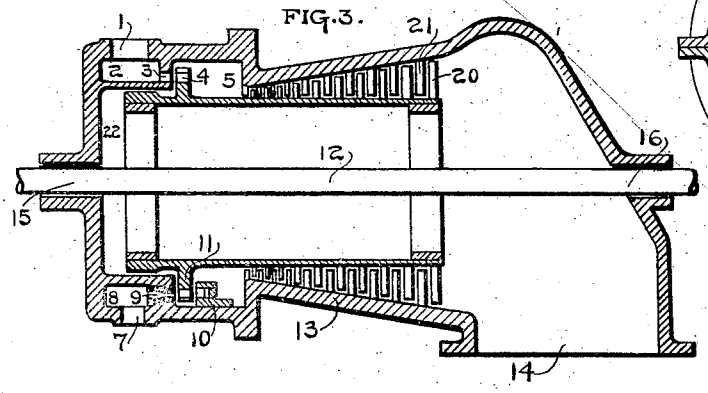

FIG. 3.

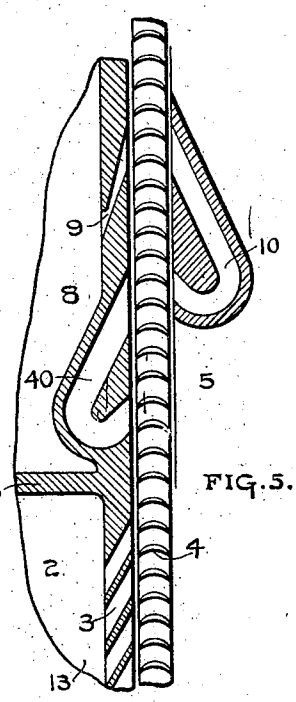

FIG. 5.

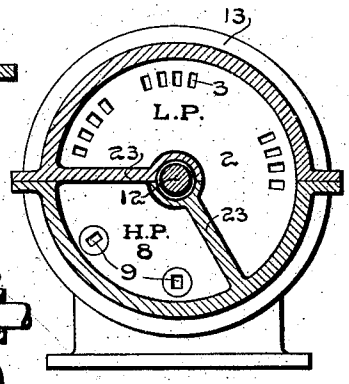

FIG. 4.

WITNESSES:

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LOW-PRESSURE STEAM-TURBINE.

961,086. Specification of Letters Patent. Patented June 7, 1910.

Application filed March 1, 1909. Serial No. 480,527.

To all whom it may concern:

Be it known that I, JOHANN FRIEDRICH MAX PATITZ, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Low-Pressure Steam-Turbines, of which the following is a specification.

This invention relates to the construction of turbines using low pressure steam or gas, usually the exhaust of some other engine, as a motive fluid.

The object of the invention is to provide a means of adding live steam or high pressure gas to the low pressure steam, in case the supply of the latter should be insufficient to drive the turbine, at a pressure equal to that of the low pressure steam, and accomplish this without throttling and without having an idle wheel during normal running. This is done by admitting the high pressure steam to an auxiliary or first wheel and expanding it therein to the pressure of the low pressure steam, at the same time utilizing the work given up by the live steam in driving the turbine shaft.

A clear conception of the invention can be obtained by referring to the accompanying drawings in which like reference characters designate the same parts in different views.

Figure 1 is a central vertical section of a velocity or action type of turbine. Fig. 2 is a similar view of a pressure or reaction type of turbine with balancing means at the exhaust end. Fig. 3 is a similar view of a reaction type of turbine with balancing means at the inlet end. Fig. 4 is a section on the line IV, IV, Figs. 1 and 2, taken in the direction of the arrows. Fig. 5 is a fragmental circumferential development in section of the nozzle walls about the first wheel, the wheel being shown developed but not in section.

The turbine shaft 12, see Fig. 1, is carried in the bearings 15, 16, located in the carriage 13, and supports the wheels 18 keyed thereon which in turn support the blades 6. The casing 13 has partitions or walls which divide it into a number of separate chambers. The port 1 opening into the chamber 2, connects with an admission pipe for low pressure steam. The port 7, opening into the chamber 8, connects with an admission pipe for high pressure or live steam. The high and low pressure steam chambers 8, 2, are separated from each other by the radial walls 23, see Fig. 4.

The straight nozzles 3 leading from the low pressure steam chamber 2, are directed toward the blades 4 of an auxiliary or first wheel 11, which is also supported by the shaft 12 and keyed thereon. The expanding nozzles 9 leading from the high pressure chamber 8, are also directed toward the blades 4 of the first wheel 11. On the side of the first wheel 11, just opposite the expanding nozzles 9, are located return passages 10, see Figs. 1, 5, the inlet of which is located directly opposite the outlet opening of nozzle 9. This return passage 10 directs its inlet and outlet toward the wheels at the same angle convenient for receiving steam discharged from the wheel from nozzle 9. Directly opposite the inlet of return passage 10 and on the same side of the wheel 11 as the nozzles 9 there is located the inlet of a second return passage 40 for again directing the steam to the wheel.

The chamber 5 in which is located the wheel 11, receives the steam delivered from said wheel. In the action turbine, Fig. 1, the wall 17 is the first of a series of nozzle walls for the remaining turbine wheels 18, and has the nozzles 19 opening from the chamber 5 to the moving blades 6 of the first of the wheels 18. The opening 14 serves as the turbine exhaust.

The construction shown in Fig. 2 differs from that shown in Fig. 1 only in the type of main turbine. The blades 20 are of the reaction type and the nozzles 19 shown in Fig. 1 are replaced in Fig. 2 by the stationary blades 21. The reaction turbine of Fig. 2 has its balancing means 22 at the exhaust end of the turbine.

The construction shown in Fig. 3 is similar to that shown in Fig. 2, differing only in having the balancing means 22 at the high pressure end instead of at the exhaust end of the turbine.

The operation of the three types of turbines, see Figs. 1, 2, 3, is alike in all respects. The low pressure steam enters the chamber 2 through opening 1 and passes through the nozzles 3, being directed against the blades 4 of the first wheel. The high pressure steam enters the chamber 8 through opening

7 and passes through the expanding nozzles 9 into wheel 11. Upon leaving wheel 11 this steam is redirected against the blades 4 by means of the return passages 10, 40, and loses its velocity derived in the expanding nozzle 9 at the expense of its high pressure being delivered from the wheel 11 at the same pressure as the low pressure steam delivered therefrom. Both the low pressure steam entering the wheel 11 through nozzles 3, and the steam leaving nozzles 40, are exhausted from the blades 4 into the chamber 5. From chamber 5 the mixture of expanded live steam and low pressure steam is admitted to the turbine proper, finally being exhausted through opening 14.

It is evident that by the expansion of the live steam by this method, nearly all of the energy translated in the expansion may be utilized on the first wheel 11, while during normal action with only low pressure steam supplied, the wheel 11 is not running idly but is receiving low pressure steam as before.

It should be understood that it is not desired to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. In a low pressure turbine, a wheel, means for translating high pressure gas to low pressure gas of high velocity, means for directing said high velocity gas successively to said wheel for fractionally imparting its velocity to said wheel, and means directing other low pressure gas to said wheel.

2. In a low pressure turbine, a wheel, a diverging nozzle for translating high pressure gas to low pressure gas of high velocity, means for directing said high velocity gas successively to said wheel for fractionally imparting its velocity to said wheel, and means directing other low pressure gas to said wheel.

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

J. F. M. PATITZ.

Witnesses:
H. C. Case,
G. F. De Wein.