No. 616,486. Patented Dec. 27, 1898.

J. C. McGOWAN.

GATE FOR SEWERS OR THE LIKE.

(Application filed Aug. 21, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

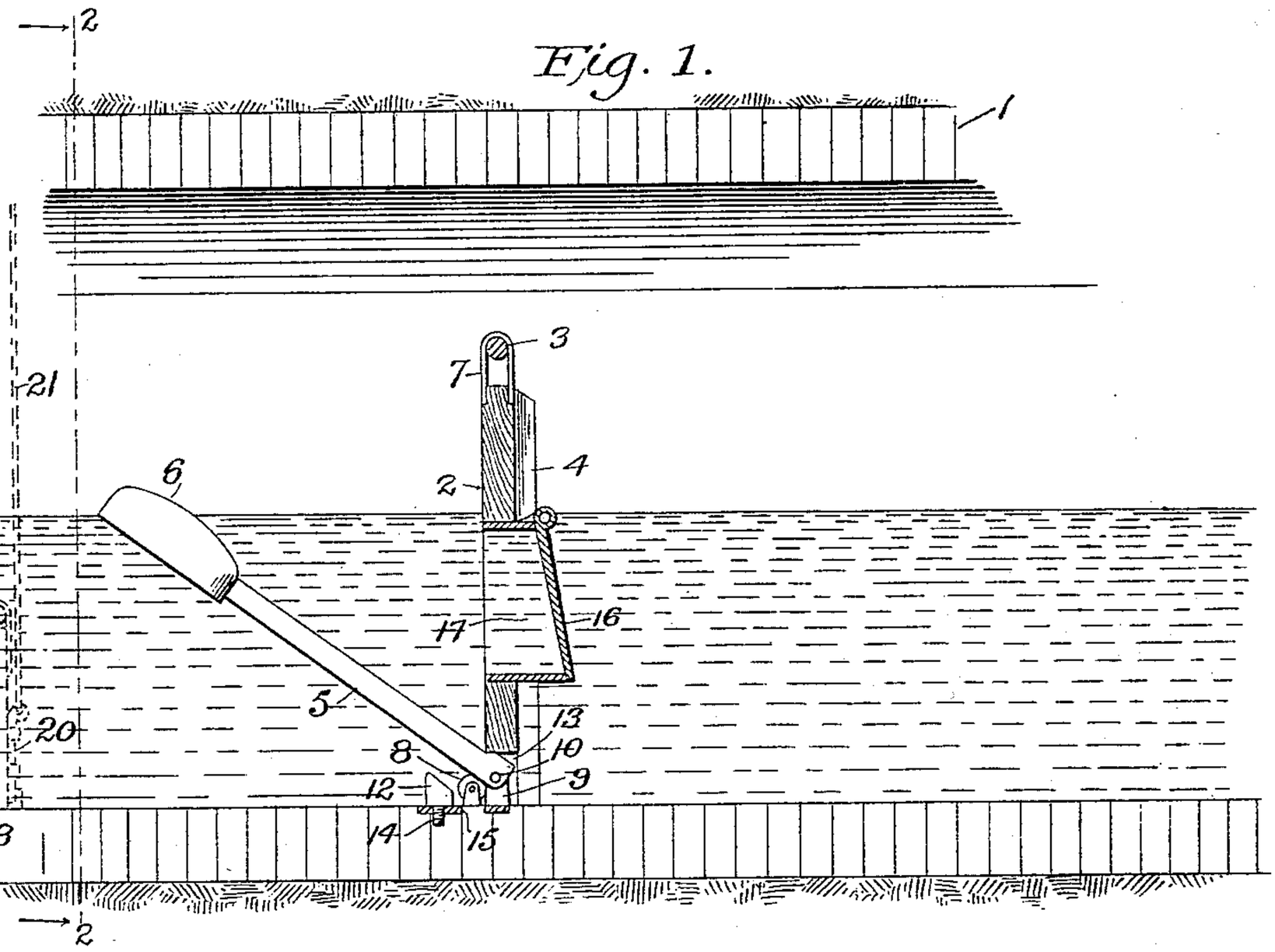


Fig. 2.

