No. 774,665. PATENTED NOV. 8, 1904.

E. J. HOFF.

WATER METER.

APPLICATION FILED JUNE 2, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

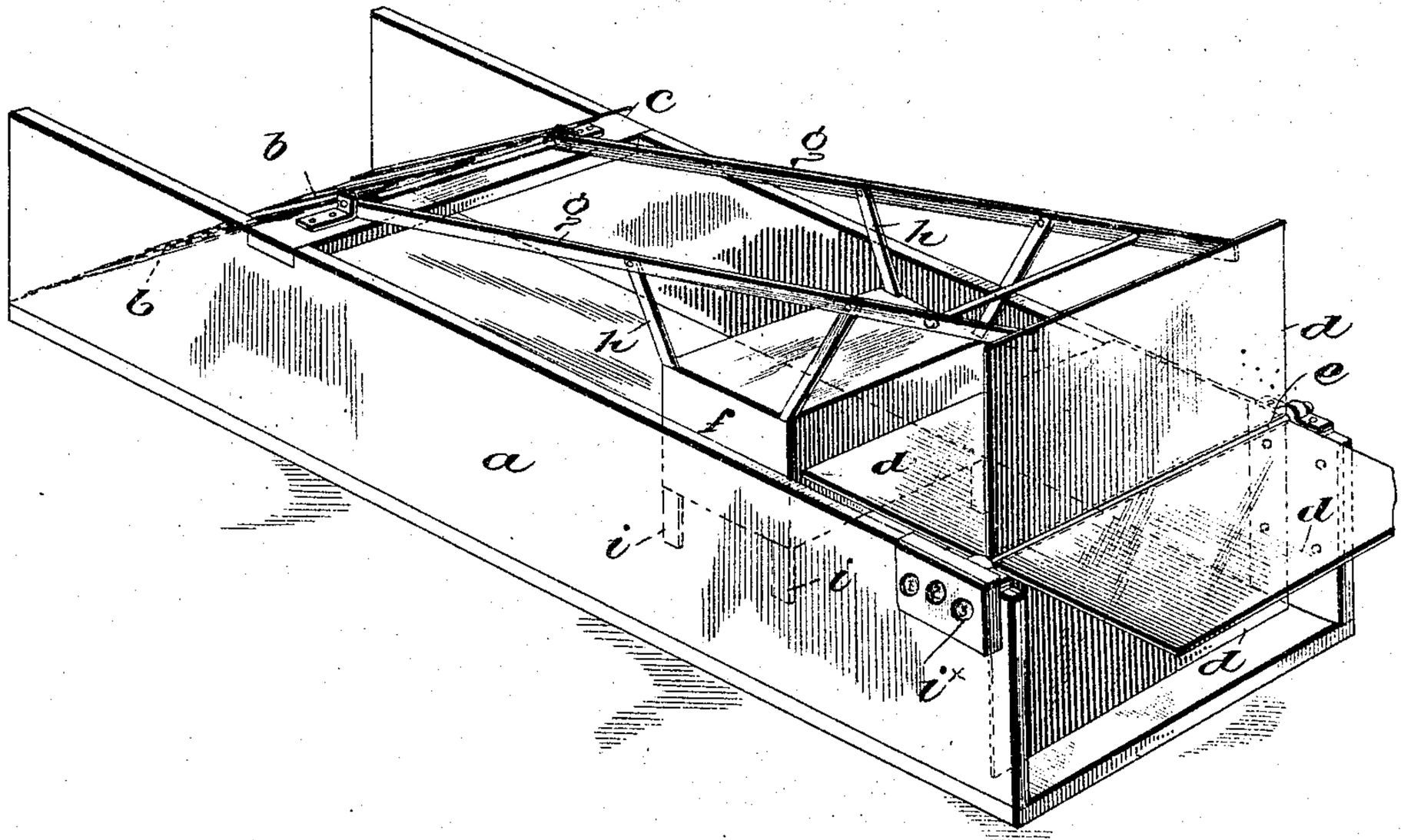
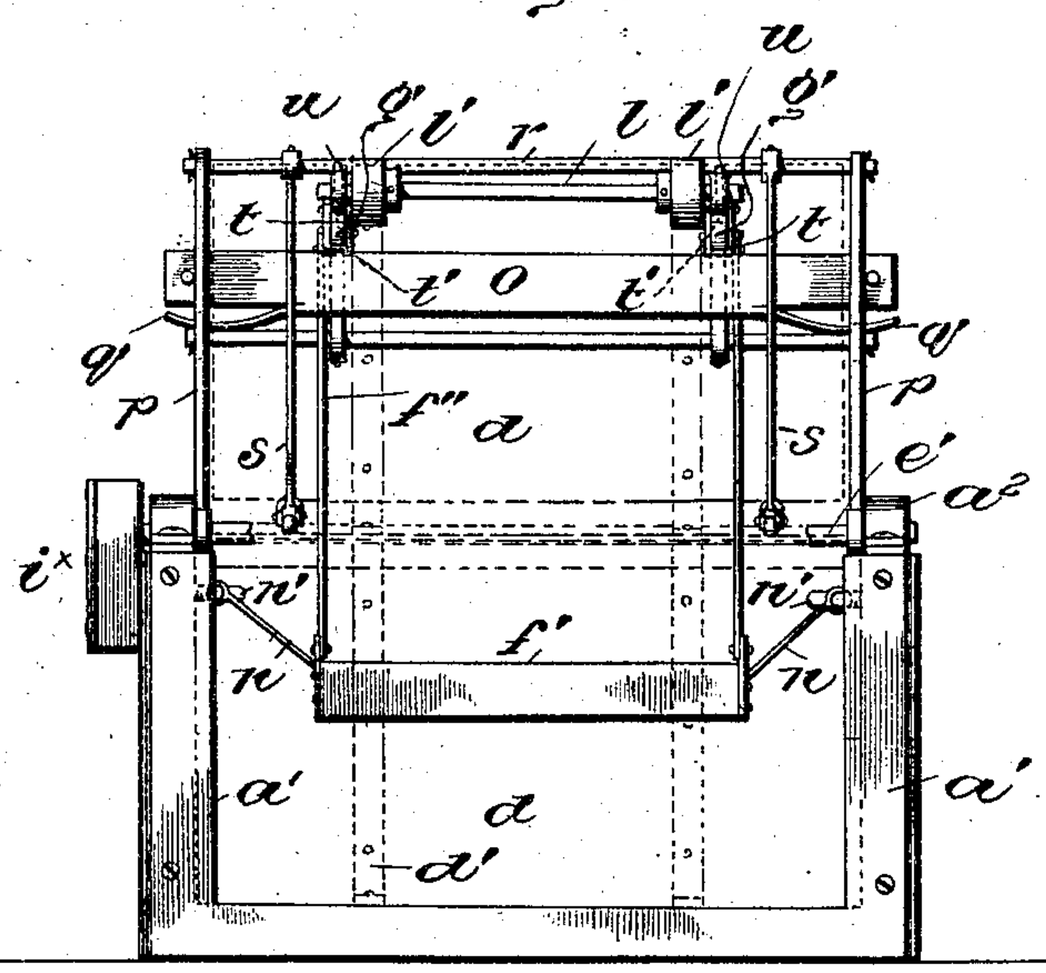


