No. 703,355. Patented June 24, 1902.

W. L. WALTER.

CURRENT MOTOR.

(Application filed Nov. 5, 1901.)

(No Model.) 3 Sheets—Sheet 1.

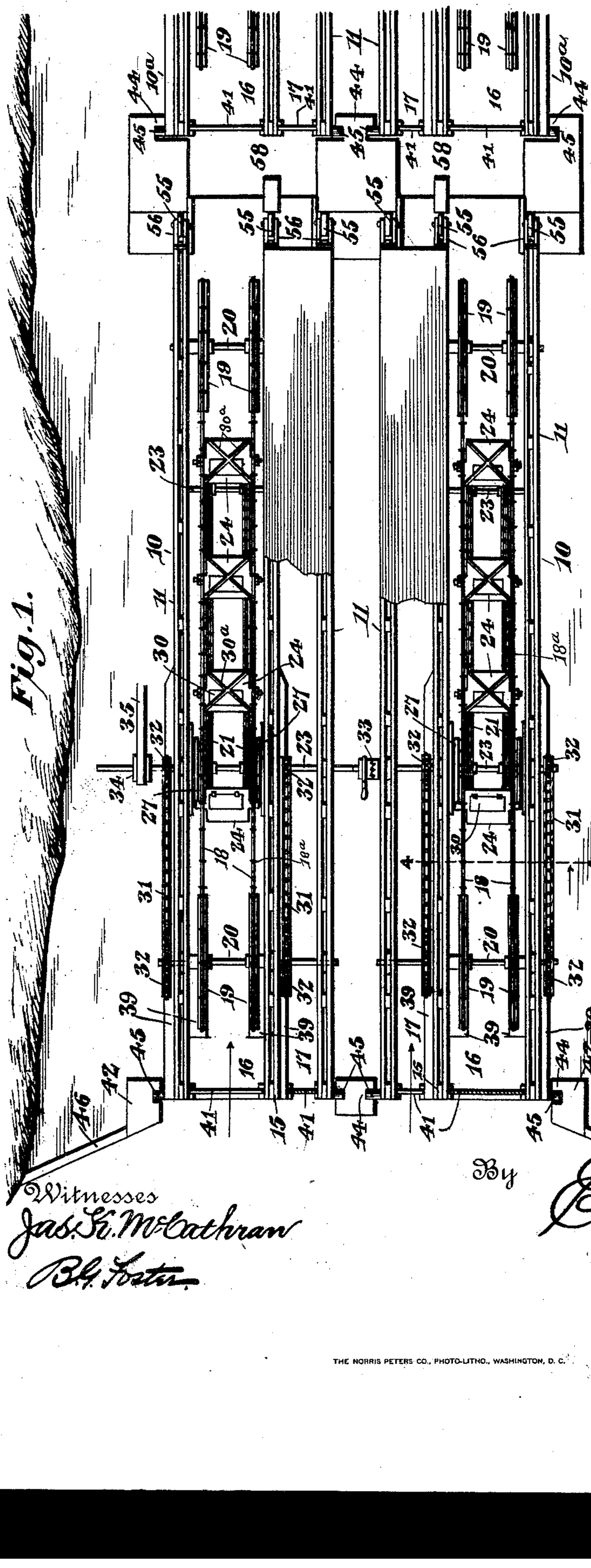

Fig. 1.

