No. 883,910. PATENTED APR. 7, 1908.

H. PIERCE.

REVERSIBLE TURBINE ENGINE.

APPLICATION FILED JUNE 20, 1907.

3 SHEETS—SHEET 1.

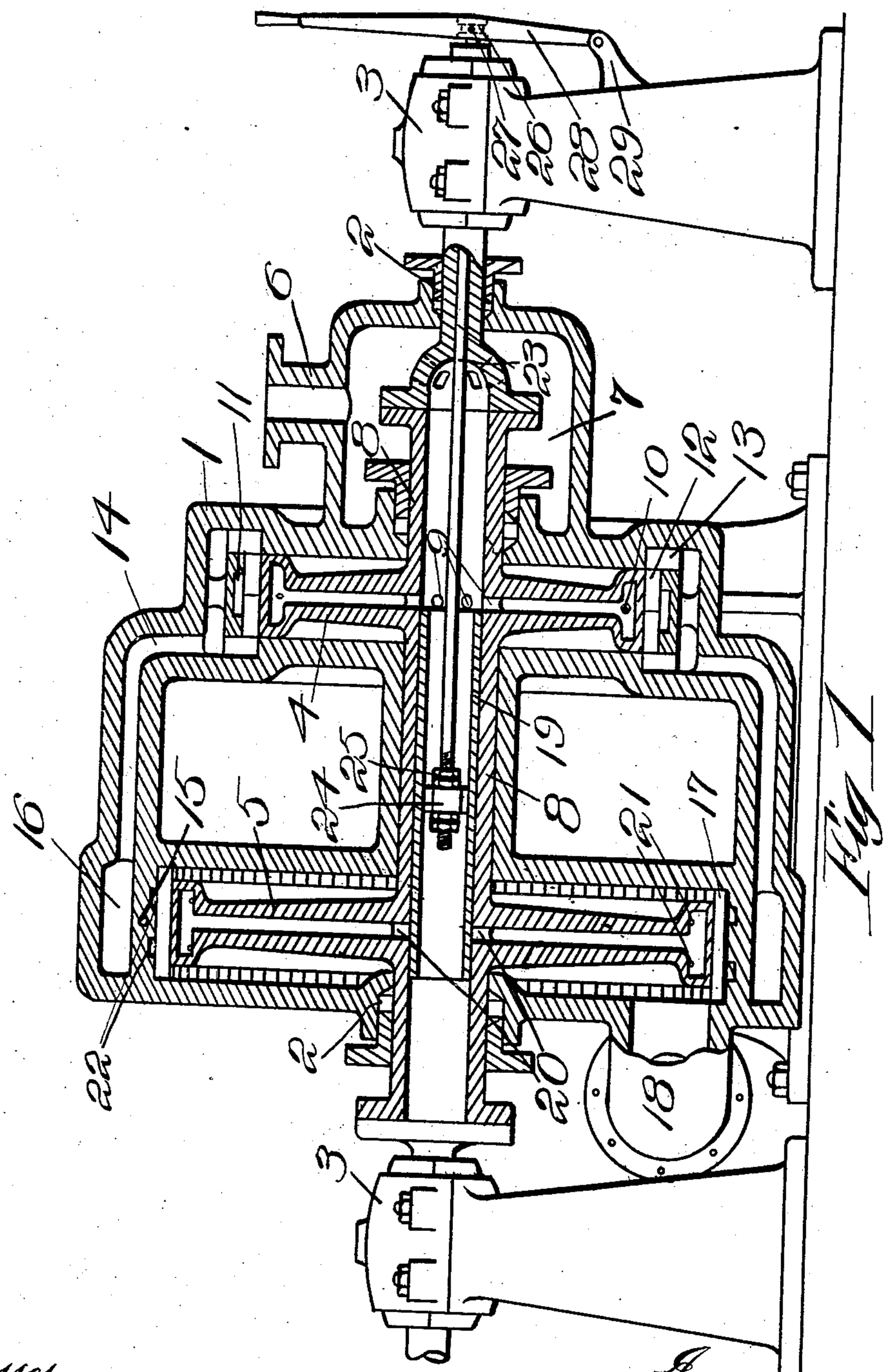

Fig. 1.

