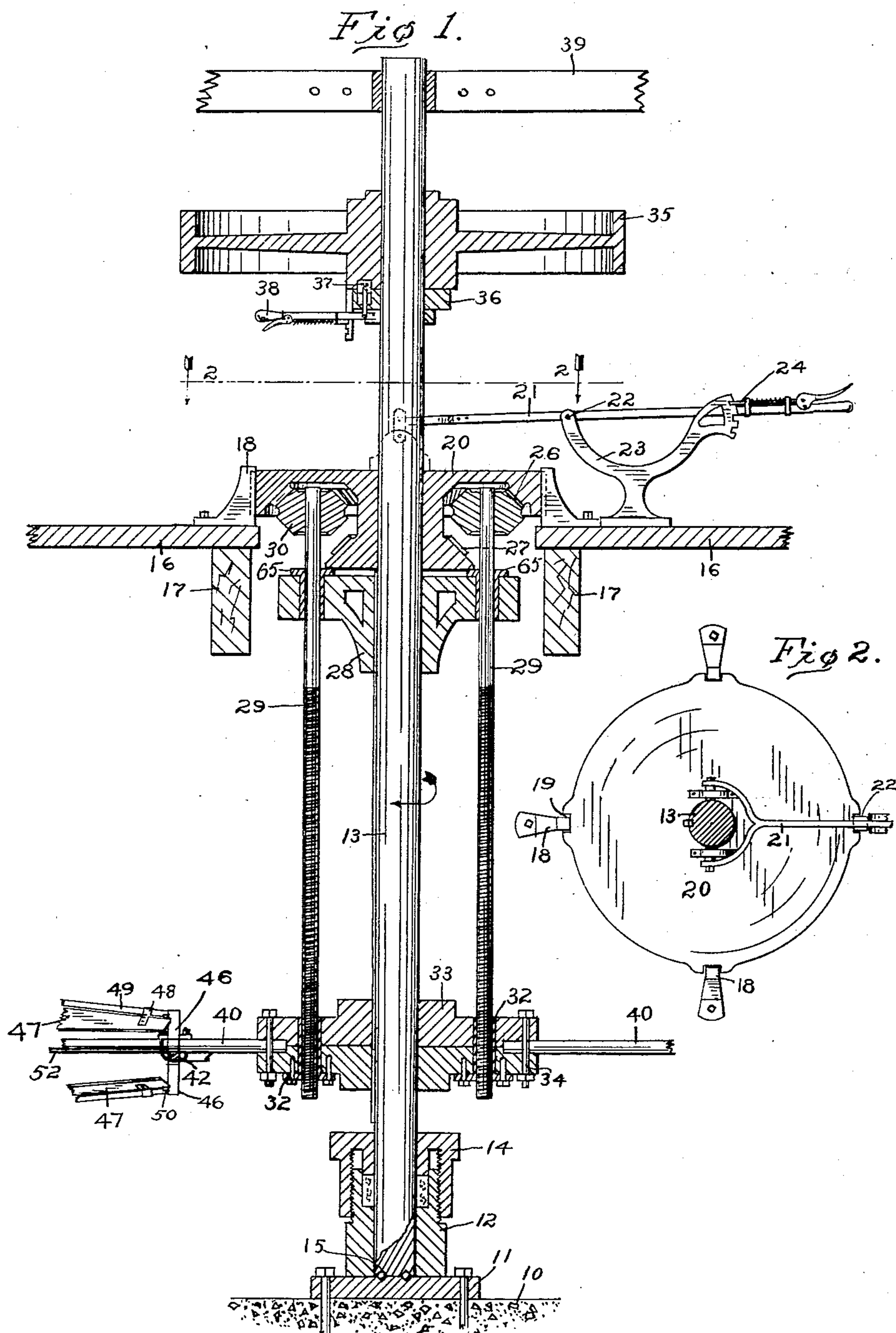


PATENTED DEC. 1, 1903.

NO MODEL.

3 SHEETS—SHEET 1.



WITNESSES:

Harry Pearce,  
Nellie Allmonor

INVENTOR.

James F. Williams,  
BY: *V. A. Fockwood*  
ATTORNEY.

