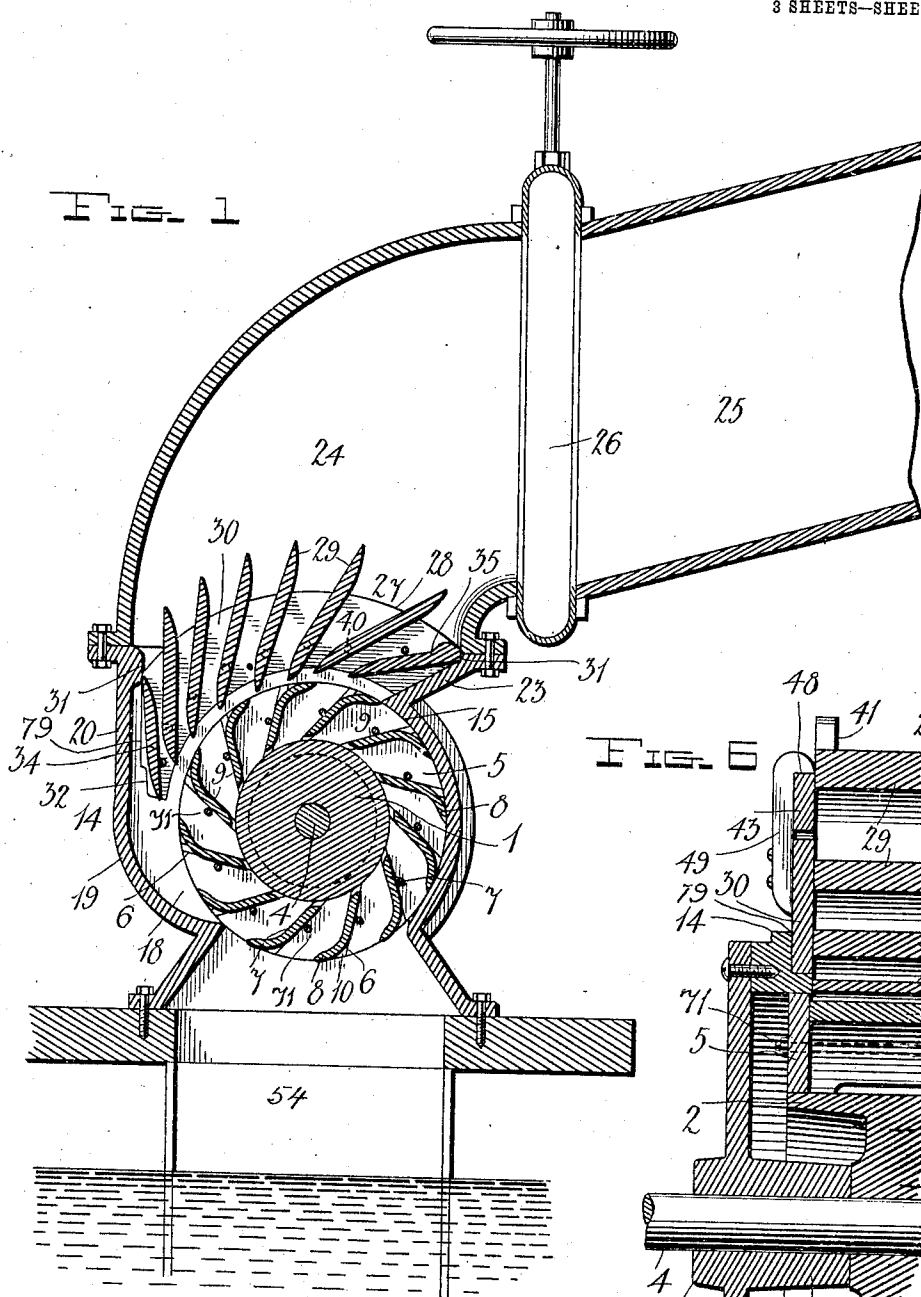


No. 833,057.

PATENTED OCT. 9, 1906.

F. M. KELLER.
OVERSHOT WATER WHEEL.
APPLICATION FILED JUNE 22, 1905.

3 SHEETS—SHEET 1.



Witnesses
J. L. [Signature]
C. H. [Signature]

Inventor
F. M. Keller
by A. [Signature]
Attorney

No. 833,057.

PATENTED OCT. 9, 1906.

