

E. F. EDGAR.
STEAM TURBINE ENGINE.
APPLICATION FILED MAY 5, 1909.

952,791.

Patented Mar. 22, 1910.

4 SHEETS—SHEET 1.

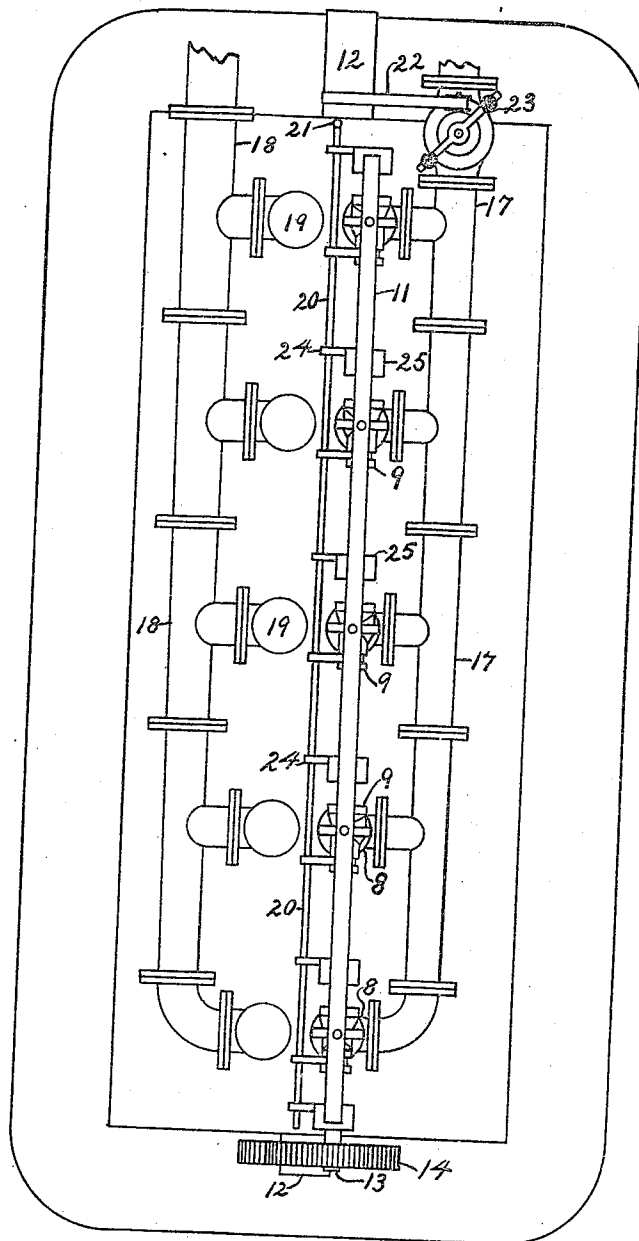


Fig. 1.

WITNESSES:

E. B. Edgar.

J. B. Edgar

INVENTOR

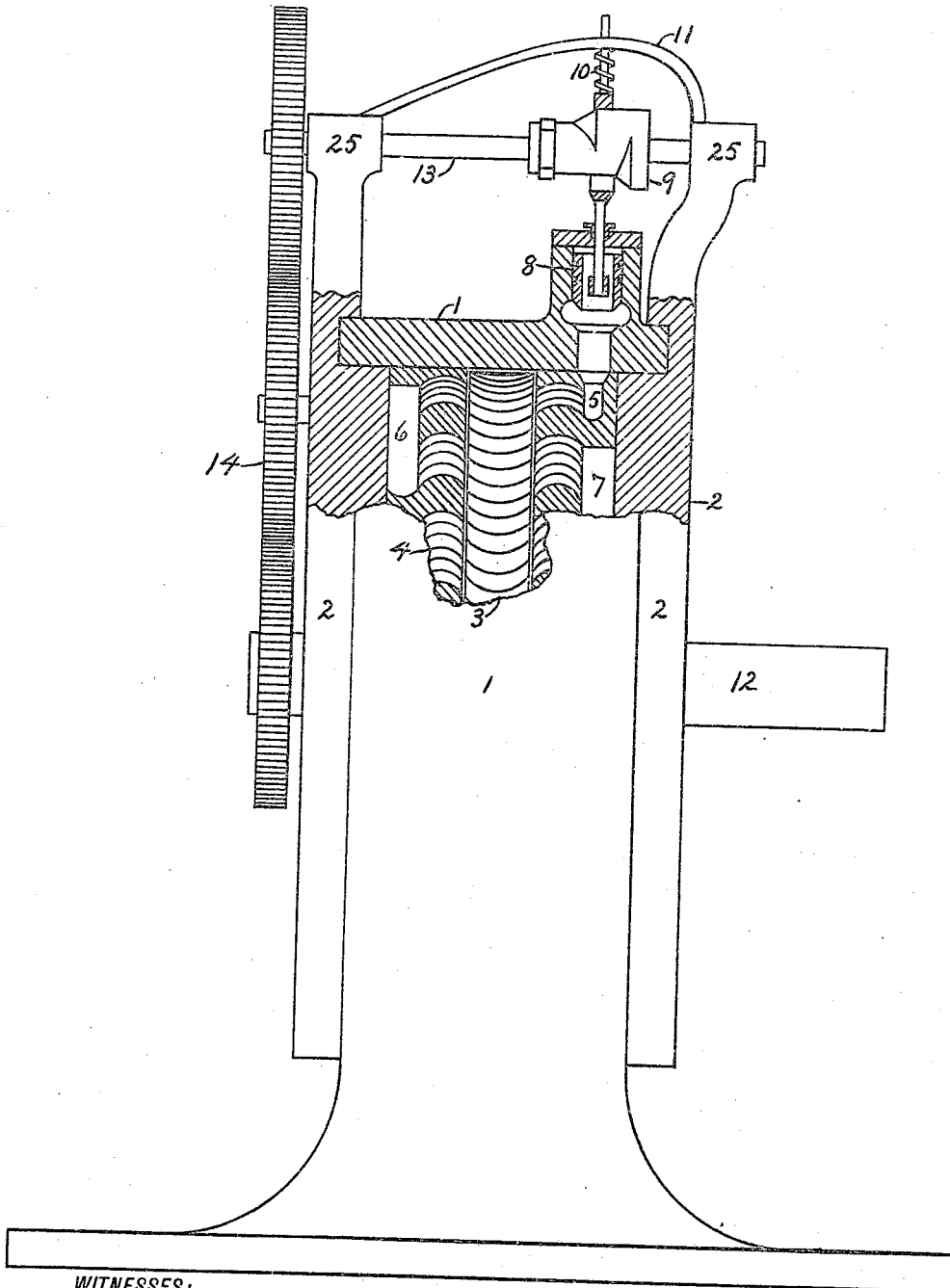
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4 SHEETS—SHEET 2.



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E. B. Edgar.
J. B. Edgar

Fig. 2.

INVENTOR
Ellis F. Edgar

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4 SHEETS—SHEET 3.

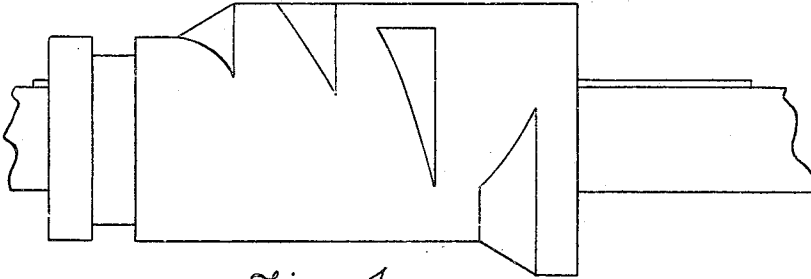


Fig. 4.

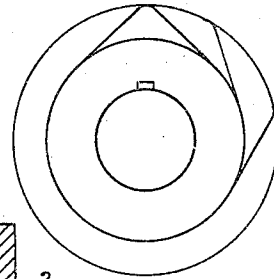


Fig. 5.

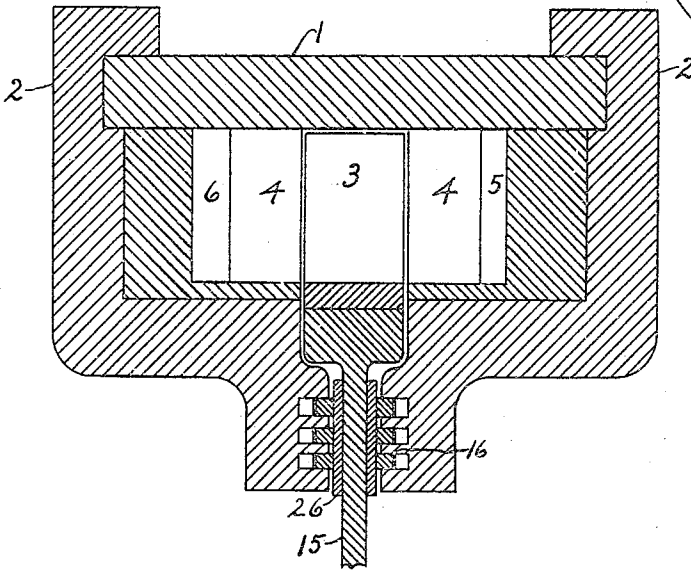


Fig. 3.