No. 745,945.

PATENTED DEC. 1, 1903.

J. F. WILLIAMS.  
WATER POWER APPARATUS.

APPLICATION FILED FEB. 20, 1903.

NO MODEL.

3 SHEETS—SHEET 2.

Fig 3.

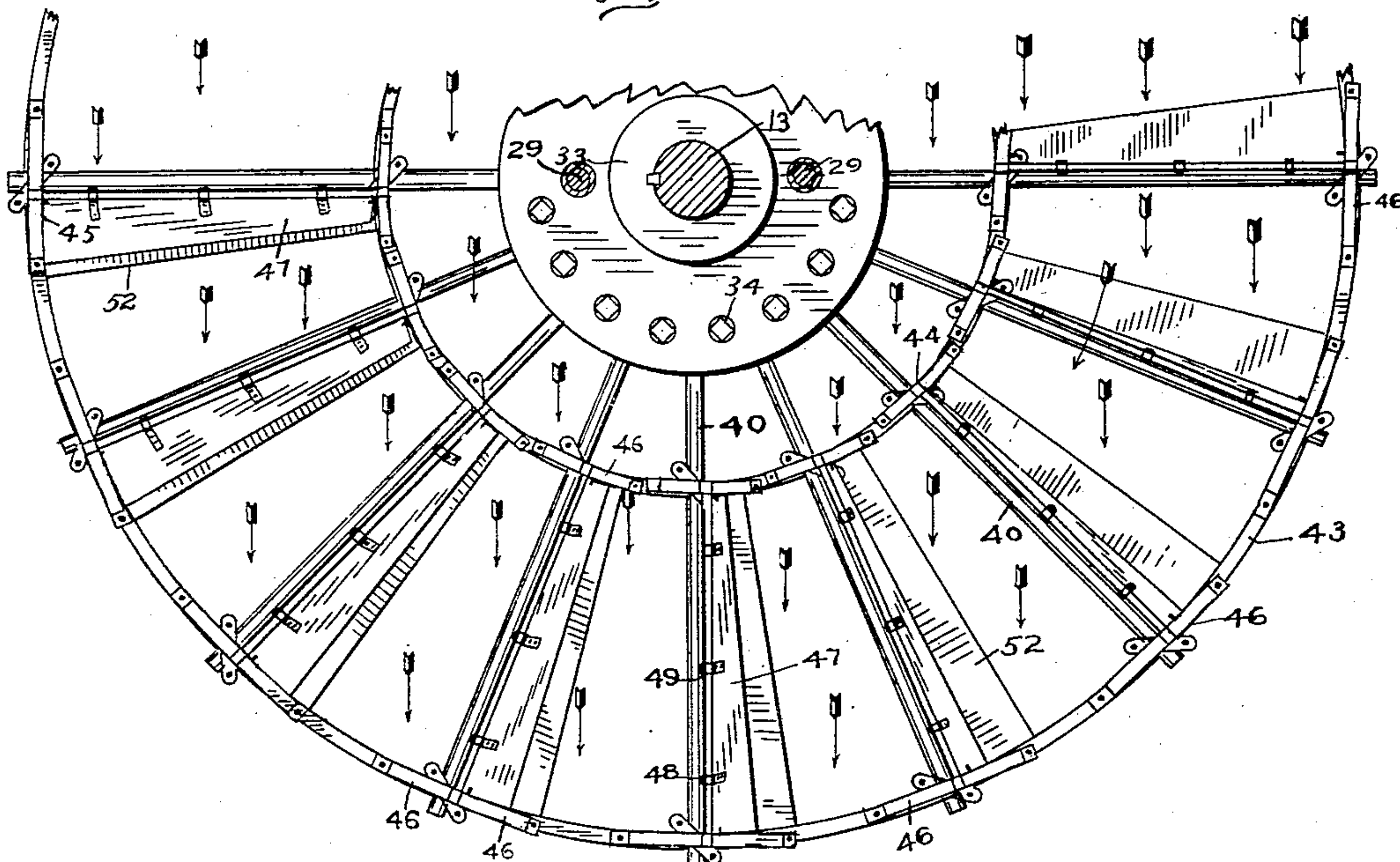
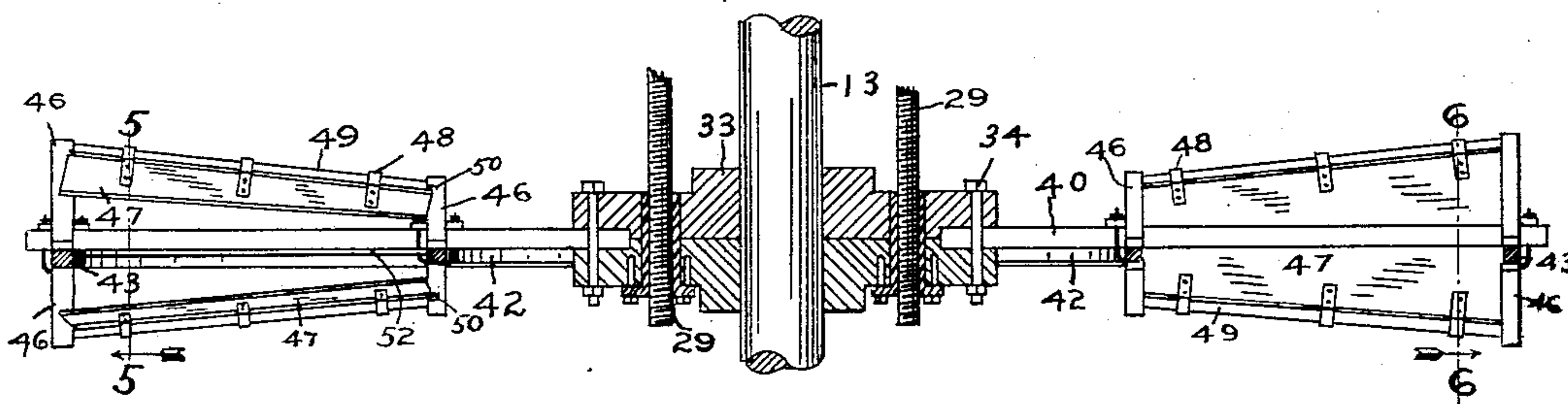