Witnesses
Chas Meyer
K. Lehmann

Inventor
Harry Pierce
By Paul & Wilcox
His Attorney

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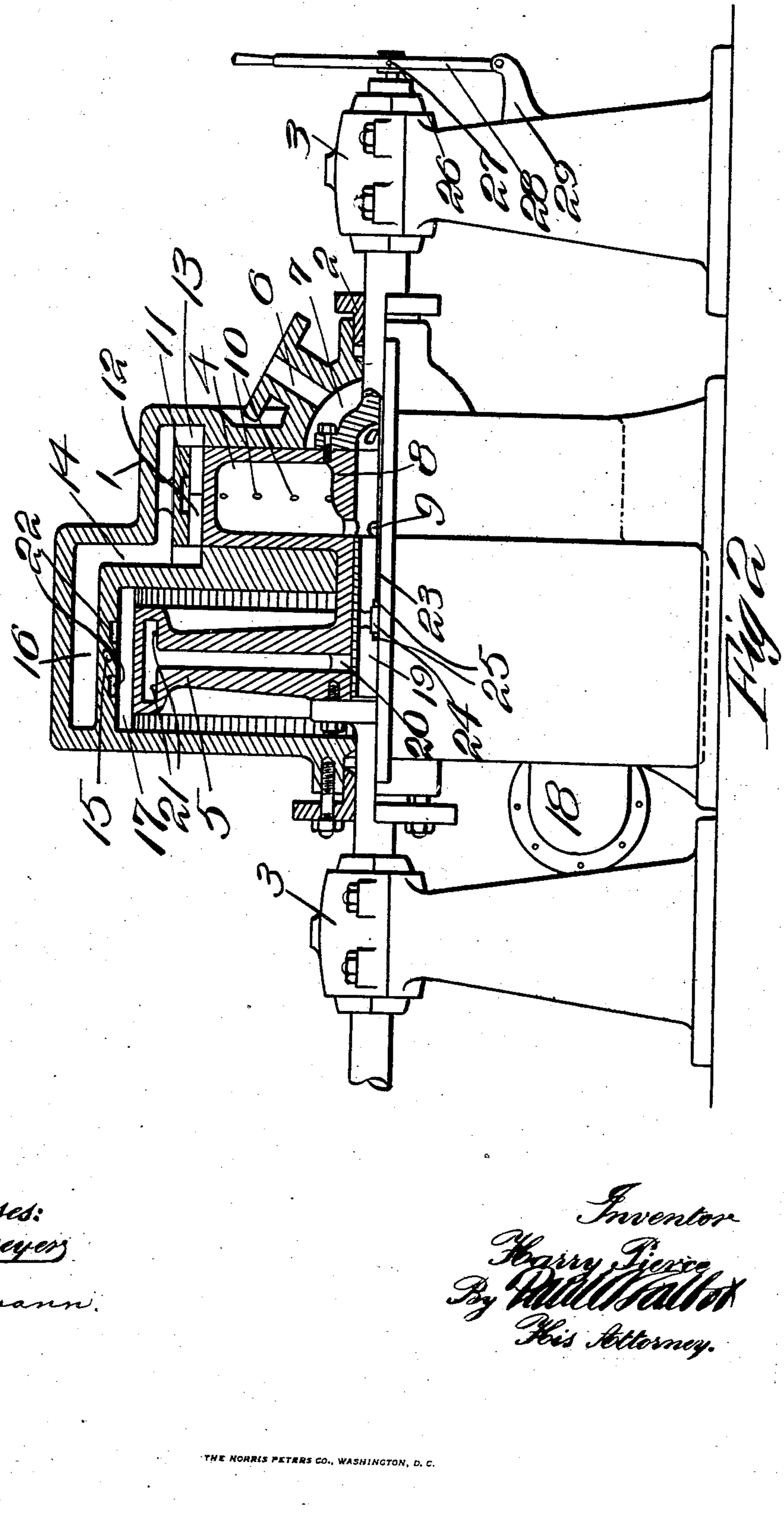

Fig. 1.