Fig. 4.



Witnesses

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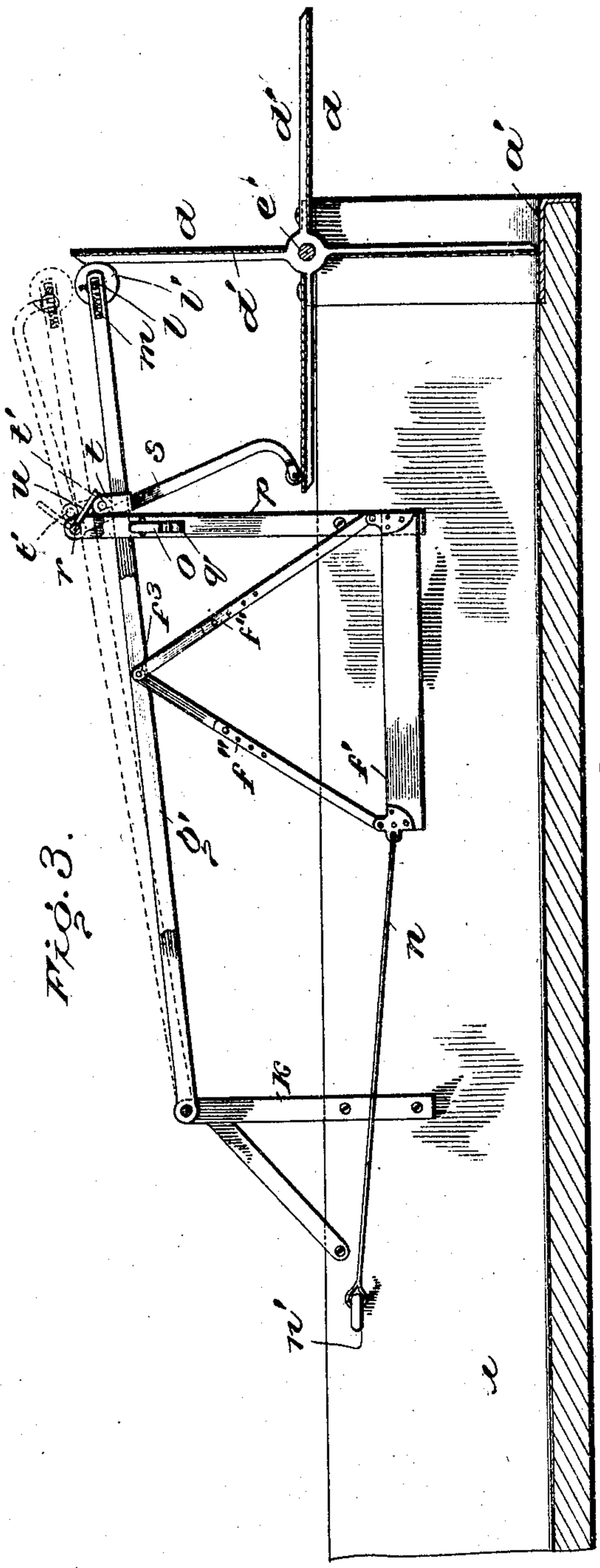

Fig. 3.