Fig 4.



WITNESSES:

Harry Pearce  
Nellie Allmon.

INVENTOR.

James F. Williams  
BY  
V. H. Fockwood  
ATTORNEY.



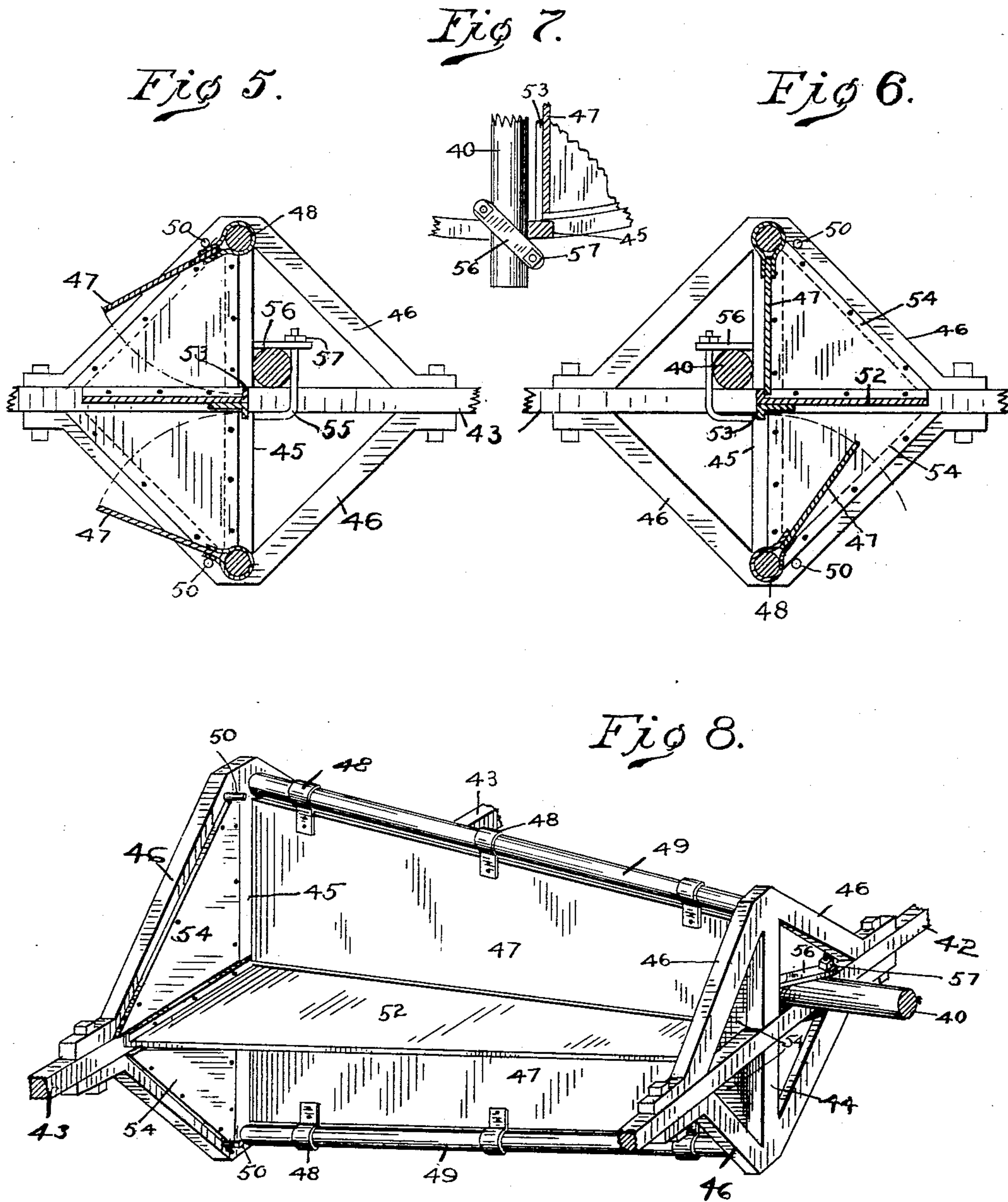
No. 745,945.

PATENTED DEC. 1, 1903.

J. F. WILLIAMS.  
WATER POWER APPARATUS.  
APPLICATION FILED FEB. 20, 1903.

NO MODEL.

3 SHEETS—SHEET 3.



WITNESSES:  
*Harry Pearce,*  
*Nellie Allmon,*

INVENTOR.  
*James F. Williams,*  
BY *V. H. Lockwood,*  
His ATTORNEY.



# UNITED STATES PATENT OFFICE.

JAMES F. WILLIAMS, OF VINCENNES, INDIANA, ASSIGNOR OF TWO-THIRDS  
TO FRANCIS SCHENKER, OF VINCENNES, INDIANA.

## WATER-POWER APPARATUS.

SPECIFICATION forming part of Letters Patent No. 745,945, dated December 1, 1903.

Application filed February 20, 1903. Serial No. 144,305. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES F. WILLIAMS, of Vincennes, county of Knox, and State of Indiana, have invented a certain new and useful Water-Power Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like figures refer to like parts.

The object of this invention is the production of an effective and conveniently-operated water-power apparatus. The novel features of the invention reside chiefly in the construction of the water-wheel and the buckets thereof and in the means for adjusting the vertical position of the water-wheel.

The nature of this invention will be understood from the accompanying drawings and the following description and claims.

In the drawings, Figure 1 is a central vertical section through the apparatus with portions broken away. Fig. 2 is a horizontal section through the device on the line 2 2 of Fig. 1. Fig. 3 is a plan view of one half of the water-wheel, the other half being broken away. Fig. 4 is a central vertical section through the water-wheel. Fig. 5 is an enlarged section on the line 5 5 of Fig. 4. Fig. 6 is an enlarged section on the line 6 6 of Fig. 4. Fig. 7 is a horizontal section above the connection between the spoke and outer rim. Fig. 8 is a perspective of a bucket with the vanes closed, parts broken away.

In detail, 10 is a base in a stream of water, on which a bearing-block 11 is secured, having a bearing 12 for the vertical shaft 13.