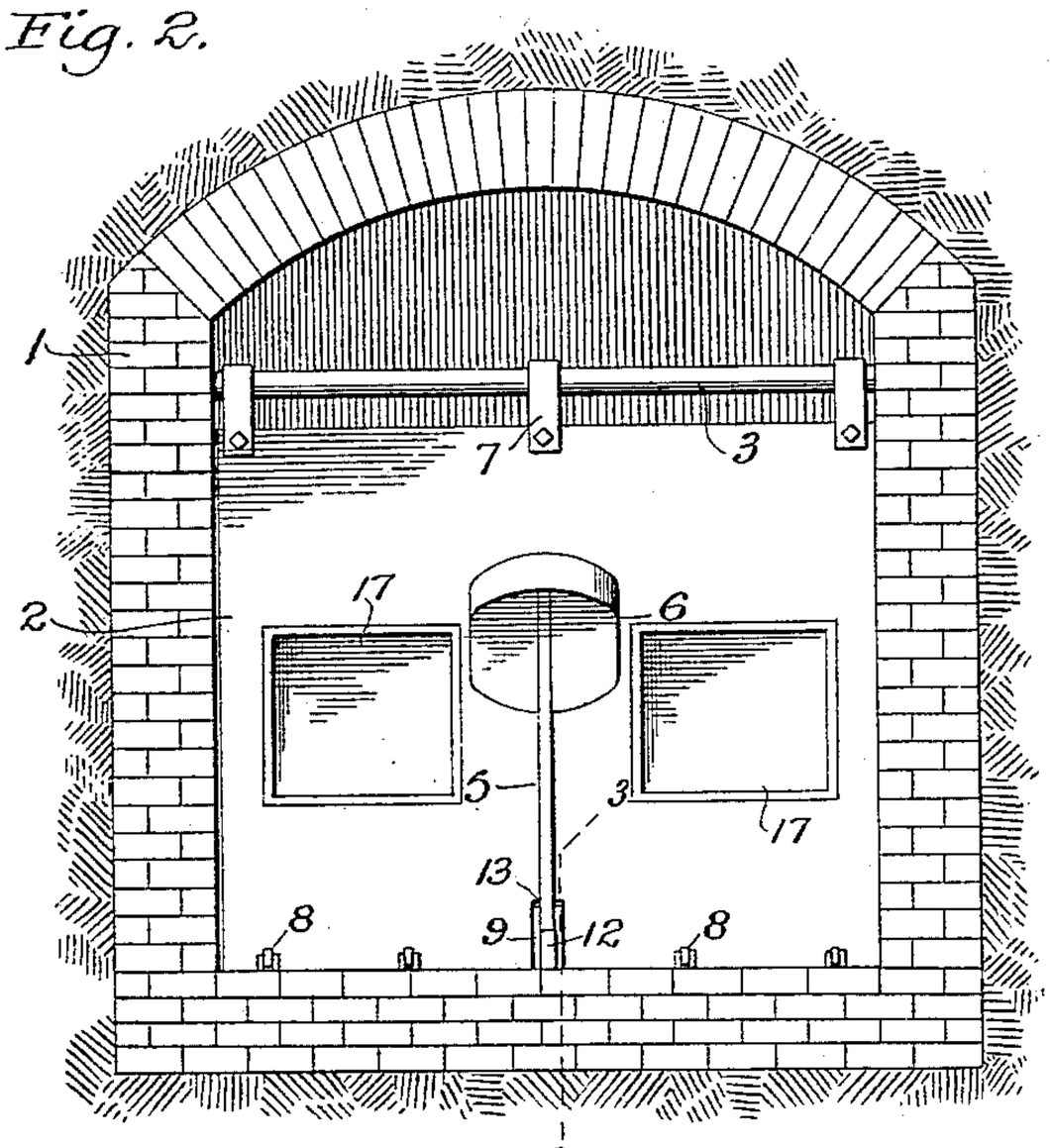


Fig. 3.

