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WATER OR LIKE MOTOR AND PUMP.

APPLICATION FILED APR. 10, 1908.

945,701. **Patented Jan. 4, 1910.**

Fig. 1.

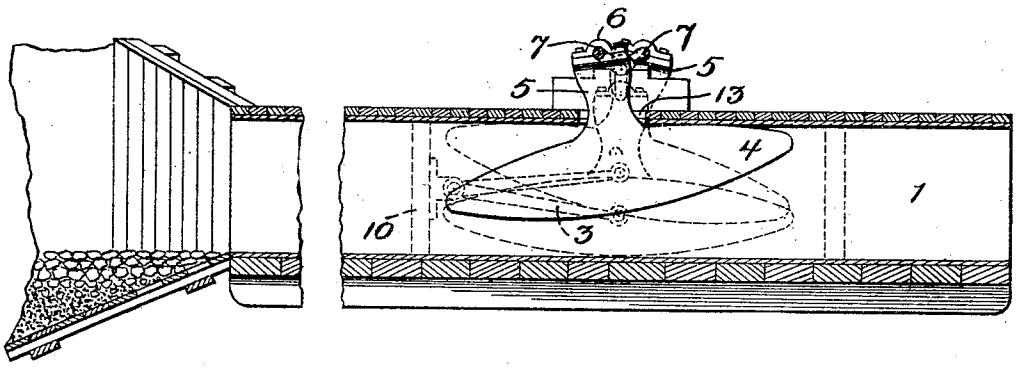


Fig. 2.

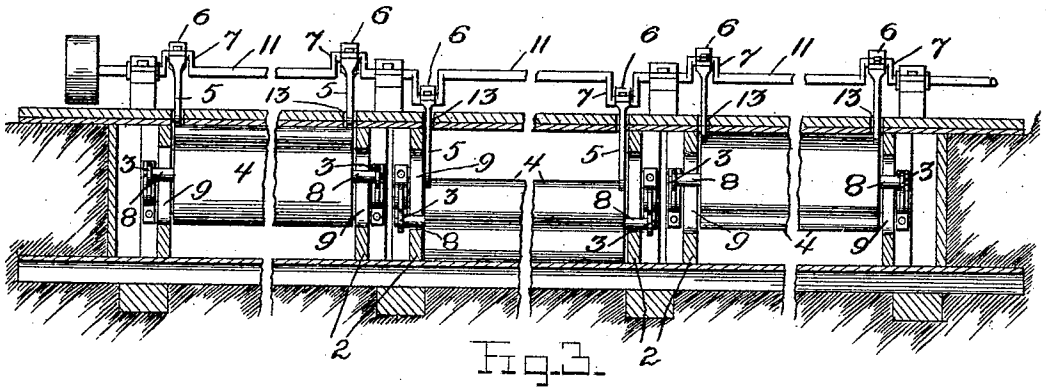
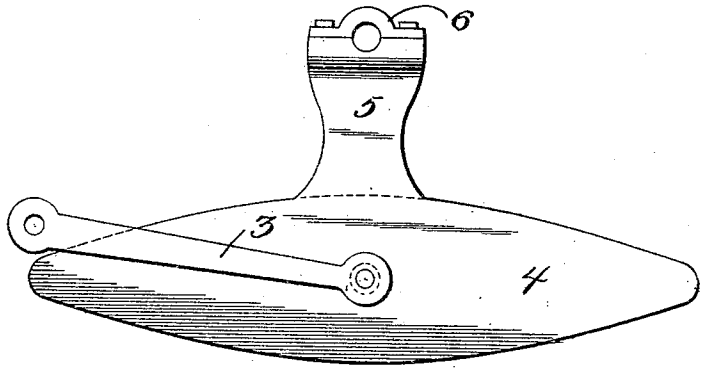


Fig. 3.



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EDGAR COURTRIGHT, OF TACOMA, WASHINGTON; ELMER L. COURTWRIGHT ADMINISTRATOR OF SAID EDGAR COURTWRIGHT, DECEASED.

WATER OR LIKE MOTOR AND PUMP.

945,701. Specification of Letters Patent. Patented Jan. 4, 1910.

Application filed April 10, 1908. Serial No. 426,355.

To all whom it may concern:

Be it known that I, EDGAR COURTRIGHT, a citizen of the United States of America, and a resident of the city of Tacoma, in the county of Pierce and State of Washington, have invented certain new and useful Improvements in Water or Like Motors and Pumps, of which the following is a specification.

My invention relates to water or like motors and pumps, the same embodying certain improvements over the construction shown in my Patent No. 419,321, dated Jan. 14, 1890.

In my present construction, the paddles are caused in traveling vertically, to move through curved paths in contradistinction to the direct or straight vertical paths of the paddles in said patent, which movement combined or compounded with that caused by the crank connections with the pitmen produces a more effective motion or movement of the paddles and overcomes dead centering of the crank.

Other objects will be set forth as the description progresses and those features of construction and combinations of parts in which the invention resides, succinctly defined in the appended claims.