14 is a stuffing-box for closing the joint water-tight, and 15 represents ball-bearings on which the shaft rests.

Above the stream of water or lower part of the construction which has been described there is shown the floor 16 of a building or other structure, mounted on suitable stringers 17, said floor having four vertical guide-castings 18 secured to it, which fit in recesses 19 in the block 20, whereby the block is vertically guided. This block is loosely mounted on the shaft 13 and is elevated or depressed by the lever 21, fulcrumed at 22 to the stand 23, which is secured on the floor, and said

lever is held in position by the latch 24. The block 20 has on its under surface two bevel-racks 26 and 27. The rack 26 is of larger diameter than the rack 27 and faces inward and downward, while the rack 27 faces upward and outward.

On the shaft 13 there is a bearing-block 28, secured to the shaft and having on opposite sides a pair of collars 65, fitting vertically and loosely in the same and through which the elevating-shafts 29 extend. Said collars are secured to the shafts so that they will support the shafts in the bearing-block 28. Said shafts have secured on their upper ends double-faced bevel-gears 30, the upper gear engaging the rack 26 on the block 20 when said block is in its lower position, as shown in Fig. 1, and the lower gear of the bevel-gears 30 engaging the rack 27 when the block 20 is in its elevated position. The lower ends of said shafts 29 are threaded, and they screw into threaded openings 32 through the hub 33 of the water-wheel. The hub of the water-wheel consists of two parts alike secured face to face by the bolts 34, and said hub is keyed on the shaft 13, so as to be vertically movable.

By means of the mechanism just described the vertical position of the water-wheel may be adjusted. The water-wheel is in Fig. 1 at its lowest position. With the double bevel-gears 30 in engagement with the upper rack 26 on the block 20, as shown in Fig. 1, the water-wheel may be lowered, assuming the water-wheel and shaft to be revolving in the direction indicated by the arrow, for as the water-wheel and shaft 13 rotate they carry the two shafts 29 around with them, and as these shafts revolve they are in turn rotated by the bevel-gears 30, and the rotation of the shafts 29, by reason of the screw-threaded connection with the hub of the water-wheel, will lower it from the position shown in Fig. 1. When the water-wheel is high enough, the block 20 is elevated by the lever 21, so that the bevel-gears 30 will not come in contact with either rack 26 or 27. If it is desired to elevate the water-wheel, the block 20 is elevated still further to bring the bevel-gears 30 into engagement with the lower rack 27,



and this will cause the shafts 29 to rotate in a direction opposite that caused by the rack 26, and the threads on said shaft will lift the water-wheel.

5 The driving-pulley 35 is loosely mounted on the shaft 13 with its hub resting on the collar 36, secured to the shaft 13. The two are locked together by the key 37 being forced upward by the lever 38. This connection is  
10 maintained, so that power may be transmitted from the shaft 13 to the driving-pulley. The driving-pulley can be thrown out of operation by pulling down on the lever 38 and causing the key 37 to disengage the pulley-  
15 hub. While the lever 38 rotates with the shaft 13, still the rotation is so slow as not to render said lever difficult to handle. The upper end of the shaft 13 has a bearing in the cross-timber 39.

20 The water-wheel has a number of spokes 40, that are clamped in place between the two plates 33 of the hub of the water-wheel by the bolts 34, there being a suitable recess or socket in said hub-plates for seating the inner end of the spoke, as shown in Fig. 4. There are continuous inner and outer rims 42  
25 and 43 secured to said spokes, as shown in Figs. 3 and 4. There is also an inner series of posts 44, one for each spoke, and secured to the inner rim 42. There is a series of longer posts 45 secured at the outer end of the spokes to the outer rim 43, as shown in Fig. 4. These are braced in both directions by the braces 46, extending from the ends of the post to the  
35 rim. These braces are connected with both the outer and inner series of posts and rims to resist the strain on the posts caused by the current of water against the vanes 47. The posts 44 and 45 extend equidistant above and  
40 below the rims, and there are vanes 47 pivotally mounted at the extreme upper and lower ends thereof, as shown in Fig. 8. These vanes are plates or swinging doors that have straps 48 passing over rods 49, that are se-  
45 cured on each end of the posts 44 and 45. The vane therefore is wider at the outer end than at the inner end, so as to close the space when necessary between the posts. The upper vane opens upward, while the lower vane  
50 opens downward. There is a stop 50, secured at both the upper and lower ends of the forward braces 46, for limiting the outward or opening movement of the vanes, so that they can never reach a position which is  
55 at a right angle to the posts and at the outward limit are at an acute angle to the plane of the wheel. The outermost positions of the vanes are shown in Fig. 5. The two vanes in Fig. 5 are in the position they occupy when  
60 the side of the wheel that they are on is moving upstream, so as to let the water pass through, being the position shown at the left end in Fig. 4. There is a stationary horizontal plate 52 secured to the inner and outer rims  
65 and extending in a plane parallel with the plane of the wheel. This plate is the same