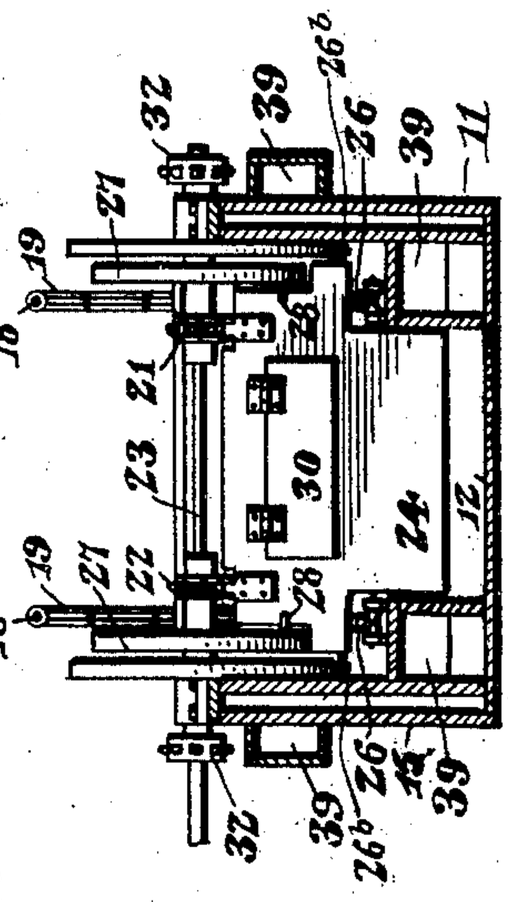

Fig. 4.

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(No Model.) 3 Sheets—Sheet 2.

