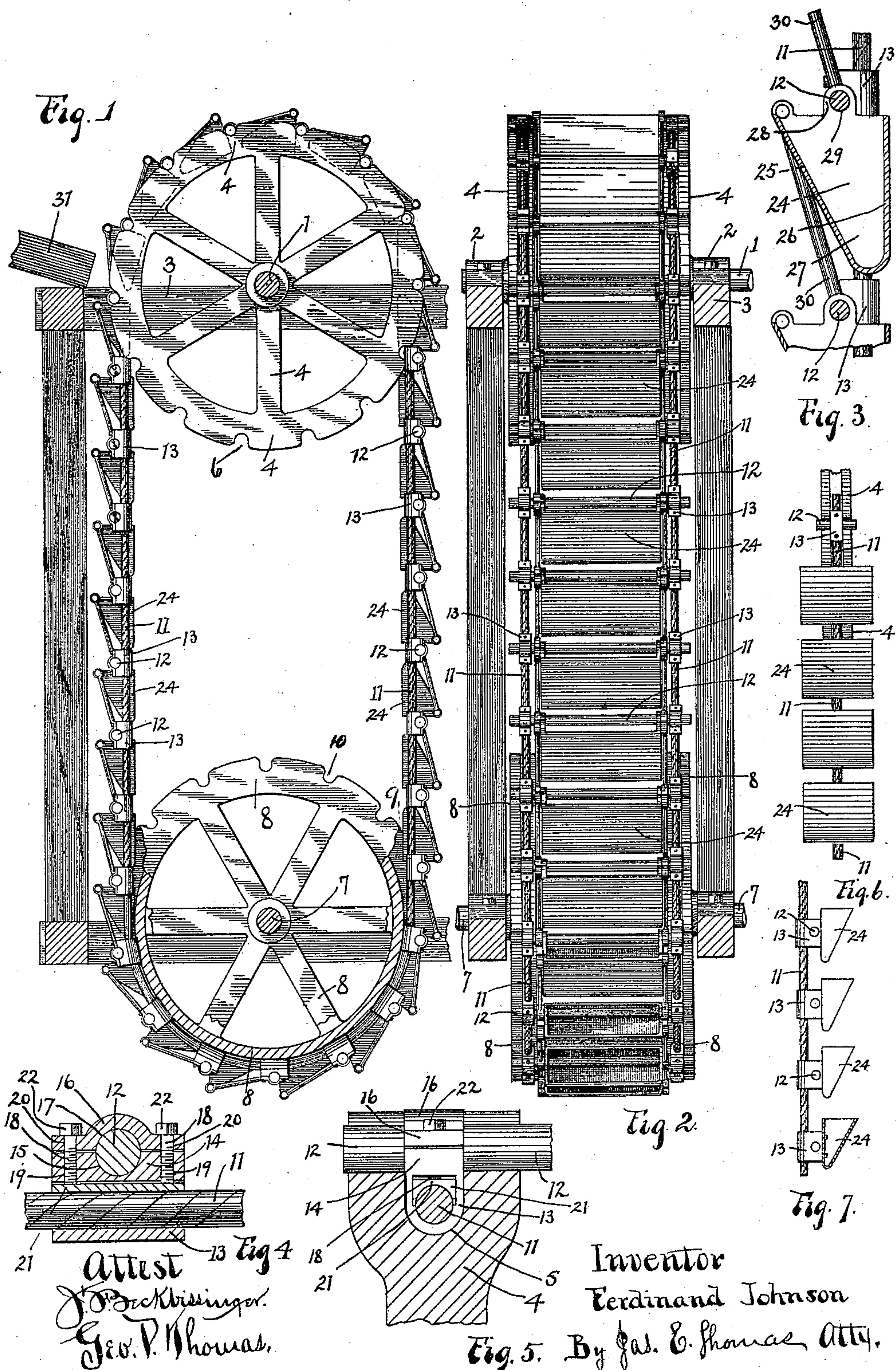


F. JOHNSON.  
HYDRAULIC MOTOR.

Patented Nov. 1, 1892.





