No. 855,041. PATENTED MAY 28, 1907.

J. A. CAMERON.

WATER CURRENT MOTOR.

APPLICATION FILED OCT. 30, 1905.

3 SHEETS—SHEET 1.

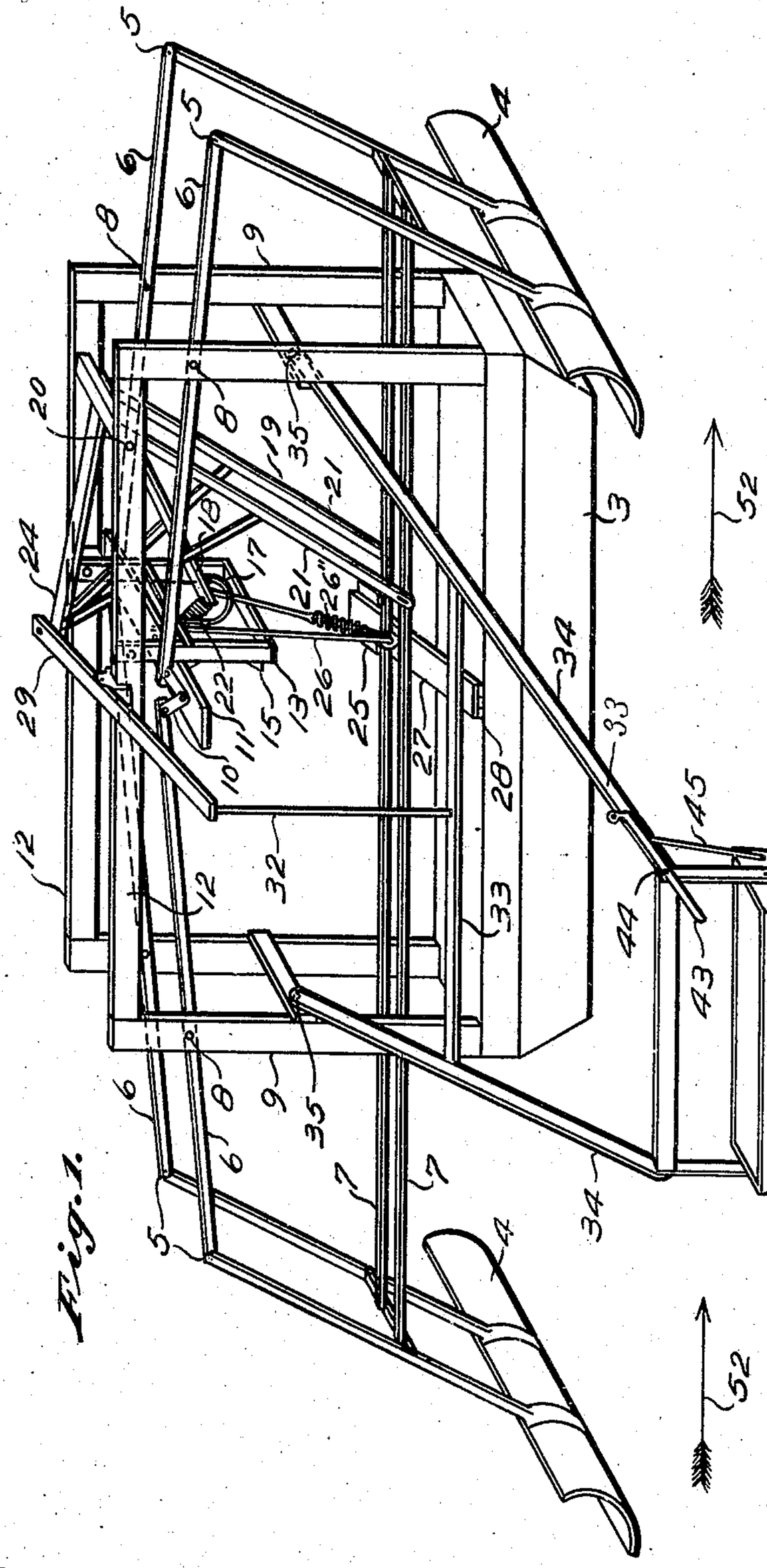

Fig. 1.