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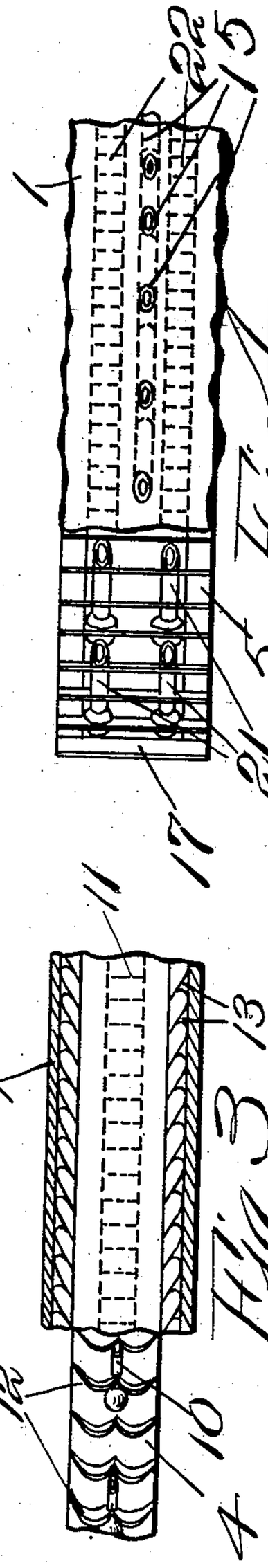

Fig. 3.

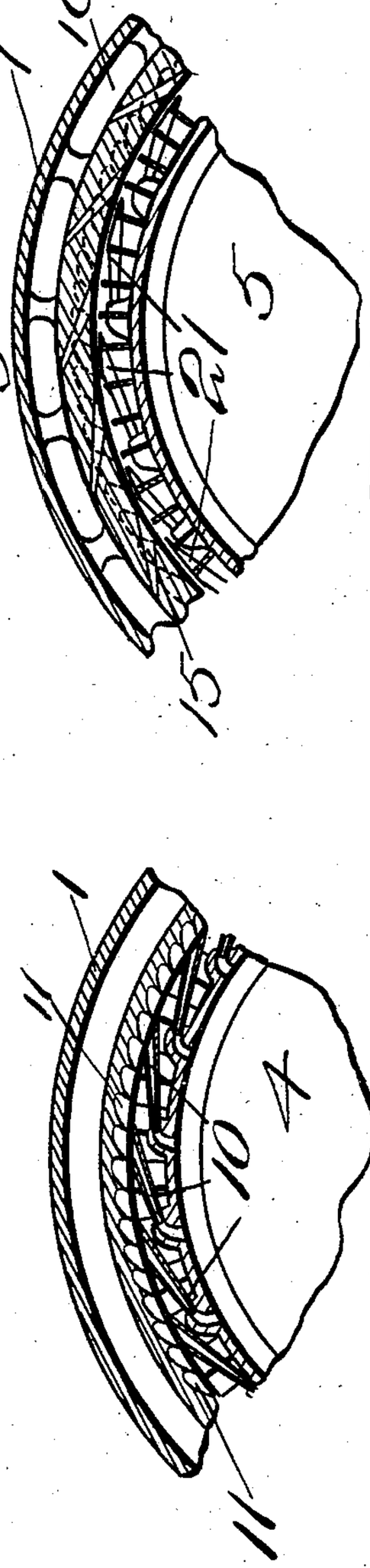

Fig. 5.

