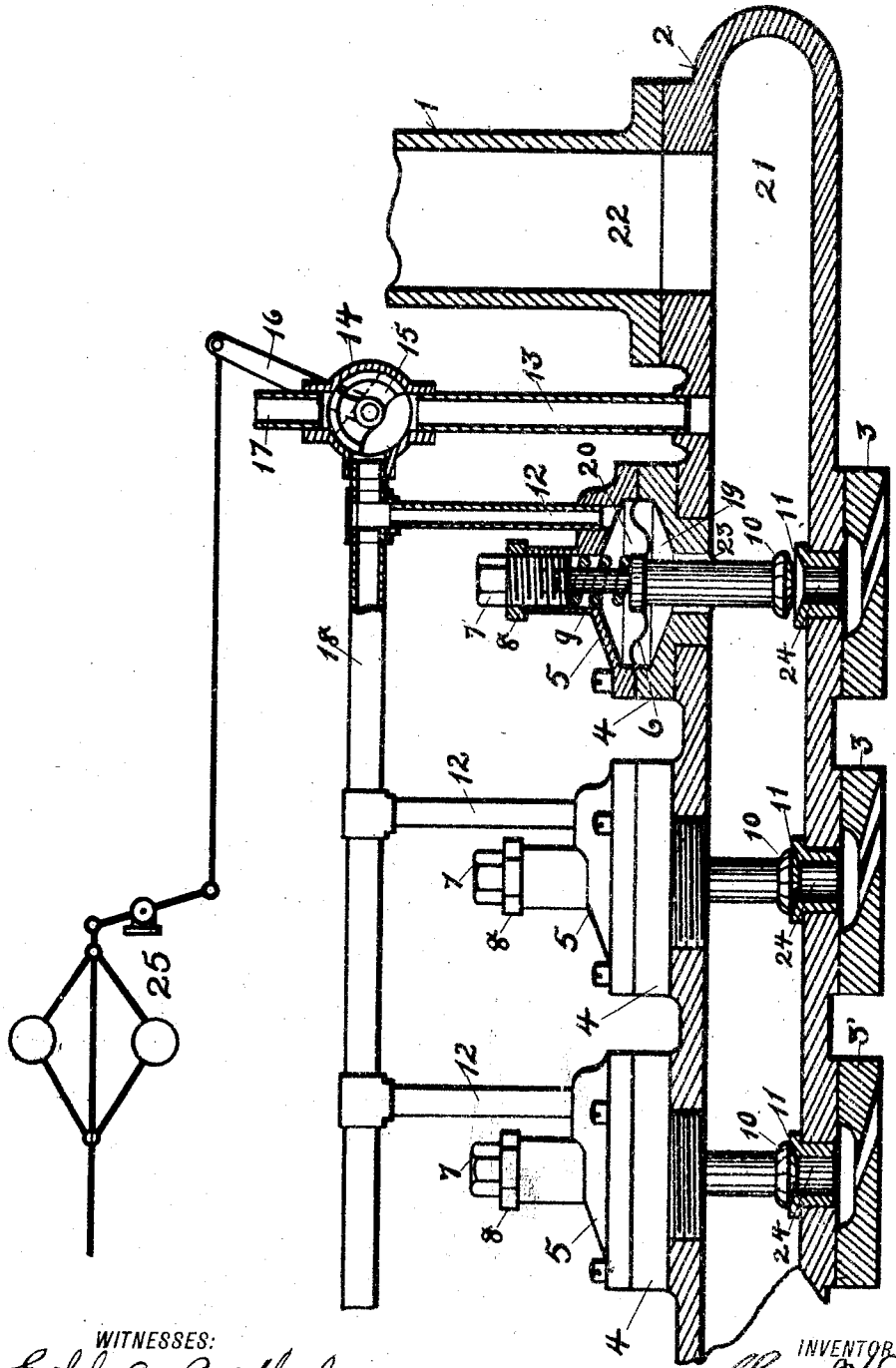
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C. W. DAKE.

ELASTIC FLUID TURBINE.

APPLICATION FILED NOV. 29, 1905.



WITNESSES:

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ELASTIC-FLUID TURBINE.

No. 833,306. Specification of Letters Patent. Patented Oct. 16, 1906.

Application filed November 29, 1905. Serial No. 289,657.

To all whom it may concern:

Be it known that I, CHARLES W. DAKE, a citizen of the United States, residing at Grand Rapids, county of Kent, State of Michigan, have invented certain new and useful Improvements in Elastic-Fluid Turbines, of which the following is a specification.

This invention relates to improvements in governing means for turbine-engines.

The objects of this invention are, first, to provide a very simple and effective means for controlling the valves to the turbine-nozzles, and, second, to provide an effective means for governing turbine-engines generally.

Further objects and objects relating to details of construction will definitely appear from the detailed description to follow.

I accomplish the objects of my invention by the devices and means described in the following specification.

The invention is clearly defined and pointed out in the claims.

A structure embodying the features of my invention is clearly illustrated in the accompanying drawing, forming a part of this specification, in which the single figure is a detail view of the turbine-casing and automatic controlling-valve and connecting mechanism in section.

Referring to the numbered parts of the drawing, the supply-pipe 1 has a passage 22 therethrough leading to the chamber 21 in the turbine-casing 2. The nozzle-sections 3 3 3′ have nozzles therethrough, the sections 3 3 having more than one.

