(No Model.) 3 Sheets—Sheet 1

F. W. TUERK, Jr.

WATER MOTOR.

No. 400,883. Patented Apr. 2, 1889.

Fig. 2.

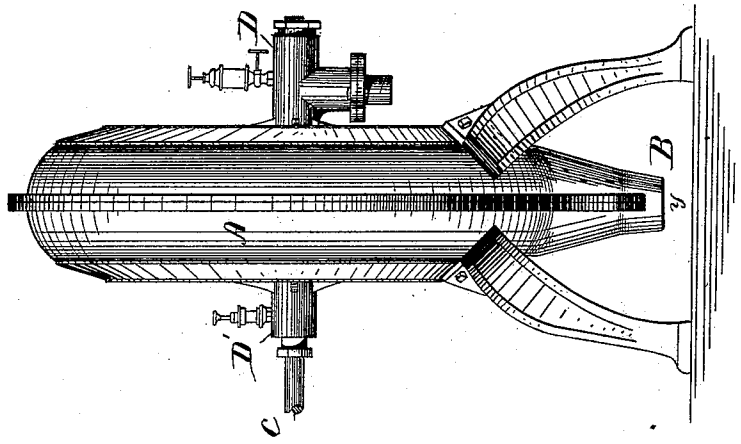
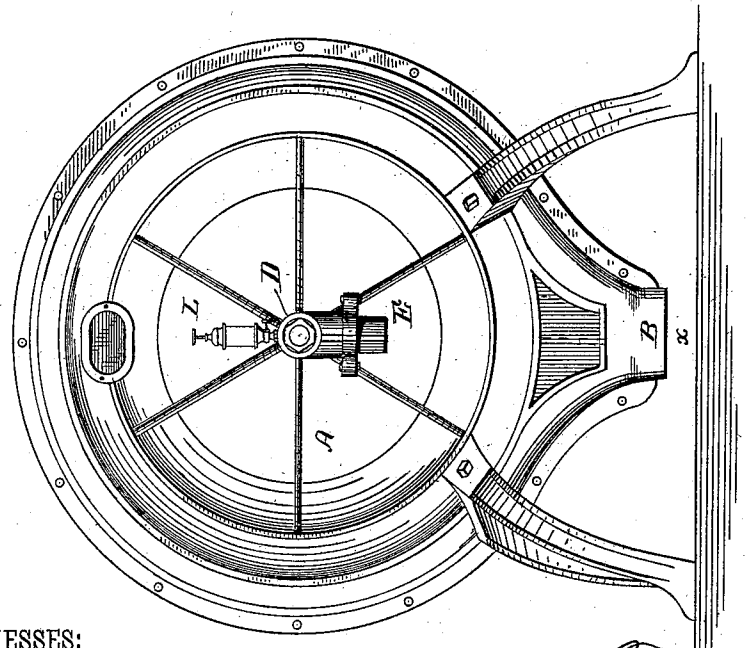


Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

F. W. TUERK, Jr.

WATER MOTOR.