# UNITED STATES PATENT OFFICE.

FERDINAND JOHNSON, OF NEW LONDON, PENNSYLVANIA.

## HYDRAULIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 485,412, dated November 1, 1892.

Application filed February 1, 1892. Serial No. 419,982. (No model.)

*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 Hydraulic Motors, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to improvements in hydraulic motors and pertains particularly to the class in which a series of buckets pivotally connected to each other or to chain cables or connecting devices are carried by upper  
15 and lower supporting drums or sheaves and arranged with a portion of the series between one side of the peripheries of the supports held upright for receiving and retaining the water for moving the series downwardly, while  
20 the series on the opposite side move upwardly in an inverted position and empty.

The invention consists in the combination, arrangement, and construction of the several parts and devices used in the construction of  
25 my improved contrivance, together with the operation of the same, as I shall hereinafter fully set forth and explain in detail, and which I shall specifically point out in the claims.

30 The object of the invention is to provide a hydraulic motor of the class mentioned, which will be durable and strong and at the same time be cheap and easily constructed and repaired and strong and efficient in its operation.

35 Another object is to provide means for supporting the buckets in a motor of the class mentioned, so that the weight carried by each bucket will be nearly equally divided and balanced on opposite sides of the pivotal supports of the same, whereby all overhanging  
40 action and outward strain on the cables or supports is avoided and the friction greatly lessened.

45 Another object is to provide devices for securely and rigidly fastening the bucket-supporting devices to the endless cables.

50 My invention will be found illustrated in the accompanying drawings in which the same figures of reference will be found illustrating the same parts throughout the several illustrations.

Figure 1 is a vertical section from front to

rear of my improved motor. Fig. 2 is a front view in elevation of the same. Fig. 3 is a longitudinal section through the buckets, showing one of the cables enlarged and with the  
55 bucket-supporting device attached thereto. Figs. 4 and 5 are sectional views of the bucket-supporting device, taken at right angles to each other. Fig. 6 is a front view of modified form of bucket. Fig. 7 is a side view of same. 60

I represents a horizontal shaft suitably journaled in boxes 2, carried by framework 3 or other proper supports, and upon this shaft is mounted the supporting-wheels 4, the peripheries of each of which is provided with a  
65 circumferential groove 5 and with a series of transverse grooves or recesses 6.

Upon the lower portion of the framework 3 is journaled a horizontal shaft 7, which carries the wheels 8, similarly constructed to the  
70 wheels 4, with which they are located in vertical alignment and provided with circumferential grooves 9 and transverse recesses 10, and upon these wheels 8 and 4 are mounted the endless cables 11 of wire rope or other  
75 suitable material.

Transversely to the cables 11 are arranged in series at a suitable distance from each other the horizontal shafts 12, with their ends extending for a short distance beyond the  
80 outer lateral sides of the cables, and these shafts are secured to the cables and held in position by a sleeve 13, which surrounds the cable loosely and is provided on one side with an outwardly-projecting bearing portion 14,  
85 which is provided with a centrally-located transverse recess 15, fitted to receive and carry the shaft, and a cap-piece 16 is placed over the portion 14 and provided with a transverse recess 17 opposite the recess 15 for bearing  
90 on the shaft, and the parts are clamped together and to the cable by screws 18, which are passed through openings 19 in the cap-piece and through threaded openings 20 in the portion 14 and with their inner ends  
95 against a clamping-plate 21, which is inserted between the cable and the portion 14, so that when the bolts are turned to a position for clamping the cap-pieces upon the shaft the lower inner periphery of the socket is drawn  
100 firmly upon the cable for retaining the socket rigidly in position upon the cable, while the



heads 22 of the bolts draw the cap-piece to the shaft and clamp the parts firmly together and the intervals between the series of recesses 6, and also between the recesses 10, are arranged to be equal to the distance between the shafts 12, so that as the wheels are revolved by the movement of the cables the shafts secured thereto will drop into and engage with the recesses and provide thereby a positive engagement for the cables with the wheels.

