M. H. CHURCHILL-SHANN.

TURBINE.

APPLICATION FILED JAN. 15, 1912.

1,038,295.

Patented Sept. 10, 1912

2 SHEETS—SHEET 1.

Fig. 1.

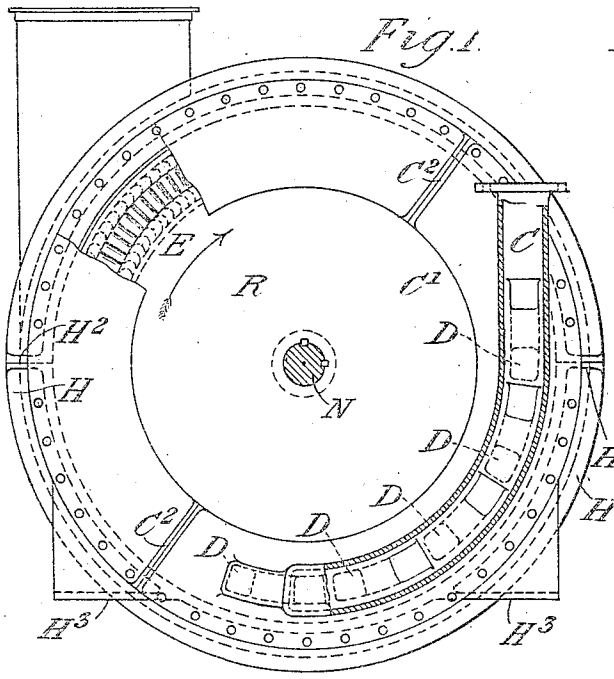
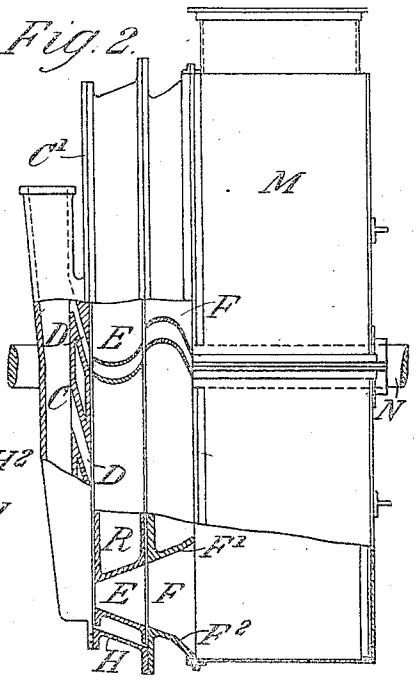



Fig. 2.




Witnesses.

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2 SHEETS—SHEET 2.

Fig. 3.

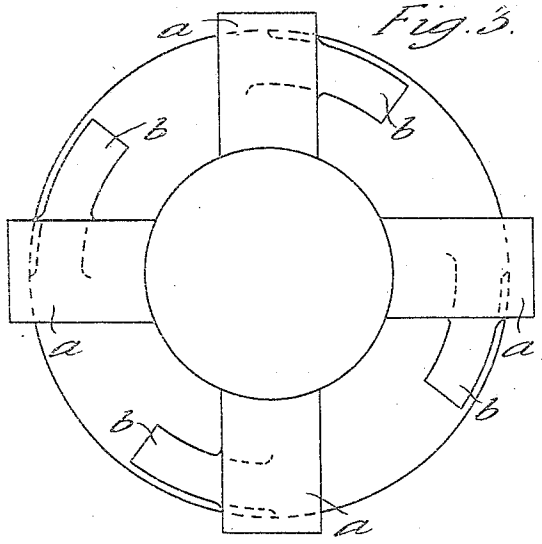



Fig. 4.

