(No Model.) 2 Sheets—Sheet 1.

J. T. OBENCHAIN.

TURBINE.

No. 379,718. Patented Mar. 20, 1888.

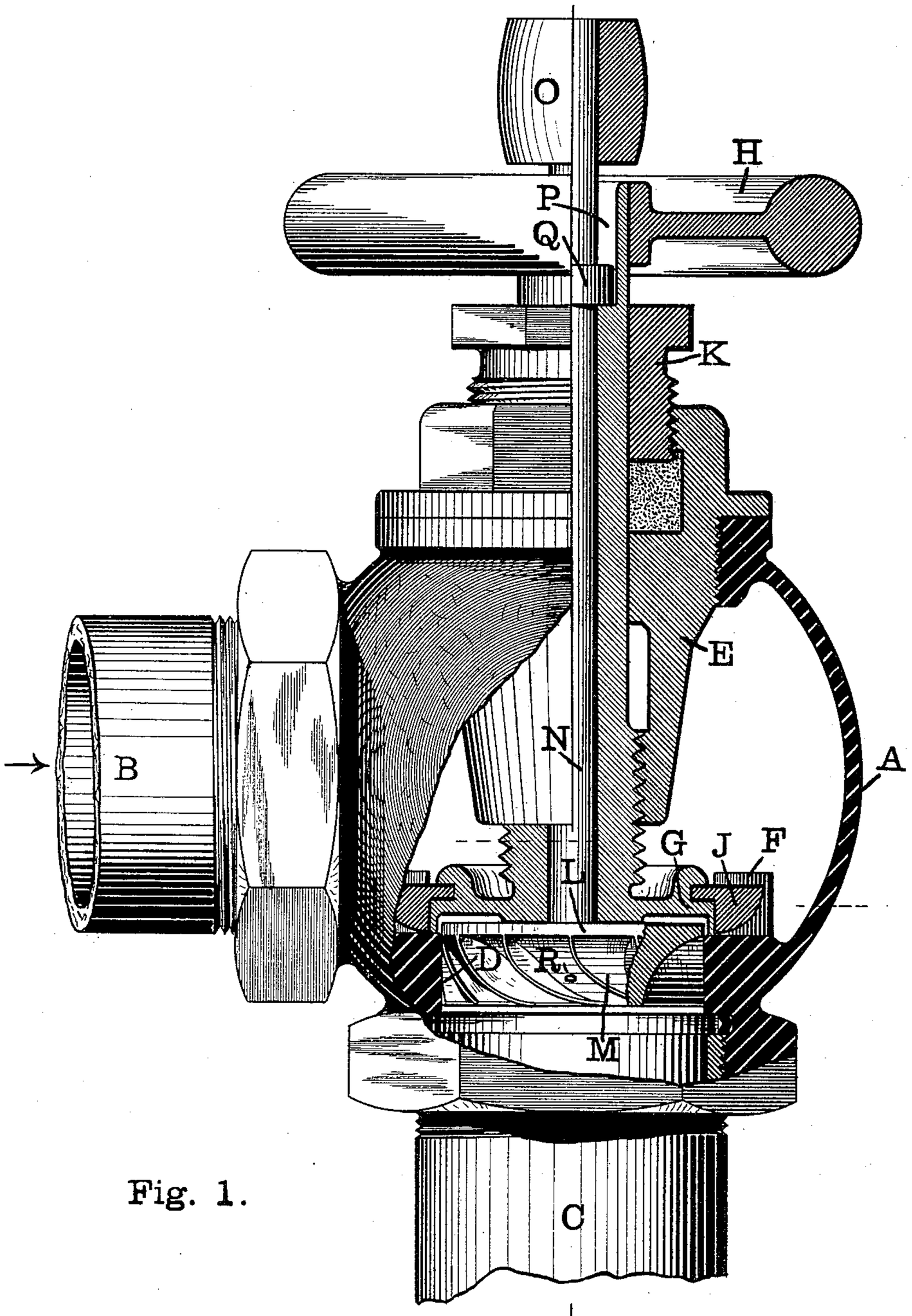

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

J. T. OBENCHAIN.