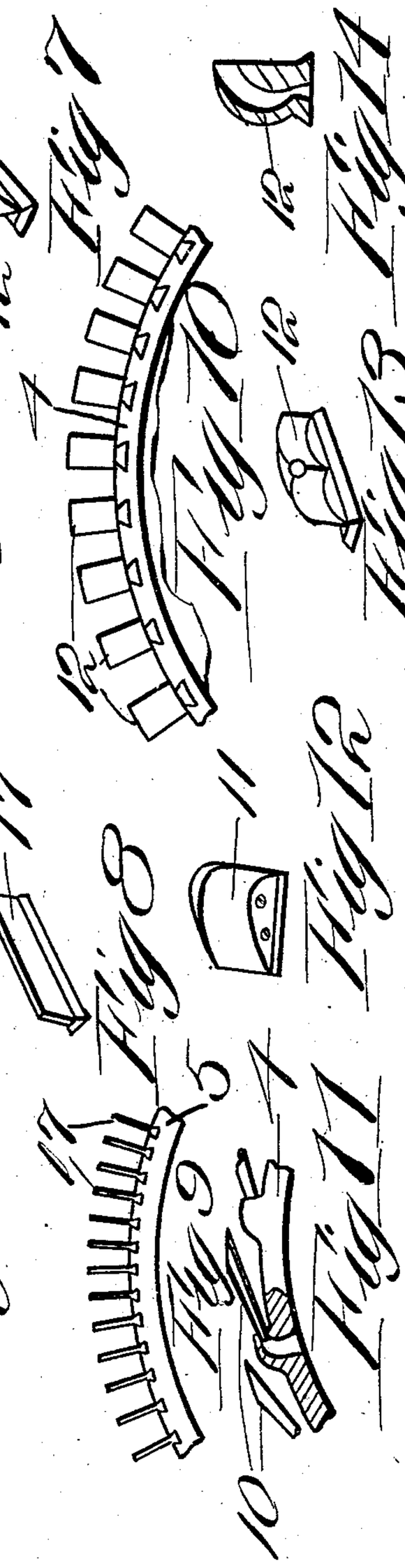

Fig. 7.

Fig. 4.

Fig. 6.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Witnesses:
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UNITED STATES PATENT OFFICE.

HARRY PIERCE, OF SEATTLE, WASHINGTON.

REVERSIBLE TURBINE-ENGINE.

No. 883,910. Specification of Letters Patent. Patented April 7, 1908.

Application filed June 20, 1907. Serial No. 379,976.

To all whom it may concern:

Be it known that I, HARRY PIERCE, a citizen of the United States, residing at the Arlington Hotel, city of Seattle, county of King, and State of Washington, have invented new and useful Improvements in Reversible Turbine-Engines, of which the following is a clear and concise specification.

My invention relates primarily to reversible turbines having the steam admitted through the rotors thereof, having expansion nozzles as well as veins to deflect the direction and utilize the velocity of the steam.

The objects of my invention are to provide a steam turbine which may be easily reversed, to provide a steam turbine with a moderate speed, and provide a reversible turbine which is simple and effective. I accomplish these as well as minor objects by the construction now preferred by me and illustrated in the accompanying drawings in which

Figure 1 is a transverse section of my device, Fig. 2 is a partial section of a modification of my device, Fig. 3 is a fragmentary section of the casing and high pressure rotor of my device showing the radially disposed vanes in said casing as well as the disposition of the nozzles on the rotor, Fig. 4 is a fragmentary view of the low pressure and reverse rotor as well as the casing, Fig. 5 is a section through the nozzles of the high pressure rotor and casing, Fig. 6 is a transverse section through the nozzles of the low pressure rotor and casing showing the disposition of the reverse nozzles, Fig. 7 is a perspective view of one of the vanes of the high pressure rotor, Fig. 8 is a perspective view of one of the vanes of the low pressure rotor, Fig. 9 is a fragmentary view of the low pressure rotor showing several of the vanes in place, Fig. 10 is a fragmentary view of the high pressure rotor showing some of the blades in place. Fig. 11 is a fragmentary view showing the nozzles of the high pressure rotor, Fig. 12 is a perspective view of one of the casing blades of my device, Fig. 13 is a perspective view of the modification of the high pressure rotor blades, Fig. 14 is a section through the center of Fig. 13.

Similar reference numerals refer to similar parts of my device as illustrated in the accompanying drawings.

