E. F. EDGAR.

STEAM TURBINE.

APPLICATION FILED AUG. 25, 1909.

943,922.

Patented Dec. 21, 1909.

2 SHEETS—SHEET 1.

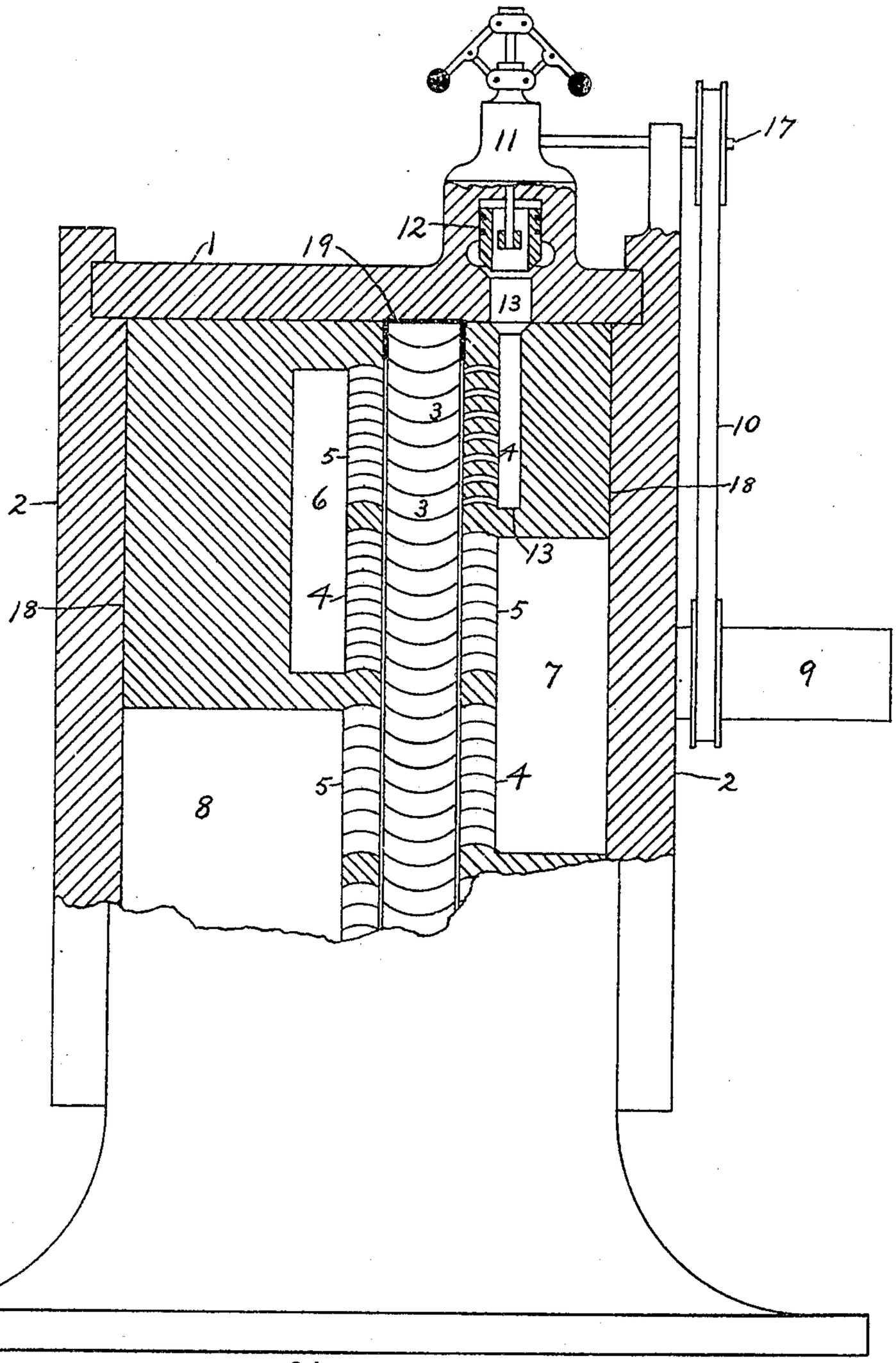

Fig. 1.

