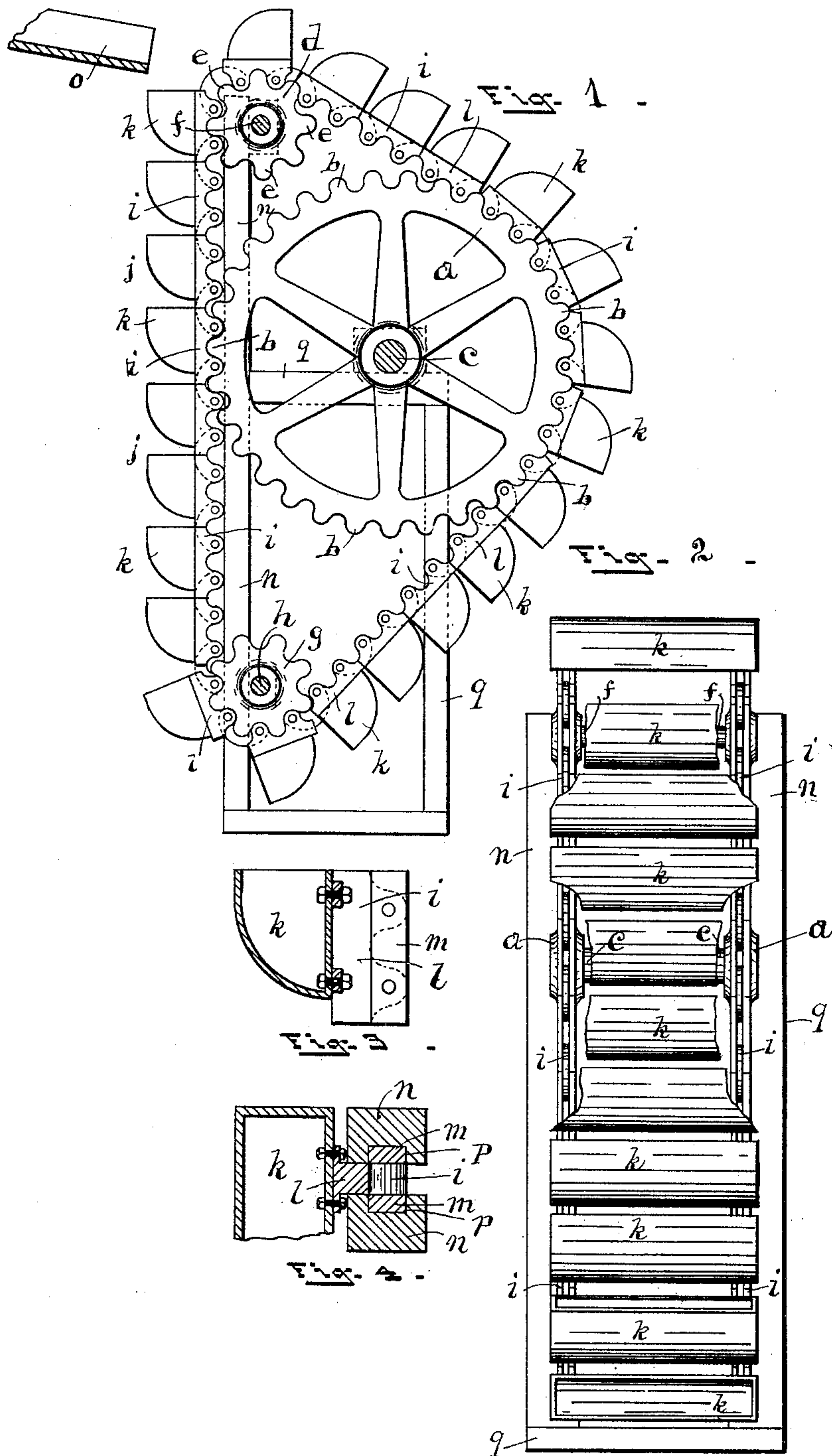


(No Model.)