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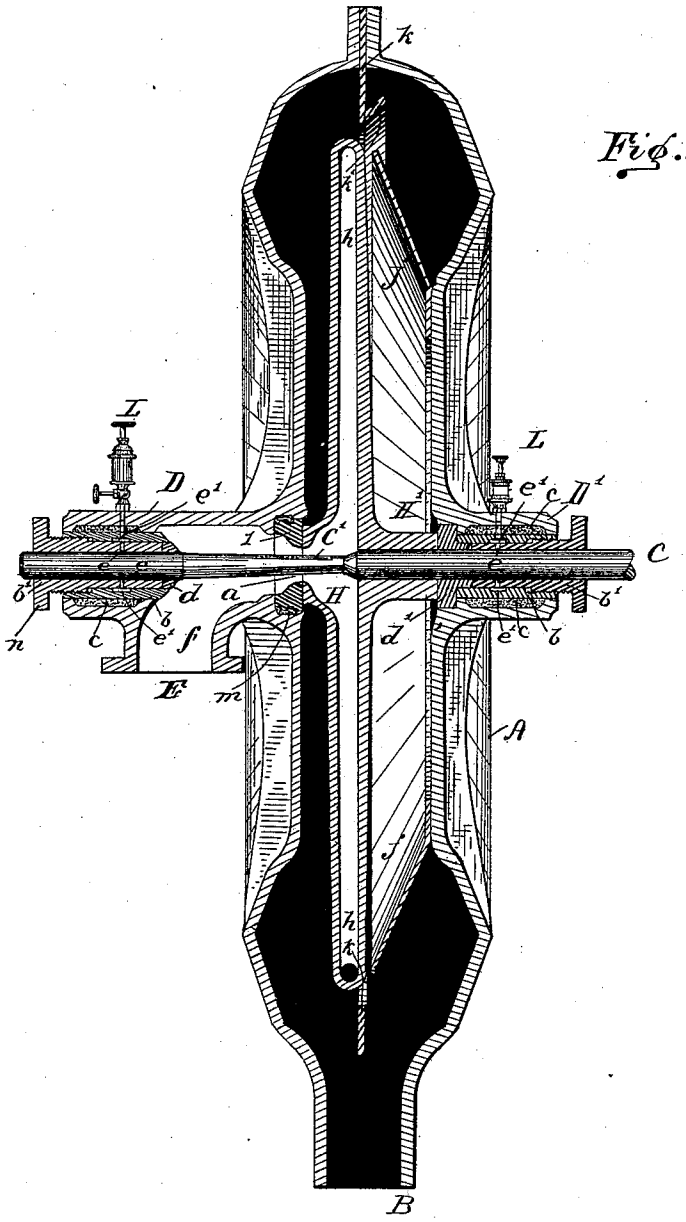

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

F. W. TUERK, Jr.

WATER MOTOR.

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Fig. 4.

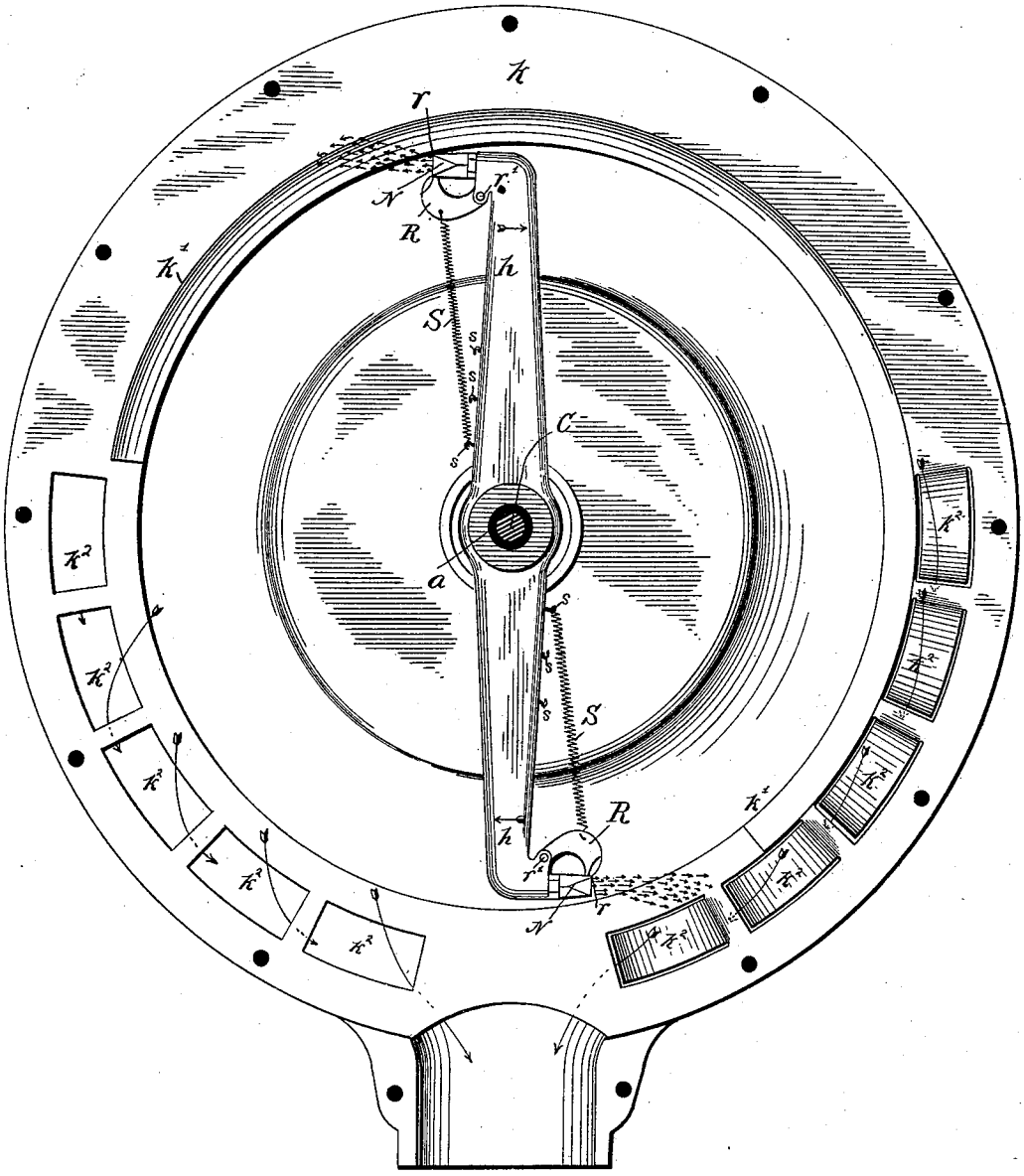
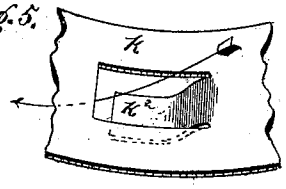


