July 5, 1932. G. BELLUZZO 1,865,551

REVERSING STEAM TURBINE WITH VARIABLE VELOCITY

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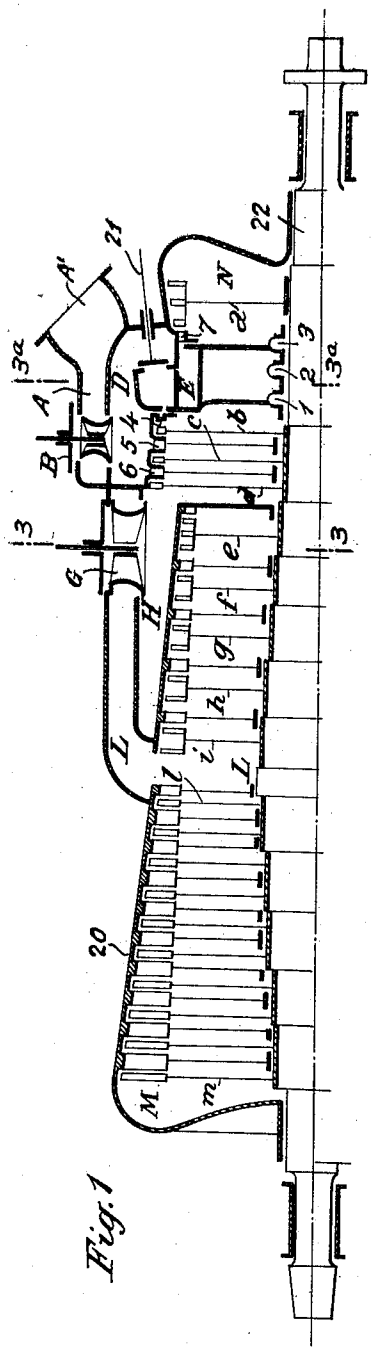