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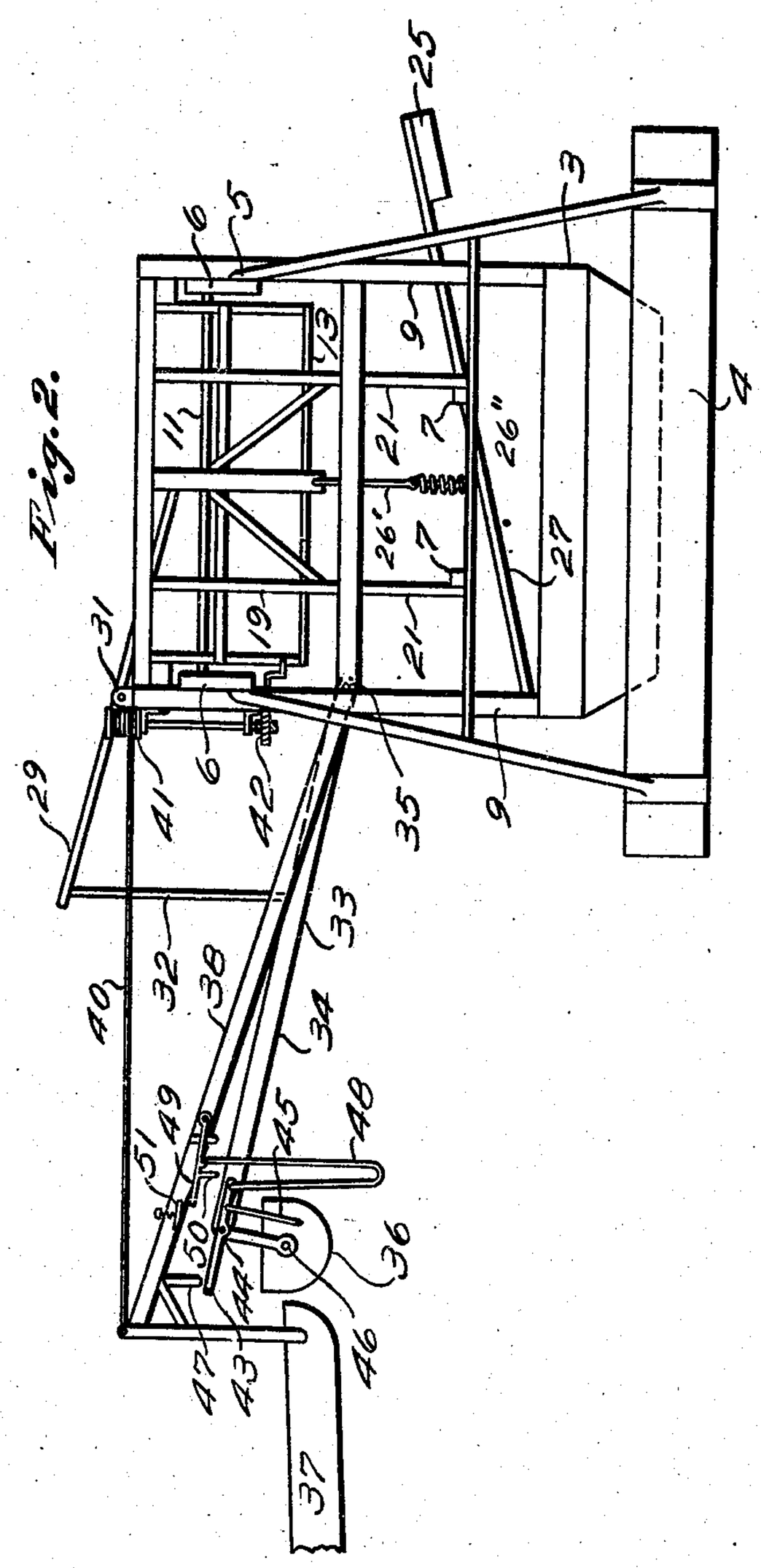
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 4.