Fig. 5.



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UNITED STATES PATENT OFFICE.

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WATER-MOTOR.

SPECIFICATION forming part of Letters Patent No. 400,883, dated April 2, 1889.

Original application filed January 8, 1887, Serial No. 223,728. Divided and this application filed September 21, 1887. Serial No. 250,272. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK W. TUERK, Jr., of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Water-Motors, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to the class of water-motors described and claimed in my application filed January 8, 1887, Serial No. 223,728, and constitutes a divisional part of the same.

In the form of motor embracing my present invention the case is provided with a water-inlet in one of its sides. The shaft extends through the case and bears the water-wheel having in the side of its hub facing the inlet an annular port from which extend hollow radial water-conducting arms.

The invention relates to the improved means by which the wheel is mounted and adjusted in the case and water-tight joints maintained between them.

It also embraces improvements in the annular water-shield depending peripherally from the case, and in the centrifugal governing-valves by which the escape of the water from the radial arms is automatically governed.

In these respects my present invention consists in the several novel features of construction and new combinations of parts, which are hereinafter so fully described, and then definitely pointed out in the claims, that further preliminary recital is unnecessary.

In specifying my invention reference is had to the accompanying drawings, forming a part of this specification, in which, like letters indicating corresponding parts in all the figures—

Figures 1 and 2 are external views of my improved water-motor, taken in planes at right angles to each other. Fig. 3 is a transverse section of the water-motor, taken on line *x x*, Fig. 1, illustrating the interior construction of the motor and the general arrangement of the parts. Fig. 4 is a view of the interior of one of the sections or parts of the motor-case, the motor-case being parted on the line *y y* of Fig. 2, and the driving-shaft being in section, and illustrating the exterior construction of the water-wheel, governing-valve, and the water-shield for diverting the water into the discharge water-space of the motor-case; and Fig. 5 is a detached view of a portion of the water-shield, illustrating the construction of the spring-ports for allowing the escape of the water into the water-discharge space of the motor-case.

A represents the case of the motor, the said case being of annular shape, and in all respects the same in construction as fully illustrated and described in my aforesaid application filed January 8, 1887, and the motor-case is provided with the water-discharge nipple B at its bottom portion.

C denotes the driving-shaft, which differs from the shaft described in my former application in that it extends through the case and is journaled in bearings formed within the horizontally-projecting journal-boxes D D'. The journal-boxes D D' are of considerably larger internal diameter than the diameter of the shaft C, and I secure in said journal-boxes anti-friction bushings or plugs *b b'*, made of bronze or composition metal, which closely embrace the shaft, and which are sustained in proper concentric position in relation to the axis of the case by means of Babbitt-metal liners *c*, interposed between the bushings and the inner sides of the journal-boxes.

