

(No Model.)

D. G. HASKINS.
SUB-SURFACE WATER MOTOR.

No. 400,209.

Patented Mar. 26, 1889.

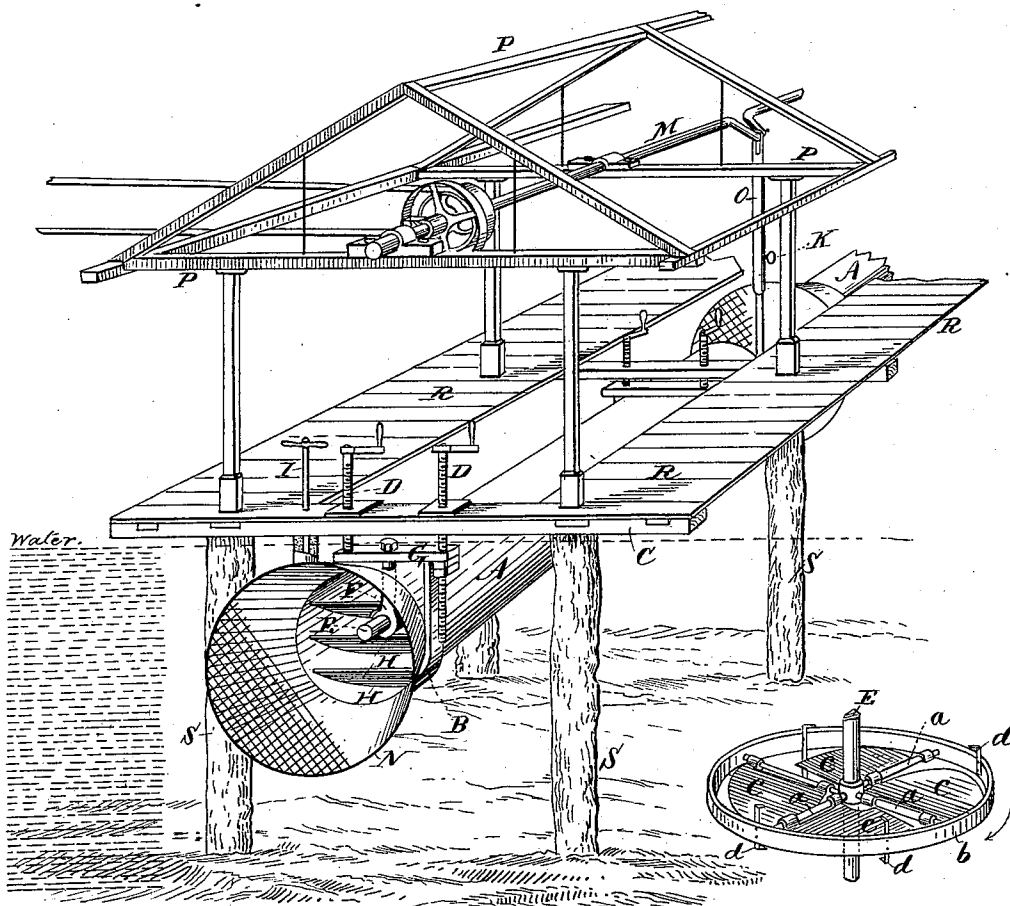


Fig. 1.

Fig. 3.

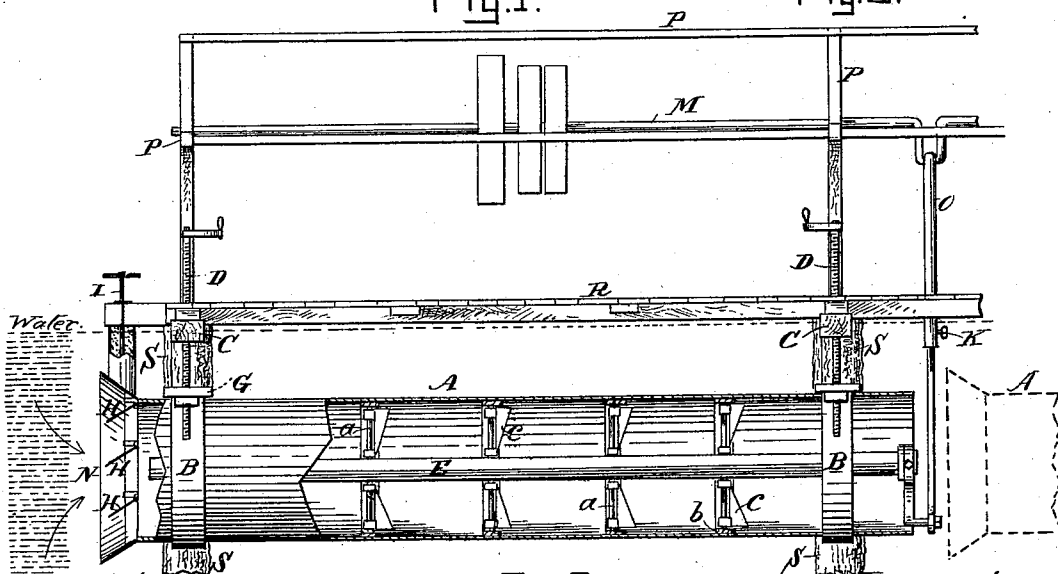


Fig. 2.