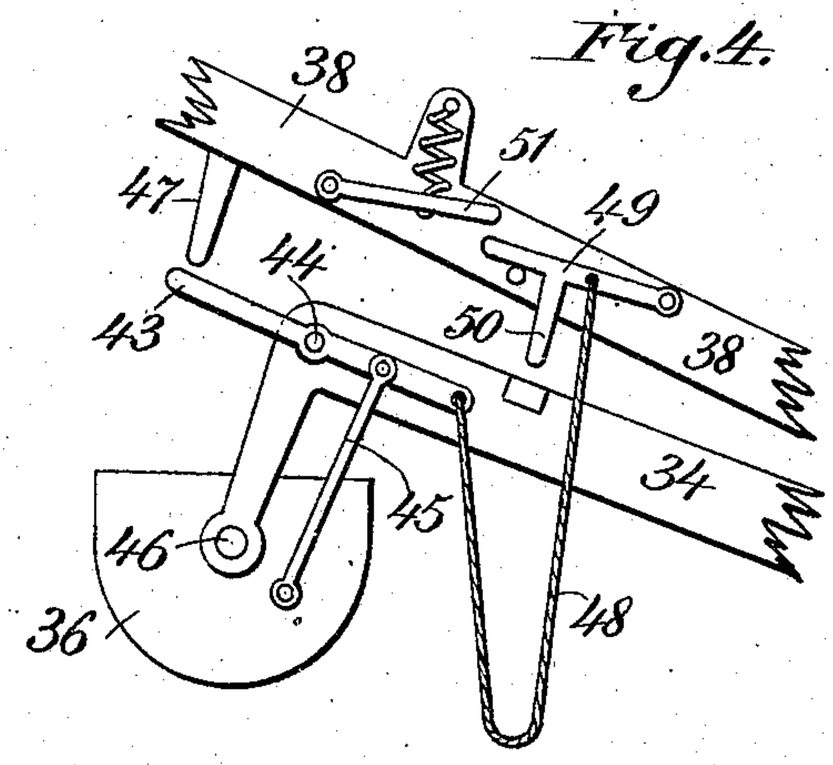
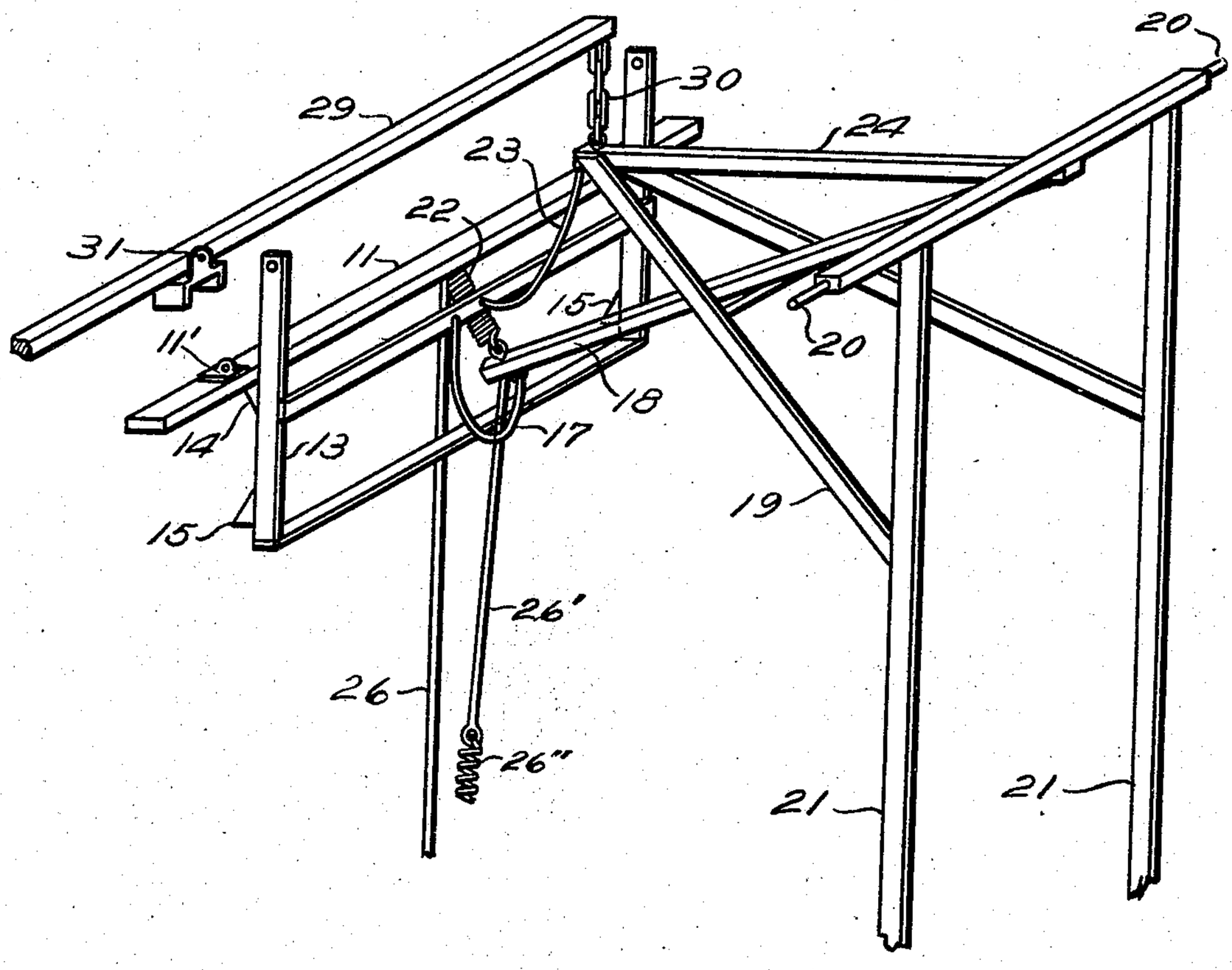