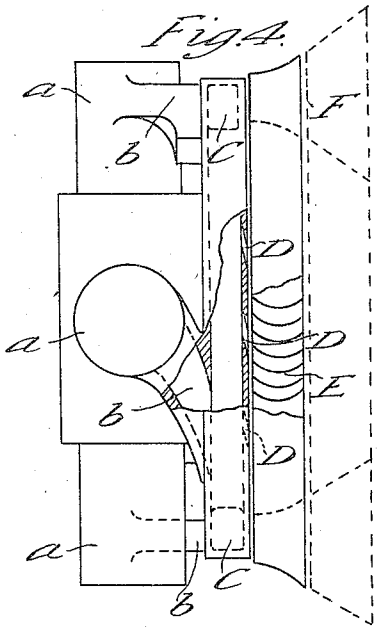
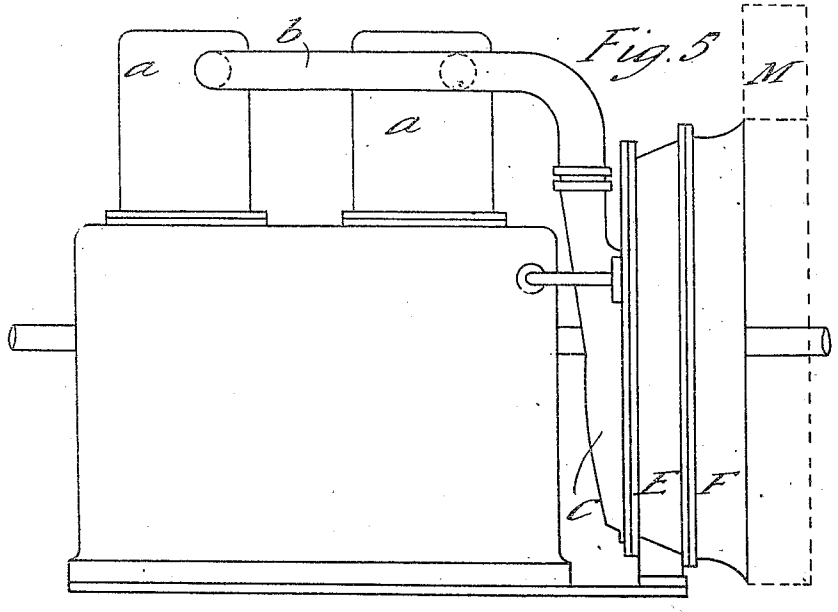



Fig. 5




Witnesses.

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# UNITED STATES PATENT OFFICE.

MONTAGUE HERBERT CHURCHILL-SHANN, OF COUNTY OF SURREY, ENGLAND.

## TURBINE.

1,038,295. Specification of Letters Patent. Patented Sept. 10, 1912.

Application filed January 15, 1912. Serial No. 671,325.

*To all whom it may concern:*

Be it known that I, MONTAGUE HERBERT CHURCHILL-SHANN, a subject of the King of Great Britain, residing in the county of Surrey, England, and whose post-office address is Abingdon, Kew Road, Richmond, in the county of Surrey, England, engineer, have invented certain new and useful Improvements in Gas-Turbines, of which the following is a specification.

This invention relates to parallel flow gas turbines which may be supplied with high pressure working fluid derived from any suitable generator of gas, or with the exhaust gases from internal combustion engines or the like.

The improved construction which constitutes the present invention comprises a peripheral chamber on the inlet side of the fixed casing and extending around the whole or part of the periphery which is adapted to impart to the gas admitted under pressure to the chamber a flow in the same general direction as that imparted to it by the ring of fixed nozzles leading from the chamber and delivering to the buckets of the rotor. The pitch of the ring of fixed nozzles is arranged to be such that the buckets of the rotor are able to substantially exhaust themselves after leaving a given nozzle and before coming into register with the next succeeding nozzle. The rotor comprises a single ring of vanes or buckets having ducts which flare toward the exhaust side and discharge into a corresponding set of ducts between a ring of fixed blades on the discharge side of the rotor, which blades are oppositely set to those of the rotor and the passages between which, like those of the buckets of the rotor, preferably flare in the direction of the flow of the gases, the primary object of the flaring ducts both in the rotor and in the fixed ring of blades being to convert the velocity of the issuing gases into pressure and thereby reduce the loss of kinetic energy as much as possible.

The invention is illustrated in the accompanying drawings, wherein—

Figure 1 is an end elevation with part broken away and part shown in section of one construction of the improved turbine; Fig. 2 is a side elevation of the same with part broken away and part shown in section; Fig. 3 is an end elevation and Fig. 4 a side elevation partly in section illustrating the application of the invention to a combined internal combustion engine of the radial cylinder type; and Fig. 5 is an elevation showing the application of the invention to a vertical cylinder internal combustion engine.