F. JOHNSON.
WATER MOTOR.

No. 407,213.

Patented July 16, 1889.



ATTEST.
W. H. Powers
J. O. Thomas

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UNITED STATES PATENT OFFICE.

FERDINAND JOHNSON, OF NEW LONDON, PENNSYLVANIA.

WATER-MOTOR.

SPECIFICATION forming part of Letters Patent No. 407,213, dated July 16, 1889.

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To all whom it may concern:

Be it known that I, FERDINAND JOHNSON, a citizen of the United States, residing at New London, in the county of Chester and State of Pennsylvania, have invented certain new and useful Improvements in Water-Motors; 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in water-motors, and is more especially designed to be used in the same manner and to take the place of overshot, breast, and undershot water-wheels of the common and well-known form and construction.

In overshot wheels as ordinarily constructed in a circular form the water is admitted to the buckets on the upper portion of its periphery, and the water thus placed upon the wheel is of no great value as a propelling force until it has been carried over a point considerably beyond the vertical radius of the wheel, the distance being usually about one-eighth of the circumference of the wheel, and of course a portion of the vertical distance which should be available as a propelling force is thereby rendered comparatively useless, as the force or gravity of the water upon the wheel is exerted, to a great extent, in the direction of its radius, and therefore does not operate as a propelling force upon the wheel, but rather tends to unduly load the wheel and causes more friction and decreases its efficiency. The same action obtains to a less degree, perhaps, upon the lower portion of the space through which the water is carried to revolve the wheel, as when the buckets arrive at a point near the lower portion of the space the water contained therein is partially discharged, the discharge continuing until the buckets have moved nearly to the vertical radius of the wheel, and the weight or propelling force of the portion of water retained in the buckets at this point is exerted upon the wheel in the direction of its radius, or so nearly so that little or no benefit is derived therefrom; and the object of

this invention is to provide a means whereby the gravity of the water will be exerted upon the wheel as a propelling force to the full distance of the "head" or fall thereof; and another object of the invention is to provide devices whereby the water will exert the same force upon the wheel at all points of its downward movement; and another object of my invention is to provide a water-motor which may be easily adapted to falls of water of different heights without material change in the mechanism, so that the expensive and complicated portions can be made in quantities from the same patterns and kept in stock and adapted to different heights of fall and quantities of water by using more or less, as required, of the less expensive and simpler parts; and my invention consists, first, in the combination and arrangement of the parts which are used in the construction of the device; and the invention also consists in endless carrying-chains provided with suitable buckets and supported by wheels so situated that the buckets receiving the water will move downward in a vertical line to the full distance of the head or fall of water in the stream, whereby the gravity of the water is utilized with the full force thereof as soon as received in the buckets, and continued with the same force throughout its downward movement.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side view, partly sectional, of my improved water-motor. Fig. 2 is a front view of the same. Fig. 3 shows a transverse vertical section of one of the buckets enlarged. Fig. 4 is a transverse section of one of the slides and the chain.

a and *a* are two wheels of corresponding size and provided on their peripheries with suitable teeth *b*, and are mounted upon a shaft *c*, which is suitably supported in boxes in the ordinary manner upon a frame-work *g*, and is connected also in any suitable manner to the machinery to which the power is to be transmitted.

d d are supporting-wheels provided with the teeth *e* of a form corresponding to the form of the teeth *b*, and are mounted upon a shaft *f* in alignment with and at a point above the wheels *a* and in a position that the

front edge of their peripheries will be vertically in alignment with the front edges of the peripheries of the wheels *a*, the shaft resting in suitable boxes and supported in position by the frame-work *q*, and *g g* are supporting-wheels of a similar form and character to the wheels *d*, and are suitably mounted and supported on a shaft *h* below and with the front edges of their peripheries in alignment with the front edges of the wheels *a* and *d*.