F. M. KELLER.
OVERSHOT WATER WHEEL.
APPLICATION FILED JUNE 22, 1906.

3 SHEETS—SHEET 2.

FIG. 2

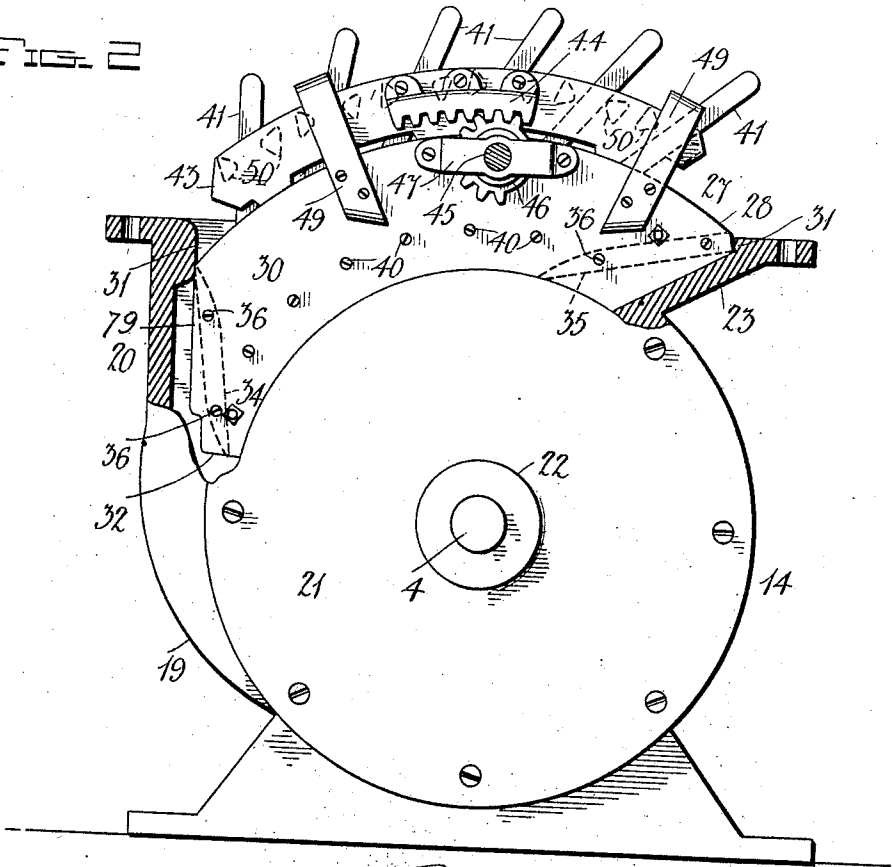
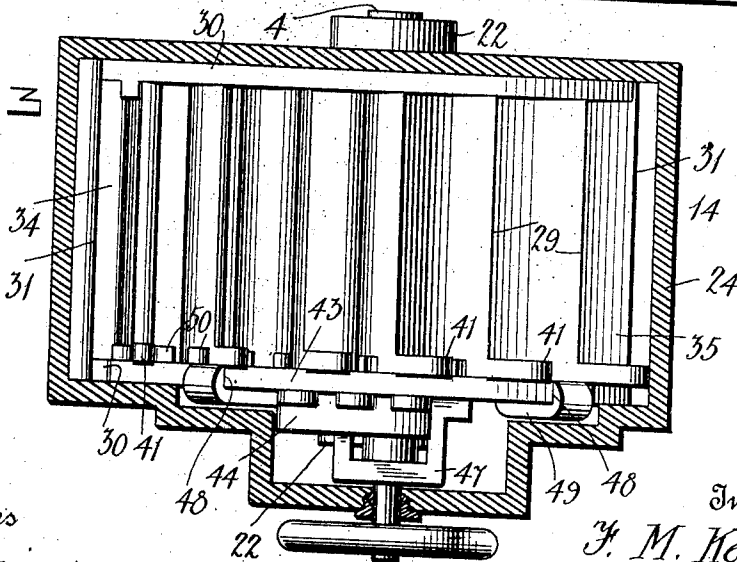


FIG. 3



Witnesses

C. A. Grieshaber

Inventor

F. M. Keller

By *A. B. Wilson*

Attorney

No. 833,057.

PATENTED OCT. 9, 1906.