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DAVID GREENE HASKINS, OF CAMBRIDGE, MASSACHUSETTS.

SUB-SURFACE WATER-MOTOR.

SPECIFICATION forming part of Letters Patent No. 400,209, dated March 26, 1889.

Application filed February 20, 1888. Serial No. 264,647. (No model.)

To all whom it may concern:

Be it known that I, DAVID GREENE HASKINS, a citizen of the United States, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Sub-Surface Water-Motors, of which the following is a specification.

My invention relates to means whereby the currents of water-ways may be utilized for creating motive power without obstruction or interference from ice, either floating or fixed, and whereby, also, the speed and power of water-motors operated by such currents may be easily regulated or checked, and, further, to the structural devices and arrangements necessary for the placing, proper protection, care, and various uses of such sub-surface water-motors.

The invention consists in the combination, substantially as hereinafter more fully set forth, of a conduit or tube wholly or partially submerged in the water-way and provided at either or both of its extremities with valves which admit of being opened to any desired extent or of being tightly closed, by means of which the flow of water through the conduit or tube may be regulated at pleasure, or when desired be wholly cut off, a shaft extending lengthwise through said conduit or tube and pivoted to turn upon its axis, a series of motors attached to said shaft at intervals along its length, said motors being formed of propelling-blades so arranged as to receive the pressure or impact of the water flowing through the conduit or tube, and thus to impart to the shaft a rotary motion which, by means of bands, belts, crank-connections, gearing, or any other device for communicating motion between two shafts, may be transmitted to a power-shaft suitably supported in or near the structure and thence to any system of machinery, a suitable structure erected in or over the water-way and above the conduit, means for supporting the conduit, and means for raising or lowering the conduit and its attachments to any desired position in the water-way. The propelling-blades, before referred to, are preferably in the form of a sector of a circle and radiate correspondingly from the shaft. Their surfaces are inclined at any desired angle to a plane at right angles to the axis

of the shaft, so that the impact of the water upon the blades will cause the shaft to rotate. It is desirable that the blades may be capable of taking any angle of inclination to this plane within certain limits on either side of the plane, in order not only that the rotation may be less impeded by friction, but also that on whichever side the water acts on the blades the shaft will always rotate in one and the same direction. Motors having blades so constructed can be made to serve as effectually in tidal waters, where the direction of the current is reversed every few hours, as in rivers, where the flow is always in the same direction. Devices constructed on this principle are described and claimed in Letters Patent of the United States No. 204,728, granted to me June 11, 1878; also in Letters Patent of the United States No. 206,447, granted to me July 30, 1878, and in Letters Patent No. 362,518, granted to me May 10, 1887.

In the accompanying drawings, Figure 1 is a perspective view of the conduit, with its various attachments and of the structure supporting the said conduit. Fig. 2 is a longitudinal sectional view of the same, a part of the conduit being shown as broken away in order to show the motors; and Fig. 3 is a perspective view of a form of motor which I can use.

In the several figures the same letters refer to the same parts.

The structure which supports the conduit consists of a suitable platform, of any desired length and width, supported above the level of the water either upon piles, piers, or side walls, which are left open at each end to permit the flow of water, or upon projecting supports, or in any other suitable manner. In the platform may be a longitudinal opening for the purpose of affording facilities for raising the conduit out of the water for inspection or repairs. Upon the platform may be erected a suitable covering for the protection of the workmen engaged thereon, and also suitable buildings for offices for the superintendent and for the protection of a dynamo or dynamos operated by the motor, and it may be illuminated by an electric light to which the dynamo or dynamos will furnish electricity.

The building may advantageously be con-

needed in certain situations with a stand-pipe or water-tower, and be supplied with chimneys, furnaces, boilers, and pipes for distributing steam and hot and cold water. In this case, especially if located at the mouth of an estuary, the tower might serve incidentally the useful purpose of a light-house. In the structure is a power-shaft, which is connected by any suitable gearing to the shaft in the conduit.

Referring to the drawings, A is the conduit or tube, which may be of any length or diameter as may be found most suitable, is wholly or partially submerged beneath the level of the water, and is supported beneath the structure by any suitable means. Convenient devices for this purpose are the hangers B B, which are supported from the cross-beams C C of the structure by the screws D D, so that the said hangers and the supported conduit can be raised or lowered to any desired point in order to get the full force of the current or to avoid ice.

E is the rotating shaft, which may be pivoted in a bar, F, extending from the cross-piece G of the hanger. The conduit may be provided at one or both ends with a flaring mouth, N, which may be covered with netting in order to prevent the entrance of obstructions.

