No. 823,526. PATENTED JUNE 19, 1906.

L. HACHENBERG.

TURBINE ENGINE.

APPLICATION FILED SEPT. 9, 1905.

3 SHEETS—SHEET 1.

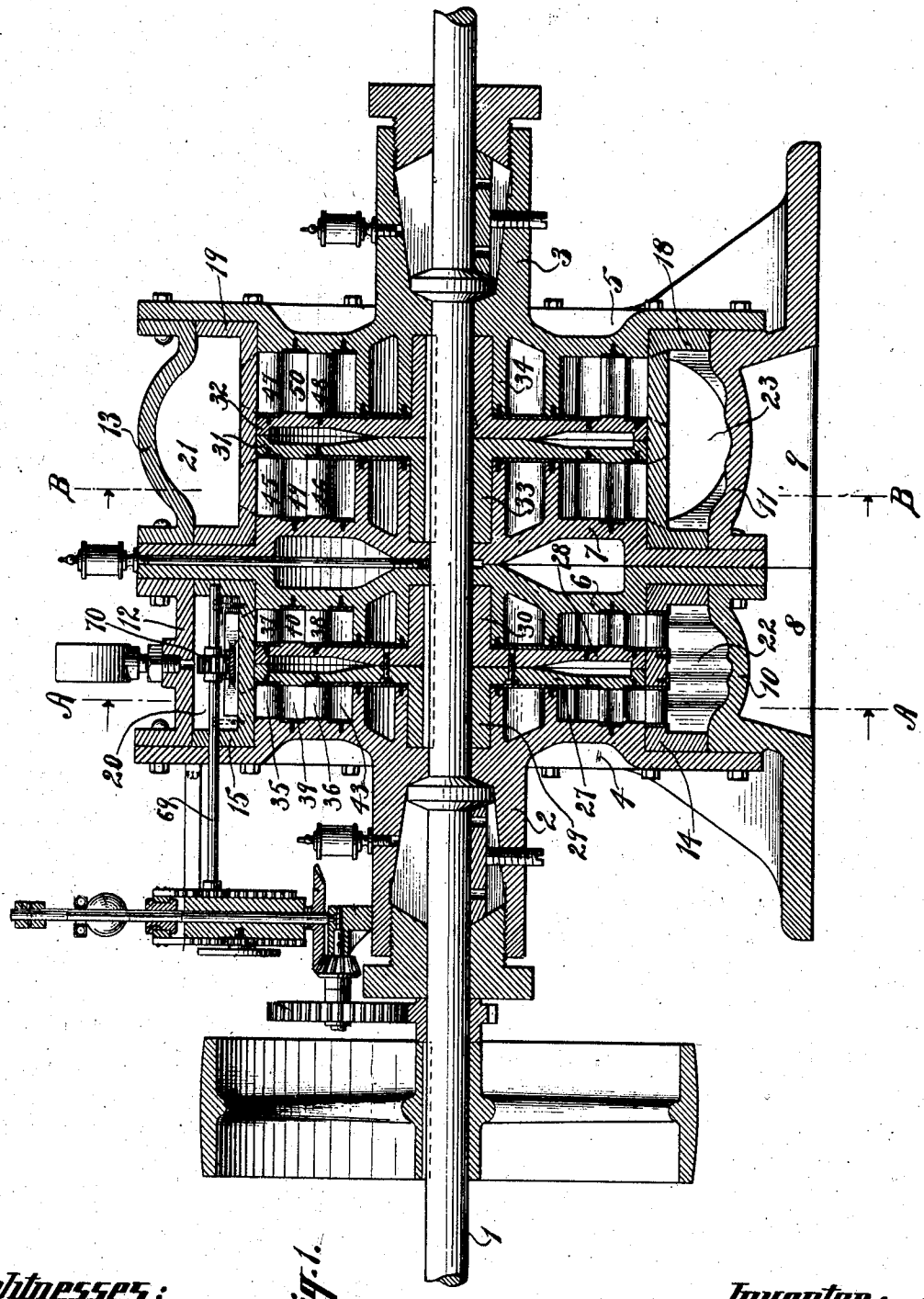

Fig. 1.

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3 SHEETS—SHEET 2.

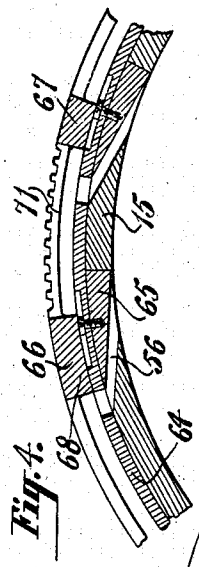

Fig. 4.

Fig. 2.