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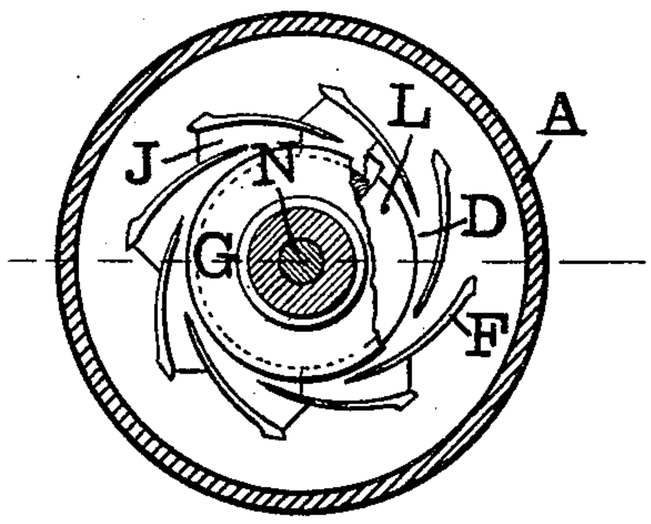

Fig. 2.

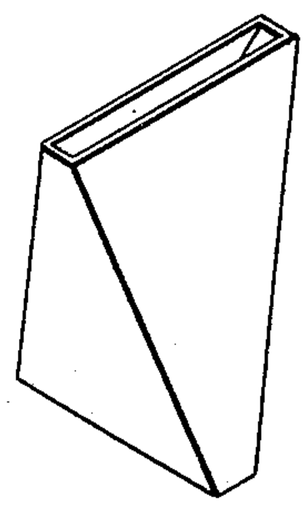

Fig. 3.

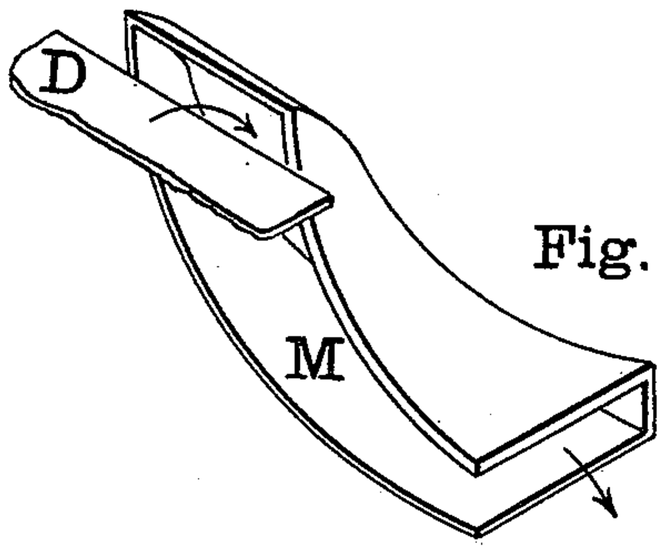

Fig. 4.

