

No. 678,811.

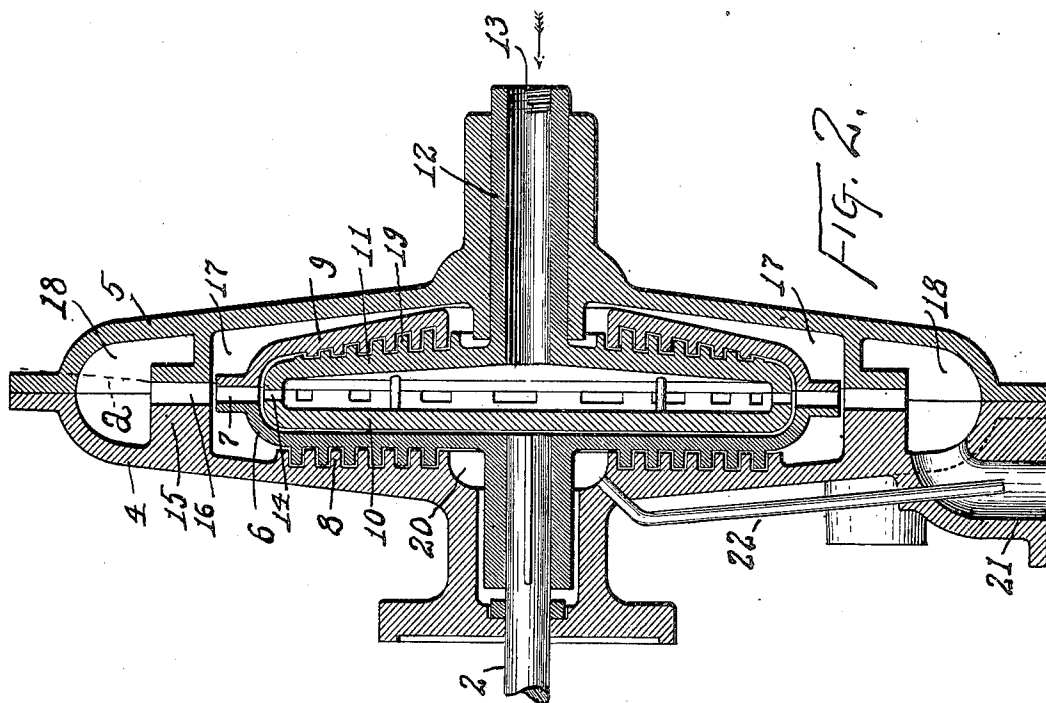
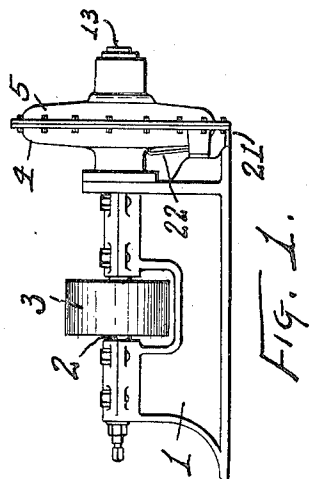
Patented July 16, 1901.

T. J. OBENCHAIN.
STEAM TURBINE.

(Application filed July 9, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:
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M. S. Belden.