size as the vanes in all respects, but it is stationary. It has upwardly and downwardly extending stop-flanges 53 along its inner edge. The vanes are wide enough for their  
70 ends to abut against these flanges 53, as seen in Figs. 5 and 6, so that when the current comes against the vanes sufficiently strong it closes them into the position shown in Fig. 8  
75 and they are stopped and held by said flanges. Then the current gives its full force to the wheel. The buckets are formed by these vanes and the plate 52 and the end plates 54, that are secured to the rims, posts, and forward braces, as shown in Fig. 8. 80

The lower vanes operate in the nature of a governor. When the wheel is first started and its motion is considerably slower than the current, the force of the current will close both vanes into the position shown in Fig. 8. 85 When, however, the wheel's speed is substantially the same as the current, the lower vane will either be moved none whatever to the closing position or be moved to the position shown in Fig. 6, a half-closed position. The  
90 upper vane will always be moved to a closed position by the current, because gravity co-operates with the current to bring it to a closed position. On the other hand, gravity tends to open the lower vane, and since its weight  
95 will be appreciable the speed of the current would have to be appreciably more than the speed of the wheel in order for the force of the current to overcome the effect of gravity on the lower vane and close it. The effect  
100 of this is that if for some reason the wheel should lag or tend to stop or have an irregular movement, whereby its movement is temporarily diminished, the force of the current would bring the lower vane shut, so that the  
105 current would act on a much larger vane-surface than when the lower vane was open.

Any means may be adopted for securing the vertical posts 45 and the inner and outer rims and the spokes together. That shown  
110 consists of a strap 55 diagonally about the spoke and the rim and the plate 56 clamped by nuts 57.

What I claim as my invention, and desire to secure by Letters Patent, is— 115

1. In a water-wheel, a plate parallel with the plane of the wheel, a vane, and means for pivoting the vane remote from the plate so that it will swing to the plate and coöperate therewith to form a bucket. 120

2. In a water-wheel, a plate parallel with the plane of the wheel, a vane, means for pivoting the vane remote from the plate so that it will swing to the plate, and means for stopping the swinging movement of said vane at  
125 a substantially right angle to said plate.

3. In a water-wheel, a plate parallel with the plane of the wheel, a stop on said plate, a vane, and means for pivoting the vane remote from the plate so that it will swing to the  
130 plate and against said stop.

4. In a water-wheel, a plate parallel with



the plane of the wheel, a vane, means for pivoting the vane remote from the plate so that it will swing to the plate, and a stop to limit the swinging movement of said vane away from the plate to a position at an acute angle to the plane of the wheel.

5. In a water-wheel with a vertical axis, a horizontally-disposed plate, a vane, and means for pivoting the vane at a point above and remote from said plate so it will swing downward to said plate and cooperate therewith to form a bucket.

6. In a water-wheel with a vertical axis, a horizontally-disposed plate, a vane, means for pivoting the vane below and remote from said plate so it can swing upward to the plate and cooperate therewith to form a bucket.

7. In a water-wheel with a vertical axis, a horizontally-disposed plate, a vane, means for pivoting the vane below and remote from said plate so it can swing upward under the influence of the current of water to said plate, and means for limiting the downward movement of said vane at an acute angle to the plane of the wheel.