I have provided a casing 1 having a stuffing box 2 and bearings 3 secured thereto and adapted to journal, and a high pressure rotor 4 and a low pressure rotor 5 cast integral or rigidly secured to the high pressure rotor 4. The steam is admitted to said casing through the steam pipe 6 which communicates with the steam chest 7 and the hollow hub 8 of said rotors 4 and 5, being admitted to the interior of said high pressure rotor 4 when the engine is running in the "go ahead" direction and through the ports 9 thence through the high pressure nozzles 10 which act against the veins 11 which are secured to said casing 1 said veins 11 discharging into the double veins 12 which are secured to said rotors 4 and adapted to discharge the steam in both directions coinciding with the axis of rotation of said rotors and into the side veins 13 in said casing 1. The steam then passes through the receiver 14 and into the low pressure nozzles 15 which communicate with said receiver 14 by means of an annular steam chest 16. The steam after passing through said low pressure nozzles 15 strikes the straight veins 17 which are rigidly secured to said low pressure rotor 5 and which extend over the edges thereof to allow a free discharge toward the center of said casing and through the exhaust pipe 18. The aforesaid hollow hub 18 is provided with a piston valve 19 adapted to shut the steam off of said rotor 4 by closing the said ports 9 and by further closing said valve 19 toward the high pressure end of my device. The reverse ports 20 are opened thus admitting steam into said low pressure rotor 5 and thence through the reverse nozzles 21 and against the reverse veins 22 which are secured to said casing which will throw the steam back and against said side veins 17 which are secured to said low pressure rotor and by the disposition of the nozzles it is obvious that said rotor will be turned in the opposite direction. The piston valve 19 is operated by the rod 23 which is adjustably secured to the spider 24 by the nuts 25. The opposite end of said rod 23 is provided with a thrust block 26 adapted to receive the thrust pins 27 and lever 28 secured to the exterior of my device by the bracket 29.

I do not wish to be limited to the specific construction illustrated in the accompanying drawings as herein set forth, but wish to depart from such details as are within the scope of my patent. I have shown the blades as being dovetailed and adapted to be secured to the rotors 4 and 5 as well as the casing 1. It is obvious that the vanes may be fastened to the parts adjacent in numerous ways. In

Figs. 13 and 14 I have shown the nozzles 10 as being formed integral with said double vanes 12 which are made of cast material.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is;

1. In a turbine engine of the nature indicated, a casing, a high pressure rotor journaled therein and secured to a hollow hub supporting said rotor and adapted to receive steam in said hollow hub, high pressure nozzles provided in said rotor, vanes secured to said casing adapted to receive steam from said nozzles, double vanes discharging on either side and secured to said high pressure rotor and adapted to receive steam from said vanes secured to said casing.

2. In a turbine engine of the nature indicated, a casing, a high pressure rotor journaled therein and secured to a hollow hub supporting said rotor and adapted to receive steam in said hollow hub, means whereby the steam may be shut off of said high pressure rotor, high pressure nozzles provided in said rotor, vanes secured to said casing adapted to receive steam from said nozzles, double vanes secured to said high pressure rotor and adapted to receive steam from said vanes secured to said casing, side vanes adapted to receive steam from said double vanes.

3. In a turbine engine of the nature indicated, a casing, a high pressure rotor journaled therein and secured to a hollow hub supporting said rotor and adapted to receive steam in said hollow hub, means whereby the steam may be shut off of said high pressure rotor, high pressure nozzles provided in said rotor, vanes secured to said casing adapted to receive steam from said nozzles, double vanes secured to side high pressure rotor and adapted to receive steam from side vanes secured to said casing, side vanes adapted to receive steam from said double vanes, means whereby the steam from said side vanes may be delivered to low pressure nozzles.

4. In a turbine engine of the nature indicated, a casing, a high pressure rotor journaled therein and secured to a hollow hub supporting said rotor and adapted to receive steam in said hollow hub, means whereby the steam may be shut-off of said high pressure rotor, high pressure nozzles provided in said rotor, vanes secured to said casing adapted to receive steam from said nozzles, double vanes secured to said high pressure rotor and adapted to receive steam from said vanes secured to said casing, side vanes adapted to receive steam from said double vanes, means whereby the steam from said side vanes may be delivered to low pressure nozzles, straight vanes adapted to receive steam from said low pressure nozzles, and adapted to discharge said steam through an exhaust pipe.

5. In a turbine engine of the nature indicated, a suitable casing, bearings secured thereto, high pressure and low pressure rotors journaled in said bearings, means whereby steam may be admitted into the central portion of said rotors, a piston valve adapted to shut the steam off of said high pressure rotor and to open the steam into said low pressure rotor to reverse the direction of travel of said engine.