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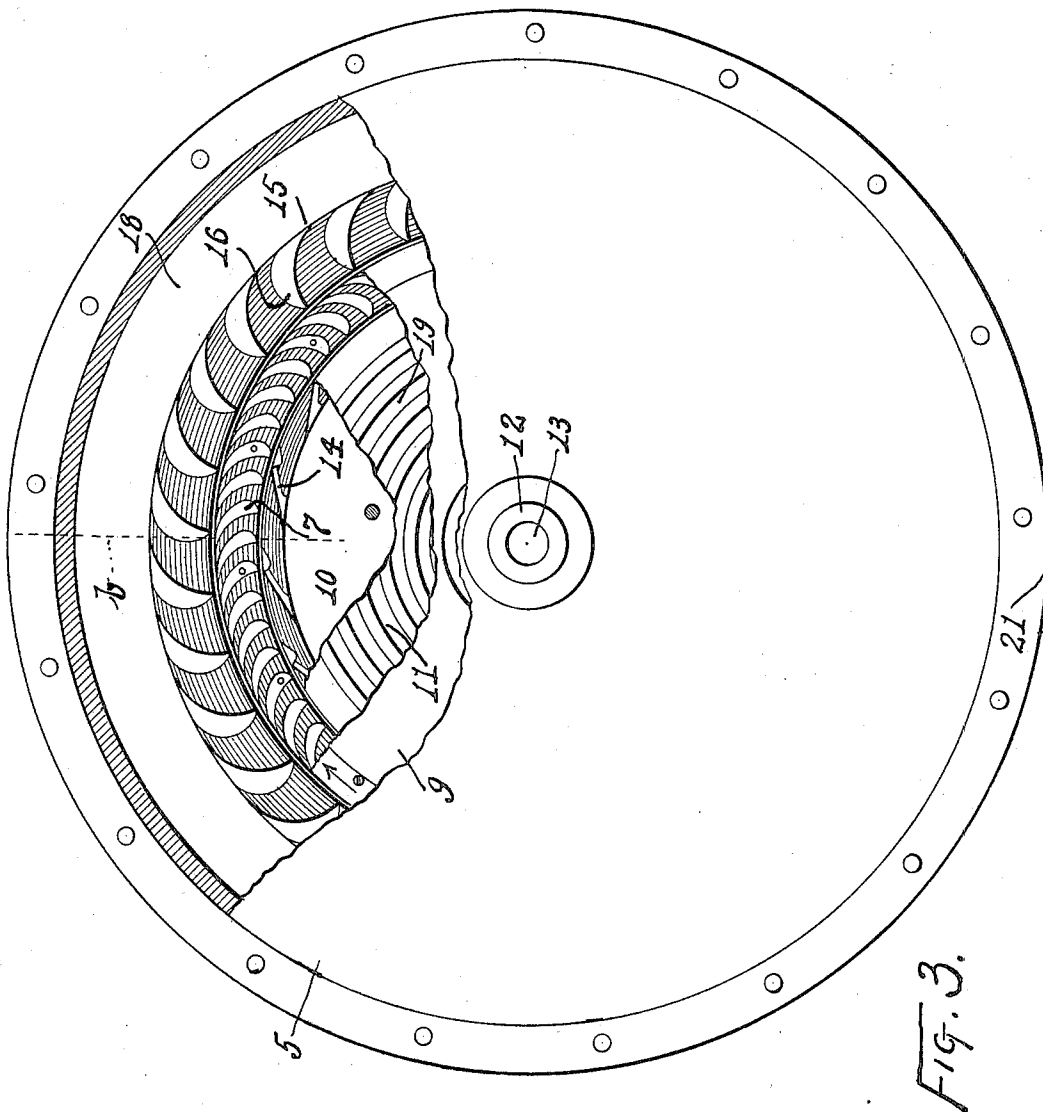


FIG. 3.

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UNITED STATES PATENT OFFICE.

THOMAS J. OBENCHAIN, OF LOUISVILLE, KENTUCKY.

STEAM-TURBINE.

SPECIFICATION forming part of Letters Patent No. 678,811, dated July 16, 1901.

Application filed July 9, 1900. Serial No. 22,947. (No model.)

To all whom it may concern:

Be it known that I, THOMAS J. OBENCHAIN, a citizen of the United States, residing at Louisville, Jefferson county, Kentucky, (post-office address No. 1110 Hepburn avenue, Louisville, Kentucky,) have invented certain new and useful Improvements in Steam-Turbines, of which the following is a specification.

This invention, pertaining to improvements in steam-turbines, will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of a steam-turbine exemplifying my invention; Fig. 2, a vertical diametrical section of the same in the plane of line *b* of Fig. 3; and Fig. 3, a face view of the machine as viewed from the right of Figs. 1 and 2, a portion of the outer casing appearing in vertical section in the plane of line *a* of Fig. 2 and portions of the inner structure being broken away for clearer exposition of parts.