F. M. KELLER.
OVERSHOT WATER WHEEL.
APPLICATION FILED JUNE 22, 1905.

3 SHEETS—SHEET 3.

FIG. 4

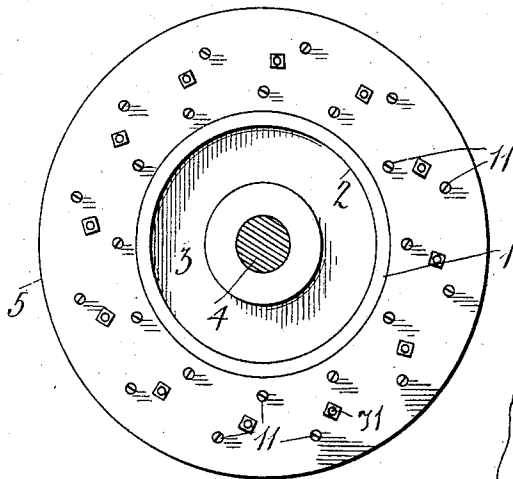


FIG. 5

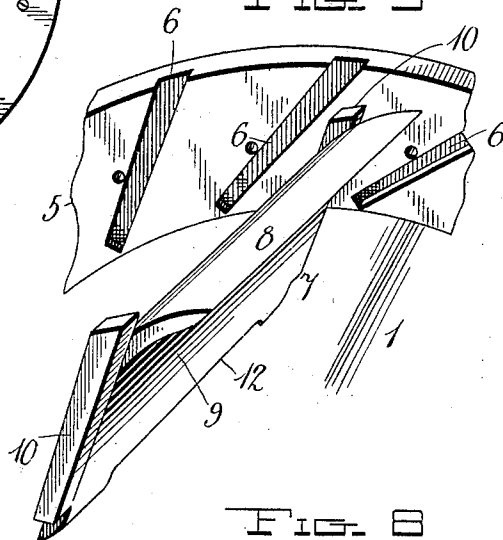


FIG. 7

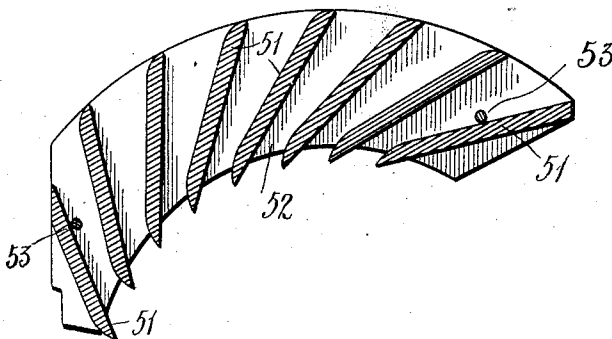
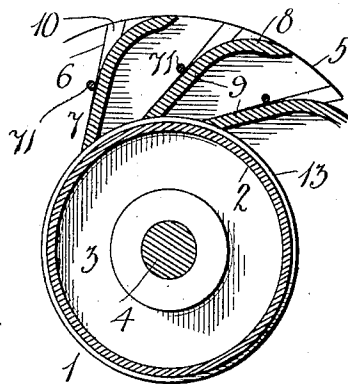


FIG. 8



Witnesses
J. B. Smith
C. H. Grubauer

Inventor
F. M. Keller
By *A. B. Wilson*
Attorney

UNITED STATES PATENT OFFICE.

FREDERICK M. KELLER, OF YORK, PENNSYLVANIA, ASSIGNOR OF ONE-FOURTH TO W. SMITH HEIGES, OF YORK, PENNSYLVANIA.

OVERSHOT WATER-WHEEL.

No. 833,057.

Specification of Letters Patent

Patented Oct. 9, 1906.

Application filed June 22, 1905. Serial No. 266,476.

To all whom it may concern:

Be it known that I, FREDERICK M. KELLER, a citizen of the United States, residing at York, in the county of York and State of Pennsylvania, have invented certain new and useful Improvements in Overshot Water-Wheels; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention is an improved overshot turbine water-wheel; and it consists in the construction, combination, and arrangement of devices hereinafter described and claimed.

One object of my invention is to effect improvements in the construction of the water-wheel.

A further object is to combine with the water-wheel an inclosing duct or casing which permits the passage of water downwardly to, around one side of, and its discharge from below the wheel and which duct or casing is provided with a distributing-gate having a plurality of wings which are substantially tangential with reference to the upper and working sides of the wheel and which serve to divide the head of water and feed the same to the respective blades on the working side of the wheel to promote the efficiency and power of the wheel and economize in the use of the water required to drive the same.