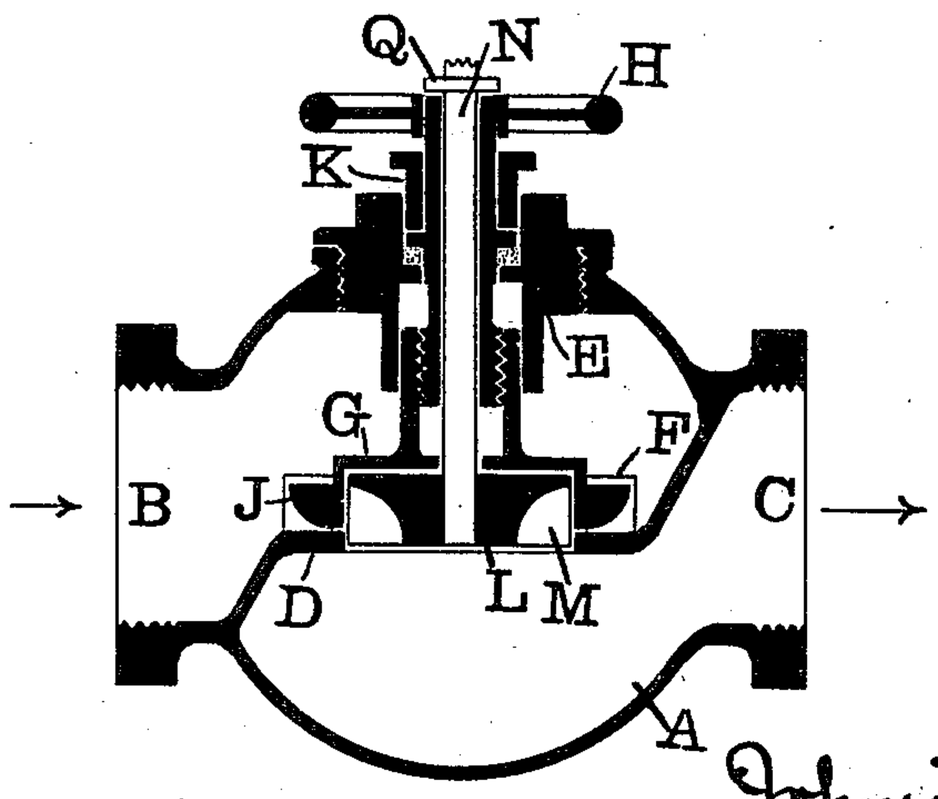

Fig. 5.

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UNITED STATES PATENT OFFICE.

JOHN T. OBENCHAIN, OF LOGANSPORT, INDIANA.

TURBINE.

SPECIFICATION forming part of Letters Patent No. 379,718, dated March 20, 1888.

Application filed June 23, 1887. Serial No. 242,240. (No model.)

To all whom it may concern:

Be it known that I, JOHN T. OBENCHAIN, of Logansport, Cass county, Indiana, have invented certain new and useful Improvements in Turbines, of which the following is a specification.

This invention pertains to turbine water-wheels, whether vertical or horizontal, and relates particularly to a structure devised for employment in connection with the water-supply system of cities where the water is used under heavy pressure—say between fifty and two hundred pounds per square inch.

My improved turbine is arranged within a casing fitted for screwed connection with the inlet and outlet pipes arranged relative to each other either in a direct line or at right angles to each other.

My improvements will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is an elevation, part section, of a turbine illustrating my improvements, the inlet and outlet pipes being shown as arranged at right angles to each other; Fig. 2, a horizontal section of the casing, showing the chutes, &c., in plan; Fig. 3, a perspective view of a tube intended as a mere illustration of a principle recognized in the formation of the wheel-buckets; Fig. 4, a perspective view serving to illustrate the principles involved in the functional design of the wheel-buckets, and Fig. 5 a vertical section of one of my improved turbines arranged in a casing for its inlet and outlet to be arranged in a right line.

In the drawings, (confining attention for the present exclusively to Figs. 1 and 2,) A represents a spherical casing of sufficient strength to withstand any pressure of water contemplated as being used in connection with a turbine; B, the inlet-connection thereto; C, the outlet-connection therefrom; D, a bored wheel-seat in the casing, faced upon its bored edge to form a valve-seat, the wheel-seat forming a part of the water-way in the casing between the outlet and inlet connection; E, a nose screwed into the casing, its axis being in line with the axis of the wheel-seat; F, chute-wings projecting upward from around the valve-seat, these chutes being arranged, as indicated in Fig. 2, to direct the water tangentially inward to the wheel-seat, the inner edges of the chutes reaching to near the periphery of the wheel-seat, but leaving sufficient room upon the upper edge thereof for the seating of a cup-valve; G, a cup-valve having a rim adapted to seat upon the valve-seat just within the inner edges of the chute-wings, this valve having a stem threaded into and projecting through the nose of the casing, after the manner of an ordinary globe-valve; H, a hand-wheel on the stem, by which the valve may be opened or closed; J, a spider-like ring carried by the valve, the projections of the spider fitting between the chute-wings and forming vertically-adjustable roofs for the chutes, the under surfaces of these projection being threaded in the same manner, that when the valve is raised these roofs are also raised and the water directed to the wheel-seat through chutes having divergent side walls and roofs; K, a gland in the nose serving to pack the stem of the valve; L, the water-wheel, disposed just below the cup-valve and with its periphery fitting neatly within the wheel-seat; M, the buckets of the water-wheel, having a form to be hereinafter more particularly described; N, the wheel-shaft, the same having the water-wheel rigidly secured to it and journaled neatly in an axial bearing extended through the valve-stem, the shaft projecting up through the valve-stem beyond the hand-wheel; O, a pulley upon the upper end of the wheel-shaft, serving as a mere exemplification of means for transmitting motion from the wheel-shaft; P, a counterbore in the top of the valve-stem around the wheel-shaft; Q, a collar secured to the wheel-shaft and resting upon the bottom of this counterbore, and R an aperture vertically through the water-wheel.