At the mouth of the conduit is placed a series of valves, H H, which can be opened to any desired extent to admit of the passage of any desired amount of water, or may be wholly closed. These valves may be operated by a rod, I, extending upward to the platform, or by any other suitable device. If a rod is used, it may be protected from frost by a suitable casing.

Upon the shaft are placed the propelling-blades, which may be arranged in sets, as shown, or spirally, as before stated. These blades radiate from the shaft and have their surfaces inclined at any desired angle to a plane at right angles to the axis of the shaft, and are preferably made capable of taking any angle of inclination to this plane within certain limits on either side of the plane. A convenient method of accomplishing this result is shown in Figs. 2 and 3 in detail. This device is that which is described and claimed in my patent, No. 204,728, of June 11, 1878, before referred to.

Referring to the drawings, *a a* are radial rods attached at one end to the shaft E and at the other to a rim, *b*, and *c c* are the blades hinged on one of their radial sides upon the rods *a* and limited in their motion in either direction by the stops *d*.

As stated in the before-mentioned patent, the result of this method of attaching the blades is that on whichever side the water impinges upon them they and the shaft with which they are connected will always rotate in one and the same direction. The same result may be accomplished by making the blades of flexible and elastic plates of metal,

or it may be accomplished in other ways, and I do not limit myself to the use of the device shown in Figs. 2 and 3. The movement of the blades in either direction may be limited by springs placed on either side of the blades. When the conduit is placed in a water-way in which the current is always in the same direction, the blades may obviously be rigidly attached to the shaft and fixed at the proper inclination to be most effectively operated by the action of the water to cause the rotation of the shaft; but even in this case it is preferable that the blades should be hinged or flexible. Several of these conduits may be arranged in series and side by side.

The shaft E is connected to the shaft M in the structure by any suitable form of device for transmitting power. The crank-connection, as shown at O, will be a suitable form, for as the force is applied to the circumference of the motors upon the shaft there will be no dead-center to the crank. The crank-rod may be constructed in two parts connected by a telescope-joint, as shown, in order that its length may be adjusted with the depression or elevation of the conduit.

The power-shaft M is furnished with fly-wheels, loose pulleys, and wheels for the transmission of power to machinery for any purpose, located either within or outside of the structure. P is the roof of the structure. R is the platform, and S' S are the piles supporting the same.

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

1. The combination, substantially as and for the purpose set forth, of a structure erected in or over a water-way and having a floor or platform above the water-level, a conduit or tube adjustably supported beneath said floor or platform and capable of being submerged in the water, said conduit or tube being provided with valves or gates to regulate the flow of water through the conduit, mechanism upon the platform for raising and depressing the conduit, a shaft extending longitudinally through the center of the conduit and rotating in the same, hangers supporting said shaft attached to the support for the conduit, a series of propelling-blades upon said shaft acting by the impact of the water flowing through the conduit to cause the rotation of the shaft, mechanism for operating the valves or gates in the conduit from the platform, a power-shaft above or near the platform, and a crank, gearing, or other means for conveying power connected adjustably to the power-shaft and to the shaft in the conduit.

2. The combination, substantially as and for the purpose set forth, of a structure erected in or over a water-way and having a floor or platform above the water-level, a conduit or tube adjustably supported from said structure and provided with gates or valves for regulating the flow of water through the conduit, mechanism for operating said valves or gates

from the platform, a shaft extending longitudinally through said conduit and rotating in the same, radial rods *a a*, arranged at intervals on said shaft, and blades *c c*, swinging by one of their edges on said rods and limited in their movement to any desired angle on either side of a plane at right angles to the axis of the shaft.

3. The combination, substantially as and for the purposes set forth, of a structure erected in or over a water-way and having a floor or platform above the water-level, U-shaped adjustable hangers depending from the cross-beams supporting said platform, a conduit or tube supported in said hangers and capable of being removed from the same, a shaft extending longitudinally through the conduit and capable of rotation in the same, hangers attached to the U-shaped hanger and supporting the shaft in the center of the conduit, blades upon the shaft acting by the impact of the water flowing through the conduit to

cause the rotation of the shaft, and mechanism upon the platform for raising and lowering said U-shaped hangers and conduit supported thereby.

4. The combination, substantially as and for the purpose set forth, of the conduit A, the U-shaped hanger B, supporting the same, the cross-bar G, connecting the ends of the hanger B, the hanger or bar F, dependent from the cross-bar G and extending to the center of the conduit, the shaft E, supported in the hangers or bars F, the cross-beam C, and the screws D D, extending through the cross-beam C and the bar G, whereby the hanger B is raised or depressed.

In witness whereof I have hereunto set my hand in the presence of the two subscribing witnesses.

DAVID GREENE HASKINS.

Witnesses:

ALEX. L. HAYES,

DAVID G. HASKINS, Jr.