A further object is to effect improvements in the construction of the distributing-gate whereby the wings thereof are adapted to be simultaneously adjusted at any angle required with reference to the buckets of the wheel to secure the best results under varying pressures of the head of water employed to drive the wheel.

A further object of my invention is to effect improvements in the construction of the water-wheel whereby the same is provided with blades or buckets which may be readily removed therefrom to facilitate repairs.

In the accompanying drawings, Figure 1 is a vertical sectional view through my improved wheel, showing the duct or casing in which it is located and the flume which conveys a head of water thereto. Fig. 2 is partly a side elevation and partly a sectional view of the same. Fig. 3 is a horizontal sectional

view taken on a plane intersecting the flume-elbow and the operating-shaft of the distributing-gate and showing such gate in top plan. Fig. 4 is a detail elevation of my improved wheel. Fig. 5 is a detail sectional perspective view of the same, showing the construction of one of the removable buckets. Fig. 6 is a detail transverse sectional view through a portion of the wheel and through one side of the distributing-gate. Fig. 7 is a sectional view showing a modified form of the distributing-gate; and Fig. 8 is a detail sectional view showing a modified construction of the wheel whereby it is provided with draining-channels in the periphery of its hub.

The hub 1 of my improved overshot turbine water-wheel is cylindrical in form and is preferably hollowed at its ends, as at 2, to reduce its weight and to form a web 3, the width of which is sufficient to secure the wheel on the shaft 4. Said hub is keyed to said shaft. On the end of the hub are heads 5, which are cylindrical in form, are of the required diameter of the wheel, and are provided with a central opening sufficient in size to receive the hub. Said heads are removably secured on the hub by keys or other suitable devices. The said heads are provided in their opposing sides with grooves 6, which are tangential to a circle of a diameter less than that of the hub and concentric therewith. The blades or buckets 7 of my improved wheel are preferably of the shape here shown in cross-section, so that they are provided at their outer edges with overhangs 8, which are disposed at a suitable angle with reference to their straight or substantially straight inner portions 9. At the ends of the said blades or buckets and forming prolongations of the flat or straight portions thereof are flanges 10, which are wedge-shaped longitudinally and adapted to fit in the grooves 6, the latter being correspondingly wedge-shaped to receive them. When the flanges of the blades or buckets have been thus seated in the grooves of the wheel-heads, they are secured in place by means of screws 11 or other suitable devices. It will be understood that this construction of the wheel enables the parts thereof to be readily disassembled and especially provides for the ready and rapid removal of any one or all of the blades or buckets, so as to greatly facilitate repairs of the wheel or of any part thereof.