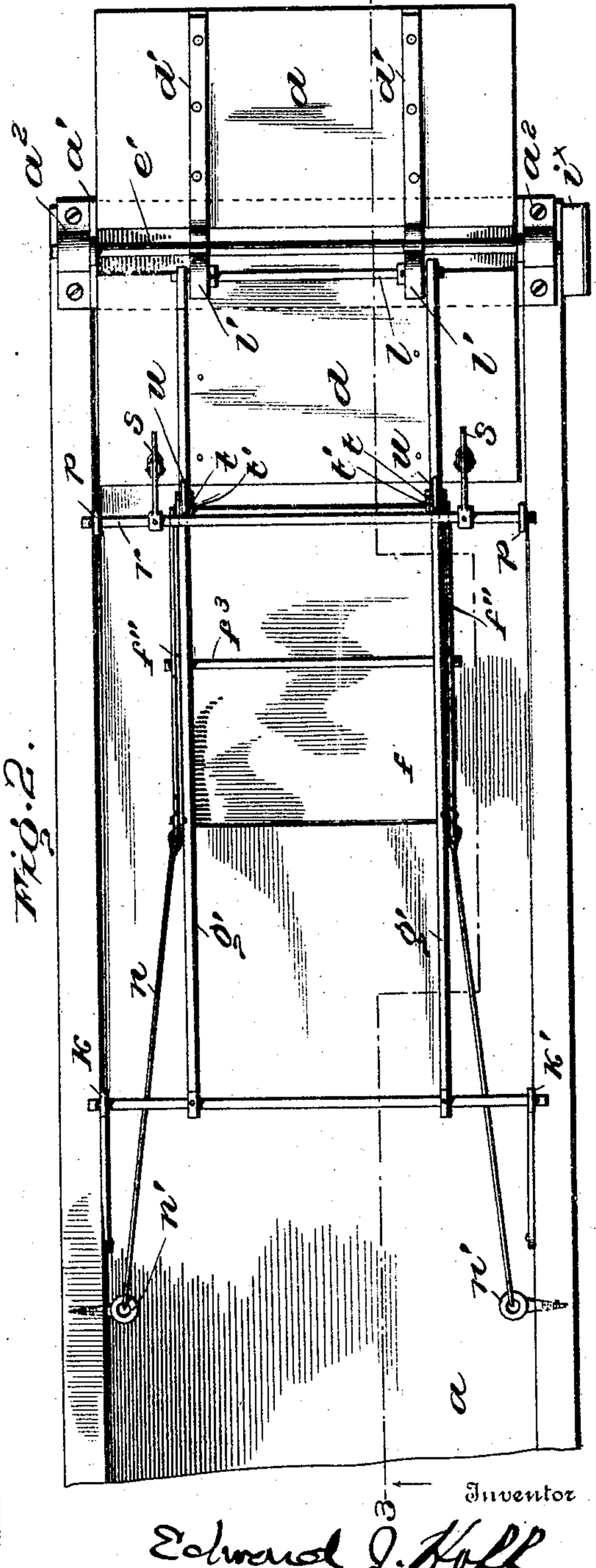

Fig. 2.

Witnesses

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No. 774,665. Patented November 8, 1904.

UNITED STATES PATENT OFFICE.

EDWARD J. HOFF, OF COLORADO SPRINGS, COLORADO, ASSIGNOR OF ONE-FOURTH TO EDWARD S. PECK, JR., OF COLORADO SPRINGS, COLORADO.

WATER-METER.

SPECIFICATION forming part of Letters Patent No. 774,665, dated November 8, 1904.

Application filed June 2, 1904. Serial No. 210,864. (No model.)

To all whom it may concern:

Be it known that I, EDWARD J. HOFF, a citizen of the United States, residing at Colorado Springs, county of El Paso, State of Colorado, have invented certain new and useful Improvements in Water-Meters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to certain improvements in water-measuring devices, and more particularly relates to improvements in water-meters peculiarly adapted for use in connection with the water canals or ditches of irrigating, mining, and the like water-supply systems.

An object of the invention is to provide a water-meter for use in irrigating systems and the like and which will by improved means measure the quantity of water delivered to a consumer with the degree of accuracy necessary in such systems and yet which can be produced at a reasonable cost and will be comparatively simple and durable in construction and reliable and efficient in action.

A further object of the invention is to provide certain improvements in arrangements and details whereby an efficient and durable irrigating-system water-meter will be produced.

The invention consists in certain novel features of construction and in arrangements or combinations of parts, as more fully and particularly explained hereinafter.

Referring to the accompanying drawings, in which I show for purposes of explanation several forms from among others within the spirit and scope of my invention, Figure 1 is a perspective view of a flume or weir provided with my invention in a simple form, the float being shown at its limit of downward movement with the stops holding the paddle or measuring wheel with one of its vanes or gates closing the outlet end of the weir. Fig. 2 is a top plan view of a modified arrangement of my invention. Fig. 3 is a longitudinal section on the line 3 3, Fig. 2, dotted lines showing the parts in different positions. Fig. 4 is a rear end view, the measuring-wheel being broken away.