WITNESSES:

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INVENTOR

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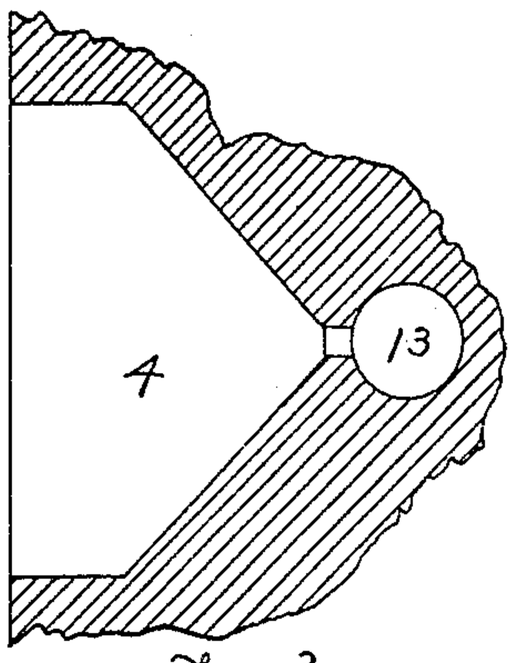


Fig. 3.

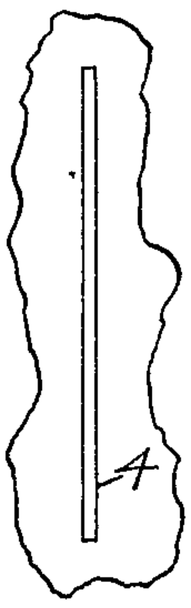
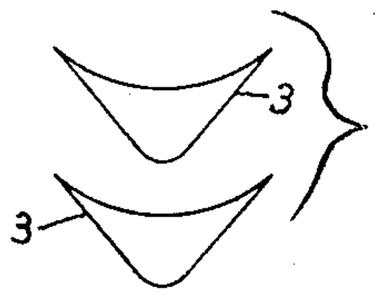


Fig. 4.

Fig. 5.