- The heads 5 of the wheel are connected together by bolts 71, which are here shown as disposed between the blades or buckets of the wheel and which serve to hold the heads after the blades have been removed therefrom and further serve to prevent the heads from being spread outwardly by the pressure of the water during the operation of the wheel.
- It is desirable to prevent water from being retained by any of the buckets of the wheel when the head is turned off and the wheel is not in operation in order that the wheel may not corrode or become fouled with sediment.
- To accomplish the discharge and drainage of the water from the wheel when the latter is not in operation, I provide channels which may be either formed, as at 12, in the inner edges of the respective blades or buckets of the wheel or may be formed as at 13 in Fig. 8. The duct or runner casing 14, in which the wheel is incased, forms a cylindrical chamber 15 for the reception of the wheel and is formed with a supply-chamber 18 on one side of the said cylindrical chamber 15, the outer wall 19 of which converges downwardly thereto, the upper portion of the said wall 19 being perpendicular, as at 20, or substantially so. In the ends of the body portion of the duct or runner casing are openings of sufficient size to clear the wheel, so that the latter may be readily placed in or removed from the said duct or runner casing, the said openings when the wheel is in place being covered by circular heads 21, which are adapted to be bolted to opposite sides of the duct or runner casing and are provided with bearings 22, which project from their outer and inner sides and are of substantially cylindrical form, the inner portions of the said bearings projecting into the hollowed ends of the wheel-hub. The wheel-shaft is journaled in the said bearings 22. The outer ends of the said bearings are exposed, so that they may be kept lubricated in order to prevent the shaft from being unduly worn. The upper portion of the duct or runner casing is formed with outwardly-projecting flanges 23, on which an elbow-section 24 of a flume or supply pipe 25 may be bolted to create a head of water above the wheel and maintain said head. A water valve or gate 26 is provided for the flume to control the supply of water to the wheel and cut off the same.
- Above the wheel and on the working side thereof is a removable distributing-gate 27, the upper portion of which lies in the upper portion of the duct or runner casing and the lower portion of which, which embraces the working side of the wheel, extends into the downwardly-narrowing chamber or channel 18. The said distributing-gate comprises a frame or body portion 28 and a plurality of removable and angularly-adjustable wings 29. The said frame or body of the distributing-gate comprises a pair of segment-shaped side walls 30, which are mounted in recesses 79 in the side walls of the runner-casing 14 and bear at their upper ends on shoulders 31, formed in the upper portion of the duct or runner casing in one side thereof and the lower ends of which bear on shoulders 32, formed in the recesses in the side walls of the channel portion 19 of said duct or runner casing. The lower side of the said walls of the frame or body portion of the gate are concentric with and are closely related to the heads of the wheel. The side walls of said frame or body portion of the distributing-gate are connected together at their upper and lower ends, respectively, by fixed wings 34 35, which are secured in place by bolts 36, are angularly disposed with respect to each other, the wing 34 being substantially perpendicular to the upper wing 35 and said wings being tangentially disposed with reference to the periphery of the water-wheel. There is a plurality of the angularly-adjustable wings 29, which are pivotally mounted at points a suitable distance from their lower edges between the side walls of the frame or body portion of the distributing-gate by means of screws 40, which permit of the ready removal of the said pivotally-mounted angularly-movable wings. Each of the said wings is provided at one end with an upwardly-extending arm 41, whereby it may be turned. To simultaneously operate the angularly-movable wings, I provide a segment-link 43, having a rack 44 and a manually-operated shaft 45, having a pinion 46 to engage said rack. Said shaft has its bearings in one side of the frame or body portion of the distributing-gate and in a bracket 47, which is bolted thereto. The segment-link is mounted for longitudinal movement on the upper side of one side wall of the said distributing-gate in guide-notches 48 on the inner sides of a pair of guide-arms 49, which are secured to said side wall of the distributing-gate by means of screws. The said segment-link is provided on its inner side with lugs 50, appropriately spaced apart and between which the arms 41 of the angularly-movable wings 29 extend, so that a slidable engagement is effected between the said arms of the wings and the said segment-link when the latter is moved in either direction by the coaction of the rack and pinion before described. When the shaft 45 is properly rotated, said wings 29 will be moved angularly to widen or contract the spaces between them and to vary their inclination with reference to the blades or buckets of the wheel.
- The function of the distributing-gate is to divide the head of water into streams which are severally directed by the wings of the gate against the respective blades on the working side of the wheel, the said wings of the gate by thus dividing the head of water

into several streams facilitating the flow of the water to the wheel and causing it to be applied thereto in jets, as it were, which are effective upon the several blades or buckets on the working side of the wheel, so that the power of the wheel is increased and a corresponding economy of water effected, and all tendency of the head to form eddies or localized portions in which the speed is reduced is obviated.

In Fig. 7 of the drawings I show a modified construction of the distributing-gate, in which the wings 51 thereof are rigidly secured between the side walls 52. The wings of this form of my improved distributing-gate, which are rigidly secured between the side walls thereof, are detachable therefrom, said walls and wings being respectively provided with grooves and flanges similar to those of the heads and blades of the wheel, said grooves and flanges permitting of the adjustment of the wings from said side walls, as will be understood. Said side walls are, furthermore, connected together by bolts 53, as shown, which prevent them from spreading and serve to greatly strengthen the construction of the distributing-gate.

It will be observed by reference to Fig. 1 that the wheel is mounted at some distance above the bottom of the flume or duct through which water is supplied thereto, so that the wheel is above the water-level of the discharge 54, and since the wheel is provided with means whereby it becomes drained when in operation the wheel becomes entirely dry when in disuse and is not subject to corrosion and does not become clogged with sediment, as is the case in that class of wheels in which the latter are at the bottom of the casing. It will be understood that my wheel enables me to dispense with the tank ordinarily employed in wheels of this kind and that the casing or shell in which the wheel is mounted is merely a part of the water-duct as distinguished from a tank or casing in which a head of water is maintained, as is customary in wheels of this type heretofore constructed. Heretofore water-wheels of this type have been placed in a tank or casing separate from the shell in which the wheel revolves, which tank has been kept constantly full of water, so that the shell in which the wheel revolves, together with the wheel, its shaft, and the bearings for the shaft, have been kept constantly submerged, no matter what the condition of the water may have been. This arrangement is very disadvantageous, as it subjects the shaft and its bearings to rust, and the wheel is likely to become clogged with the sediment which settles in the water in the tank. In accordance with my invention I entirely dispense with the use of such tank or casing and locate the wheel in a shell or casing which is supplied with water from a pipe or duct directly over