Referring first to Figs. 1 and 2, C is the curved peripheral gas inlet chamber leading to the fixed ring of nozzles D, C′ being the face plate of the casing secured to C or cast integral therewith, being preferably in the latter case made in two halves with flanges $C^2$ whereby the parts may be bolted together. The ring of moving blades E which may be cast in one piece with the body of the rotor R, are designed so that the passages between successive blades increase in cross sectional area in the direction of flow of the working fluid; for example, the discharge end of the ring of blades may be made of greater diameter than the inlet end.

The housing H for the moving blades may, as shown, also be formed in two halves provided with flanges $H^2$ by which they are bolted together and may be formed with or have attached to it feet $H^3$ whereby the turbine may be bolted down to a support.

The rotary blades E discharge into a ring of fixed blades F which may be separately formed and secured between an inner fixed ring F′ and an outer fixed ring $F^2$, or may be cast in one with either or both of the two continuous rings F′, $F^2$, these rings being preferably cast in two halves bolted together. Further, the outer ring $F^2$ as well as the housing H of the rotor are preferably formed with flanges on their abutting edges whereby they may be bolted together. The fixed blades or buckets F are oppositely set to those of the rotor and discharge direct into an exhaust chamber M through which passes the shaft N of the turbine.

In Figs. 3 and 4 *a*, *a*, *a*, *a*, represent the cylinders of a four-cylinder engine and *b*, *b*, *b*, *b*, are discharge passages from the same leading to the annular nozzle chamber C of the turbine which in this case is shown of uniform cross sectional area. As before, D are the nozzles, only three of which are shown but which it is to be understood are equally spaced around the periphery of the chamber C.

When the cylinders *a* do not rotate, E is the ring of moving blades and F the ring of fixed reaction blades as before. When the cylinders *a* rotate, the annular gas chamber

C rotates with them, and in this case no energy of rotation is imparted to the cylinders by the form of the ports *b*.

In Fig. 5 the parts corresponding with the apparatus already described are indicated by similar reference characters, and no separate description is called for.

It will be understood that when the turbine is associated with an internal combustion engine as described, it may be mounted on a separate shaft instead of the crank shaft of the engine

Having thus described the nature of the said invention and the best means I know of carrying the same into practical effect, I claim:—

1. A parallel flow gas turbine comprising in combination a single ring of moving blades the passages between which increase in area from their inlet toward their exhaust ends, a ring of nozzles connected with a supply of working fluid and delivering to the ring of moving blades, the pitch of these nozzles being considerably greater than that of the moving blades, and a ring of fixed reaction blades on the exhaust side of the moving blades.

2. A parallel flow gas turbine comprising in combination a single ring of moving blades the passages between which increase in area from their inlet toward their exhaust ends, a ring of nozzles connected with a supply of working fluid and delivering to the ring of moving blades, the pitch of these nozzles being considerably greater than that of the moving blades, and a ring of fixed reaction blades on the exhaust side of the moving blades, the passages between said fixed blades increasing in area toward their discharge ends.

3. A parallel flow gas turbine comprising in combination a single ring of moving blades the passages between which increase in area from their inlet toward their exhaust ends, a ring of nozzles connected with a supply of working fluid and delivering to the ring of moving blades, the pitch of these nozzles being considerably greater than that of the moving blades, a ring of fixed reaction blades on the exhaust side of the moving blades, and a peripheral gas inlet chamber on inlet side of fixed casing communicating with the ring of nozzles and adapted to impart to the gas admitted under pressure to the chamber a flow in the same general direction as that imparted to it in the nozzles.

4. A parallel flow gas turbine comprising in combination a single ring of moving blades the passages between which increase in area from their inlet toward their exhaust ends, a ring of nozzles connected with a supply of working fluid and delivering to the ring of moving blades, the pitch of these nozzles being considerably greater than that of the moving blades, and a peripheral gas inlet chamber on inlet side of fixed casing communicating with the ring of nozzles and adapted to impart to the gas admitted under pressure to the chamber a flow in the same general direction as that imparted to it in the nozzles.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MONTAGUE HERBERT CHURCHILL-SHANN.

Witnesses:
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