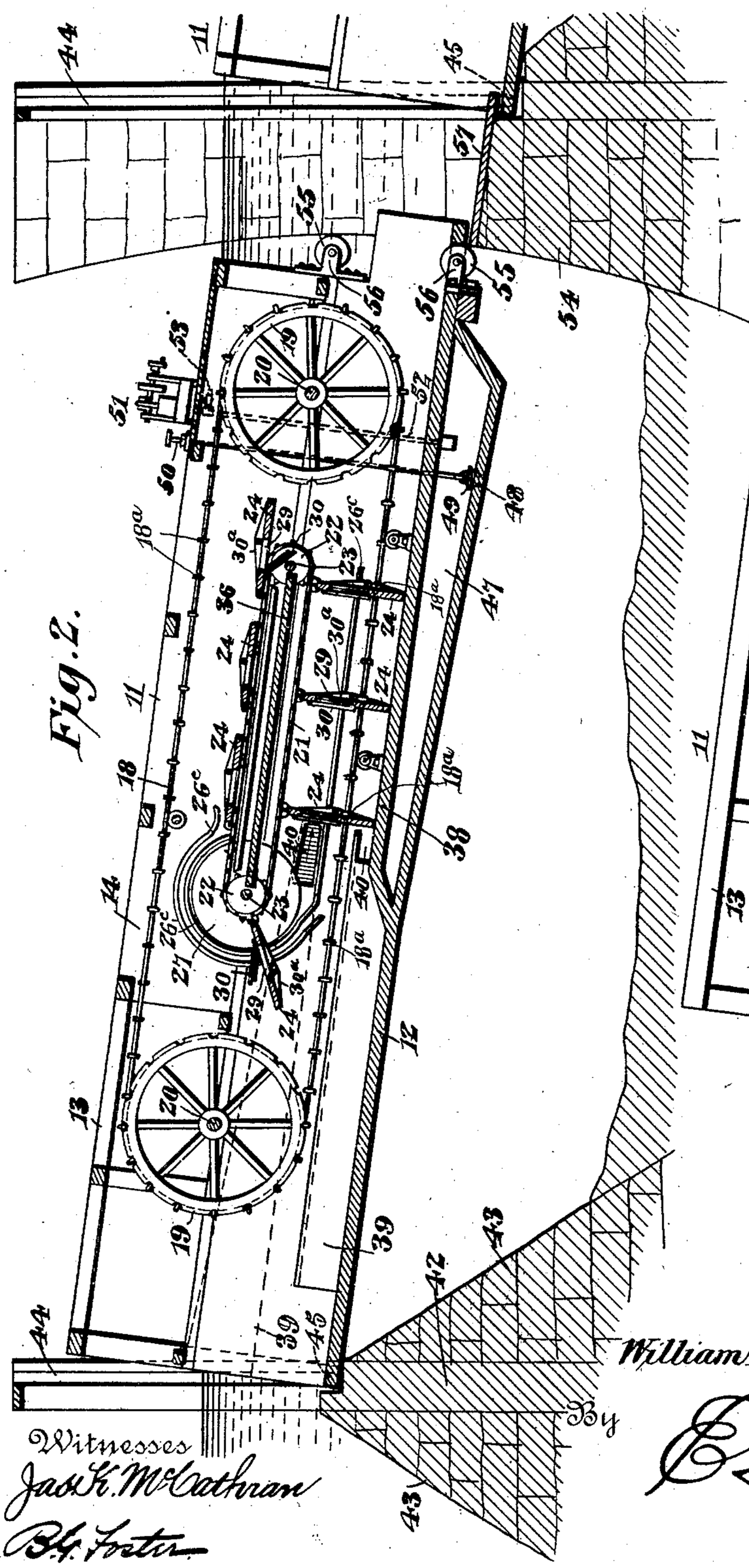

Fig. 2.

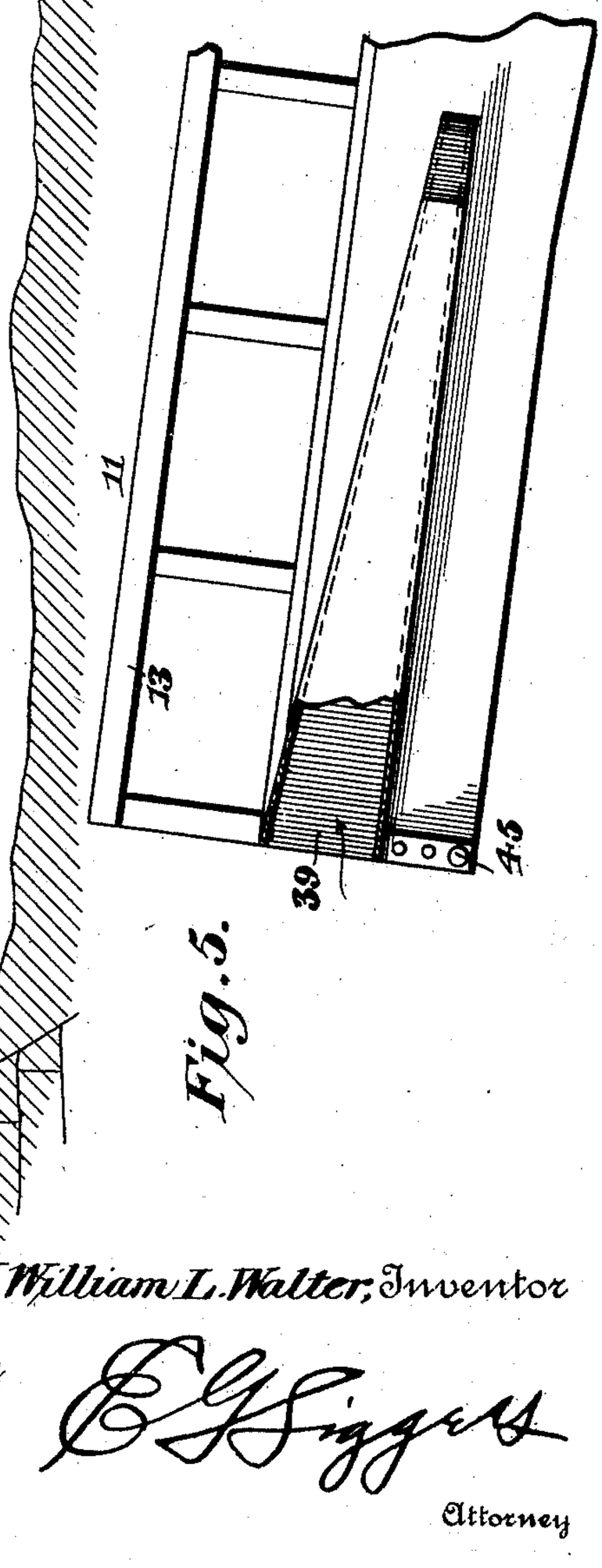

Fig. 5.