In Fig. 1 of the drawings, *a* is a weir or flume of any suitable or ordinary construction and through which the water flows under head from the main canal or supply-channel into the consumer's branch or lateral supply ditch or conduit. At the inlet end of this weir I show any suitable screen *b* to prevent passage into the weir of floating bodies or other matter which might interfere with the proper working parts of the meter. In the particular example illustrated by Fig. 1 I show this screen composed of slats extending upwardly and rearwardly from the front edge of the bottom of the weir to a rigid cross-bar *c*, secured at the top edges of the vertical sides of the weir. I provide suitable means for automatically closing and opening the outlet or discharge end of the weir controlled by the quantity of water in the weir for the purpose of permitting the discharge of water from the weir in predetermined measured quantities. As an example of means which can be employed for this purpose I show a series of equally-spaced similar gates *d*, each adapted to close the discharge end of the weir—that is, these gates are arranged to successively close the discharge end of the weir and to then permit discharge or escape of the accumulated water from the weir. As a convenient means for mounting and operating these gates I show them radiating from and rigid with a cross-shaft *e*, extending horizontally across the top of the rear end of the weir, and mounted to turn in suitable journal-boxes, carried by the top edges of the sides of the weir. I show four gates *d*, equally spaced around the shaft and each of a size with respect to the cross-sectional dimensions of the outlet end of the weir to practically close said end when the gate depends vertically from the shaft.

It is obvious that the device so far described will permit free passage of water through the weir, as the flow of the water would constantly rotate the measuring-wheel formed by the gates and shaft. However, as the depth of the water passing through the weir varies,

the quantity of water cannot be measured with any degree of accuracy by such a constantly-rotating wheel. I have hence provided means for holding said wheel to confine or accumulate water in the weir until a certain predetermined quantity is stored therein and to then release such measured quantity, so that by an indicator or recorder a record can be kept of the number of measured quantities of water which have during a given period passed through the weir. To accomplish this result, I control the movement of the gates by the height of the water in the weir. For instance, I can provide a stop mechanism controlling the gates and controlled or actuated by a float located in the weir. As an example of simple means which can be employed for this purpose I show a vertically-swinging stop-frame arranged longitudinally of the weir and at its front end hinged or fulcrumed to the cross-bar *c* and with its rear free end arranged to move into and out of the path of movement of the gates, and I attach to this frame a suitable float *f*, located in the weir. This swinging controlling or stop frame is shown composed of two parallel and connected bars *g*, suitably hinged at their front ends, as before described, to permit the vertical movement of their rear ends, which form stops or abutments to successively engage the gates of the measuring-wheel and hold said wheel against rotation with the current. The float *f* is hung from said stop-frame in any suitable manner, as by the hangers *h*, at their lower ends rigidly secured to the float and at their upper ends secured to the stop-bars *g*. The float can be provided with feet *i* to rest on the floor or bottom of the weir, so that water can freely flow under the float when the float drops to its downward limit and the stop-frame moves to locking position. Where the four equally-spaced radiating gates are employed, the lower vertical gate closes the weir against outflow of water and the upper vertical gate abuts against said stop-frame and is thus held by the pressure of water in the weir and against the lower gate. The stop-frame and its float or other controlling device actuated by the height or depth of the water in the weir are so arranged that the gates will be thus locked against water-discharging movement so long as the water in the weir is below the predetermined depth. As soon as the predetermined quantity of water has accumulated in the weir the float controlled thereby moves the stop-frame up clear of the upper vertical gate, and thereby releases the wheel, and the pressure of water in the weir and against the lower vertical gate swings the same outwardly, permitting escape of the measured predetermined quantity of water from the weir. The wheel is thereby turned to bring another gate into position, closing the weir-outlet and another gate to position against and held by the stop-frame, which previously dropped to locking position as its float lowered with the water in the weir. The measured quantity of water discharges rapidly from the weir during the quarter-turn of the wheel and the float drops to the floor of the weir before the upper gate passes beyond the vertical locking position. The stop-frame having thus locked the wheel with its lower gate closing the weir-discharge, the water again gradually rises in the weir and lifts the float to release the wheel when the measured quantity has again accumulated in the weir. The float is so weighted as to cause release of the wheel when a certain quantity or depth of water has accumulated in the weir, and this measured quantity can be increased or diminished by adding to or removing from the weight of the float.