Fig. 1

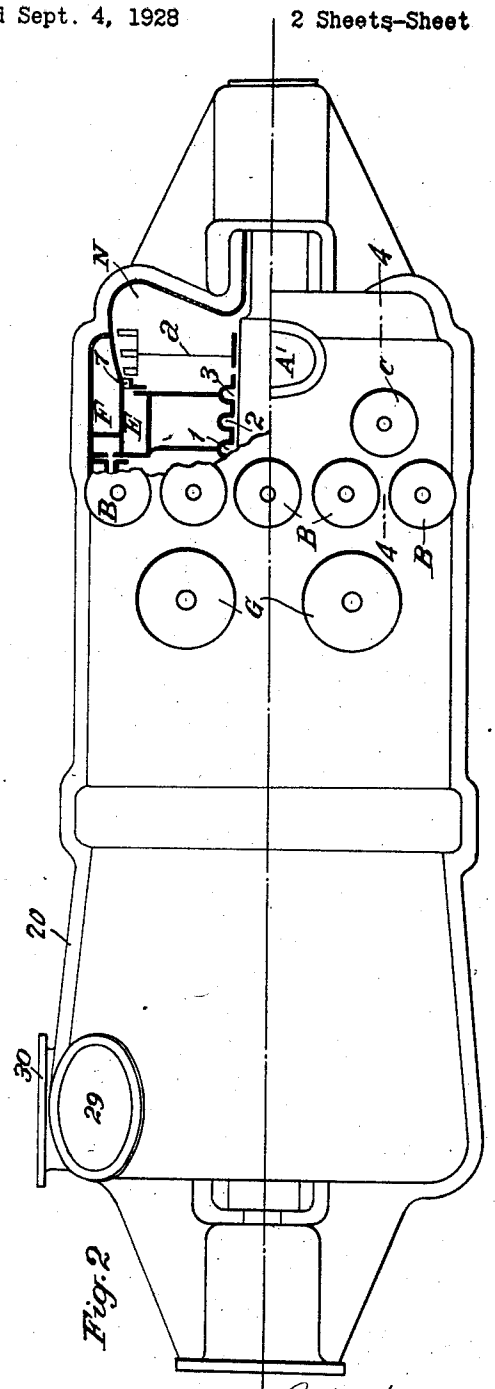

Fig. 2

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Fig. 3

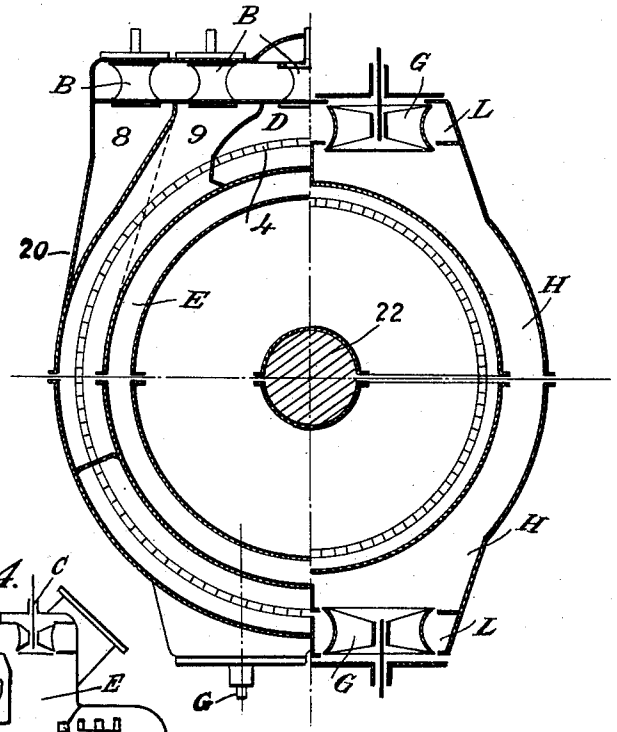
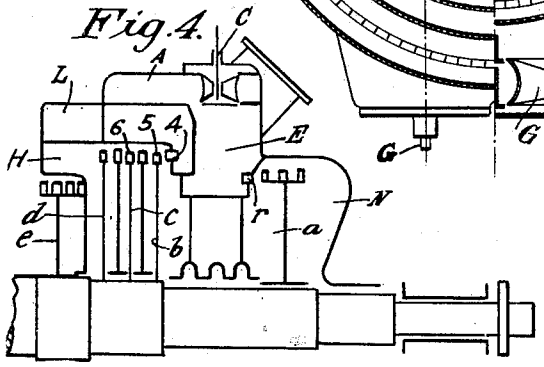


Fig. 4.



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UNITED STATES PATENT OFFICE

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REVERSING STEAM TURBINE WITH VARIABLE VELOCITY

Application filed September 4, 1928, Serial No. 303,718, and in Italy October 17, 1927.

This invention relates to improvements in steam turbines and has for its object to provide an improved turbine of simplified and economical construction.

A further object of the invention is the provision of a turbine provided with a novel arrangement of steam valves and passages for controlling the speed of the turbine as desired.

In the accompanying drawings wherein an approved embodiment of the invention is illustrated:

Fig. 1 is a vertical half section diagrammatically illustrating the improved turbine.

Fig. 2 is a top plan view of the improved turbine.

Fig. 3 is a diagrammatic vertical section taken at right angles to Fig. 1, the right hand portion of the figure being taken on the line 3—3 and the left hand portion being taken on the line 3*a*—3*a*.

Fig. 4 is a section taken on the line 4—4 of Fig. 2.

Referring to the drawings in detail, the casing of the improved turbine is indicated generally at 20 which is provided with a steam inlet A′ communicating with a steam chamber A. Two groups of valves are located in the chamber A, one group consisting of five valves B and the other group consisting of two valves C.

The valves B supply steam to the first group of turbine elements *b*, *c* and *d*, the nozzles of which are indicated at 4, 5 and 6. The nozzles 4 are arranged circumferentially in groups and each group of nozzles is in communication with a separate steam supply conduit two of which are indicated in Fig. 3 and designated by the numerals 8 and 9. As will be understood, the nozzles 4 are divided into five groups controlled respectively by the five valves B. The central conduit communicating with the uppermost group of nozzles 4 is indicated in Fig. 1 at D and a manually operable control valve 21 is interposed in said chamber between the valve B and the nozzles 4.

A reverse turbine element *a* is located in the forward chamber N and is arranged adjacent a group of nozzles 7 in communication with a chamber E. The supply of steam from the supply chamber A to the chamber E is controlled by the two valves C, as shown in Fig. 4, the valves C being arranged at opposite sides of the chamber D. Suitable packing glands 1, 2 and 3 are interposed between the first group of forward turbine elements and the reverse turbine elements and receive the rotor or shaft 22.

As will be understood, the several valves B are capable of independent adjustment for varying the quantity of steam admitted to the first turbine element.

The turbine element *d* discharges into a steam chamber H surrounding the second group of turbine elements *e*, *f*, *g*, *h* and *i*. The first turbine element *e* of the second group is provided with three rows of blades, while the remaining turbine elements are provided with two rows of blades each. The chamber H extends completely about the second group of turbine elements and communicates by four valves G with a conduit L for conducting steam to the third group of turbine elements, the first of which latter is indicated at *l* and the last at *m*. Two of the valves G are arranged at the top and two at the bottom of the casing 20 and each of the turbine elements *l* to *m* is provided with a single row of blades. From the last turbine element *m* the steam discharges into a chamber M from which it flows through the outlets 29 and 30.

At cruising velocities, the valves G are closed and the steam, after acting on the three turbine elements *b*, *c* and *d*, acts on the cruising or second turbine group *e* to *i* and discharges through the turbine elements *l* to *m*. At higher velocities, the valves G are opened and the steam after acting on the first group of turbine elements is conducted to the third group through the conduit L.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:

In a turbine, three groups of rotary turbine elements, the first group consisting of three turbine elements, the second group of turbine elements comprising five wheels, four of which are provided with two rows of blades

and one of which is provided with three rows of blades and operated by steam only at cruising speeds, the third group of turbine elements comprising a plurality of wheels each provided with one row of blades actuated upon by steam at all speeds, steam supply means, and valve means controlling communication between the exhaust of the first group and the steam inlet of the third group.

In testimony whereof I have hereunto set my name.

GIUSEPPE BELLUZZO.