With the parts as shown in Fig. 1 the valve is closed in its seat and no water can pass to the wheel-seat. By turning the hand-wheel the valve will be lifted from its seat and water can flow inward through the chutes to the wheel-seats, and as the valve lifts the chute-roofs also lift. The water is thus at liberty to flow in tangential lines to the wheel-seat. With the parts as shown in Fig. 1 the water-wheel is so far down within the wheel-seat that the wheel itself practically forms a piston-

valve, a valve of sufficient tightness in character to serve in regulating the flow of water and the velocity of the wheel, but not of sufficient tightness in character to serve in completely shutting off the water under the extremely high pressures liable to be used with this device. As the valve lifts, the wheel also lifts in the wheel-seats and water becomes admitted to the wheel-buckets in proportion as the tops of the buckets are brought above the level of the wheel-seat. Lubricating material is placed in the counterbore P, and it finds its way under the collar Q and then through the shaft-bearing. The outlet-connection of the casing is supposed to be connected with a draft-tube, so that there is no upward pressure under the wheel, and the aperture R, leading up through the top of the wheel and the buckets themselves, places any loose space about the shaft-bearing in communication with such draft-tube, and thus prevents the lubricant from being forced upward in the bearing, and also avoids the necessity for packing the wheel-shaft.

In Fig. 1 I have illustrated the casing as fitted for connection with inlet and outlet pipes arranged at right angles to each other; but the casing may, if desired, be arranged for inlet and outlet pipes arranged in the same line, as will be readily understood from an inspection of Fig. 5.

I show a pulley, O, upon the top of the wheel-shaft; but any other means for transmitting the motion from the wheel-shaft may be employed. These turbines, under the extraordinary high pressures mentioned, and being of very small diameter, in some cases as small as one inch, will run at very high velocities, and it may be desirable to transmit motion from the wheel-shaft through the medium of worm-gearing. The hand-wheel H serves as a means for raising and lowering the wheel in the wheel-seat, and thereby regulating the velocity of the wheel, and also as a means for closing the cup-valve and stopping the wheel entirely. In case it should be desirable to apply a governor to the device, the governor may perform its office by actuating the hand-wheel or equivalent connection on the rotary valve-stem.

In Fig. 1 I illustrate the cup-valve as provided with a rigidly-attached stem, after the manner of ordinary globe-valves, as well known in the market; but the valve may, if desired, be attached articulately to its stem, as is common construction in connection with globe-valves in the market. I also show in Fig. 1 the stem as arranged to rise and fall as it raises and lowers the valve. This is a common construction in connection with globe-valves; but I also contemplate the employment of valve-stems having endwise motion as they are rotated, the valve simply rising and falling upon the stem—a well-known construction in connection with ordinary globe-valves. This will be understood by inspecting Fig. 5, in which it will be seen that the valve-stem carrying the hand-wheel does not move endwise as it is rotated, but its rotation causes the rising and falling of the cup-valve by reason of the stem being threaded in the valve. In Fig. 1 the valve, being fast upon its stem, must rotate with the stem, and therefore the roof-spider J is illustrated as journaled to the valve, so as to rise and fall with the valve, but to permit the valve to turn. Such articulation of the spider upon the valve is not necessary where the stem rotates within the valve, as illustrated in Fig. 5, in which it will be seen that the valve does not revolve and that the roof-spider is formed integral with the valve. In the construction illustrated in Fig. 1 the regulation of float of the wheel after the first opening of the valve was effected by raising and lowering the water-wheel within the wheel-seat. In the construction illustrated in Fig. 5, however, the wheel is not raised and lowered in its seat; but so far as its relation to wheel-seat is concerned the wheel-buckets are always open, but the admission of water to the buckets is controlled entirely by the raising and lowering of the valve.

The construction illustrated in Fig. 1 is the preferable one, inasmuch as it initiates the inflow of water to the top of the buckets, while in the construction illustrated in Fig. 2 the effect at part gate is to admit water near the bottom of the buckets. The construction as shown in Fig. 1 also is of advantage by permitting the valve to be accurately and forcibly seated by a rotary motion upon its seat.