Referring to the accompanying drawing, in which like numerals of reference indicate like parts throughout: Figure 1 is a vertical longitudinal section of an apparatus constructed in accordance with my invention. Fig. 2 is a cross sectional view thereof, and Fig. 3 is a detail view of one of the paddles, and portions of the mechanism directly associated therewith.

The motor herein illustrated is constructed to be operated by the current of a stream, the water being directed and confined in a conduit in which the motor proper works. This conduit, indicated at 1 may be of any desired construction at the intake end thereof. Rearwardly of the intake end, however, conduit 1 is divided preferably into a plurality of parallel sections separated by double walls 2. Within the chambers in the double walls 2, formed by suitable cross partitions, are housed the radius arms 3.

The water acts on the paddles 4 in a manner similar to that described in the above mentioned patent. I have, however, constructed a conduit with horizontal upper and lower walls and have changed the shape of the paddles 4, the shape of said paddles being arrived at in the manner hereinafter described. The paddles 4 are provided with pitmen 5 which are secured thereto close to the edges thereof, there being two pitmen 5 for each paddle. The pitmen 5 have journal boxes 6 on their ends through which the cranks 7 pass. The paddles 4 are further provided with trunnions 8 extending from the centers of the sides thereof, and passing through curved slots 9 into the chambers within the double walls. These trunnions 8 are engaged by the ends of the radius arms 3 which are pivoted to the stirrup blocks 10 secured to the frame of the conduit within the double walls 2. Thus the motion of the paddles 4 is compounded of two rotary motions, one caused by the crank connection with the pitman, causing the center of the journal box to travel on a true circle and the other caused by circular motion of the trunnion about the center of the pivot of the radius arm. Now the shape of the paddles 4 is such that the rolling motion thereof of the upper or lower surfaces of the conduit is uniform and the resulting rotation of the crank is also uniform. This shape is found to be not truly circular and is also found to be different in the four quadrants of the paddle. The shape can be arrived at graphically but I find the simplest method is to make a templet by taking a piece of metal larger than needed, causing a point in the metal corresponding with the center of the journal box, to revolve about a fixed point corresponding with the shaft at a radius equal to that of the crank, causing the trunnion point in the templet to particularly revolve about the fixed stirrup point at a radius equal to that of the radius arm, and then drawing two lines across said templet in positions corresponding to the top and bottom of the conduit, for every position of the crank and these various sets of lines will meet and cross each other on the metal and form the curved outline of the paddle.

Pitmen 5 have their upper end portions connected to the cranks 7 of a shaft 11 which is journaled in suitable stands on top of the conduit, as illustrated.

The pitmen, as now considered, are flat and pass through the holes 13 in the top wall of conduit 1 and have their sides curved in such manner that the holes 13 will be closed thereby in all positions of the paddle 4 and

the cranks 7. This however, is not absolutely essential to my invention. The shapes of these curves are arrived at through a process similar to that described above for obtaining the shape of the paddles 4 and may be obtained on the same templet and at the same time by marking thereon the positions of the holes 13 relatively to the paddles 4 in the various positions thereof.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States of America, is:

1. In an apparatus of the character described, the combination with a conduit, of a substantially horizontally disposed paddle arranged longitudinally therein for vertical movement, an arm pivotally connected to said paddle and a relatively fixed part, a shaft provided with a crank, and a driving connection between said paddle and the crank of said shaft.

2. In an apparatus of the character described, in combination with a conduit, a substantially horizontally disposed paddle arranged longitudinally therein for vertical movement, a radial arm pivotally connected to said paddle and to a relatively fixed part, a shaft provided with a crank, and an extension fixed to said paddle and being connected to the crank of said shaft.

3. In an apparatus of the character described, the combination with a conduit, radial arms pivoted exteriorly of said conduit, a shaft mounted above said conduit and having parallel cranks, a substantially horizontally disposed paddle arranged longitudinally within said conduit and pivoted to the free end portions of said radial arms, and a pair of extensions secured to said paddle and connected to the cranks of said shaft whereby the undulatory motion of said paddle is transformed into the rotary motion of said shaft.

4. In an apparatus of the character described, the combination of a conduit having uniform rectangular sides, double walls therein dividing said conduit into parallel longitudinal compartments, radial arms pivoted within said double walls, a shaft, mounted across said conduit and having pairs of cranks thereon, paddles within said compartments adapted to have a uniform undulatory motion, pairs of extensions secured to the sides of said paddles and connected to the cranks of said shaft, and trunnions secured to the sides of said paddles and passing through slots in said double walls and being engaged and controlled by said radial arms.

5. In an apparatus of the character described, the combination of the closed conduit, a paddle within said conduit adapted to have undulatory motion, a closed chamber on each side of said conduit, radial arms pivoted in said closed chambers and engaging trunnions on the sides of said paddle, said trunnions passing through curved slots in the wall between said conduit and said chamber, extensions secured to said paddle and passing through holes in the top of said conduit and shaped so as to close said holes in whatever position said paddle may be in, and a shaft journaled over said conduit and having cranks connected to said extensions.

Signed at Tacoma, Washington, this 13th day of January, 1908.

EDGAR COURTRIGHT.

Witnesses:
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