In the drawings, 1 indicates a housing which is merely of exemplifying character, intended to illustrate a form of housing suitable for the turbine when mounted for rotation upon a horizontal axis; 2, the shaft, mounted in suitable boxes in the housing; 3, a pulley on the shaft to serve as a means for transmitting power by belt from the turbine; 4, the rear portion of a disk-like casing, disposed concentric with the shaft and bolted or otherwise rigidly attached to the housing; 5, the front portion of the casing, the two casing portions 4 and 5 forming an inclosing disk-like case for the wheel, the two casing portions being secured together, as by flanges and bolts, so as to permit the casing to be readily opened; 6, the wheel or rotary part of the general turbine system, the same being in the form of a hollow disk disposed within the casing and rigidly secured to the shaft; 7, a circumferential series of curved ports extending through the periphery of wheel 6; 8, a series of intermembering annular tongues and grooves formed upon the rear surface of wheel 6 and upon the front surface of casing part 4, these tongues and grooves running in close contiguity without contact; 9, the front wall of wheel 6, the same being open at its center; 10, the steam-chest, the same being

a hollow disk-like structure concentrically and fixedly disposed within the wheel 6, the periphery of the steam-chest coming near to, but not touching, the inner periphery of the wheel; 11, the front wall of the steam-chest; 12, a hollow hub projecting from the front wall of the steam-chest and supported fixedly in a hub on the outer portion 5 of the casing; 13, the live-steam inlet leading through hub 12 and into the interior of the steam-chest; 14, a circumferential series of ports leading diagonally through the periphery of the steam-chest; 15, an annular partition formed within the casing and closely surrounding, but not touching, the periphery of the wheel; 16, a circumferential series of ports through the annular partition 15; 17, the chamber within the casing exterior to the wheel, but interior to annular partition 15; 18, the exhaust-chamber within the casing exterior to partition 15; 19, a series of annular intermembering tongues and grooves upon the front face of the steam-chest and the rear face of the front wall 9 of the wheel, these tongues and grooves being similar to those at the rear face of the wheel; 20, a chamber within the casing around the hub of the wheel and within the series of tongues and grooves 8; 21, the exhaust-outlet of the engine, the same leading from annular chamber 18, and 22 a drain-pipe placing chamber 20 in communication with the exhaust-outlet.

The hollow steam-chest might, of course, be cast in one piece and have its peripheral ports formed by coring or cutting; but the preferable construction is to form the walls 10 and 11 separate and then secure them together, as by means of the stay-bolts illustrated, such construction permitting the more convenient casting or cutting of the ports in the periphery of the chest, the ports being rather small and uniformity and accuracy being somewhat desirable. The wheel 6 must necessarily have its front wall 9 removable in order to permit the wheel to be assembled over the steam-chest, and the forming of the front and rear walls of the wheel separately permits of the convenient formation of the ports in the periphery of the wheel by casting or cutting, the two walls of the wheel being united by suitable joint-screws. The case is necessarily formed with its two walls

separate to permit its being assembled on the wheel, and the joint of separation between the two walls may pass down through the ports 16, preferably at one side of the ports, thus permitting the convenient formation of these ports by casting or cutting.

The ports 14 in the steam-chest are tangential to a circle struck from the axis of the steam-chest, and the faces of the buckets forming the walls of the ports 7 in the wheel are so disposed relative to the steam-chest ports 14 that the steam in jetting from the latter strikes the faces of the buckets at substantially right angles to the jets. The buckets of the wheel are so curved upon their front and rear faces that the ports formed between the buckets lead rearwardly and form discharges in a direction against that in which the buckets move as the wheel rotates, each port in the wheel therefore providing a tangential rearward jet from the periphery of the wheel. The walls which form between them the ports 16 in annular partition 15 of the casing constitute stationary buckets, and their forward faces are so curved that the steam jetting rearwardly and outwardly from ports 7 of the wheel will strike them substantially at right angles.