WITNESSES:

E. B. Edgar.

J. B. Edgar

INVENTOR

Ellis F. Edgar

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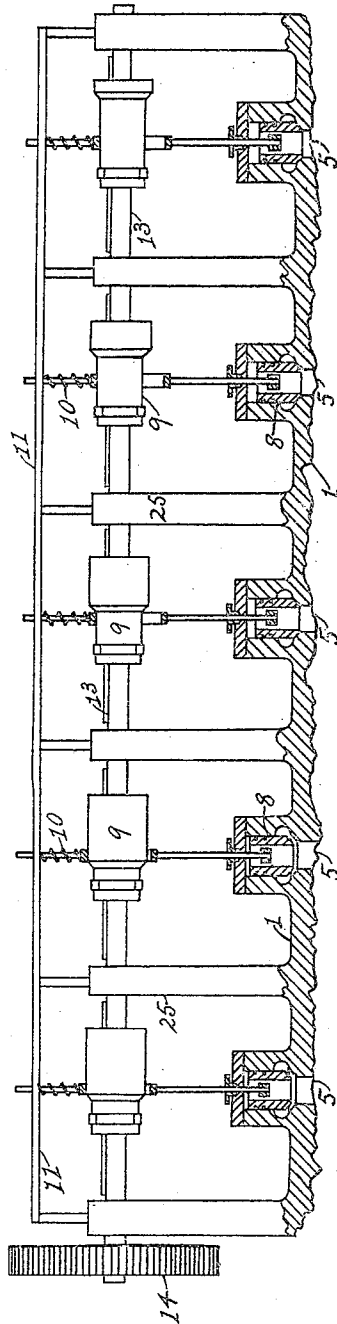


Fig. 6.



Fig. 7.

WITNESSES:

E. B. Edgar.
I. B. Edgar

INVENTOR

Ellis F. Edgar.

UNITED STATES PATENT OFFICE.

ELLIS F. EDGAR, OF WOODBRIDGE, NEW JERSEY.

STEAM-TURBINE ENGINE.

952,791.

Specification of Letters Patent. Patented Mar. 22, 1910.

Application filed May 5, 1909. Serial No. 494,107.

To all whom it may concern:

Be it known that I, ELLIS F. EDGAR, citizen of the United States, and resident of Woodbridge, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Steam-Turbine Engines, of which the following is a specification.

Figure 1 is a plan view of a five cylinder engine. Fig. 2 is a vertical elevation view of a one-cylinder engine part in section through the puppet valve and in front of the puppet valve. Fig. 3 is a section view through a cylinder behind the puppet valve. Fig. 4 is a side view of one of the multiple cams. Fig. 5 is an end view of one of the multiple cams. Fig. 6 is a section view through the puppet valves and upper portion of high pressure steam chests and longitudinal side elevation view of the opening and closing and full stroke cams. Fig. 7 is an end view of one of the opening and closing and full stroke cams.

I had in view in designing this engine a steam turbine capable of using steam at one thousand pounds pressure or more, and to be used with or without a cut-off valve preferably with a puppet cut-off valve and preferably with four or more cylinders, whereby an early cut-off can be used thereby obtaining economy as hereinafter set forth.

Details of construction.—1, outside casing of cylinder; 2, end and inner circumference casing of cylinder; 3, movable blades; 4, stationary blades; 5, high pressure steam chest; 6, first expansion steam chest; 7, second expansion steam chest; 8, puppet valve; 9, multiple cam; 10, spring for closing puppet valve; 11, bar for guiding puppet valve stem and yoke; 12, driving shaft of engine; 13, multiple cam shaft; 14, gearing from engine shaft to multiple cam shaft; 15, driving wheel of engine; 16, packing strips; 17, live steam line; 18, exhaust steam line; 19, exhaust port; 20, ratchet arm shaft; 21, connection for operating ratchet arm shaft; 22, governor belt; 23, governor; 24, ratchet arms; 25, bearing for multiple cam shaft, also bearing for the bar guiding the puppet valve stem; 26, plate secured to driving wheel 15.