6. In a turbine engine of the nature indicated, a suitable casing, bearings secured thereto, high pressure and low pressure rotors journaled in said bearings, means whereby steam may be admitted into the central portion of said rotors, a piston valve adapted to open and close the steam in said high pressure rotor and to admit steam into said low pressure rotor, means provided on the exterior of said rotary engine to operate said piston valve to reverse the direction of travel of said engine.

7. In a rotary engine of the nature indicated, a high pressure rotor, double vanes secured thereto, nozzles provided therein, a casing, vanes provided therein to receive steam from said nozzles and to discharge steam into said double vanes.

8. In a rotary engine of the nature indicated, a high pressure rotor, double vanes secured thereto, nozzles provided therein, a casing, vanes provided therein to receive steam from said nozzles and to discharge steam into said double vanes, side vanes secured to said casing adapted to receive steam from said double vanes and to discharge said steam into low pressure nozzles.

9. In a rotary engine of the nature indicated, a high pressure rotor, double vanes secured thereto, nozzles provided therein, a casing, vanes provided therein to receive steam from said nozzles and to discharge steam into said double vanes, side vanes secured to said casing adapted to receive steam from said double vanes and to discharge said steam into low pressure nozzles, a low pressure rotor rigidly secured to said high pressure rotor, straight vanes secured to said rotor adapted to receive steam from said low pressure nozzles, means whereby said steam may be exhausted from said engine.

10. In a rotary engine of the nature indicated, a high pressure rotor, double vanes secured thereto, nozzles provided therein, a casing, vanes provided therein to receive steam from said nozzles and to discharge steam into said double vanes, side vanes secured to said casing adapted to receive steam from said double vanes and to discharge said steam into low pressure nozzles, a low pressure rotor rigidly secured to said high pressure rotor, reverse nozzles provided in said low pressure rotor, reverse vanes provided in said casing adapted to receive steam from said reverse nozzles,

straight vanes secured to said low pressure rotor adapted to receive steam from said reverse vanes to change the direction of rotation of said engine.

11. In a rotary engine of the nature indicated, a high pressure rotor, double vanes secured thereto, nozzles provided therein, a casing, vanes provided therein to receive steam from said nozzles and to discharge steam into said double vanes, side vanes secured to said casing adapted to receive steam from said double vanes and to discharge said steam into low pressure nozzles, a low pressure rotor rigidly secured to said high pressure rotor, reverse nozzles provided in said low pressure rotor, reverse vanes provided in said casing adapted to receive steam from said reverse nozzles, means whereby the steam may be shut off of said reverse nozzles and said high pressure nozzles.

12. In a turbine engine of the nature indicated, a casing provided with vanes and rotors adapted to revolve in said casing, nozzles provided in said rotor adapted to direct steam against said vanes, side vanes adapted to receive steam from said vanes, means whereby steam from said side vanes may be directed against straight vanes provided in a reversible rotor, means whereby said steam may be exhausted substantially as set forth.

13. In a turbine engine of the nature indicated, a casing provided with vanes and rotors adapted to revolve in said casing, nozzles provided in said rotor adapted to direct steam against said vanes, side vanes adapted to receive steam from said vanes, means whereby steam from said side vanes may be directed against straight vanes provided in a reversible rotor.

14. In a rotary engine of the nature indicated, a high pressure rotor, double vanes secured thereto, nozzles provided therein, a casing, vanes provided therein to receive steam from said nozzles and to discharge steam into said double vanes, side vanes secured to said casing adapted to receive steam from said double vanes and to discharge steam into low pressure nozzles, a low pressure rotor rigidly secured to said high pressure rotor, reverse nozzles provided in said low pressure rotor, and reverse vanes provided in said casing adapted to receive steam from said reverse nozzles.

15. In a rotary engine of the nature indicated, a high pressure rotor, double vanes secured thereto, nozzles provided therein, a casing, vanes provided therein to receive steam from said nozzles and to discharge steam into said double vanes, side vanes secured to said casing adapted to receive steam from said double vanes and to discharge said steam into low pressure nozzles, a low pressure rotor rigidly secured to said high pressure rotor, and straight vanes secured to said rotor adapted to receive steam from said low pressure nozzles.

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

HARRY PIERCE.

Witnesses:
CHAS. MEYER,
PAUL A. TALBOT.