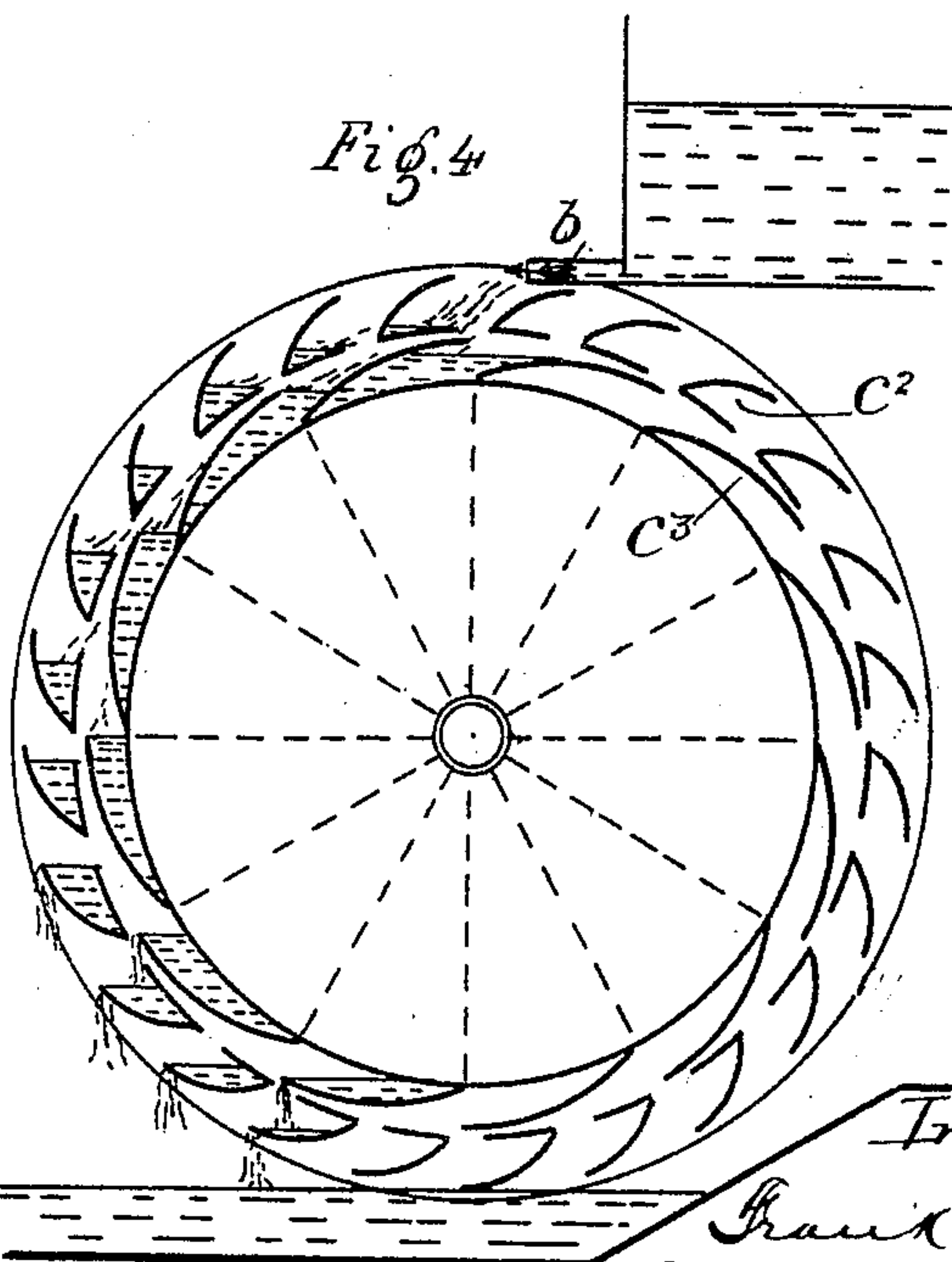