Fig. 3.



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UNITED STATES PATENT OFFICE.

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WATER-CURRENT MOTOR.

No. 855,041. Specification of Letters Patent. Patented May 28, 1907.

Application filed October 30, 1905. Serial No. 285,217.

To all whom it may concern:

Be it known that I, JAMES A. CAMERON, a citizen of the Dominion of Canada, and a resident of Butte, county of Silver Bow and State of Montana, have invented certain new and useful Improvements in Water-Current Motors, of which the following is a specification.

This invention relates to water current motors and particularly to the type which is adapted to derive power from an ordinary running stream and which requires only enough head to produce a current.

The main objects of this invention are to provide an improved form of water current motor of this type; to provide simple mechanism for concentrating and transmitting power from the current; to provide improved mechanism for transmitting power from horizontally movable paddles; to provide automatic controlling mechanism for directing the paddles in the successive operations of entering the stream, moving therewith, lifting therefrom and returning to their initial positions; and to provide a simple form of pumping device for raising water to a water carrying flume.

I accomplish these objects by the device shown in the accompanying drawings, in which:

Figure 1 is a perspective view of a motor constructed according to my invention, the flume and its supports being omitted. Fig. 2 is an end elevation looking from the right of Fig. 1. Fig. 3 is an enlarged view also in perspective of a portion of the operating mechanism shown in Fig. 1, some of the parts being removed. Fig. 4 is a detail on a larger scale, of the bucket tilting and tripping mechanism.

In the form shown in the drawings, the device is mounted on a float 3 so that the paddles will maintain a certain relation to the surface of the stream regardless of rise or fall of the water level. One or more paddles 4 are mounted on depending swinging arms at each end of the float. These arms are pivoted at 5 to rocking beams 6 and are connected together by links 7. The beams 6 are fulcrumed at 8 to the supporting frame 9. The inner ends of the beams 6 are connected by links 10 to lugs 11′ on a cross-piece 11. The parts 12 of the supporting frame have pivoted thereto, near the middle, a frame 13, upon which are mounted two pairs of dogs 14 and 15. The dogs 14 engage the cross-piece 11 for keeping the paddles immersed during the down stream stroke and the dogs 15 engage the cross-piece 11 during the return stroke. At the completion of each downstream stroke of the paddles, the frame 13 is swung to pull the dogs 14 out of engagement with the cross-piece 11, by a cord 17, one end of which is attached to the frame 13, the other end to an arm 18 of a trussed frame 19. The frame 19 serves as a bell crank lever and is fulcrumed at 20 to the parts 12 of the supporting frame. This bell crank lever has three arms 18, 21, and 24, having fixed relation to each other. The arm 21 is double and is pivotally connected to the link 7. A coiled tension spring 22 connects the arm 18 with the cross-piece 11. The spring 22 with the aid of the weight 25 is adapted to draw the cross-piece 11 downwardly into engagement with the dogs 15 at the completion of each downstream stroke of the paddles and thus lift the paddles from the water. The spring 22 is stretched through the swinging of the frame 19 during the downstream stroke of the paddles to allow such spring to overcome the difference in weight between the paddles and the counterbalance 25 for withdrawing the paddles from the water at the proper time. At the end of each return stroke of the paddles, the frame 13 is swung to draw the dogs 15 out of engagement with the cross-piece 11 by the cord 23, which is attached to the arm 24 of the frame 19. This allows the paddles to again drop into the water for the next downstream stroke.