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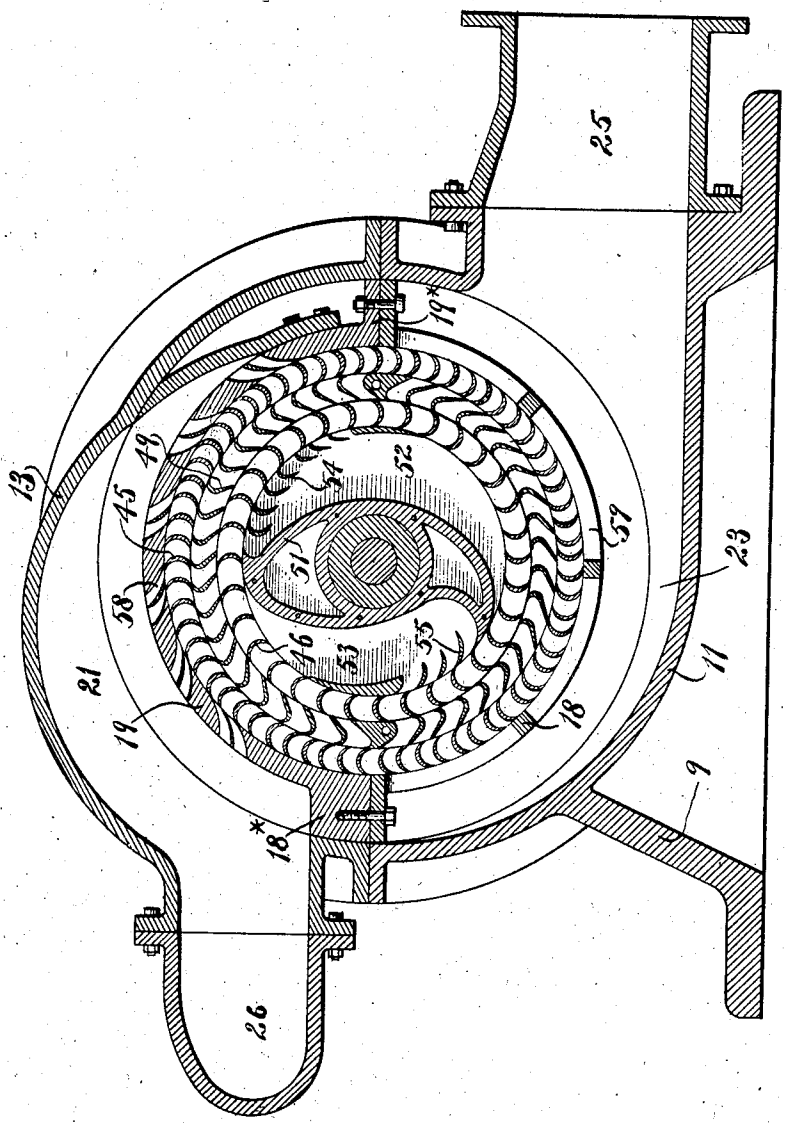
3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

LOUIS HACHENBERG, OF NEW YORK, N. Y.

TURBINE-ENGINE.

No. 823,526. Specification of Letters Patent. Patented June 19, 1906.

Application filed September 9, 1905. Serial No. 277,715.

To all whom it may concern:

Be it known that I, LOUIS HACHENBERG, a citizen of the United States, and a resident of the borough of Bronx, in the city and State of New York, have invented a new and useful Turbine-Engine, of which the following is a specification.

The object of this invention is to provide a turbine-engine which has embodied therein certain improvements in the construction, form, and arrangement of the several parts, whereby the motive fluid may be directed in the most economical manner through the engine.

A further object is to provide certain improvements in that type of engine which is shown, described, and claimed in my Patents Nos. 801,585 and 801,586, dated October 10, 1905.

In the accompanying drawings, Figure 1 represents the engine in longitudinal central section. Fig. 2 is a transverse section taken in the plane of the line A A of Fig. 1 looking in the direction of the arrows. Fig. 3 is a transverse section taken in the plane of the line B B of Fig. 1 looking in the direction of the arrows; and Fig. 4 is a detail view, on an enlarged scale, showing the construction of the inlet-valve and its adjacent parts.

The engine-shaft 1 extends through central lugs 2 and 3 of the outer cylinder-heads 4 and 5. The inner cylinder-head is herein shown as comprising two plates 6 and 7, portions of the same being cored out to obtain lightness of construction.

The engine-base is herein shown as comprising two sections 8 and 9, which sections are formed integral with the lower half-sections 10 and 11 of the outer cylinder-rings, the upper half-sections of which rings are denoted, respectively, by 12 and 13. The outer ring 11 13 is shown of greater width than the outer ring 10 12 for compensating for the expansion of the motive fluid after it passes through the first piston, as will hereinafter appear.