Suitable specially-constructed valve-seats 11 are around passages 23, leading to these nozzle-sections from the turbine-chamber 21. Valves 10 are arranged to properly seat on each of the valve-seats 11 11. Opposite each valve is arranged a casing made up of an inner half 4 and an outer half 5, between which are flexible diaphragms 6, of sheet metal, which are preferably corrugated somewhat, the center of each diaphragm being secured to the stem of a valve 10, such valve-stem extending on and into a tubular extension of the casing part 5. A coiled spring 9 surrounds the valve-stem and holds the valve normally seated. The tension of this spring is adjusted by the screw 7, which is locked in position by means of the lock-nut 8, permitting a complete and perfect adjustment of the tension on the valve.

A pipe 12 leads up from the outer casing 5 of each valve and connects the chamber 20, which is to the outside of the diaphragm 6, to a pipe 18, which pipe is common to all of the valves. An open space 23 around the valve-stem connects the chamber 19, which is beneath the diaphragm 6, to the chamber 21. A pipe 13 extends up from the chamber 21 in the casing 2 to a suitable valve-casing 14, containing a three-way valve 15, which by a lever 16 is connected to a suitable governor 25 for controlling its movement. This valve, being a three-way cock, serves to connect the pipe 13 to the pipe 18 or to shut off the pipe 13 and connect the pipe 18 to a pipe 17, which leads to the exhaust or a condenser or other low pressure. The tension of the spring 9 for closing the valves is adjusted to yield at various pressures.

Having now enumerated and described the various parts, I will state that in operation, the turbine being at rest and no pressure being in the several passages, the various nozzle-valves will be closed and the governor will of course be at rest, the valve 14 being in position for the connection of the pipe 18 to the exhaust-pipe 17, thereby relieving the pressure in the chamber 20 through the various pipes 12. The inner pressure now being turned on, the pressure will rise in the chamber 21, and as the chamber 19 of each valve is connected by means of the space around the valve-stem the pressure will rise in the chamber 19, which will force the diaphragm back and lift each valve 10 from its seat, admitting fluid through the various passages 24 to the nozzles. The turbine will then start to revolve and increase in speed until the governor begins to operate. When the governor operates, it will change the position of the valve 15 so that it will make communication with the passages 13, 18, and 12 and will close the passage 17. The elastic fluid will then enter the chamber 20 gradually and tend to balance the pressure on both sides of the diaphragm 6. This permits, first, as the pressure increases, the strongest spring to close its valve 10, and, the speed still continuing to increase, a greater amount of steam will enter the chambers 20, increasing their pressure, and the successively weaker springs will close their respective valves 10, depending on their differently-adjusted tensions to do so, thus gradually controlling the nozzles. Each spring has a means of setting its tension, so that where more than one valve and nozzle-section are used each may be set at proper tension so as

to close at a different pressure, and consequently at a different time.

I desire to remark that the details of construction of my invention set forth herein may be considerably modified without departing therefrom. The passages can be otherwise formed, and the casing obviously might contain them. I have shown the same in its most simple and effective form.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a governing means for turbine-engines, the combination of the engine-casing with a chamber or passage 21 therein; nozzle-sections 3 3 3′ with suitable valve-seats 11 for each of them; a supply-passage 22 leading to the chamber; a valve 10 with a suitable stem extending across the chamber 21; a casing consisting of sections 4 and 5, through which the stem of the valve extends transversely; a diaphragm 6 clamped between the parts 4 and 5 of said casing, and secured at its center to the valve-stem, forming outer and inner chambers 19 and 20, the chamber 19 being connected to the passage 21; a coiled spring 9 engaging a shoulder on the valve-stem and forcing it normally to the closed position; a screw 7 for adjusting the tension on said spring with suitable lock-nut for retaining it in position; a pipe 18 with branches 12 connected to the outer chamber 20 of each of the valve-chambers; a three-way valve 15; a passage 13 extending from the chamber 21 to the said valve 15; a governor for controlling the three-way valve 15 to connect the passage 13 with the pipe 18, or to connect the pipe 18 with the outlet 17, coacting for the purpose specified.

2. In a governing means for turbine-engines, the combination of the engine-casing with a chamber or passage therein for connecting to the nozzle-sections; nozzle-sections 3 3 3′ with suitable valve-seats for each; a source of supply connected to the chamber or passage 21; a valve 10 with a suitable stem extending across the chamber 21 for each nozzle-section; a casing surrounding the valve-stem, having a flexible diaphragm across it, dividing the same into an outer and inner chamber, and being operatively connected to the valve-stem, the inner chamber being connected with the supply-chamber; an adjustable spring for holding each valve normally toward its seat; a passage connecting to the outer chamber; a valve connected to a suitable governor with a passage leading therethrough to connect to the outer chamber of the valve mechanism, coacting for the purpose specified.

3. In a governing means for turbine-engines, the combination with an engine-casing of a valve for controlling the nozzle-passages; a casing surrounding the valve, with a flexible diaphragm across it and operatively connected to the valve, forming a chamber both inside and outside of the said diaphragm, the inner chamber being normally connected with the source of supply, the outer chamber having a passage connecting it with the source of supply; a three-way valve in the last-named passage; and a governor for controlling the said three-way valve to regulate the pressure in the outer valve-chamber, whereby the nozzle-valve is controlled, as specified.

4. In a governing means for turbine-engines, the combination with an engine-casing of a valve for controlling the nozzle-passages; a casing surrounding the valve, with a flexible diaphragm across it and operatively connected to the valve, forming a chamber both inside and outside of the said diaphragm, the inner chamber being normally connected with the source of supply, the outer chamber having a passage connecting it with the source of supply; a valve in the last-named passage; and a governor for controlling the said passage to regulate the pressure in the outer valve-chamber, whereby the nozzle-valve is controlled, as specified.

In witness whereof I have hereunto set my hand and seal in the presence of two witnesses.

CHARLES W. DAKE. [L. S.]

Witnesses:
ADELAIDE I. ADAMS,
OTIS A. EARL.