

(No Model.)

D. HUG.
WATER WHEEL.

No. 576,728.

Patented Feb. 9, 1897.

fig. 1.

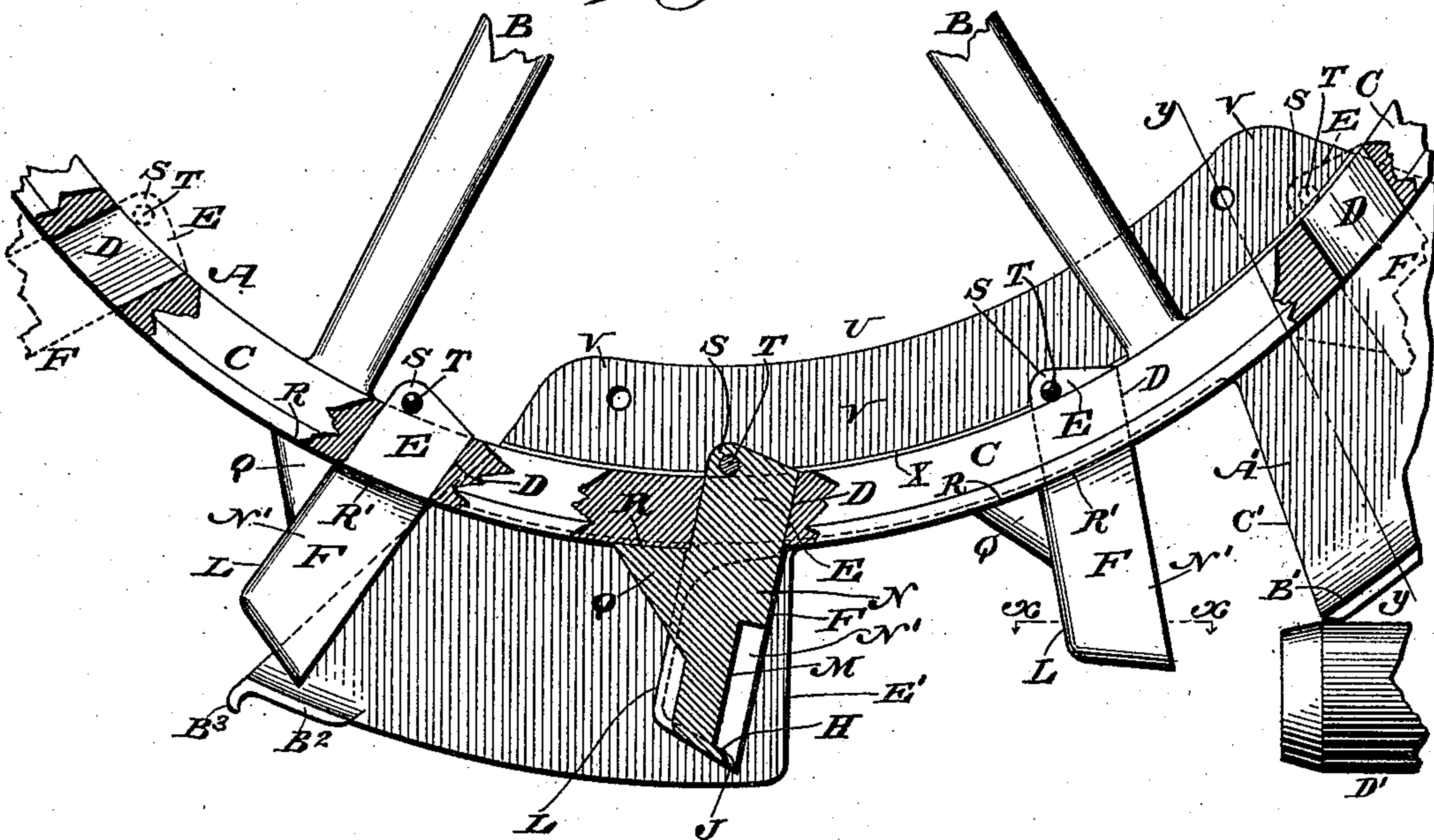


fig. 2.