To insure the accuracy of the arrangement of the bushings in relation to the axis of the case A, I secure the bushings in all their requisite positions by introducing temporarily in the journal-boxes a false mandrel or shaft of the same diameter as the shaft C proper, and slip the bushings *b b'* on said mandrel, and after the latter has been properly adjusted in its requisite central position I pour molten Babbitt metal into the space between the bushings and inner sides of the journal-boxes. After the Babbitt metal has become cold and hard I withdraw the false mandrel. The aforesaid bushings I make adjustable longitudinally, so as to compensate for the wear on the inner end of one of said

bushings, against which the hub H′ of the water-wheel abuts, said bushings being formed of two tubes or sleeves fitted one within the other and with male and female screw-threaded portions at their outer ends, as shown in Fig. 3 of the drawings.

The shaft C is provided upon the end journaled in the bearing D, Fig. 3, with a collar, *d*, and the inner sleeve or smaller bush-section, *b′*, abuts against the said collar, and a tight-fitting joint is thereby produced, which prevents the water from flowing through the journal-box and extending through the end of the shaft C, which protrudes through the nut *n* on the end of the bush-section *b′*. The sleeve *b′* of the other bushing bears against the loose collar *d′*, mounted on the shaft C, and by turning said sleeve in the manner above described it is caused to push the loose collar *d′* endwise, and thereby crowd it against the hub H′.

The described journal-boxes and inclosed bushings and liners have lubricating-channels *e e′* through their tops, and in order to maintain the channels *e′* of the adjustable sections *b′* of the bushings in communication with those of the liners I longitudinally elongate the channels *e′*, as shown in Fig. 3 of the drawings.

The journal-box D, I make of sufficient length to form between the inner end of the bushing a water-inlet, *a*, of the case A, and water space or passage *f*, which communicates with the water-induction nipple E, projecting from the journal-box for the attachment of the water-supply pipe. The driving-shaft C, I form with a circumferentially-reduced portion, C′, at the induction-port *a* of the hub H, as represented in Fig. 3 of the drawings, said reduced portion of the shaft being gradually enlarged to the full size of the shaft from the hub H to the opposite end of the water-passage *f*.

The pressure of the water upon the aforesaid circumferentially-reduced tapered portion C′ of the shaft counteracts to some extent the side pressure on the wheel incident to the arrangement of the water-inlet *a* at one side of said wheel. The smaller portion of the circumferentially-reduced shaft passes through the water duct or inlet *a* in the hollow hub H of the water-wheel, and forms an annular port around the shaft through which the water from the inlet *a* passes to the hollow tapering water-conducting arms *h h* of the water-wheel.

The water-wheel is constructed as fully described and illustrated in my aforesaid application of January 8, 1887, and therefore need not be specifically described herein, the salient feature of difference between the motor described in my aforesaid application and my present invention consisting in constructing the driving-shaft C with the reduced portion C′ and providing the annular water-port in the hub H of the water-wheel.

The advantage of my present construction accrues from the fact that the water-wheel is supported by the journal-bearings at each end of the driving-shaft C; hence a very steady motion under a high speed is secured, and the motor is very durable and effective in use.

The interior of the water-motor case A is divided into two spaces or compartments, in one of which the water-wheel rotates, and the other serves to receive the water-discharge from the nozzles of the arms *h h*, and these two compartments are formed by water-shields *k* and *j*, as described and illustrated in my aforesaid application of January 8, 1887, and my present construction differs therefrom simply in the construction of the shield *k*, which projects from the peripheral portion of the interior of the case. In my present invention the shield *k* is provided with an inclined or V-shaped lip, *k′*, as best shown in Figs. 3 and 4 of the drawings, the said lip *k′* extending part way around on the lower edge of the shield *k*, as best shown in Fig. 4. I also provide openings k^2 in the lower portion of the shield *k* for the escape of the water, as best shown in Fig. 4, said openings being formed by cutting the metal out, as best shown in Fig. 5, and slightly bending the same inwardly. This construction permits the water which spatters over the shield to escape into the water compartment or space in the motor-case A, and constitutes very effective means to secure the desired result.