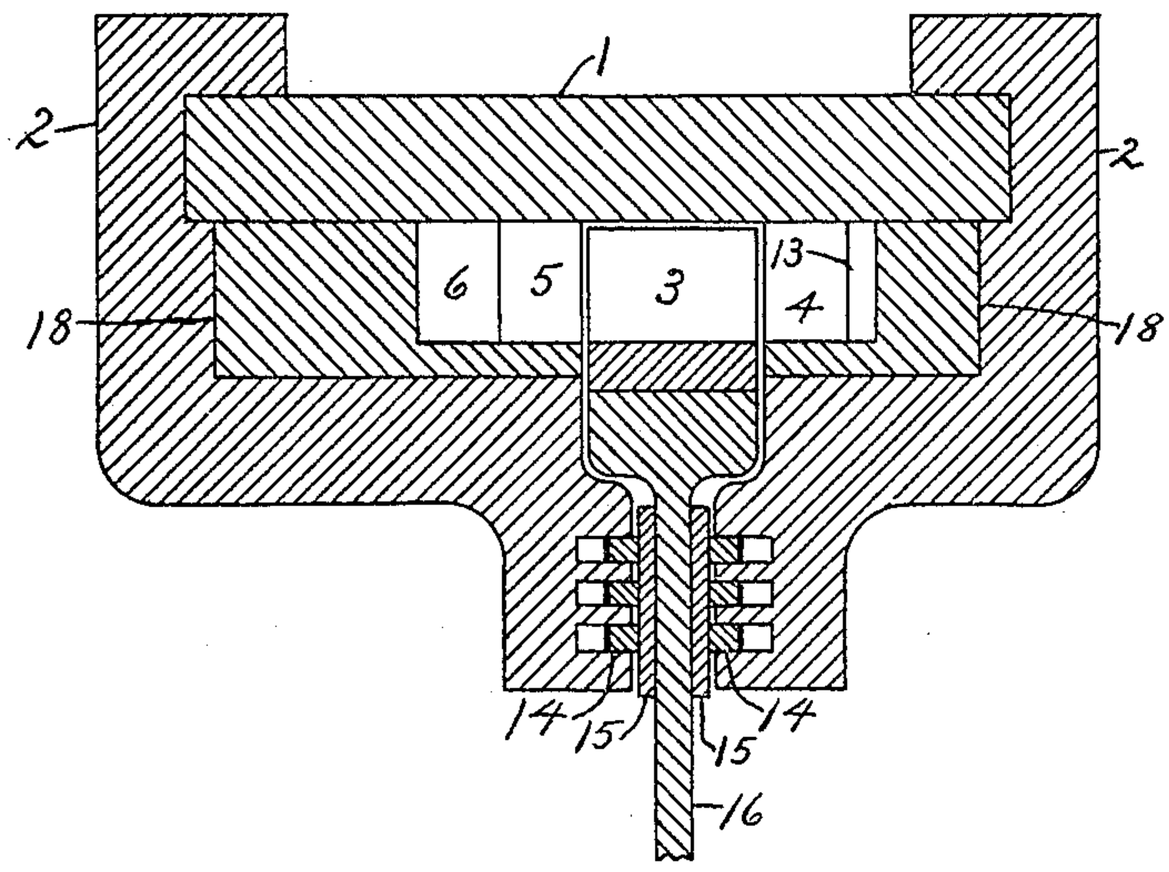


Fig. 2.

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ELLIS F. EDGAR, OF WOODBRIDGE, NEW JERSEY.

STEAM-TURBINE.

943,922. Specification of Letters Patent. Patented Dec. 21, 1909.

Application filed August 25, 1909. Serial No. 514,480.

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 an elevation view part in section and part in full of an engine embodying my invention. Fig. 2 is a section through the cylinder at the high pressure steam chest. Fig. 3 is a section across the high pressure steam chest and through one guide from the high pressure steam chest to moving blades. Fig. 4 is a view of the mouth of one of the guides facing on the moving blades. Fig. 5 is a view of two blades 3, showing contraction of space between said blades.

I had in view in designing this engine, a steam turbine capable of using steam from one thousand to five thousand pounds working pressure, thereby producing an engine of great power in small space and economical in first cost of installation, also per H. P. in operation as hereinafter set forth.

Details of construction:—1, outside casing of cylinder, 2, end and inner circumference casing of cylinder, 3, moving blades on outer periphery of driving wheel, 4, steam guides from steam chests to moving blades, 5, reacting blades or abutments, 6, second steam chest, 7, third steam chest, 8, fourth steam chest, 9, driving shaft, 10, governor belt, 11, governor, 12, puppet cut-off valve, 13, high pressure steam chest, 14, packing strips, 15, bearing plate for packing strips, 16, driving wheel, 17, governor shaft, 18, block filling containing steam chests, 19, packing strips around moving blades between high and low pressure steam chests.

General description:—This engine is composed of a driving shaft, a driving wheel secured thereto having blades on its outer periphery, their greatest length being longitudinally with the driving shaft, the curved surface being the longest way of the blade as shown in Fig. 5; the blade when two or three inches wide should be six inches long on the curved surface, and when eight inches wide should be two feet long on the curved surface to allow for the high velocity of the steam to be utilized without too high a speed to the engine; these blades between the high pressure steam chest and low pressure steam chest are surrounded by red metal packing strips so arranged to be lubricated and to touch the moving blades to prevent leakage between high and low pressure steam chests, the high pressure steam chest being preferably round and having fan shaped guides as shown in Fig. 3 to lead the steam on the moving blades and at such an angle as to throw the steam on the curved surface so as to pass through the contracted surface made by the projection on the lower portion of the blades as shown in Fig. 5, the two blades on the detail sheet, the blades being marked 3. This construction is to prevent the steam when striking the reaction blades coming back under the blades to the point of entrance of the steam from the mouth of the guides as the high velocity of the steam coming out of the mouth of the guides might cause this result which would deduct some from the efficiency. These guides are fan shaped as shown in Fig. 3, the mouth of which is a long slot as shown in Fig. 4 and are set at such an angle as to throw the steam on the curved surface of the moving blades as to give all the bearing possible on the moving blades in combination with the reacting blades. Preferably I would have this style of guides from all of the steam chests to the moving blades. Preferably, I would have the reacting blades or abutments composed of a series of blades as shown, but an abutment might be formed in a different manner, I do not confine myself to this particular form shown. Blocks 18 I would secure both to the outer casing 1 and end casing 2 of the cylinder which will permit of the outer casing being made of lighter material as these blocks not only help to hold this casing together but take the strain off of the outer casing as the steam chests are made in these blocks which is of a great advantage especially in the high pressure steam chests as a pipe from the puppet valve can be threaded right through the outside casing into the block and into the high pressure steam chest, there being no pressure on the casings of the cylinder until after the first expansion from the mouth of the leads on the blades to the second steam chest 6 and by the time the steam has reached this second steam chest 6, it will have exhausted most of its pressure as the high pressure steam chest will cover about one fifth of the total number of blades on the outer periphery of the driving wheel and by the size of these