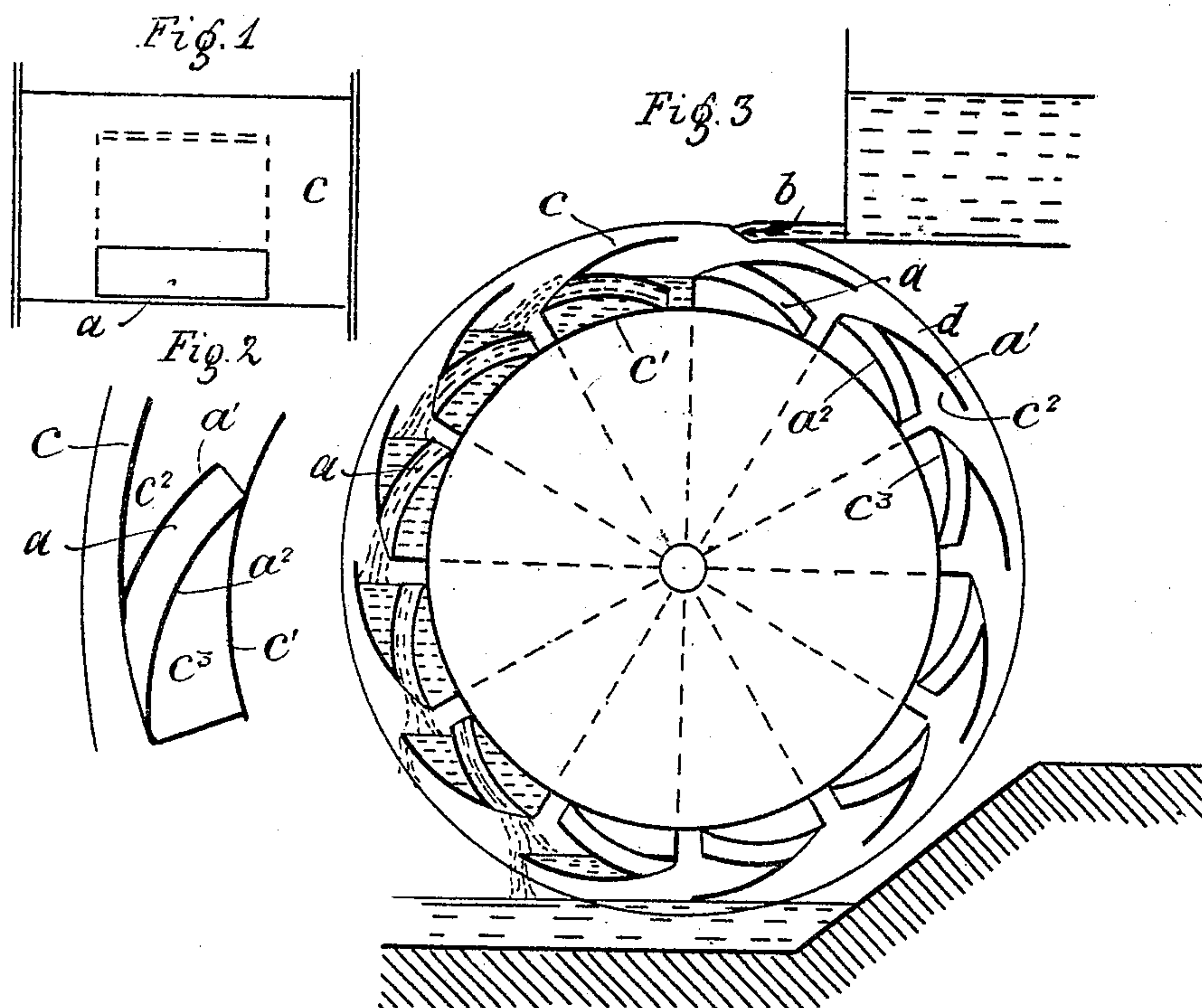