24 are series of buckets provided with backwardly-inclined front sides 25 and with a substantially-vertical rear side 26, and the ends 27 of these buckets are provided with ear-pieces 28, located slightly in rear of the middle of their upper edges, and these ear-pieces are provided with openings 29, through which the shafts 12 are passed, thereby pivotally securing the buckets to the shafts, so that the weight carried by the buckets will be located on each side of the shaft, and the position of the loaded bucket will be perpendicular when traveling over the vertical portion of its route.

To the outer or front portion of the upper edge of the buckets are pivoted one end of the braces 30, and these braces extend downwardly and are each pivotally secured at their lower ends to one end of the next shaft 12, beyond the bucket, so as to provide a means for retaining the buckets in an upright position as they pass downwardly and over a portion of the periphery of the lower wheel, and to hold the buckets in a position in relation to the cables to allow the buckets to tip and empty their contents when they arrive at a point considerably below the horizontal center of the lower wheel.

31 is a flume or trough for admitting water to the upper upright bucket of the series, and this flume can be located so as to conduct the water either over the upper wheels of the motor or from the front side thereof as may be desired, and the water from the flume being let into the upper bucket of the upright series its gravity moves the series downwardly, so that each bucket as it passes the flume receives its complement of water and retains the same until it has passed over the entire length of its downward vertical movement, and also over a portion of the periphery of the lower wheel, the braces serving to still retain the buckets in an upright position as they move over the wheel until they reach a point approaching the vertical center of the wheel, and as the buckets then begin to move upwardly they are inverted and entirely emptied of their contents and move upwardly in a direct line, to be again filled at the beginning of their downward movement after passing over the upper periphery of the upper wheel.

It will be seen that by this construction the full power of the water is utilized for moving the motor, and the horizontal shafts 12, engaging with the transverse recesses in the peripheries of the wheel impart a positive rotary movement to the wheels 8 and the shafts 7, so that motion may be conveyed from the shaft 7 by any desired common means for driving machinery of any kind. Of course it will be seen that I need not necessarily be confined entirely to two cables for carrying the buckets, for, as shown in Fig. 6, one cable only could be used with good effect, the shafts 12 projecting on each side of the cable forming supports for engaging with the transverse recesses in the wheel, while the buckets are secured by their rear portions to the cap-piece 16 and by suitable bolts. In this form the cable passes behind the bucket instead of on the side, as before stated, and for small motors and light work the braces 30 may be omitted, if desired, as the buckets of a smaller size when firmly secured to the cap-piece retain a proper position in relation to the cable when the quantity of water carried thereby is of a limited quantity; and it will also be noticed that it is not necessary in all cases to have the lower wheels 8 for supporting the lower end portion of the motor, as, especially with a short fall of water, the proper rigidity of the cables and the form of the lower curvature of the same is maintained to a suitable degree by the weight of the water carried by the descending buckets; so that I do not limit my invention altogether to the use of the lower wheel for supporting the cables.

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

In a hydraulic motor, the combination of the upper and lower horizontal shafts, the carrying-wheels mounted on the shafts and provided on their peripheries with circumferential grooves and with a series of transverse recesses, the endless cables resting in said grooves with a series of horizontal shafts secured by their end portions to said cables and adapted to engage with said transverse recesses in the wheels, a series of buckets with their upper portions pivotally secured to said shafts at a point nearly central from front to rear, and the diagonal braces with their upper ends pivoted to the outer upper edge of the buckets and with their lower ends pivoted to one of the shafts above the buckets, substantially as set forth.

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

FERDINAND JOHNSON.

Witnesses:

T. HUES,

JAS. E. THOMAS.