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(No Model.) 3 Sheets—Sheet 3.

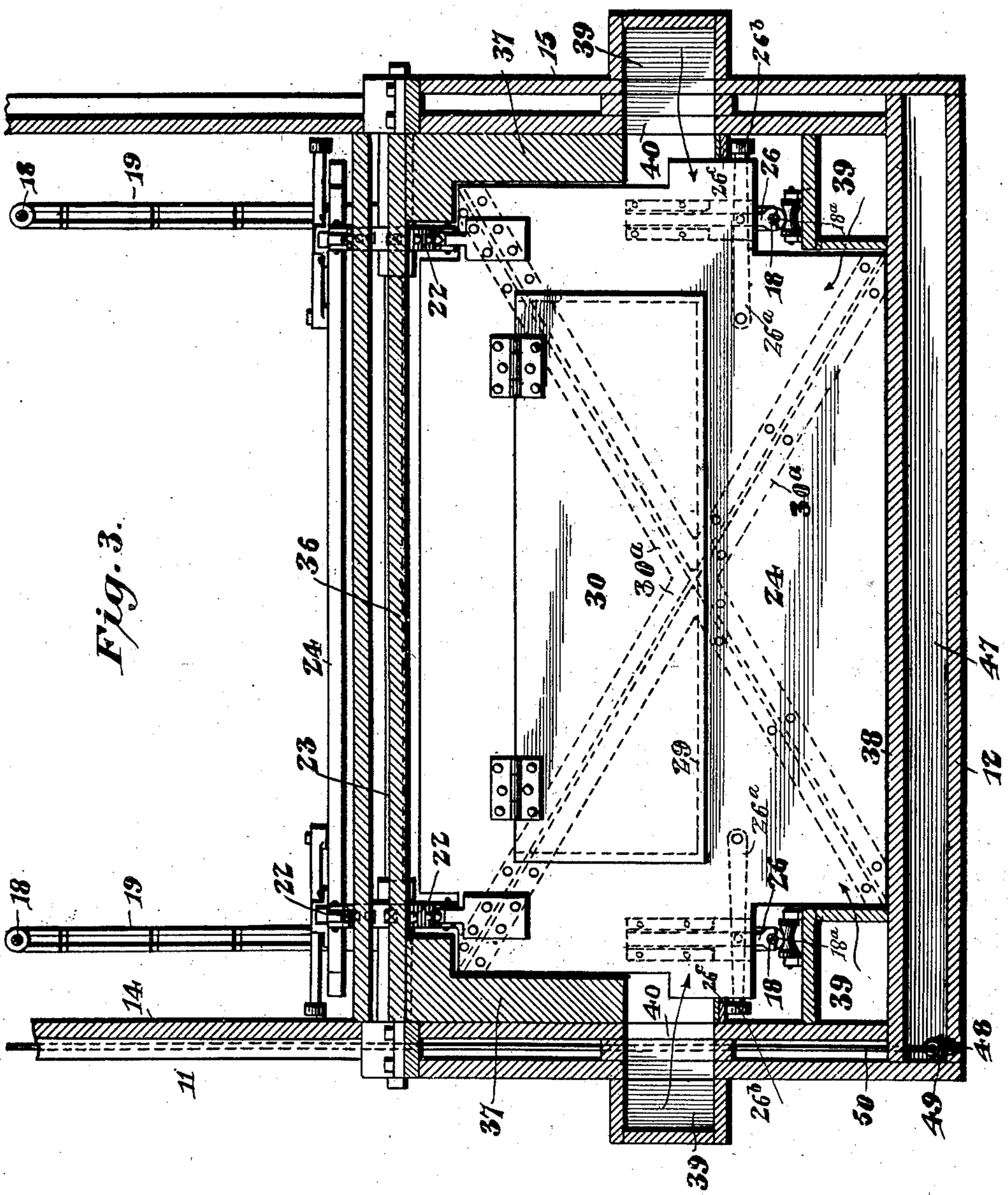

Fig. 3.