i and *i* are endless chains or cables passed over the wheels *d* and *g*, and also over the wheels *a*, the portion *j* of the chain between the wheels *d* and *g* being preferably vertical, but may be slightly inclined, if desired, the links of the chain engaging with the teeth of the wheels *d* and *g*, and also with the teeth *b* on the front and rear sides of the wheels *a*, the form of the chain or cable to be used being preferably that shown and described in Letters Patent No. 327,446, dated September 29, 1886, as being the best adapted to the construction of the device, although any other form may be used, if desired and more convenient.

k k are a series of buckets constructed in a suitable form to receive the water, and secured in a suitable manner to the chains in a position that the open sides of the buckets will be upward as they pass over the vertical space between the wheels *d* and *g*. Upon the lateral sides of the links or sections *l* of the chain are provided the projecting guides *m* and *m*, and *n n* are vertical slides placed in position between the wheels *d* and *g*, and provided with the grooves *p* to receive the guides *m* and support the buckets in a proper upright position as they pass downwardly over the vertical portion of their travel.

o is a trough for conveying the water to the buckets *k*, and may be located to convey the water from the front to the buckets at the upper end of the vertical portion or run *j* of the series, as shown in Fig. 1, or, as shown in Fig. 3, may convey the water to the buckets from the rear of the wheel.

The operation of the device is that, the water being conveyed by the trough *o* into the upper buckets of the vertical series, they are carried downward by its gravity through the vertical space, and as they pass beneath the lower wheels *g* of course the buckets are inverted and the contents thereof discharged, the empty buckets passing upward in the rear of the wheels *a*, and the chains *i*, engaging with the teeth *b* of the wheel *a*, cause it to revolve and transmit the power contained in the weight of water moving downward through the vertical space to whatever machinery may be connected to the shaft *c*.

It will be observed that the distance between the wheels *d* and *g* can be regulated to

the height of the fall of water, and that the wheels *a*, *d*, and *g* may be used of the same size for all heights of water fall, so that the same device will be applicable to utilize the water for the entire distance of the fall thereof by adapting the distance between the wheels *d* and *g* to conform to the distance the water may fall, so that the buckets will receive the water at the beginning of its natural descent and discharge the same when the bottom of the fall is reached.

Another great advantage gained by my improved motor is that the water being received by the upper bucket at once begins to operate with the full force of its gravity to actuate the wheel, the same force continuing without perceptible diminution or change until the bottom of the fall is reached, where the water is discharged from the buckets, so that the full height of the fall of water is utilized and the full force of the gravity of the water is used without loss.

Having described my improvement, what I claim as my invention is—

1. In a water-motor, the combination, with the wheels *d*, provided on their peripheries with teeth or engaging devices, and the wheels *g*, located below the said wheels *d* and provided on their peripheries with teeth or engaging devices, and the central wheels *a*, suitably mounted and with one edge of their peripheries in alignment with one edge of the peripheries of the said wheels *d* and *g*, and provided with radially-projecting teeth, the endless chains *i*, passed over the peripheries of the said wheels and engaging with the teeth thereon and carrying a series of buckets *k*, and having the guides *m*, projecting laterally from the sides of its sections or links, of the vertical slides *n* on each side of the vertical run *j* of the chain, and provided with the grooves *p*, carrying the said side pieces *m*, substantially as set forth.

2. In a water-motor, the combination, with the frame *q*, the upper supporting-wheels *d*, and the lower supporting-wheels *g*, each provided on its periphery with radial teeth or engaging devices, of the central wheel *a*, provided on its periphery with suitable teeth, and suitably mounted in a position between and with one edge of its periphery in vertical alignment with one edge of the peripheries of the said wheels *d* and *g*, the endless chains *i*, carrying buckets *k*, passed over the said wheels *d*, *g*, and *a*, and engaging with the said teeth thereon, and the trough or flume *o*, substantially as and for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

FERDINAND JOHNSON.

Witnesses:

JAS. E. THOMAS,
G. P. THOMAS.