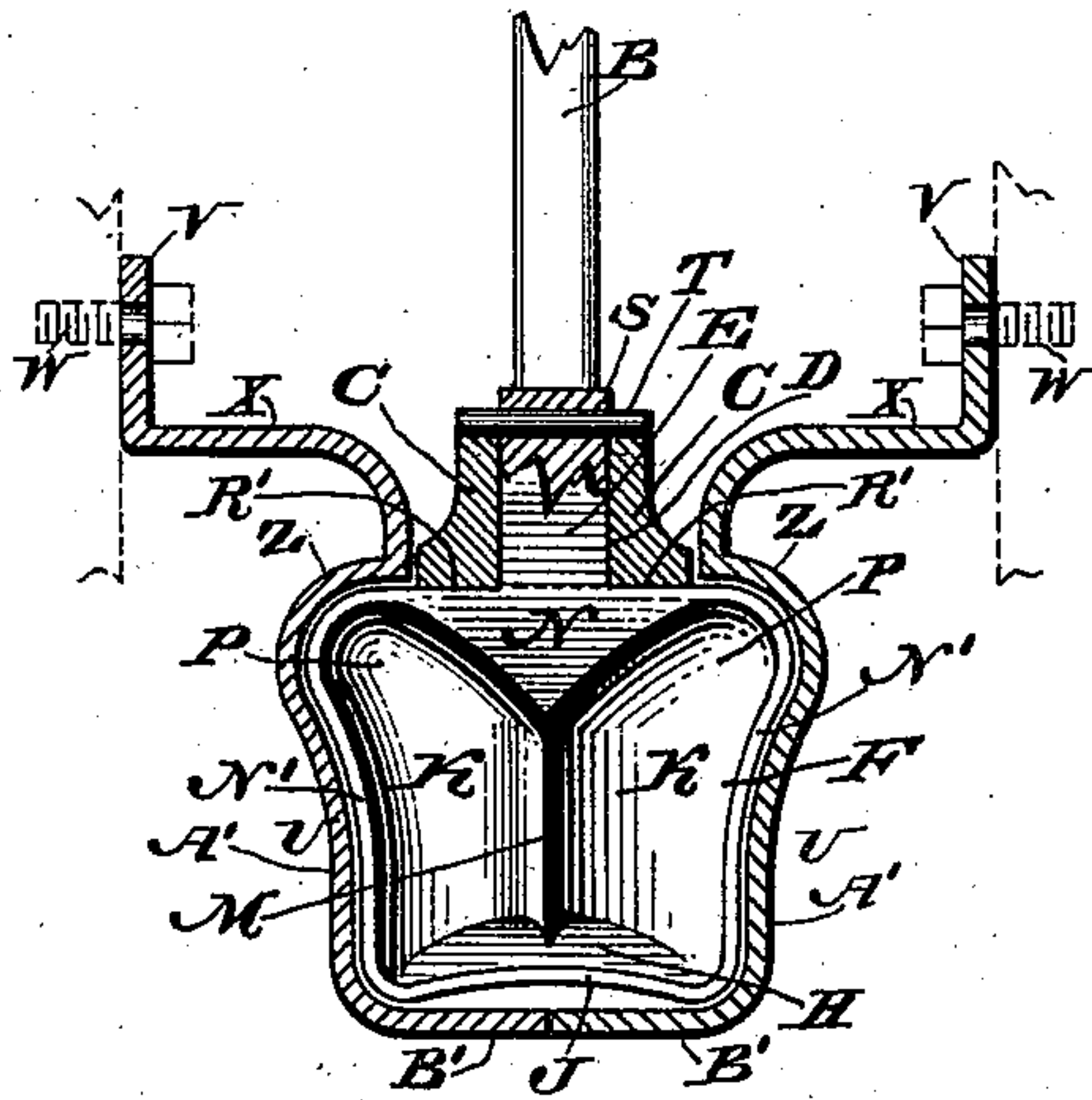