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Witnesses
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UNITED STATES PATENT OFFICE.

WILLIAM L. WALTER, OF PORT HURON, MICHIGAN, ASSIGNOR OF ONE-FOURTH TO BERTT H. BROCKWAY, OF WASHINGTON, DISTRICT OF COLUMBIA.

CURRENT-MOTOR.

SPECIFICATION forming part of Letters Patent No. 703,355, dated June 24, 1902.

Application filed November 5, 1901. Serial No. 81,234. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM L. WALTER, a citizen of the United States, residing at Port Huron, in the county of St. Clair and State of Michigan, have invented a new and useful Current-Motor, of which the following is a specification.

The present invention relates to current-motors, and particularly to motors of that class set forth in my copending application, Serial No. 66,696, filed July 1, 1901.

One of the objects of the present invention is to provide a novel flume in which the motor is placed, said flume being so constructed that the water will be delivered to the motor with great efficiency and without causing any backwater.

A further object is to construct a flume which may be regulated to the amount of water flowing in the stream or body of water in which the motor is placed, said flume automatically adapting itself to any sudden rise, as in the case of floods or freshets, thereby reducing the danger of injury to the motor to a minimum.

A still further object is to provide a system containing a series of motors arranged in tandem relation and successively employing the same water for motive power, together with means for cutting out any one or more motors without interfering with the operations of the others.

Another object is to improve the construction of motor by strengthening and simplifying the same and reducing the frictional resistance thereof to a minimum.

In the accompanying drawings the preferred embodiment of the motor is fully illustrated, and the construction and operation thereof is described in the following specification. The right is reserved, however, to make such changes from the construction shown and described as the scope of the claims hereto appended will permit.

In the drawings, Figure 1 is a top plan view showing a portion of a system constructed in accordance with the present invention. Fig. 2 is a vertical sectional view through the same. Fig. 3 is a vertical transverse section, on an enlarged scale, taken through one of the flume-sections. Fig. 4 is also a vertical sectional view on the line $x\,x$ of Fig. 1; and Fig. 5 is a side elevation of a portion of one of the flume-sections, more clearly illustrating one of the conduits employed.

Similar numerals of reference designate corresponding parts in all the figures of the drawings.

In Fig. 1 portions of two flumes are shown side by side, each flume being composed of separate sections, (designated as a whole by the reference-numerals 10 and 10^a, respectively.) As these sections are similar in all respects, but one need be described. The sections are entirely independent of one another and are arranged in tandem relation, as shown in Figs. 1 and 2. Each section comprises a body having spaced side walls 11, connected by a bottom 12, said side walls being constructed upon a suitable frame 13, covered by a sheathing, as 14. The section is divided by a vertical longitudinal partition 15 into two channels 16 and 17, the said partition being nearer one wall than the other, so that the channel 16 will be wider than 17. In the channel 16 is mounted the motor proper.

This motor is constructed quite similar to the motor described in the above-mentioned copending application, but is much simpler than the same. Endless holding-cables 18 are mounted upon large sprocket-wheels 19, which wheels are secured to transverse shafts 20, journaled in the side walls of the flume, the lower stretches of these cables being located contiguous to the bottom of the flume, while the upper stretches are disposed near the top. Between the upper and lower stretches of the holding-cables 18 is arranged a drive-cable 21, that runs upon sprockets 22, secured to transverse shafts 23, located in parallel relation to the shafts 20 and preferably in the same plane therewith. Paddles 24 are hinged to the drive-cable at suitable distances apart and carry bolts 26, that engage the lower stretches of the cables 18 to hold said paddles in upright position during their movement toward the rear end of the flume. These bolts 26 are slidably mounted upon the paddles and have forked lower ends, that embrace the cables 18 and abut against buttons