No. 824,662.

PATENTED JUNE 26, 1906.

F. KIRCHBACH.
WATER WHEEL.

APPLICATION FILED FEB. 16, 1904.



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UNITED STATES PATENT OFFICE.

FRANK KIRCHBACH, OF MUNICH, GERMANY.

WATER-WHEEL.

No. 824,662.

Specification of Letters Patent.

• Patented June 26, 1906.

Application filed February 16, 1904. Serial No. 193,778.

To all whom it may concern:

Be it known that I, FRANK KIRCHBACH, a citizen of Germany, residing at Munich, Germany, have invented certain new and useful Improvements in Water-Wheels; and I do hereby 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 relates to water-wheels, and particularly to those of the overshot pattern.

The object of my invention is to provide a water-wheel in which the initial impulse of the water is considerably increased, thus overcoming difficulties incident to the starting of such wheels from a standstill.

In contradistinction to the usual construction hitherto employed, in which a comparatively small number of buckets are filled, the force of the water being applied tangentially to the wheel over a limited area of its periphery, my invention is designed to bring the force of the water to bear upon the periphery of the wheel in a much greater degree. This object is accomplished by the peculiar arrangement of the buckets, whereby the overflow from one serves to successively fill those next lower to the extent of approximately one-half of the wheel.

My invention will be rendered perfectly clear by reference to the accompanying drawings, in which—

Figure 1 is a plan of one of the buckets, showing the mouth of the overflow-canal. Fig. 2 is a vertical sectional view of the same. Fig. 3 is a vertical section of a water-wheel, showing the relative arrangement of the buckets and canals, and Fig. 4 is a similar view of a modification.

Referring to the drawings more in detail, overflow-canals a , having outer walls a' and inner walls a^2 , are provided, having substantially the same cross-section as that of the water-supply sluice b . These canals are shown as curved and arranged within the buckets formed by the outer and inner walls c and c' and lead from the inner upper portion of the bucket to and through the lower outer portion in such manner that each serves to conduct the overflow therefrom in an outward direction to the next lower bucket, where it is discharged against the inner side of the outer curved wall c , so as to utilize the impact and avoid waste. This opera-

tion continues without waste until almost all of the buckets on one side of the axis of the wheel are filled, the discharge from each bucket not being complete in operation until the respective bucket reaches its lowermost position. It will be evident that as a result not only is the momentum of the water utilized by impact upon the buckets, but also the entire weight of the same is brought to bear to effect the overcoming of inertia and to give a starting impulse to the wheel.

It will be seen by an inspection of Fig. 3 that the outer wall of the bucket c , occupying the uppermost position and receiving the direct discharge from the sluice b , receives the full force of the impact of the water, none of which enters directly into the overflow-canal a , while such canal immediately begins to draw off the water from a point close to the inner wall of the bucket adjoining the periphery of the wheel proper and discharges into the bucket next in advance against its outer wall, so as to in all cases utilize the full impact force of the water at a point farthest removed from the axle of the wheel, and consequently having the greatest leverage.

A modified form of my invention is shown in Fig. 4, in which to avoid any possible disadvantages incident to the obstruction presented by the walls of the canal to the discharge of the water from each bucket in a lateral direction these canals are done away with, and in lieu thereof the wheel is provided with two series of buckets concentrically arranged and so disposed relative to each other that the overflow from one series discharges into the next lower buckets of that and the other series. In this way practically the same result is achieved as in the preferred construction, one entire half of the wheel being burdened with the water, which is not discharged until the respective buckets reach their lowermost position, as plainly shown in said figure.

In both forms of construction illustrated it will be observed that outer and inner chambers are, in effect, constituted. According to Fig. 3 the portion of the interior of the bucket bounded by the outer wall c of the bucket and the outer wall a' of the canal forms an outer chamber c^2 , which receives the inflowing water, whence it passes around the canal a into the inner chamber c^3 , bounded by the inner wall a^2 of the canal a and the in-

ner wall c' of the bucket, where the water is protected by the canal-wall from violent disturbance by the inflowing water, and whence it flows through the canal a to the outer chamber c^2 of the next lower bucket. According to Fig. 4 outer and inner chambers c^2 and c^3 are formed, respectively, by the outer and inner series of buckets, the flow of the water being analogous to that in Fig. 3.