An inner piston-ring is located between the outer cylinder-head 4 and the plate 6 of the inner cylinder-head, which ring comprises two half-sections 14 15. The space between the inner ring 14 15 and the outer ring 10 12 is divided into two chambers by partitions 16 17, formed by flanges on the said inner-ring sections.

An inner piston-ring is located in the space between the cylinder-head 5 and the plate 7 of the inner cylinder-head, which ring comprises two half-sections 18 19. The space between the inner ring 18 19 and the outer ring 11 13 is divided into two chambers by partition-flanges 18* 19*, similarly to the space between the inner ring 14 15 and the outer ring 10 12.

The upper chambers between the inner and outer rings serve as a primary inlet-chamber 20 and a secondary inlet-chamber 21, while the lower chambers between these rings serve as a primary exhaust-chamber 22 and a secondary exhaust-chamber 23. A suitable valve-inlet 24 is provided for the primary inlet-chamber 20, and a suitable outlet 25 is provided for the secondary exhaust-chamber 23. The primary exhaust-chamber 22 is in open communication with the secondary inlet-chamber 21 through a passage 26 by means of a pipe-coupling on the exterior of the outer rings. The space within the inner ring 14 15 is divided into a pair of piston-chambers by means of a piston fixed to the shaft 1, which piston is shown as comprising two disks 27 28, secured together and having flanges 29 30 keyed to the shaft 1. The space within the inner ring 18 19 is also divided into a pair of piston-chambers by a piston comprising two disks 31 32, secured together and having flanges 33 34 keyed to the shaft 1.

The piston in the space within the inner ring 14 15, which I designate the "primary" piston, is provided with annular series of piston-wings, leaving ports of the desired area between the wings. In the present instance I have shown the primary piston as being provided with two annular series of piston-wings 35 36, projecting from the disk 27, and two annular series 37 38, projecting from the disk 28. An annular series of stationary wings 39, carried by the cylinder-head 4, are located between the annular series of piston-wings 35 36, and an annular series of stationary wings 40, projecting from the plates 6 of the inner cylinder-head, are interposed between the series of piston-wings 37 38. These wings are arranged oppositely to the piston-wings. A partition extends across the space between the inner annular series of piston-wings 36 for dividing the space into two chambers 41 42. The lower part of the chamber 42 and the upper part of the chamber 41 are open, while the upper part of the chamber 42 and the lower part of the chamber 41 are provided with several wings 43 44, respectively, for giving direction to the motive fluid for causing it

to pass freely in a direct path through the chambers from the ports between the wings 36 at the upper side of the engine to the ports between the wings 36 at the lower side of the engine. The sides of these chambers 41 42 flare laterally toward the shaft 1, so as to give a greater area to the chambers 41 42. It is to be understood that the central space of the other side of the primary piston is similarly divided to that hereinbefore described.

The piston located within the space formed by the inner ring 18 19, which I call the "secondary" piston, is provided with oppositely-arranged annular series of piston-wings. In the present instance I have shown two annular series of piston-wings 45 46, projecting from the disk 31, and two annular series of piston-wings 47 48, projecting from the disk 32. Annular series of stationary wings 49 50 project from the inner and outer cylinder-heads and are interposed between the annular series of piston-wings 45 46 and 47 48, respectively, which wings are arranged in the opposite direction to the piston-wings. The central space formed inside the annular series of piston-wings 46 is divided by a partition 51 into two central piston-chambers 52 53. The upper part of the chamber 52 and the lower part of the chamber 53 are left open, and the lower part of the chamber 52 and upper part of the chamber 53 are provided with several wings 54 55, respectively, for giving direction to the motive fluid. It is to be understood that the central space formed by the inner annular series of piston-wings 48 is divided similarly to the space within the annular series of piston-wings 46, as just above described.

The motive fluid is fed from the primary inlet-chamber 20 into engagement with the outer annular series of piston-wings 35 37 through a number of diagonal ports 56 in the upper section 15 of the inner ring 14 15. The lower section 14 of this inner ring is provided with a series of wings 57, arranged to direct the motive fluid from the lower half of the annular series of piston-wings 35 37 into the primary exhaust-chamber 22. From thence the motive fluid passes through the passage 26 into the secondary inlet-chamber 21. The motive fluid passes from this secondary inlet-chamber 21 into engagement with the outer annular series of piston-wings 45 47 through diagonal ports 58 in the upper section 19 of the inner ring 18 19. The lower section 18 of the said ring is provided with a plurality of openings 59, arranged to permit the motive fluid to escape from the lower half of the piston-wings 45 47 into the secondary exhaust-chamber 23, from whence the motive fluid passes out through the exhaust-outlet 25. The sides of these piston-chambers are flared toward the shaft, so as to give increased area to these chambers 52 53.