18ª, secured thereto. They are connected to horizontally-disposed pivoted arms 26ª, the free ends of which project beyond the paddles and preferably carry antifriction-rollers 26ᵇ, that bear against the under sides of suitable guide-strips 26ᶜ, having upturned front ends, which strips thus hold the forked ends of the bolts down upon the cables, as shown in Fig. 3. The bolts will be raised from their engagement with the cables as the paddles are raised at the rear sprocket-wheel 22, and said paddles are thereupon swung by the force of the escaping water to a substantially horizontal position and maintain this position during their return movement to the forward sprocket-wheel 22. Disks 27, mounted upon the forward shaft 23, carry projections 28, (illustrated in Fig. 4,) which projections engage the paddles as they reach the forward limit of their movement and turn them over to bring them again into operative position, whereupon the rollers 26ᵇ of the arms 26ª will be moved beneath the upturned front ends of the guide-strips 26ᶜ, so that as the paddles each swing into position at the upper end of the motor the bolts will be moved downwardly to again engage the cables, as will be readily understood.

The paddles are provided with openings 29, and valves 30 are hinged at their upper ends to the front face of said paddles to normally close said openings. The purpose of these valved openings is to prevent back pressure as the paddles are thrown over to their operative position. When the paddle first strikes the water during this operation, the pressure will be against the rear face of the same, and this pressure is immediately relieved by the opening of the valve, as shown in Fig. 2. As the paddle continues to swing down, the water, striking the front face of the same, will immediately close the valve, and thereby seal the opening. Braces 30ª extend diagonally across each paddle and are disposed in intersecting relation. In order that the drive-cable and holding-cable will always operate in unison, the front shafts carrying the same are connected by sprocket-chains 31, which pass over suitable wheels 32, secured, respectively, to said shafts and of the proper relative size to insure the necessary relative movement of the two cables. The forward shaft 23 is employed as the driving-shaft, and in the case of the flumes being located side by side, as shown in Fig. 1, these shafts are connected by a clutch 33, so that they may be coupled or uncoupled, as desired. The pulley 34, secured to a projecting portion of this shaft, affords means for attaching a belt 35, which belt is connected with any kind of machinery desired to be driven.

In order to obtain the maximum efficiency of the water, the paddles while in operative positions pass through a contracted inclosed passage-way, this passage-way being formed by a partition 36, located in line with the shafts 23 and extending entirely across the flume. The side walls of the flume in this passage-way are provided with inset portions 37, (shown in Fig. 3,) which fit snugly against the end edges of the paddles, so as to avoid the loss of water at these points. The bottom beneath the partition 36 is upset, as shown at 38, and the lower edges of the paddles fit snugly upon the same. The upper ends of the paddles are likewise extended up above the hinges to fill in the space between the sprocket-wheels 22 and prevent the passage of water over said paddles. As a result very little water can pass by the paddles after they are thrown to operative position; but in order to overcome any such escape after the foremost paddle has reached its first operative position between the partition 36 and the upstanding bottom 38 water is introduced into the space between said foremost paddle and the one next adjacent through conduits 39, leading from the front end of the flume and having discharge-openings 40 opening into the contracted passage-way just in rear of the front end of the upset portion 38 of the bottom. Two of these conduits are located in the opposite lower corners of the flume, and one is arranged upon the exterior face of each channel-wall containing the motor, the latter tapering toward their discharge ends. It will therefore be seen that all the water below a certain level passing through the channel 16 will necessarily operate against the paddles, and the force thereof will be consumed in driving the motor. The other channel, 17, is open from end to end and will permit the free passage of water. Located at the upper ends of each channel are gates 41, which are entirely independent of each other, so that either may be raised or lowered to cut off the passage of water through the respective channels controlled thereby. When the gate of the channel 17 is opened and that of the channel 16 is closed, the motor will be stopped and the water will flow freely down past the same. On the other hand, when the gate of the channel 17 is in closed position and the gate of the channel 16 is raised, the water must necessarily pass through the motor and operate the same. Any well-known form of valve or gate may be employed for controlling the passage of water through the outside conduits 39.