The paddles are nearly counterbalanced by a weight 25 which is hung from the cross-piece 11. The weight 25 is preferably attached to an arm 27 which is connected with the cross-piece 11 by a cable 26. The arm 27 is hinged at 28 to the float. The weight 25 is also connected by a cable 26′ and spring 26″ to the arm 18 of the frame 19 so that the weight will be lifted during the return stroke of the paddles, and offer no resistance to the immersion of the paddles at the proper time. The spring 26″ takes up any shock which might occur when the cable 26′ suddenly becomes strained.

The arm 24 of the frame 19 is connected to a lever 29 by a chain 30. The lever 29 is fulcrumed to the supporting frame at 31 and has

a downwardly extending rod 32 connecting it to a cross-piece 33 of the swinging frame or arm 34. The arm 34 is pivoted to the supporting frame 9 at 35. A bucket 36 is suspended at the outer end of the arm 34 and is adapted to lift water from the stream and discharge it into a flume 37. The end of the flume 37 is suspended from the supporting frame 9 by means of a cable 40 and a crane arm 38, which is fulcrumed at 35 to the supporting frame 9. The cable 40 is wound around and secured to a drum 41. The flume 37 is adjustable relatively to the surface of the water by means of the worm gearing 42, which rotates the drum 41 upon which the cable 40 is wound.

The mechanism for tipping the bucket 36 when filling and emptying the same is shown in Fig. 2 and consists of a lever 43 fulcrumed at 44 to the arm 34; a rod connection 45 between the lever 43 and the bucket 36, eccentric to the fulcrum 46 of the bucket; a lug 47 on the frame 38 adapted to engage the lever 43 and swing the same for tilting the bucket when it nears its uppermost position; and a cord 48 connecting said lever 43 to an arm 49 on the frame 38 for tipping the bucket when it enters the water. The arm 49 is provided with a downwardly extending lug 50. The lug 50 is adapted to be engaged by the arm 34, when said arm has almost reached the limit of its upward movement for the purpose of pushing the arm 49 over a spring catch 51. The spring catch 51 takes enough of the strain on the cord 48 to tip the bucket for filling when said bucket is about to enter the water, but not enough to prevent the arm 49 from pulling free from said catch to allow the bucket to regain its upright position after entering the water.

The operation of the device shown is as follows: Fig. 1 shows the position of the various parts at the beginning of the downstream stroke of the paddles, the paddles being immersed and the bucket 36 filled ready for hoisting. The arrows 52 indicate the direction of the current. The paddles swing to the right, with the current, in an arc about their pivotal centers 5. This movement, through the links 7, the bell crank 19, and the lever 29, raises the arm 34 until the lever 43 comes into contact with the lug 47 and empties the bucket 36 into the flume 37. A slight further lifting of the bucket arm 34 causes the arm 49 to be engaged by the spring catch 51. At the completion of the downstream stroke when the bucket 36 has been emptied the cord 17 tightens and swings the frame 13 so as to draw the dogs 14 out of engagement with the cross-piece 11. The spring 22 which was stretched during the downstream stroke of the paddles now adds its pull to that of the weight 25 and draws down the cross-piece 11, swinging the beams 6 so that the paddles are raised out of the water. When the paddles are free from the water, the weight of the bucket 36 is sufficient to return them to their farthest upstream position ready to be immersed for the next downstream stroke. That is, the falling of the bucket makes the lever 29 and frame 19 swing in a reverse direction to the movement which the current effects. As the bucket starts to fall the tension on the cord 17 is released and the dogs 15 engage the cross-piece 11 and hold the same, in its lowest position, until the paddles have completed the return stroke, when the cord 23 tightens and disengages the dogs 15 from the cross-piece 11. Since the paddles overbalance the weight 25, they will now again drop into the water, the cord 23 becoming slack and the cross piece 11 being lifted into engagement with the dogs 14, preparatory for the next downstream stroke.