8. In a water-wheel, a fixed plate parallel with the plane of the wheel, a vane, means for pivoting the vane remote from the plate so that it will swing to the plate, a stop to limit the movement of the vane toward the plate at substantially a right angle therewith, and a plate secured at each end of said fixed plate at a right angle to the fixed plate and vane for cooperating with them to form a bucket.

9. In a water-wheel with a vertical axis, a horizontally-disposed fixed plate, a vane, means for pivoting the vane remote from said plate so it will swing to said plate, and plates secured at the ends of said fixed plate and vane to cooperate therewith when the vane is closed to form a bucket.

10. In a water-wheel, a plate parallel with the plane of the wheel, a pair of independent vanes, means for pivoting the vanes on opposite sides of said plate and remote therefrom so each will swing to the plate, means for stopping the swinging movement of said vanes at substantially right angles to said plate and in line with each other to cooperate with said plate in forming a double bucket.

11. In a water-wheel, a pair of radially-extending vanes, and means for pivoting the vanes along their remote edges so they will swing toward each other, and means for stopping their movement toward each other at a position substantially in alignment with each other.

12. In a water-wheel, a pair of radially-extending vanes pivotally mounted along their opposite edges with their free edges adapted to approach each other, means for stopping the swinging movement of said vanes in one direction in a position substantially in alignment with each other, and stops for limiting the swinging movement of said vanes in the

opposite direction to a position at an acute angle to the plane of the wheel.

13. In a water-wheel, a stationary plate extending radially lengthwise and parallel with the plane of the wheel transversely, a pair of vanes, one on each side of said plate and both pivotally mounted along their edges remote from said plate and adapted to swing toward said plate and in close proximity therewith, and means for stopping the swinging movement of said vanes at a position substantially at right angles to said plate.

14. In a water-wheel, a stationary plate extending radially lengthwise and parallel with the plane of the wheel transversely, flanges along the inner edge of said plate extending in opposite directions at right angles to said plate, and a pair of vanes, one on each side of said plate and both pivotally mounted along their edges remote from said plate so as to swing toward said plate and against said flanges.

15. In a water-wheel, a stationary plate extending radially lengthwise and parallel with the plane of the wheel transversely, a pair of vanes, one on each side of said plate and both pivotally mounted along their edges remote from said plate so as to swing toward said plate and in close proximity therewith, means for stopping the inward movement of said vanes under the influence of the current of water at a position substantially at right angles to said plate, and end plates secured at the ends of said stationary plate and at a right angle thereto and extending to the closing position of said vanes to form upper and lower buckets.

16. A water-wheel having a number of spokes, a stationary plate secured parallel with and behind each spoke and parallel with the plane of the wheel, a pair of posts secured to said spoke, one near each end of said plate and extending at a right angle to said plate, and a vane pivotally mounted on the extreme ends of said posts and adapted to swing toward and in close proximity to said plate.

17. A water-wheel having a number of spokes, an outer rim secured to said spokes, an inner rim secured thereto, a stationary plate secured to said rims parallel with the plane of the wheel, a pair of posts secured to said spokes and rims, one near each end of said plate and extending at a right angle to said rims, and a vane pivotally mounted on the extreme ends of said posts and adapted to swing toward and in close proximity to said plate.

18. A water-wheel having a number of spokes, an outer rim secured to said spokes, an inner rim secured thereto, a stationary plate secured to said rims parallel with and behind each spoke and parallel with the plane of the wheel, a pair of posts secured to said spokes and rims, one near each end of said plate and extending at a right angle to said



rims, a vane pivotally mounted on the extreme ends of said posts and adapted to swing toward and in close proximity to said plate, and braces extending from the extreme ends of said posts and secured to said rims to resist the force of the current of water against said vane.

19. A water-wheel having a number of spokes, an outer rim secured to said spokes, an inner rim secured thereto, a stationary plate secured to said rims parallel with and behind each spoke and parallel with the plane of the wheel, a pair of posts secured to said spokes and rims, one near each end of said plate and extending at a right angle to said rims, a vane pivotally mounted on the extreme ends of said posts and adapted to swing toward and in close proximity to said plate, braces extending from the extreme ends of said posts and secured to said rims to resist the force of the current of water against said vane, and stop-lugs extending from said braces in the path of said vane to limit its outward movement.