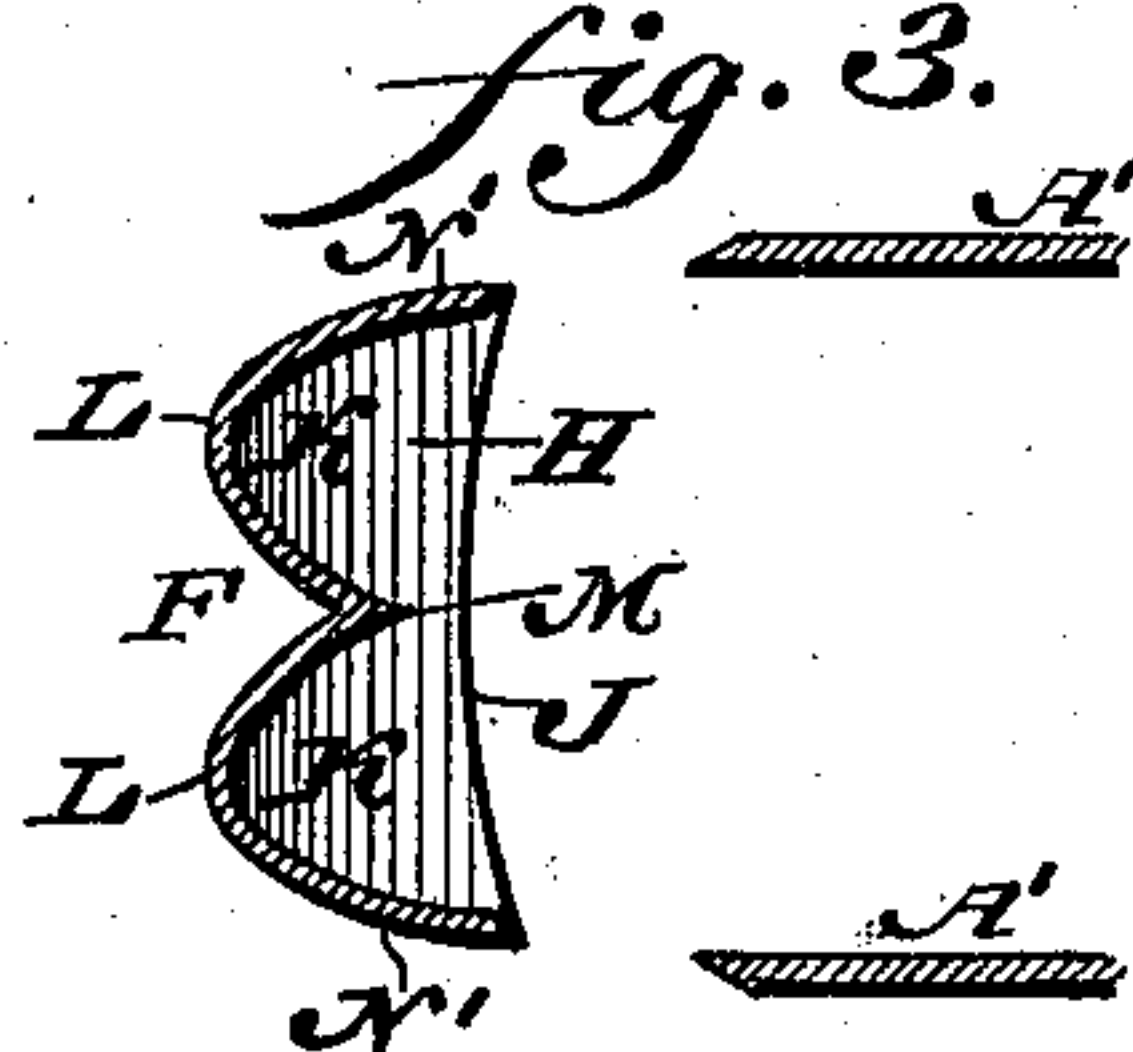