$i^{\times}$ indicates any suitable counter, indicator, or recorder actuated by the rotation of the wheel or the gates thereof to register the number of rotations or the number of discharges of predetermined or measured quantities of water from the weir.

Any suitable means can be provided to prevent retrograde movement of the wheel or the gates thereof, and also, if found necessary, suitable means can be provided to accelerate the turning movement of the wheel to bring the gate fully and properly to the closing position after a discharge of a measured quantity of water.

The weirs are usually located at the inlet end of the consumer's ditches, and they can be suitably inclosed to prevent tampering by unauthorized persons.

In the form shown by Figs. 2, 3, and 4 the weir *a* is employed; but the outlet or discharge end thereof is braced and strengthened against warping and to provide as close a fit as possible for the gates by a U-shaped metal frame or facing *a'*, formed to cover or fit the end edges of the weir as well as to extend onto the bottom surface and vertical inner side faces thereof. At the upper ends of its legs or vertical portions this frame is provided with the journal-boxes a^2, receiving the rotary shaft *e'* of the gates or wheel. The gates *d* are secured rigidly to the radiating arms *d'* of strong metal spider-frames having central hubs rigidly secured on said shaft. In the present instance I show two such spider-frames with their arms *d'* traversing the rear faces of the gates. *k* represents rigid vertical brackets secured to and projecting up from the sides of the weir and to the upper ends of which the forward end of the vertically-swinging gate controlling or stop frame is fulcrumed. This frame comprises the two longitudinal strong bars *g'*, secured together, and at their forward ends secured together by a cross-bar, at its ends fulcrumed in said brackets. At their rear or free ends said bars *g'* are provided with a transverse bar *l*, on which are mounted the antifriction-