20. A water-wheel having a number of spokes, an outer rim secured to said spokes, an inner rim secured thereto, a stationary plate secured to said rims parallel with and behind each spoke and parallel with the plane of the wheel, a pair of posts secured to said spokes and rims, one near each end of said plate and extending at a right angle to said rims, a vane pivotally mounted on the extreme ends of said posts and adapted to swing toward and in close proximity to said plate, braces extending from the extreme ends of said posts and secured to said rims to resist the force of the current of water against said vane, and triangular plates secured to the rims and braces at the ends of said stationary plate.

21. A water-wheel having a number of spokes, a stationary plate secured parallel with and behind each spoke and parallel with the plane of the wheel, a pair of posts secured between their ends to said spoke, one near each end of said plate and extending at right angles to said plate, and a vane pivotally mounted on each side of said plate at the extreme ends of said posts and adapted to swing toward each other and in close proximity to said plate.

22. A water-wheel having a number of spokes, a stationary plate secured parallel with and behind each spoke and parallel with the plane of the wheel, a pair of posts secured between their ends to said spoke, one near each end of said plate and extending at right angles to said plate, a vane pivotally mounted on each side of said plate at the extreme ends of said posts and adapted to swing toward each other and in close proximity to said plate, a stop for limiting the inward movement of said vanes, braces secured to said posts, stops secured to said braces for limit-

ing the opening movement of said plates to an acute angle with reference to the plane of the wheel, and end plates secured to said plate and braces substantially as set forth.

23. A water-power apparatus including a main shaft, a water-wheel keyed on said shaft so as to be movable longitudinally thereon, a screw-threaded opening through the hub of the wheel, a collar secured on said shaft away from the wheel, a small shaft extending loosely through said collar with one end threaded and fitting in the threaded opening of said water-wheel, a gear secured on said small shaft, and a rack not rotatable with the main shaft adapted to be moved into and out of engagement with said gear for adjusting the position of the water-wheel on said main shaft.

24. A water-power apparatus including a main shaft, a water-wheel keyed on said shaft so as to be movable longitudinally thereon, a plurality of screw-threaded openings through the hub of the wheel, a collar secured on said shaft away from the wheel, a plurality of small shafts extending loosely through said collar with one end threaded and fitting in the threaded openings in said water-wheel, a gear secured on said small shaft, and a rack not rotatable with the main shaft adapted to be moved into and out of engagement with said gear for adjusting the position of the water-wheel on said main shaft.

25. A water-power apparatus including a main shaft, a water-wheel keyed on said shaft so as to be movable longitudinally thereon, a plurality of screw-threaded openings through the hub of the wheel, a collar secured on said shaft away from the wheel, a plurality of small shafts extending loosely through the collar with one end threaded and fitting in the threaded openings in said water-wheel, a double bevel-gear secured on each of said small shafts, a block not rotatable with the main shaft with a pair of oppositely-facing annular racks, one of which is adapted to engage one side of said bevel-gears when said block is in one position and the other rack adapted to engage the other side of said bevel-gears when said block is in another position, and means for moving said block longitudinally of the main shaft.

26. A water-power apparatus including a main shaft, a water-wheel keyed on said shaft so as to be movable longitudinally thereon, a plurality of screw-threaded openings through the hub of the wheel, a collar secured on said shaft away from the wheel, a plurality of small shafts extending loosely through the collar with one end threaded and fitting in the threaded openings in said water-wheel, a double bevel-gear secured on each of said small shafts, a block loosely mounted on the main shaft with a pair of oppositely-facing racks, one of which is adapted to engage one side of the bevel-gears when the block is in one position and the other rack adapted to



engage the other side of the bevel-gears when  
the block is in another position, a plurality  
of stationary guides for guiding said block  
and preventing its rotation, and a lever for  
5 moving said block longitudinally of the main  
shaft.

In witness whereof I have hereunto affixed

my signature in the presence of the witnesses  
herein named.

JAMES F. WILLIAMS.

Witnesses:

JAMES W. HOUSE,  
WILLIAM H. HILL.