As the bucket 36 is about to enter the water the cord 48 tightens and tips the bucket so that it will easily fill. The bucket 36 then regains its upright position through the slackening of the cord 48 which is pulled free from the spring catch 51 just after the bucket enters the water. This cycle of operations repeats itself automatically and continuously without requiring the attention of an operator.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a current motor, the combination of a supporting frame mounted above a stream of water; a horizontally disposed beam mounted to oscillate on said frame; a depending arm pivotally connected to one end of said beam and having thereon a paddle adapted to dip into the stream and cause said arm to be swung in one direction by the current; a spring connected to the paddle arm and to the opposite end of said beam and adapted to swing the beam and raise the paddle out of the water when it arrives at a certain downstream position; and means for preventing the tilting of the beam until the paddle arrives at said downstream position.

2. In a current motor, the combination of a supporting frame mounted above a stream of water; a horizontally disposed beam mounted to oscillate on said frame; a depending arm pivotally connected to one end of said beam and having thereon a paddle adapted to dip into the stream and be swung in one direction by the current; a spring connected to the paddle arm and to the opposite end of said beam and adapted to swing the beam and raise the paddle out of the water after the completion of its downstream stroke; dogs movably mounted on the support and adapted to hold said beam at the limits of its oscillation; and means for automatically releasing said dogs to permit an oscillation of the beam at the completion of each stroke of the paddles.

3. In a current motor, the combination of a supporting frame mounted above a stream of water; a horizontally disposed beam mounted to oscillate on said frame; a depending arm pivotally connected to one end of said beam and having thereon a paddle adapted to dip into the stream and be swung in one direction by the current; a spring connected to the paddle arm and to the opposite end of said beam and adapted to swing the beam and raise the paddle out of the water after the completion of its stroke; dogs movably mounted on the support and adapted to hold said beam at the limit of each oscillation thereof; said dogs being connected to said paddle arm and adapted to release said beam at the completion of each backward and forward stroke of the paddle.

4. In a current motor, the combination of a supporting frame mounted above a stream of water; a horizontally disposed beam mounted to oscillate on said frame; a depending arm pivotally connected to one end of said beam and having thereon a paddle adapted to dip into the stream and be swung in one direction by the current; means for automatically oscillating said beam; dogs movably mounted on the support and adapted to hold said beam at the limit of each oscillation thereof; said dogs being connected to said paddle arm and adapted to release said beam at the completion of each backward and forward stroke of the paddle.

5. In a current motor, the combination of a supporting frame mounted above a stream of water; a horizontally disposed beam mounted to oscillate on said frame; a depending arm pivotally connected to one end of said beam and having thereon a paddle adapted to dip into the stream and be swung in one direction by the current; a spring connected to the paddle arm and to the opposite end of said beam and adapted to swing the beam and raise the paddle out of the water when it arrives at a certain downstream position; means for preventing the tilting of the beam until the paddle arrives at said downstream position; a bucket vertically movable on the frame and adapted to lift water from the stream, and means connecting said bucket and paddle arm, said means being adapted to lift the bucket through the movement of the paddle by the current and to swing the paddle to its initial position through the weight of the bucket when said paddle is lifted from the water.