blades I propose to utilize over half the steam pressure with this first expansion. It will be seen that the length or the width of the moving blades are much longer than the length or width of the stationary blades or guides. In some cases they would be four or five times the length of the stationary blades or guides and much farther apart which will prevent choking and allow a free passage of the steam to the exhaust port as it expands. By making the moving blades long on the curved surface, I am able to obtain high economy from high pressure steam as I am enabled to utilize the velocity due to the high pressure with less speed to the driving wheel than I believe has been obtained heretofore.

In very large units I would preferably build this engine of the multiple cylinder type, each cylinder having an independent puppet cut-off valve preferably of the balanced cylinder type, as shown, and operated by a centrifugal governor, each governor being set to cut off at different speeds which will always give full boiler pressure on the load as the load varies which means higher economy. This has never been done before to my knowledge. These cylinders are composed of circular cylinders preferably made of steel castings entirely surrounding moving blades 3 on the outer periphery of driving wheel, 16, and made steam tight by packing strips, 14 which bear against bearing plate 15 secured to driving wheel, 16. Packing strips 14 are held against bearing plate 15 by springs which makes the cylinder perfectly steam tight.

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

1. A steam turbine engine composed of a driving shaft, a driving wheel secured thereto, said driving wheel having blades on its outer periphery and a steam chest on each side of said driving wheel blades, one, the high pressure steam chest having guides leading to the said driving wheel blades, the other steam chest having reacting blades located therein, the said driving wheel blades being longer and spaced farther apart than said guides or reacting blades and being longer longitudinally with the driving shaft than crosswise, all substantially as set forth.

2. A steam turbine engine composed of a driving shaft, a driving wheel secured thereto, said driving wheel having blades on its outer periphery and a steam chest on each side of said driving wheel blades, one, the high pressure steam chest having guides leading to the said driving wheel blades, the other steam chest having re-acting blades located therein, the said driving wheel blades being longer and spaced farther apart than said guides or re-acting blades, all substantially as set forth.

3. A steam turbine engine composed of a driving shaft, a driving wheel secured thereto having blades on its outer periphery, a high pressure steam chest, said steam chest having an inlet chamber containing a balanced cylinder puppet valve, said steam chest having connections to fan shaped guides terminating in a long narrow opening whereby the steam is directed on aforesaid blades in a sheet form all substantially as set forth.

4. A steam turbine engine composed of a driving shaft, a driving wheel secured thereto, said driving wheel having blades on its outer periphery said blades being surrounded by a circular cylinder having blocks located therein, containing more than one steam chest on each side of said driving wheel blades, the smallest steam chest, the high pressure steam chest having a puppet cut-off valve, and guides leading to said driving wheel blades the second steam chest, the first increase in area having reacting blades in one end and guides in the other end leading to the driving wheel blades, the third steam chest the second increase in area having reacting blades at one end and guides in the other end leading to the driving wheel blades and the fourth steam chest the third increase in area having reacting blades at one end and an exhaust at the other it being over one hundred times the area of the first and high pressure steam chest, the driving wheel blades being longer longitudinally with the shaft than the guides or reacting blades, said driving wheel blades having packing strips between the high pressure steam chest and the exhaust steam chest, all substantially as set forth.

5. A steam turbine composed of a driving shaft, a driving wheel secured thereto, said driving wheel having blades on its outer periphery, a row of steam chests on each side of said driving wheel blades, said steam chests having guides spaced closer together and not so long as said driving wheel blades, said steam chests guides and driving wheel blades being surrounded by a casing forming a steam tight circular cylinder having packing strips so arranged as to press against plates secured to said driving wheel, said cylinder having an exhaust port and inlet port, said inlet port having a puppet cut-off valve all substantially as set forth.

Signed at New York in the county of New York and State of New York this 21st day of August A. D. 1909.

ELLIS F. EDGAR.

Witnesses:

E. B. EDGAR,

I. B. EDGAR.