To prevent the water from entering into the compartment of the case containing the wheel from the water-space *f*, I interpose between the induction side of the hollow hub H and the adjacent side of the case A an anti-friction metal bearing, *l*, which I lock in position in the case by a Babbitt-metal liner, *m*, entering grooves in the back of the aforesaid anti-friction metal bearing, said bearing being secured in its requisite position in the same manner as hereinbefore described—*i. e.*, by introducing through the journal-boxes D D′ a false mandrel of proper size to properly support upon it the bearing *l*, which has been previously finished to its proper shape, and after the bearing *l* is placed in its required position the molten Babbit metal is poured through suitable holes in the case.

The water-wheel is provided upon the extremities of the tapering arms *h h* with nozzles N and a valve, *r*. A pivoted lever, R, pivoted at *r′*, is provided to close the valve *r*, and is held normally open by means of spiral S, secured at one end to the lever R, and its other extremity to the hook *s*, projecting from the arm *h* of the water-wheel.

It will be observed that this valve constitutes a centrifugal governor, being actuated by the centrifugal force caused by the rotation of the water-wheel on the shaft C, as fully described in my above-mentioned application for a patent. The spiral S is rendered adjustable by providing several hooks, *s s*, as

best shown in Fig. 4, and the tension on the spring is readily changed by simply changing the point of attachment to the arm.

The strainer device described in my previous application may be employed in connection with my present invention to good advantage where the water used to operate the motor contains much grit or other impurities.

The operation of my improvement will be readily understood from the foregoing and from a consideration of the drawings.

I do not herein claim the combination, with the rotary hollow water-conducting arms, of a discharge-nozzle on the free ends of said arms, a valve in said nozzle, a lever hinged on said arms and carrying the valve, and a spring connected with said lever and arranged to normally sustain the valve in its open position. This invention is embraced in an application filed by me January 8, 1887, Serial No. 223,728, and I therefore herein claim with respect to this matter only the modified and improved construction hereinafter particularly set forth; nor do I herein claim, broadly, a case for a water-motor provided on its interior with an annular inclined plate, forming a water passage or duct at one side of the case and with a peripheral shield the inner edge of which projects toward said plate, as this invention also is embraced in my earlier application, hereinbefore mentioned.

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

1. In an improved water-motor, the combination of the case provided with a water-inlet in one side thereof, a shaft extending through the case central of the water-inlet, and a hub having in the side facing the inlet an annular port around the shaft and hollow radial arms extending therefrom, said shaft being journaled in boxes projecting from the sides of the case and provided with metal sleeves adjustable axially to maintain water-tight joints between the hub and the case, substantially as described.

2. In a water-motor, the case provided with a water-inlet in the center of one side, a shaft extending through the case central of the water-inlet, and a hub mounted on said shaft and provided with an induction-port at the side facing the inlet in the case, and hollow radial arms extending from said port, in combination with an annular anti-friction bearing between the face of the hub at the induction-port and the case at its water-inlet, and the adjustable collar bearing on the opposite end of the hub, whereby the joint between the hub and case at the water-inlet is kept tight, substantially as described.

3. In a water-motor, the case having a central water-inlet at one side, the shaft extending therethrough, and the wheel having hollow hub and radial arms extending therefrom with nozzles on their free ends and deflected laterally from the inlet side of the case, in combination with the annular inclined water-shield extending from the opposite side of the case, and the shield depending peripherally from the case and having a V-shaped lip and water-escape openings, substantially as described.

4. In combination with the case having journal-boxes projecting from opposite sides thereof and the driving-shaft extending through said boxes, and the wheel secured to said shaft, a longitudinally-adjustable bushing secured in one of the journal-boxes and bearing against a loose collar on one side of the wheel-hub, a longitudinally-adjustable bushing in the other journal-box, and a collar affixed to the shaft at the inner end of said latter bushing, all constructed and combined to adjust the wheel within the case, substantially as described and shown.

5. The within-described centrifugal governing-valve on the nozzle N, the water-conducting arms *h*, consisting of the valves *r*, pivoted lever R, and an adjustable spring, S, all substantially as and for the purpose set forth.

6. The water-shield *k*, provided with the V-shaped lip *k'*, depending peripherally from the annular case A of the water-motor, and provided with the water-escape openings k^2, substantially as and for the purpose set forth.

In testimony whereof I have hereunto signed my name, in the presence of two attesting witnesses, at Syracuse, in the county of Onondaga, in the State of New York, this 26th day August, 1887.

FREDERICK W. TUERK, JR.

Witnesses:
FREDERICK H. GIBES,
E. C. CANNON.