General remarks.—This engine of the steam turbine type is composed of a circular cylinder having two rows of steam chests extending all the way around from the inlet port to the exhaust port, said steam chest

containing the stationary blades of the engine, which are numbered 4, and located between these two rows of steam chests and stationary blades 4 are located moving blades 3, which are secured to the outer periphery of driving wheel 15, said driving wheel being made steam tight by packing strips 16, which bear against plates 26, both the packing strips and these plates can be easily renewed. The packing strips are held against these plates by springs. Driving wheel 15 is secured to driving shaft 12. Steam entering high pressure steam chest 5 preferably at one thousand pounds pressure or more is guided by the stationary blades in said steam chest 5 on moving blades 3 and through stationary blades and steam chest 6 to the upper portion of the open space in steam chest 6, which permits of the first expansion, then passes from the bottom of the open space in said steam chest 6 through the stationary blades there located again on moving blades 3 and through the stationary blades located in the second expansion steam chest 7 to the upper portion of the open space in said steam chest 7, thence to the bottom of the open space in said steam chest 7, then through the stationary blades there located again on the moving blades 3, and in this manner passes backward and forward to the steam exit, giving the desired number of expansions to obtain the desired economy according to the diameter of the engine. These steam chests increase in area from the inlet port to the exhaust port and preferably the number of stationary blades in said steam chests increase in number and preferably the spacing between these stationary blades increases in distance between said blades, while the distance between moving blades 3 is the same. In an engine of four cylinders or more the steam may be admitted through the puppet valves in conjunction with the multiple cams to all of the cylinders in starting and then cut off automatically at any desired point. It will readily be seen that in a 6 cylinder engine cutting off at one-sixth the stroke or in an eight cylinder cutting off at one-eighth the stroke a high economy may be obtained, from a simple and compact engine, and one or more of the cylinders may be cut out of action in an engine of this type as shown in Fig. 6 which shows the upper end of five high pressure steam chests with their balanced cylinder puppet valves two open and three closed and

a longitudinal side elevation of the opening and closing and full stroke cams. These cams open and close the valves and allow the steam to flow through the open valves at boiler pressure continuously while open. They do not pulsate or cut off at part stroke. They can be operated automatically or manually as desired. Economy is obtained with these cams by opening only enough valves to carry the load, one, two or more or all as desired and by using full boiler pressure through only enough valves to take care of the load the highest economy can be obtained. In using the cams shown in Figs. 4 and 5 economy is obtained by cutting off at any part of the stroke desired, and the same load carried by simply moving the multiple cam to another cut-off, and in an eight cylinder there can be two cylinders added to the same driving shaft with the puppet valve and blades so arranged as to run in the reverse action and give the same power by cutting off at half stroke. While this would not be economical it is usually only necessary in emergencies such as arise on steamships. In a one-cylinder engine the steam may be admitted to a third or half stroke in starting, then moved to any desired cut-off after the engine is running. A reversing engine can be made with a one-cylinder by having two sets of inlet ports and exhaust ports, but if the same power is desired there would also be a loss due to the back pressure. While this engine may be operated without a cut-off valve, I prefer a cut-off valve and preferably a puppet cut-off valve of the type here shown. To prevent leakage by the sides and outer ends of moving blades 3 between the back of the inlet port and the exhaust port, I would place a red metal plate held against the blades at this point by springs.

I do not confine myself to the exact form of blades herein set forth as I may change the area and shapes, or use ports in the steam chests.

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

1. A steam turbine engine, having a plurality of high pressure steam chests each with an inlet port containing a balanced

cylinder puppet valve and means for operating the same, whereby steam at boiler pressure may be admitted through all or any number of said valves as desired.

2. A steam turbine engine having a plurality of high-pressure steam chests, each with an inlet port containing a puppet valve in conjunction with an opening and closing cam, composed of different diameters of varying widths of surface and so arranged at each valve whereby steam at boiler pressure may be admitted through all or any number of said valves as desired for the full stroke and continuously.

3. A steam turbine engine having a balanced puppet cut off valve in conjunction with a multiple cam consisting of a series of cams of varying length, whereby steam may be admitted to the cylinder for the full revolution by moving the multiple cam to the last cam which extends the full circle and when the engine is running steam may be admitted to the cylinder for any part of the revolution desired by moving the multiple cam to a cam extending the desired length of the circle and whereby the cut off will take place automatically as set forth.

4. A steam turbine engine composed of a plurality of cylinders, each cylinder having a balanced puppet cut-off valve in conjunction with a multiple cam consisting of a series of cams of varying length, whereby steam may be admitted in starting to all of the cylinders simultaneously by moving the multiple cam to the last cam which extends the full circle and when the engine is running will admit steam to each cylinder independently and successively by moving the multiple cam to one of the cams extending only part of the circle and on different locations of the circle for each cylinder and whereby the cut off will take place automatically, all substantially as set forth.

Signed at New York in the county of New York and State of New York this fourth day of May A. D. 1909.

ELLIS F. EDGAR.

Witnesses:

E. B. EDGAR,
I. B. EDGAR.