or to the wheel, thus saving the expense of the extra tank or casing. Moreover, my construction and arrangement of the wheel and its casing protects the wheel, its shaft, and the bearings from contact with the water when the wheel is not in use, prevents rust thereof, prevents the wheel and its shell or casing from becoming clogged with sediment, and, moreover, affords access to all of the parts.

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

1. In combination with a water-wheel having peripheral buckets, a shell or casing, open in its upper side, having a cylindrical chamber in which said wheel is concentrically mounted for revolution and further provided with a supply-chamber on one side of the cylindrical chamber and opening into the buckets on one side of the wheel, and a discharge-opening below and spaced from the said supply-chamber and immediately below the wheel, that portion of the casing between the lower end of the supply-chamber and the discharge-opening being in close proximity to the periphery of the wheel to prevent the water other than that carried by the wheel from passing from the supply-chamber to the discharge-opening, substantially as described.

2. In combination with a water-wheel having peripheral buckets, a shell or casing open at its upper side and having a cylindrical chamber in which said wheel is concentrically mounted for revolution, said shell or casing being further provided with a supply-chamber contracted downwardly, disposed on one side of the cylindrical casing, and opening into the buckets on one side of the wheel, and a discharge-opening below and spaced from said supply-chamber and immediately below the wheel, that portion of the casing between the lower end of the supply-chamber and the discharge-opening being in close proximity to the periphery of the wheel to prevent the water, other than that carried by the wheel, from passing from the supply-chamber to the discharge-opening, substantially as described.

3. In combination with a water-wheel having peripheral buckets, a shell or casing open in its upper side, having a cylindrical chamber in which said wheel is concentrically mounted for revolution, and further provided with a supply-chamber open at its upper end, disposed on one side of the cylindrical chamber and opening into the buckets on one side of the wheel, and a discharge-opening below and spaced from the said supply-chamber and immediately below the wheel, that portion of the casing between the lower end of the supply-chamber and the discharge-opening being in close proximity to the periphery of the wheel, a flume dis-

charging into the opening in the upper side of the casing, a frame in and removable from said opening and disposed above the wheel, and distributing-wings in said frame to divide the head of water in the casing and flume into a plurality of streams and direct such streams against the respective buckets of the wheel on the upper and working side thereof.

10 4. A water-wheel of the class described comprising a cylindrical hub member, heads connected thereto and provided in their opposing sides with outwardly-extending, inwardly-contracting, wedge-shaped grooves, 15 open at their outer ends, and blades or buckets having their ends provided with wedge-shaped flanges seated in said grooves and adapting the buckets to be separately removed from the wheel by drawing them 20 outwardly from the hub.

5. In combination with an overshot wheel, a shell or casing in which the same is inclosed, and a distributing-gate comprising a frame in and removable from the shell or casing, 25 and a plurality of wings mounted in said frame, to divide the head of water in the casing into a plurality of streams and direct such streams against the respective buckets of the wheel, on the upper and working side 30 thereof.

6. In combination with an overshot wheel, a shell or casing in which the wheel is inclosed, open on its lower side to discharge from

the wheel, and a distributing-gate in and removable from the shell or casing and comprising a frame and wings, to divide the head of water in the casing into a plurality of streams and direct such streams against certain of the buckets of the wheel. 35

7. A water-wheel comprising a hub, heads having central openings to receive the hub, and provided in their opposing sides with outwardly-extending grooves, open at their outer ends, and blades or buckets having their ends provided with flanges seated in said 45 grooves and adapting the same to be separately removed from the wheel by drawing them outwardly from the hub.

8. A water-wheel of the class described, comprising a cylindrical hub member, heads 50 connected thereto and provided in their opposing sides with outwardly-extending grooves, open at their outer ends, and blades or buckets having their ends provided with flanges seated in said grooves and adapting 55 the buckets to be separately removed from the wheel by drawing them outwardly from the hub.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses. 60

FREDERICK M. KELLER.

Witnesses:

F. X. ZINN,

J. W. C. AUSTIN.