An auxiliary exhaust-port 60 leads from the primary exhaust-port 22 into the main exhaust-outlet 25, which port is provided with a valve 61, arranged to open and close the same, as may be desired. A by-pass 62 leads from the valved inlet 24 to the exhaust-outlet 25, which by-pass is provided with a cock 63 for opening and closing the same.

The manner in which the ports 56 are formed in the upper section 15 of the inner ring 14 15 is as follows: A band 64 is located on the periphery of the section 15, which band has secured thereto inwardly-extended wedge-shaped blocks 65, the inclined surface of each block forming one wall of the port 56, the ring being cut away to permit the insertion of the block into the same.

The inlet-valve is constructed and operated as follows: This inlet-valve 66 is arranged to slide longitudinally and is curved to fit the periphery of the section 15 of the inner ring. This valve is provided with a plurality of alternating long and short cut-offs 67 68, so arranged that when the valve is at the limit of its movement in one direction all of the ports 56 will be open and when moved toward the limit of its movement in the other direction every alternate port will be closed, and finally all of the ports will be closed. The means which I have shown for operating this valve comprises a shaft 69, which extends into the primary inlet-chamber 20 and is there provided with a pinion 70, which meshes with a rack 71 on the valve. In the accompanying drawings I have shown a governor controlled by the speed of the engine-shaft for operating the valve 66, so that as the speed of the engine-shaft increases the inlet-valve 66 will be moved in a direction to gradually close the ports 56, and thus prevent the shaft from racing.

By the construction of the cylinders and pistons as herein set forth I am enabled to produce an engine in which the pressures are counterbalanced in the different piston-chambers and at the same time provide a structure in which the motive fluid after it has been directed inwardly from the periphery to the center of the piston-chamber will be directed outwardly from the center to the periphery again without causing the motive fluid to be turned from its natural direction and without unduly confining the motive fluid. Furthermore, by providing the piston with oppositely-arranged annular series of wings and causing the piston to divide each cylinder into separate piston-chambers the advisable result of balancing the pressures is obtained by a very simple arrangement.

What I claim is—

1. In a turbine-engine, a rotary shaft, a cylinder, a piston fixed to the shaft, alternating annular series of stationary and piston wings, a partition dividing the central space within the inner annular series of wings into two separate chambers and means

for directing the motive fluid from the periphery to the center and from thence outwardly to the periphery in engagement with the stationary and piston wings.

2. In a turbine-engine, a rotary shaft, a cylinder, a piston fixed to the shaft for dividing the cylinder into two piston-chambers, annular series of stationary and piston wings in each piston-chamber, a partition in each piston-chamber dividing the space within the inner annular series of wings into two chambers and means for simultaneously directing the motive fluid from the periphery through both of the piston-chambers to the center and from thence outwardly to the periphery in engagement with the stationary and piston wings.

3. In a turbine-engine, a cylinder having heads, inner and outer rings and partitions dividing the interior into inlet, exhaust and piston chambers, a shaft, a piston fixed thereto, annular series of stationary and piston wings and a partition dividing the central piston-space into two chambers.

4. In a turbine-engine, a cylinder having heads, inner and outer rings and partitions dividing the chambers into inlet, exhaust and piston chambers, a rotary shaft, a disk piston fixed thereto, annular series of piston-wings projecting from opposite sides of the piston, annular series of stationary wings arranged to coact with the piston-wings and a partition for dividing each of the central piston-spaces into two separate chambers.

5. In a turbine-engine, a rotary shaft, a cylinder, a piston fixed to the shaft, alternating annular series of stationary and piston wings, a laterally-enlarged central piston-space and a partition for dividing the space into two separate chambers.

6. In a turbine-engine, a rotary shaft, a cylinder, a piston fixed to the shaft, alternating annular series of stationary and piston wings, a partition dividing the central space within the inner annular series of wings into two chambers, each chamber being open at one end and provided with wings for giving direction to the motive fluid at the other end.

7. In a turbine-engine, a rotary shaft, a cylinder, a piston fixed to the shaft, alternating annular series of stationary and piston wings, a partition dividing the central space within the inner annular series of wings into two chambers, one of said chambers being provided with wings for directing the motive fluid into the same and the other chamber being provided with wings for directing the motive fluid out of the same.

8. In a turbine-engine, a rotary shaft, a cylinder, a piston fixed to the shaft, alternating annular series of stationary and piston wings, a partition dividing the central space within the inner annular series of wings into two separate chambers, one of said chambers being provided with wings at one end for directing the motive fluid into the same and having its other end open for permitting the escape of the fluid and the other of said chambers having an open end for receiving the motive fluid from the annular series of wings at one point and provided with wings at its other end for directing the motive fluid from the chamber into engagement with the annular series of wings at another point.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 5th day of September, 1905.

LOUIS HACHENBERG.

Witnesses:
FREDK. HAYNES.
HENRY THIEME.