Many modifications of the particular shape of the buckets and arrangement thereof will suggest themselves to one skilled in the art, which modifications come well within the scope of my invention, the essence of which resides in the adaptation of the buckets of a water-wheel so that the force of the water is applied to the entire half of the wheel as distinguished from a comparatively smaller portion of its periphery.

I am aware that water-motors have been devised in which chains equipped with buckets pass from one wheel to another in a substantially vertical line of travel, such buckets being provided with different forms of passages from one to another, and this I do not claim. In the present invention a different principle is involved. In water-wheels provided upon their periphery with vanes or buckets into which water is discharged from a sluice the force exerted by the water is constantly changing as the buckets assume a different relation to the axle of the wheel. It has been found difficult to utilize both the weight and impact of the water in any large proportion of the total downward travel of the buckets, and it is because of this difficulty that chain-buckets have been devised to travel vertically from one wheel to another in order to increase the proportion of the time during which the power was applied. The results of these attempts, however, have not been satisfactory, as an increase of mechanism and gearing was necessarily involved, together with attendant friction. In the present invention the overflow from one bucket to another changes in quantity and direction as the buckets travel in a downward circular path first outward and then inward. At first the overflow is entirely through the channels outward against the outer wall of the next lower bucket, there being no wastage of the water until the bucket reaches a point approximately three-fourths of the way from the uppermost to the lowermost position, and thereafter the wastage continues, the bucket not being emptied until it reaches a point directly below the axle. During three-fourths of its travel the entire weight of the water in the buckets is thus practically conserved and utilized in driving the wheel, while during the same time the overflow is used to the best possible advantage by directing the same outwardly and downwardly

against the curved walls of the underlying buckets. It is this principle as applied to a water-wheel as distinguished from chain-buckets that I claim as my invention.

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

1. A water-wheel having a series of buckets forming outer chambers adapted to receive the impact of the water discharged from the sluice and inner chambers adapted to receive the water from said outer chambers, and a passage between said chambers adapted to receive the overflow and to direct it into the next lower outer chambers of the series.

2. A water-wheel provided with a series of buckets about its periphery, each bucket being provided with a canal dividing said bucket into an inner and an outer chamber and leading from its upper part through its outer wall to discharge the overflow of the bucket into the outer chamber of the next lower one.

3. A water-wheel provided with a series of buckets about its periphery, each bucket being provided with a canal extending over a part of its length and leading from its upper and inner portion through a portion of its outer wall at a point removed from its inner wall to discharge the overflow of the bucket into the next lower one.

4. A water-wheel provided with a series of buckets about its periphery, each bucket being provided with a canal extending over a part of its length and leading from its upper and inner portion through its outer wall at a point removed from its inner wall, said canal having its discharge end curved inwardly to direct the overflow of the bucket into the next lower one.

5. A water-wheel provided with a series of buckets about its periphery, each bucket being provided with an overflow-canal leading from its upper and inner portion through its outer wall at a point removed from its inner wall, the outer wall of said buckets extending upward and beyond the inlet of said canal.

6. A water-wheel provided with a series of buckets about its periphery, each bucket being provided with an overflow-canal leading from its upper and inner portion through its outer wall at a point removed from its inner wall, and having its discharge end curved inwardly, the outer wall of said buckets being curved tangentially to the outer periphery of the wheel and extending upward beyond the inlet of said canal.

7. A water-wheel provided with a series of buckets about its periphery, each bucket being provided with an overflow-canal leading from its upper and inner portion through its outer wall at a point removed from its inner wall, the outer wall of said buckets extending

upward and beyond the inlet of said canal, in
combination with a water-supply sluice ar-
ranged to discharge water into said buckets
in a direction substantially tangential to the
5 periphery of the wheel and above the over-
flow-canals.

In testimony whereof I affix my signature

to this specification in the presence of two
witnesses.

FRANK KIRCHBACH.

Witnesses:

HERM. M. SCHILLING,
ABRAHAM SCHLESINGER.