rollers l', arranged to engage the spider-arms d' of the gates during the operations of stopping and releasing said gates. By providing these spider-frames, and thus causing the stop device to engage the arms of said frames, the gates themselves are relieved of the strain and shock incidental to the gate-locking operation. If desired, I can provide a cushioning or spring-bumper device to relieve the parts from strain when the gates are suddenly locked under a heavy pressure. For instance, I show the rod or bar l passing through longitudinal slots in the ends of the stop-frame bars g' and heavy coiled springs m on said bars g' and pressing the rod l to the outer ends of said slots, so that said springs can give slightly when a gate forcibly engages the stop-rollers l', thereby forming cushions. f' is the float arranged in the weir and hung from the stop-frame by the longitudinally-adjustable hangers f'', converging upwardly and confined on the cross-bar f^3 between the longitudinal bars g' of the stop-frame, so that the float is pivotally hung from the stop-frame. The float is maintained in its proper horizontal position by the light pivotally-connected links, draw-bars, or wires n, extending forwardly in the weir from the front corners of the float to the eyes or loops n', rigidly secured to the side walls of the front portion of the weir. By providing the longitudinally-adjustable hangers it is possible to easily vary the normal vertical position of the float to cause discharge of the water from the weir when a certain quantity has accumulated therein and to easily determine the depth to which the water shall accumulate before discharge. In this form I do not employ feet for the float, but provide other means for limiting the downward movement of the float and stop-frame. For instance, I arrange a transverse stop-bar o beneath the stop or controlling frame to limit the downward movement thereof and of the float. If desired, this stop-bar o can be cushioned to break the shock when the vertically-movable stop-frame drops thereon. The horizontal stop-bar o is arranged beneath the rear portions of the stop-frame bars g', with its ends confined in vertical slots in the rigid upright posts p, secured to the sides of the weir. The bar o is shown yieldingly upheld by the curved bow or plate springs q, rigid therewith and with their free ends arranged below the lower edge of the stop-bar and resting on the lower end walls of the vertical slots in the uprights p. When the stop-frame reaches its normal gate-locking position, it rests on and is upheld by this stop-bar, with the float upheld in the weir at its normal position. I also provide means for forcing the wheel to its normal position, with a gate closing the weir, and to prevent retrograde movement of the wheel. In this connection r is a rock-shaft mounted in the upper ends of the posts p and arranged transversely above the stop-frame. s represents lateral stop-arms rigid with this rock-shaft and normally depending therefrom and bearing down on the top surface of the gate extending horizontally and forwardly from the wheel-shaft, the next gate to move to position closing the weir-outlet. These arms are preferably provided with rollers mounted in their free ends to engage the gate. These depending arms thus engaging the gate serve to hold the gate and wheel against retrograde movement, as the rock-shaft is arranged above the gate, approximately directly over the same. As these depending arms when in their normal position are located in the path traveled by the gates as the wheel rotates, it is desirable to permit the same to move out of said path at each release of the wheel and to provide for the return of the arms to normal position. I provide means whereby these arms are controlled by the stop-frame, so that as the stop-frame moves upwardly to release the wheel it causes the rock-shaft to oscillate and swing said arms upwardly and out of the path of the descending gate. To this end, t represents casings or brackets adjustably secured on the longitudinal stop-frame bars g' and at their upper ends provided with rollers t', arranged below and adapted to engage and swing upwardly the toes or lateral strikers u, rigid with the rock-shaft. Hence when the float rises and the stop-frame moves up the rollers t' engage said lateral toes u, and thereby quickly oscillate the rock-shaft to swing the stop-arms up to a point above the path traveled by the gates, so that said arms are above said path before the gate-wheel is actually released. When the gate-wheel is released, the pressure of water in the weir quickly carries the wheel around to almost a quarter-turn. The float thereupon drops, releasing the stop-arms, which drop onto the upper side of the forwardly-projecting gate and push the same down to the horizontal position and the depending gate to closing position, and as the stop-frame has previously dropped to locking position said dropping movement and downward pressure of the stop-arms also brings the upwardly-extending gate up positively against the free ends of the locking-frames.

I do not wish to limit the broad features of my invention to the specific arrangement shown of gates forming a wheel, as possibly other means to close and open the weir-discharge might be otherwise arranged and locked and released or controlled by means actuated or controlled by the quantity or height or depth of the water in the weir. Also I do not wish to limit the broad features of my invention to the exact gate stop or controlling devices shown, and it is evident that various changes and modifications might be resorted to without departing from the spirit and scope of my invention. Hence I do not

wish to limit myself to the exact construction shown.

What I claim is—

1. A water-meter comprising a weir, a rotary gate-wheel for periodically closing and opening the weir-outlet, registering mechanism, and controlling means for said gate-wheel controlled or actuated by the height or quantity of water in the weir, whereby the water will be discharged from the weir in predetermined measured quantities, substantially as described.

2. A water-meter comprising a weir, movable means actuated by the flow of water for periodically closing and opening the weir-outlet, registering mechanism, and a stop mechanism for said means and moved to and from locking position by the water in the weir.

3. A water-meter comprising a weir, movable means moving with and actuated by the flow of water through the weir for periodically closing and opening the same, and a movable locking device controlling said means and provided with and moved into and out of locking position by a float in the weir.

4. A water-meter comprising a weir, a rotary wheel comprising a series of gates adapted to successively close the weir-outlet, and a movable stop member controlling the rotation of said wheel and adapted to lock and release the same and provided with actuating means controlled by the height of the water in the weir.

5. A water-meter comprising a weir, a series of connected gates adapted to successively move into position closing the weir-outlet, and movable gate controlling and locking means controlled and actuated by the height of the water in the weir.

6. In combination, in a water-meter, a weir, a rotary wheel comprising a series of radiating gates adapted to successively close the outlet end of the weir, and stop mechanism controlling the rotation of said wheel and controlled by the height of water in the weir, and thereby periodically locking and releasing the wheel, for the purpose substantially as described.