The form of the wheel-buckets is such as to present practically in each bucket a water-conduit of substantially equal area throughout the length of the conduit. Fig. 3. represents a tube very wide and very shallow at the top, while at the bottom the tube is very narrow and very deep. The two ends of this tube and all intermediate points in the length of the tube have substantially equal areas. Fig. 4 illustrates this principle of construction applied to the wheel-buckets, D representing the top of the wheel-seat, from which the water must flow to reach the bucket. The buckets are very wide and very shallow at their tops, and they are very narrow and very deep at their bottoms, and the area throughout the length is arranged to be substantially uniform. This form of bucket avoids the evils due to causing water to pass through alternate swells and strictures in a conduit.

The buckets are arranged in circumferential overlapping series around the wheel, the periphery of the wheel being open, and consequently the buckets without outer walls. The inner walls of the buckets are formed by an inward downward curve of the bucket-roof, as seen in the drawings, the combined roof and wall being wide where it starts at the periphery of the wheel and decreasing in width, and it curves inward and downward to the bottom of the wheel.

The nose is screwed into an opening in the casing, and this opening made of a size to permit the ready insertion of the wheel, valve,

and roof-spider, or it may be made of sufficient size only to permit the passage of the valve, and in such case the roof-spider may be formed in two parts, as indicated in Fig. 2, so as to permit the insertion of the spider in sections through one of the water-connections.

I claim as my invention—

1. In a turbine, the combination, substantially as set forth, of a water-tight casing provided with an inlet, an outlet, a wheel-seat and a valve-seat, a nose secured to said casing with its axis in line with the axis of said wheel-seat, a valve arranged for motion parallel to its axis and to coact with said valve-seat, a threaded tubular valve-stem engaging said nose and valve and projecting outwardly through said nose and arranged to serve in opening said valve from the outside of said casing, a gland engaging said nose and stem, a shaft passing axially through said valve and stem, and a water-wheel secured to said shaft within and below said valve, and chutes at the periphery of said wheel-seat.

2. In a turbine, the combination, substantially as set forth, with a casing, a nose, a wheel-seat, a water-wheel, and chutes, of a valve, a valve-stem having a shaft-bearing at its axis, provided with a counterbore at its upper end, and a wheel-shaft journaled in said shaft-bearing and provided with a collar engaging over said valve-stem.

3. In a turbine, the combination of a casing provided with an inlet and with an outlet adapted for connection to a draft-tube, and with a wheel-seat, a nose secured thereto, a wheel-shaft projecting through said casing and provided with a collar outside said casing, a water-wheel secured to the lower end of said shaft and provided with aperture R, leading vertically through the wheel, and a tubular stem supported in said nose and inclosing said wheel-shaft from the top of the water-wheel to a point outside said casing, substantially as and for the purpose set forth.

4. In a turbine, the combination, substantially as set forth, with a casing, a nose, a water-wheel, a wheel-shaft, a valve surrounding the water-wheel, a valve-seat, a valve-stem, and chutes surrounding said valve, of chute-roofs attached to said valve and engaging the chutes.

5. In a turbine, the combination, substantially as set forth, of a casing provided with a wheel-seat, inlet and outlet connections, and a circle of chutes surrounding said wheel-seat, a water-wheel adapted for insertion into said wheel-seat through said circle of chutes, a wheel-shaft, and a nose screwed to said casing and projecting thereinto to near said wheel and supporting said shaft and water-wheel.

6. In a turbine, the combination, substantially as set forth, of a casing provided with a wheel-seat, a valve-seat, and chutes, a nose, a valve, a tubular valve-stem projecting through said nose, a gland engaging said nose and stem, a handle on said stem, a water-wheel, and a wheel-shaft journaled in said stem.

7. In a turbine, the combination, substantially as set forth, of water-wheel L, shaft N, valve G and its stem disposed over said wheel and around said shaft, chute-roofs J, attached to said valve, and casing A, provided with connections B and C and with wheel-seat D and chutes F, said chutes being engaged by said chute-roofs.

8. In a turbine, the combination, substantially as set forth, of the wheel-seat D and the water-wheel L, having circumferential overlapping series of outwardly-open buckets M, whose roofs and inner walls curve inwardly and downwardly and become narrower from the circumference of the wheel.

9. In a turbine, the combination, substantially as set forth, of a casing provided with an inlet, an outlet, and a wheel-seat, a nose provided with a packing-gland, a valve having an axially-bored stem projecting through said nose and gland, chutes in the casing, a water-wheel, and a wheel-shaft journaled in said axially-bored valve-stem, said axial bore communicating with the atmosphere outside the casing-nose and with the outlet of the casing.

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