fig. 3.



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DANIEL HUG, OF DENVER, COLORADO.

WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 576,728, dated February 9, 1897.

Application filed October 1, 1896. Serial No. 607,529. (No model.)

To all whom it may concern:

Be it known that I, DANIEL HUG, a citizen of the United States, residing at Denver, in the county of Arapahoe, in the State of Colorado, have invented a new and useful Improvement in Water-Wheels, which improvement is fully set forth in the following specification and accompanying drawings.

My invention relates to water-wheels, and more particularly to the improvement of the buckets thereof; and it consists of a novel construction of the same whereby the fluid which is discharged against said buckets is separated into two streams, which are caused to diverge and be discharged from opposite portions of the bucket in such a manner that the whole reactionary force of the water or other actuating fluid is utilized, in addition to the direct force of the impinging jet.

It further consists of novel means for cheaply and expeditiously attaching the buckets to the desired portion of the water-wheel, whereby they can be readily and quickly repaired in case of accident, and when in position are braced and secured in a most effective manner.

It further consists of a novel construction of protector or casing which is adapted to inclose that portion of the wheel which is in proximity to the jet or nozzle.

It further consists of novel details of construction, all as will be hereinafter fully set forth, and specifically pointed out in the claims.

Figure 1 represents a side elevation, partly in section, of a portion of a water-wheel having attached thereto buckets embodying my invention, certain of said buckets being shown in elevation. Fig. 2 represents a section on line *y y*, Fig. 1, showing the relative position of the buckets and the casing or protector therefor. Fig. 3 represents a section on line *x x*, Fig. 1. Fig. 4 represents a perspective view of the front of the bucket in detached position. Fig. 5 represents a perspective view of the back of the bucket in detached position.

Similar letters of reference indicate corresponding parts in the several figures.

Referring to the drawings, A designates a portion of the water-wheel, the same being provided with a suitable hub (not shown)

from which extend the spokes B to the rim C, the structure of the latter in cross-section being indicated in Fig. 2.

D designates slots which are located at certain intervals in the rim C, it being noted that said slots are in the present instance at an angle to the radius of the wheel, said slots being adapted for the reception of the tongues or tenons E of the buckets F, the front and rear view of said buckets being clearly understood from Figs. 2, 4, and 5.

H designates the base of the bucket, the same inclining slightly downwardly and having its edge J slightly concaved, as will be evident from Figs. 2, 3, and 4.

K designates chambers having the base H, and the rear walls L of said chambers being curved, so that as little resistance as possible is offered to the flow of the water or other fluid, the two chambers K being separated by the apex M, which extends from the base H to the V-shaped upper wall N, between which and the outer wall N' of the bucket are formed the chambers P, the same being continuous of the chambers K and discharging in diverging directions, it being noted that said chambers P gradually contract toward the outlet, thus having the function of a nozzle, whereby a retardation is caused to the flow of the water, thus permitting the reactionary force of the water to be applied to the buckets, as is evident.

Q designates a shoulder or abutment which is attached to the rear portion of the bucket and has its top R adapted to contact with the outer perimeter of the rim C, which latter also contacts with the top R' of said bucket when the parts are assembled.

S designates an extension which is given to the tongue or tenon E of each bucket, whereby a stock is provided for the passage there-through of the pins T, it being noted that said pins do not pass through the rim C, but rest on the inner periphery thereof, the above device forming a cheap, convenient, and effective means for expeditiously assembling the buckets in position and being greatly superior to any device in which a threaded stem and engaging nut are employed to secure the buckets in position, since in this latter construction the threaded stem, and con-

sequently the bucket, must be of wrought-iron, and the expense of making the bucket of this material and of cutting the threads on the stem and providing the necessary nuts is a grave objection to this mode of fastening. By my invention, however, I simply core the slots D in the rim C in practice, and, the buckets being produced in any convenient manner, it is only necessary to pass the tongue Z through a slot and insert the locking-pin in place.

In case it is desired to remove or replace the bucket the pin can be readily withdrawn by any handy implement, whereas when a threaded stem and nut are employed the same invariably become rusted together and difficult of removal without the proper implements, which are often not at hand.

U designates a protector or casing employed which is located at the lower portion of the wheel adjacent to the inlet-nozzle D', the wheel being shown in the present instance used as an undershot wheel, said protector or casing U being preferably made in halves or sections and consisting of the upright flanges V, which are secured to suitable supports by means of the bolts W or other devices, each section of the protector having a lateral inwardly-extending flange X, which turns downwardly and has the outwardly-curved portion Z attached thereto, said portion Z having the inwardly-curved continuation A' and being thence continued laterally at B', it being understood that each half of the protector or casing is substantially the same, the sides A' thereof being cut away at a point C', adjacent to the nozzle D', said cut-away portion extending to the wall E'.

The operation is as follows: The actuating medium, which may be water, steam, air, or other fluid, enters through the nozzle D' and is discharged against the bucket in front thereof. The discharged fluid on striking the inclined face of the base or lower wall H is then divided into two streams, each stream passing into a chamber K and thence upwardly and outwardly through the chamber P, the V-shaped wall N acting as a deflector and effectively dividing and directing each stream outwardly from the bucket, it being noted, however, in addition that the chamber P gradually contracts toward the outlet, so that it has to a certain extent the function of a nozzle, the flow of the water being thus retarded, while the reactionary power thereof is effectively applied to the walls of the said chambers P and K and a greatly accelerated impulse is imparted to the wheel, the dead water being discharged from the bucket to either side of the protector U from the chamber P, so that each bucket as it emerges at the left of said protector is entirely free from water and none of the latter will be thrown upwardly or carried over the top of the wheel, no matter how fast or how slow the same should revolve. The portion B² of the protector closes in the same, as at B', and ends

in a bent-down lip B³, so that all the drainage water from the buckets is deflected downwardly and prevented from getting into rotary motion with the wheel, at the same time creating a partial vacuum in the casing above the protectors.