Steam is supplied to the turbine through inlet 13, which inlet may be under the control of any ordinary or suitable throttling-governor. The entering steam passes under pressure to the interior of the steam-chest and passes outwardly therefrom in many jets through ports 14. These numerous jets impinge against the buckets of the wheel and cause its rotation. The wheel-buckets forming the walls of the wheel-ports 7 are so proportioned in thickness that the ports lessen in area toward their outer ends, thus restricting the free expansion of the steam after it has impinged upon the wheel-buckets. Steam passing from the wheel-buckets impinges against the fixed buckets of annular partition 15, and the reaction of these jets tends to enhance the effect of the steam upon the wheel. The steam passes outwardly through ports 16 and reaches annular exhaust-chamber 18, whence it passes freely to exhaust-outlet 21. Intermembering tongues and grooves 19 serve as a practically frictionless water packing by condensation of the steam in the small and tortuous spaces and prevent undue outflow of steam inwardly along the outer side of the steam-chest, and thence to the outside of the wheel. Tongues and grooves 8 similarly serve in preventing undue leakage of steam inwardly along the rear face of the wheel. What leakage does occur past tongues and grooves 8 will find its way to chamber 20, and thence be drained by pipe 22 to the exhaust.

While the construction has been illustrated in connection with a wheel arranged for rotation upon a horizontal axis, it is obvious that the construction is adapted also for a vertical disposition of the axis, and it will be

readily understood by the skilled constructor that many of the merely structural forms may be subject to many variations without departure from the spirit of the invention.

I claim as my invention—

1. In a steam-turbine, the combination, substantially as set forth, of a stationary disk-like steam-chest within the rotary wheel provided with an inlet for steam and having at its periphery a circumferential series of inclined outlet-ports, a wheel inclosing the steam-chest and supported wholly from one side of the casing, and mounted for rotation concentric to said steam-chest and having in its periphery a circumferential series of buckets with their inner ends adapted to pass close to but free from the periphery of the steam-chest at the outlet-ports therein, and a casing inclosing said steam-chest and wheel and having an exhaust-outlet.

2. In a steam-turbine, the combination, substantially as set forth, of a stationary disk-like steam-chest within the rotary wheel provided with an inlet for steam and having at its periphery a circumferential series of inclined outlet-ports, a wheel inclosing the steam-chest and supported wholly from one side of the casing, and mounted for rotation concentric to said steam-chest and having in its periphery a circumferential series of buckets with their inner ends adapted to pass close to but free from the periphery of the steam-chest at the outlet-ports therein, the faces of said buckets being so disposed that steam jetting from the outlet-ports of the steam-chest will strike the bucket-surfaces at substantially right angles to the jets, and a casing inclosing said wheel and steam-chest and having an exhaust-outlet.

3. In a steam-turbine, the combination, substantially as set forth, of a stationary disk-like steam-chest within the rotary wheel provided with an inlet for steam and having at its periphery a circumferential series of inclined outlet-ports, a wheel inclosing the steam-chest and supported wholly from one side of the casing and mounted for rotation concentric to said steam-chest and having in its periphery a circumferential series of buckets with their inner ends adapted to pass close to but free from the periphery of the steam-chest at the outlet-ports therein, said wheel-buckets being so formed that the ports between them taper from their inner to their outer ends, and a casing inclosing said wheel and steam-chest and provided with an exhaust-outlet.

4. In a steam-turbine, the combination, substantially as set forth, of a stationary disk-like steam-chest within the rotary wheel provided at the center of one of its side walls with an inlet for steam and having in its periphery a circumferential series of inclined outlet-ports, a wheel mounted for rotation concentrically at one side of said steam-chest and having a wall near the other side of the steam-chest wholly supported by the wheel at one

side of the casing, the two walls of the wheel joining at the periphery of the wheel around the steam-chest and being there provided with a circumferential series of buckets, and a casing inclosing said wheel and steam-chest and having an exhaust-outlet.