6. In a current motor, the combination of a frame mounted above a stream, a pair of horizontally disposed beams extending longitudinally of the stream and pivotally mounted on opposite ends of said frame, a member vertically movable in said frame and connected to the adjacent ends of said beams; depending paddles pivotally hung on the outer ends of said beams and adapted to swing longitudinally of the stream, a link connecting said paddles, mechanism operated by the paddles for moving said member to oscillate said beams for raising the paddles, movable dogs for securing said member in an upper and lower position for controlling the elevation of the paddles, a spring comprised by said mechanism and connected to said member and to said paddles and adapted to draw said member downwardly when the paddles have reached the limit of their down stream stroke, means for causing the paddles to be returned to their initial position when lifted from the water, and means for automatically releasing said dogs to permit the beams to oscillate at the completion of each stroke of the paddles.

7. In a current motor, the combination of a supporting frame mounted above a stream of water, a horizontally disposed balance beam pivotally mounted on a horizontal axis in said frame, a depending arm pivotally connected to one end of said beam and having thereon a paddle adapted to dip into the stream and to be swung in one direction by the current, said beam being adapted to oscillate to move said paddle into and out of the stream, movable dogs for securing said beam at the limits of its oscillation, being connected with said paddle and arranged to release said beam when the paddle is in either limit of its movement, means normally urging the paddle toward its upstream position, and a spring connected to the paddle and to the opposite end of said beam and adapted to swing the beam and raise the paddle out of the water at the completion of its stroke.

8. In a current motor, the combination of a supporting frame mounted above a stream of water, a horizontally disposed balance beam pivotally mounted on a horizontal axis in said frame, a depending arm pivotally connected to one end of said beam and having thereon a paddle adapted to dip into the stream and to be swung in one direction by the current, said beam being adapted to oscillate to move said paddle into and out of the stream and being unequally balanced and adapted to normally urge the paddles to a submerged position, movable dogs for securing said beam at the limits of its oscillation, being connected with said paddle and arranged to release said beam when the paddle is in either limit of its movement, means normally urging the paddle toward its upstream position, and a spring connected to the paddle and to the opposite end of said beam and adapted to swing the beam and raise the paddle out of the water at the completion of its stroke.

9. The combination of a frame mounted above a stream of water, a horizontally-disposed arm, pivotally mounted on said frame and adapted to oscillate in a vertical direction between certain limits, mechanism oper-

ated by current of the stream for oscillating said arm a bucket mounted on said arm and adapted to normally assume an upright position, mechanism for tipping said bucket when the same is in a raised position, and means for adjusting said tipping mechanism to cause said bucket to tip at different elevations.

10. The combination of a frame mounted above a stream of water, a horizontally-disposed arm pivotally mounted in said frame and adapted to oscillate vertically thereon, mechanism operated by current of the stream for oscillating said arm a bucket pivotally mounted at the free end of said arm and adapted to normally assume an upright position thereon, a second arm pivotally mounted on said frame in axial alinement with the first arm, and means connected with said second arm and adapted to tip the bucket for discharging its contents when said first arm approaches the second arm, substantially as described.

11. The combination of a frame mounted above a stream of water, a horizontally-disposed arm pivotally mounted on a horizontal axis in said frame and adapted to oscillate vertically thereon, mechanism operated by current of the stream for oscillating said arm a bucket pivotally mounted on said arm and adapted to normally assume an upright position thereon, a support located above said arm and having thereon means adapted to co-act with means on said arm for tipping said bucket when said arm approaches said support, and means adapted to tip the bucket when said arm is lowered a certain distance below said support.

12. The combination of a frame mounted above a stream of water, a horizotally-disposed arm pivotally mounted on a horizontal axis in said frame and adapted to oscillate vertically thereon, mechanism operated by current of the stream for oscillating said arm a bucket pivotally mounted on said arm and adapted to normally assume an upright position thereon, a second arm pivoted on the frame in axial alinement with said first arm, means for adjusting said second arm angularly on said axis, means mounted on said second arm and adapted to tip said bucket when said first arm approaches the second arm, and tripping mechanism connecting said bucket and said second arm and adapted to tip the bucket when the first arm has been lowered a certain distance below said second arm and to release said bucket to cause the same to assume an upright position when said first arm reaches a certain further distance below the second arm.