The sections are held in a stream in the following manner: Supports 42 are mounted in vertical position and are braced at their lower ends by suitable abutments 43. These supports have grooves 44 in their opposing faces, in which fit pintles 45, arranged upon the front ends of each section. The abutments 43 extend to the bottom 12 of the sections, and thereby prevent the water from flowing beneath the same. The outer abutments are connected with the banks of the stream by dams 46, which also constitute overflows for the surplus water. Each section is therefore pivotally supported at its front ends and is

preferably arranged in inclined position. For the purpose of raising and lowering the rear end to adjust the motor to the flow of the stream said rear end is provided in its bottom with an inclosed chamber 47, having a water-inlet 48, normally closed by a valve 49, said valve being operated by means of a stem 50, that projects above the side walls. An air-pump 51 has its discharge communicating with said chamber through a pipe 52, and said pipe has, preferably, located in its upper end a relief-cock 53. Assuming the chamber 47 filled with air and it being desired to lower the rear end of the section, the valve 49 is raised and the air-cock 53 opened, whereby the water will be admitted to the chamber, and the air being expelled therefrom the end of the section will lose its buoyancy and sink. When the desired position has been obtained, the valve 49 is again closed. On the other hand, to raise the rear end of the section it is only necessary to open the valve and pump air into the chamber, thereby expelling the water and regaining the buoyancy.

To relieve the pintles 45 of the longitudinal strain, abutments 54, preferably of stone, are built at the rear ends of each section, the front faces of said abutments being curved on a line concentric to the pivot axis of said section. Rollers 55, journaled in boxings 56, secured to said section, bear against the curved faces of the abutments, and thus, while permitting of the up-and-down movement of the section, receive the longitudinal strain thereof and relieve the pivots of the same. As already stated, a plurality of these sections will be employed where the nature of the stream permits, in which case each succeeding section will be pivoted upon the rear abutments of the one preceding it, as shown in Figs. 1 and 2, and an apron 57, secured between the rear abutments, will lead the water from the preceding section to the succeeding one. The sections, although in alinement, are spaced a suitable distance apart so that their corresponding channels will have communication with each other, as shown at 58 in Fig. 1, so that the water passing through either channel of the upper section may be either permitted to pass directly down through the corresponding channel of the lower section or be diverted into the other channel by manipulating the gates 41.

In operation the sections are first arranged at the desired inclination, whereupon the head-gates 41 of the channels 16 are opened, while those of the channels 17 are closed. As a result the water flowing through the channels 16 will operate the several motors arranged in tandem relation. If, however, it is desired to stop any one motor either for repair or other cause, the head-gate above said motor is closed, while the head-gate of the by-pass channel 17 is opened. The water will therefore flow down said channel until it reaches the next section, and there can be diverted back to the channel 16, while the motor will be cut out entirely. Should a sudden rise in the water take place, the lower end of each section will rise to a corresponding degree, and thus automatically adjust itself to any dangerously-swift current that might injure the paddles or other portions of the motor.

From the foregoing it is thought that the construction, operation, and many advantages of the herein-described invention will be apparent to those skilled in the art without further description, and it will be understood that various changes in the size, shape, proportion, and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

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

1. In apparatus of the class described, a pivoted vertically-swinging flume having a longitudinal partition dividing the same into separate channels, independent gates located at the upper ends of said channels, and a water-motor located in one channel.

2. In apparatus of the class described, a flume comprising separate vertically-swinging sections pivoted at their upper ends, each section having a longitudinal partition dividing the same into separate channels, the channels of one section communicating with the corresponding channels of the succeeding section, gates located across the channels at the head of each section, and a water-motor mounted in one of the channels of each section.

3. In apparatus of the class described, a flume pivotally supported at one end, means for raising and lowering the other end, and a motor located in the flume.

4. In apparatus of the class described, a flume pivotally supported at one end and having a chamber at the other, means for admitting and expelling water from the chamber, and a motor located in the flume.