5. In a steam-turbine, the combination, substantially as set forth, of a stationary disk-like steam-chest within the rotary wheel provided at the center of one of its side walls with an inlet for steam and having in its periphery a circumferential series of inclined outlet-ports, a wheel mounted for rotation concentrically at one side of said steam-chest and having a wall near the other side of the steam-chest wholly supported by the wheel at one side of the casing, the two walls of the wheel joining at the periphery of the wheel around the steam-chest and being there provided with a circumferential series of buckets, a casing inclosing said wheel and steam-chest and having an exhaust-outlet, and a series of intermembering tongues and grooves disposed upon one face of the wheel and the contiguous face of the casing.

6. In a steam-turbine, the combination, substantially as set forth, of a disk-like steam-chest provided at the center of one of its side walls with an inlet for steam and having in its periphery a circumferential series of inclined outlet-ports, a wheel mounted for rotation concentrically at one side of said steam-chest and having a wall near the other side of the steam-chest, the two walls of the wheel joining at the periphery of the wheel around the steam-chest and being there provided with a circumferential series of buckets, a casing inclosing said wheel and steam-chest and having an exhaust-outlet, and intermembering tongues and grooves disposed concentrically upon one wall of said steam-chest and the inner surface of the contiguous wall of the wheel.

7. In a steam-turbine, the combination, substantially as set forth, of a disk-like casing provided with a central hub and with an exhaust-outlet, a wheel inclosing the steam-chest and supported wholly from one side of the casing, and mounted for rotation in said casing concentric to said hub and having at its periphery a circumferential series of buckets, a stationary disk-like steam-chest disposed concentrically within said wheel and having in its periphery a circumferential series of diagonal outlet-ports adapted to discharge against said buckets, and a hollow hub projecting from said steam-chest through said casing-hub and adapted to serve as a support for the steam-chest and as an inlet for steam.

8. In a steam-turbine, the combination, substantially as set forth, of a disk-like casing having an exhaust-outlet, a hollow wheel mounted for rotation therein and having in

its periphery a circumferential series of buckets, a steam-chest disposed concentrically within the wheel and having a steam-inlet and being provided at its periphery with a circumferential series of inclined outlet-ports, a series of intermembering annular tongues and grooves upon a wall of the wheel and the contiguous wall of the casing, and a conduit leading from a space radially within the innermost ones of said tongues and grooves to the exhaust-outlet of the casing.

9. In a steam-turbine, the combination, substantially as set forth, of a disk-like casing having an exhaust-outlet, a shaft projecting into said casing through one side thereof, a disk-like wheel inclosing the steam-chest and supported wholly from one side of the casing, and mounted upon said shaft within the casing and having at its periphery a circumferential series of buckets, a stationary disk-like steam-chest disposed concentrically within said wheel and having at its periphery a circumferential series of inclined outlet-ports, and a hollow hub projecting from said steam-chest through the wall of said casing opposite said shaft.

10. In a steam-turbine, the combination, substantially as set forth, of a disk-like casing having an exhaust-outlet, an annular partition disposed within said casing and provided through it with a circumferential series of ports, a hollow wheel inclosing the steam-chest and supported wholly from one side of the casing, and mounted for rotation concentrically within said casing with its periphery near but free of contact with the inner surface of said partition and having in its periphery a circumferential series of ports adapted to discharge diagonally against the buckets formed between said partition-ports, and a stationary disk-like steam-chest within the interior of said wheel.

11. In a steam-turbine, the combination, substantially as set forth, of a stationary disk-like steam-chest within the rotary wheel provided with an inlet for steam and having in its periphery a circumferential series of inclined outlet-ports, a wheel inclosing the steam-chest and supported wholly from one side of the casing, and mounted for rotation concentric to said steam-chest and having at its periphery a series of buckets adapted to be impinged upon by jets from said steam-chest ports, a casing inclosing said wheel and steam-chest and having an exhaust-outlet, and an annular partition disposed within said casing around said wheel and having a circumferential series of buckets adapted to be impinged upon by steam flowing from the ports formed between said wheel-buckets.

THOMAS J. OBENCHAIN.

Witnesses:

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