7. In combination, a weir, a rotary wheel comprising gates adapted to successively close the weir-outlet, said wheel rotated by the flow of water from the weir, a vertically-swinging frame the free end of which is movable into and out of the path of rotation of said gates to stop and release the wheel, said weir provided with a support to which said frame is fulcrumed, and the float in the weir for actuating said frame.

8. In combination, a weir, a U-shaped metal frame facing the discharge end and edges of the weir and provided with journal-boxes, and a rotary gate-wheel comprising a shaft mounted in said boxes and radiating gates adapted to successively fit said frame and close the weir-outlet, substantially as described.

9. In combination, a water-receptacle having an inlet and outlet, a rotary gate-wheel comprising gates to successively close said outlet, a vertically-movable stop-frame arranged to lock and release said wheel, controlling means for said frame controlled by the quantity of water in said receptacle, said stop-frame provided with cushioned bumpers to engage said gate-wheel.

10. In combination, a weir, and a rotary gate-wheel comprising radiating gates arranged to successively close the outlet from the weir, a shaft and spider-frames rigid therewith, the gates being secured to the radiating arms of said spider-frames and gate-wheel-controlling means engaging the arms of said spider-frame.

11. In combination, a water-receptacle having an inlet and outlet, a rotary gate-wheel having radiating gates arranged to successively close said outlet, and comprising a shaft having rigid radiating arms to which said gates are secured and which extend transversely across said gates, and a movable stop-frame controlling said wheel and arranged to engage said arms in locking and releasing said wheel.

12. In combination, a receptacle having an inlet and outlet, a rotary gate-wheel having gates to successively close said outlet, a movable stop-frame controlling said wheel and provided with an actuating-float arranged in said receptacle, and adjustable connections between said frame and said float.

13. In combination, a receptacle having an inlet and an outlet, a gate-wheel comprising gates to successively close said outlet, a swinging stop-frame controlling said wheel, a float arranged in said receptacle, means pivotally hanging said float from said frame, and means for maintaining the float approximately horizontal, substantially as described.

14. In combination, a receptacle having an inlet and an outlet, a rotary gate-wheel having gates to successively close said outlet, a movable stop-frame controlling said wheel, a float actuating said frame and carried thereby, and a stop limiting the downward movement of said frame and its float.

15. In combination, a receptacle having an inlet and an outlet, a rotary gate-wheel to successively close and open said outlet, controlling means for said wheel controlled by the height of the water in said receptacle for locking and releasing said wheel, and mechanism controlled by said means for holding said wheel against retrograde movement and for actuating said wheel to complete each closing movement thereof.

16. In combination, a receptacle having an inlet and an outlet, a rotary gate-wheel for successively closing and opening said outlet, a movable stop-frame controlling said wheel and provided with an actuating-float in the receptacle, and a swinging stop and push de-

vice acting on said wheel and controlled by said frame.

17. In combination, a receptacle having an inlet and an outlet, a rotary gate-wheel for successively closing and opening said outlet, a controlling stop-frame for locking and releasing said wheel, and a rock-shaft actuated by said frame and provided with a push and stop arm acting on said wheel to complete each oscillation thereof and to prevent retrograde movement thereof.

18. In combination, a receptacle having an inlet and an outlet, a rotary gate-wheel controlling said outlet, a stop-frame controlling said wheel to lock and release the same and provided with an actuating-float, a rock-shaft arranged transversely of said frame and having a lateral pusher and stop to operate on said wheel, and means whereby said frame oscillates said rock-shaft.

19. In combination, in a water-meter, a receptacle having an inlet and an outlet, movable means actuated by the flow of water through the outlet to periodically close and open said outlet, and controlling locking mechanism for said means controlled by and moved to and from locking position by the water in the receptacle, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD J. HOFF.

Witnesses:

W. N. ARMSTRONG,

B. WINFRED STIVERS.