5. In apparatus of the class described, the combination with a flume, of a support located at one end of the flume, a pivotal connection between the support and the adjacent end of the flume, an inclosed chamber arranged at the bottom of the opposite end of the flume, and means for admitting and expelling water from the chamber.

6. In apparatus of the class described, a flume pivotally supported at one end, means for raising and lowering the other end, an abutment located against the movable end of the flume, and a motor located in the flume.

7. In apparatus of the class described, a flume pivotally supported at its upper end, means for raising and lowering the lower end, an abutment located contiguous to the lower end of the flume, rollers carried by the flume and movably bearing against the abutment, and a motor located in the flume.

8. In apparatus of the class described, a flume having side walls and a partition extending across the channel above the bottom, said bottom having the portion located beneath the partition raised to form a contracted passage-way, a motor provided with paddles movable through the passage-way, and inclosed water-conduits opening into the passage-way contiguous to the front end thereof.

9. In apparatus of the class described, the combination with a flume, of a motor located in the flume, said motor comprising an endless holding-cable, means for supporting one stretch of the cable within the flume, a series of paddles movable through the flume and engaging the holding-cable during their movement in one direction but detached from said cable during the return movement.

10. In apparatus of the class described, the combination with a flume, of a motor located in the flume, said motor comprising an endless holding-cable having an upper and a lower stretch movable in opposite directions, one of said stretches being located within the flume, a series of paddles movable through the flume and detachably engaging the holding-cable during their movement in one direction but detached from said cable during their return movement.

11. In apparatus of the class described, the combination with a flume, of a motor located in the flume, said motor comprising an endless holding-cable having an upper and a lower stretch movable in opposite directions, the lower stretch being located contiguous to the bottom of the flume, an endless drive-cable mounted between the stretches of the holding-cable, and paddles pivoted upon said drive-cable and detachably engaging the lower stretch of the holding-cable during their movement in one direction, but detached from said cable during their return movement.

12. In apparatus of the class described, the combination with a flume, of a motor located in the flume, said motor comprising an endless holding-cable having an upper and a lower stretch movable in opposite directions, the lower stretch being located contiguous to the bottom of the flume, an endless drive-cable mounted between the stretches of the holding-cable, connections between the two cables to maintain their operative relation to each other, and paddles pivoted upon the said drive-cable and detachably engaging the lower stretch of the cable during their movement in one direction but detached from said cable during their return movement.

13. In apparatus of the class described, a current-motor comprising a drive-cable, a holding-cable having a stretch located below the driving-cable, paddles pivotally mounted on the drive-cable, said paddles detachably engaging the holding-cable and projecting below the same, and braces extending diagonally across each paddle from top to bottom, said braces being disposed in intersecting relation.

14. In apparatus of the class described, a current-motor comprising a drive-cable, a holding-cable having a stretch located below the drive-cable, paddles pivotally mounted on the drive-cable and having openings, said paddles detachably engaging the holding-cable and projecting below the same, valves hinged upon the front faces of the paddles and normally closing the openings thereof, and braces extending diagonally across each paddle, said braces being disposed in intersecting relation and extending across the portion of the paddles projecting beneath the holding-cable.

15. In apparatus of the class described, a current-motor including a pair of cables, each of which has stretches movable in opposite directions, paddles connected to one cable and having detachable engagements with one stretch of the other cable during the movement of said paddles in one direction but detached from said cable during their return movement, and means connecting the two cables to cause them to move in unison and maintain the paddles in fixed relation thereto while said paddles are connected to both cables.

16. In apparatus of the class described, a flume comprising separate sections arranged in tandem relation, a support located at the front of each section, a pivotal connection between the front of each section and the adjacent support, and a motor located in each section.

17. In apparatus of the class described, a flume comprising separate sections arranged in tandem relation, a support located at the front of each section, a pivotal connection between the front end of each section and the adjacent support, the rear end of each section abutting against the support of the next section, and a motor located in each section.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WILLIAM L. WALTER.

Witnesses:
RALPH E. HOLLISTER,
HUGH W. FRED.