I desire to call especial attention to the location and function of the wall N, since by its employment I attain greater advantages than can be attained by the usual construction of buckets where said wall is dispensed with or where a flat surface exists.

It will be further noted that since all the passages located in the bucket into which the water is received or discharged are curved there are no surfaces to obstruct the free and rapid flow of the water away from the bucket.

The manner of attaching the buckets to the wheel has already been referred to and is believed to require no further description.

It will of course be understood that the terms "upright," "inclined," &c., employed are merely relative terms and apply to the parts only in substantially the positions shown.

It will be evident that changes may be made by those skilled in the art which will come within the scope of my invention, and I therefore reserve to myself the right to make all such changes or modifications which may come within the spirit of the same.

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

1. In a water-wheel, a bucket having diverging chambers arranged side by side, the upper portion of said bucket having a V-shaped wall therein, the sides of which assist in forming the top of said chambers, the latter discharging at opposite sides of the bucket.

2. In a water-wheel, a bucket having an inclined base, a plurality of chambers diverging therefrom, a V-shaped wall in the upper portion of said bucket, the sides of which wall assist in forming the top of said chambers, the latter having their exits curved and contracted, and means for attaching said bucket to a water-wheel.

3. In a water-wheel, a bucket having a plurality of diverging chambers, the upper portion of said chambers having a V-shaped wall therein, the sides of which wall assist in forming said chambers, which latter discharge at opposite sides of said bucket, an abutment on the latter and a tongue attached to said bucket, in combination with the rim of said water-wheel, a slot in said rim, in which said tongue is inserted, and a pin passing through said tongue and having a suitable bearing on said rim, said abutment being adapted to contact with the outer periphery of said rim.

4. In a water-wheel, a bucket having an inclined base H the chambers K extending therefrom, the upper portion of said bucket being V-shaped and assisting in forming the top wall of said chambers K, and the chambers P into which the latter chambers dis-

charge, said chambers P being a continuation of the chambers K and each having the curved wall N' and a contracted outlet, a shoulder Q attached to the rear of said bucket, and a tongue S projecting from the latter.

5. In a water-wheel, a protector or casing, the same having attaching devices for a suitable support, an inwardly laterally extending portion, the same being continued downwardly and an outwardly-curved portion, the same being curved inwardly and thence continued laterally, and a portion of said protector adjacent the discharge-nozzle being cut away.

6. A protector for a water-wheel consisting of two sections, each section having an upright flange V, the laterally and inwardly extending member X, the same being curved downwardly and having the outwardly-curved portion Z, the same extending thence downwardly and having the curvature A', and the lateral extension B' attached thereto.

7. A protector for a water-wheel, consisting of two sections, each section having an upright flange V, the laterally and inwardly extending members X, the same being curved downwardly and having the outwardly-curved portion Z, the latter extending thence downwardly and having the curvature A', the lateral extension B' attached thereto, one extremity of said casing having the downwardly-deflected lip B³, and means for hold-

ing said sections in position, a portion of the latter being cut away.

8. The combination of a bucket provided with a shoulder or abutment Q, and a tongue or tenon E attached to said bucket and extending at an oblique angle to said abutment, with a water-wheel having a slot in the rim thereof, through which said tongue passes, said slot being out of alinement with a radius of said wheel, and a pin passing through said tongue and resting transversely upon the inner periphery of said rim, said abutment being in contact with the outer periphery of said wheel.

9. In a water-wheel, a bucket having a plurality of diverging chambers, the upper portion of said bucket having a V-shaped wall therein, the sides of which wall assist in forming said chambers, which latter discharge at opposite sides of said bucket.

10. In a water-wheel, a bucket having a suitable base a plurality of chambers diverging therefrom, a V-shaped wall in the upper portion of said bucket, the sides of said wall assisting in forming the top of said chambers, and means for attaching said bucket to a water-wheel.

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Witnesses:

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