13. The combination of a frame mounted above a stream of water, a horizontally-disposed arm pivotally mounted on a horizontal axis in said frame and adapted to oscillate vertically thereon, mechanism operated by current of the stream for oscillating said arm a bucket pivotally mounted on said frame and adapted to normally assume an upright position thereon, a second arm pivoted on the frame in axial alinement with said first arm, means for adjusting said second arm angularly on said axis, a flume having one end suspended from said second arm and being adjustable vertically therewith, and means on said second arm adapted to tip said bucket and cause the same to discharge its contents into said flume when said bucket has been lifted to a certain position above the flume.

14. The combination of a frame mounted above a stream of water, a horizontally-disposed arm pivotally mounted in said frame on a horizontally-disposed axis and adapted to oscillate vertically thereon, mechanism operated by current of the stream for oscillating said arm a bucket pivotally mounted on said arm and adapted to assume a normally upright position, a lever fulcrumed upon said arm above said bucket, a link connecting said lever with said bucket, a vertically adjustable support above said arm and having thereon a shoulder adapted to engage said lever for tilting the bucket when said first arm approaches said support, a cord or the like connecting said lever with said support and adapted to tip the bucket when said arm has been lowered a certain distance below said support, and means for suddenly releasing the tension on said cord to permit said bucket to regain its upright position while said arm is in its lowest position.

15. The combination of a frame mounted above a stream of water, a horizontally-disposed arm pivotally mounted in said frame on a horizontally-disposed axis and adapted to oscillate vertically thereon, mechanism operated by current of the stream for oscillating said arm a bucket pivotally mounted on said arm and adapted to normally assume an upright position, a support above said arm, a member mounted on said support and having a limited vertical movement thereon, said member being adapted to be lifted by the raising of said arm, a catch for holding said member in its lifted position, and a cord or the like connected between said bucket and member and adapted to tip the bucket when in a lowered position, said catch being adapted to yield for releasing said member through a further downward movement of the bucket and thereby permit the bucket to return to its normal upright position, substantially as described.

16. In a current motor, the combination of a frame mounted above a stream of water and a horizontally-disposed arm pivotally mounted in said frame on a horizontally-disposed axis and adapted to oscillate vertically thereon, a bucket pivotally mounted on said arm and adapted to normally assume an up-

right position, mechanism operated by the current of the stream and adapted to oscillate said arm for alternately dipping the bucket into the stream and lifting it a certain distance above the surface of the stream, mechanism for tipping the bucket to discharge its contents when in a lifted position and mechanism for tipping the bucket while the same is being lowered into the stream, said mechanism being adapted to automatically release the bucket to permit its return to its normal upright position, before being again lifted from the stream, substantially as described.

17. In a current motor, the combination of a frame mounted above a stream, a pair of horizontally-disposed beams extending longitudinally of the stream and pivotally mounted at opposite ends of the frame, a member vertically movable in said frame and connected to the adjacent ends of said beams, depending paddles pivotally hung on the outer ends of said beams and adapted to swing longitudinally of said stream, a link connecting said paddles, mechanism operated by the paddles for moving said member to oscillate said beams for raising the paddles from the stream at certain downstream positions, movable dogs for securing said member in its upper and lower positions for controlling the elevation of the paddles, mechanism for returning the paddles to certain upstream positions after the same have been lifted from the stream and means controlled by the paddles for moving said dogs to release said member and permit said beams to oscillate when said paddles arrive at certain upstream and downstream positions.

18. In a current motor, the combination of a supporting frame mounted above a stream of water, a horizontally disposed beam mounted to oscillate on said frame, a depending arm pivotally connected to one end of said beam and having thereon a paddle adapted to dip into the stream and cause said arm to be swung in one direction by the current, mechanism acting between the paddle arm and said beam and adapted to swing the beam and raise the paddle out of the water when it arrives at a certain downstream position, a part arranged to be lifted during the downstream stroke of the paddle and adapted through its weight to return said paddle to a certain upstream position when the paddle is lifted from the water, a detent for preventing the tilting of said beam while said paddle is being swung between said upstream and downstream positions, and means operated by the paddle for withdrawing said detent when the paddle reaches said certain downstream position.

Signed at Chicago this 2nd day of October 1905.

JAS. A. CAMERON.

Witnesses:

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BEATRICE MACFARLANE.