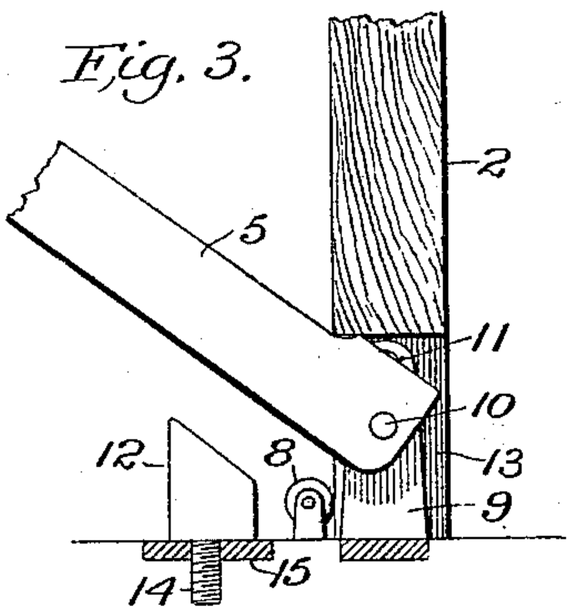
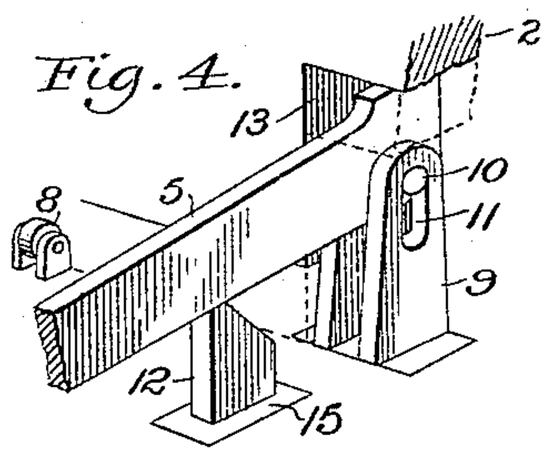


Fig. 4.



Witnesses
James F. Duhamel
Victor J. Evans

Inventor,
JOHN C. McGOWAN,
by John Wedderburn
Attorney

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(No Model.) 2 Sheets—Sheet 2.

Fig. 5.

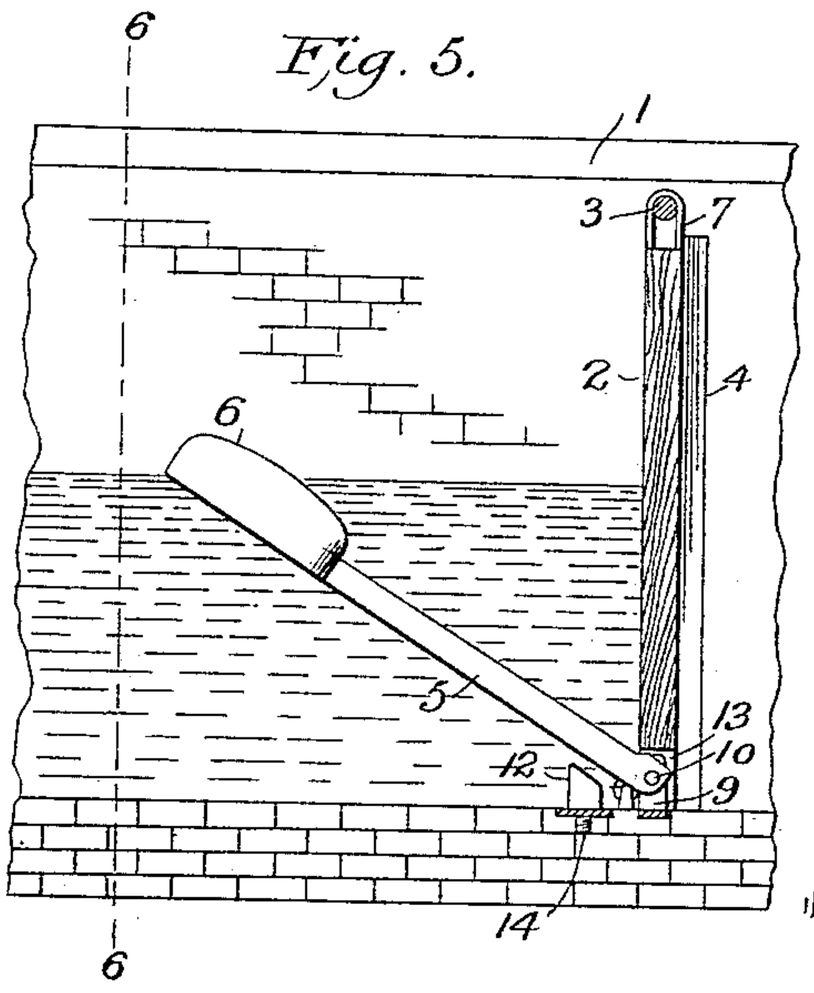


Fig. 6.

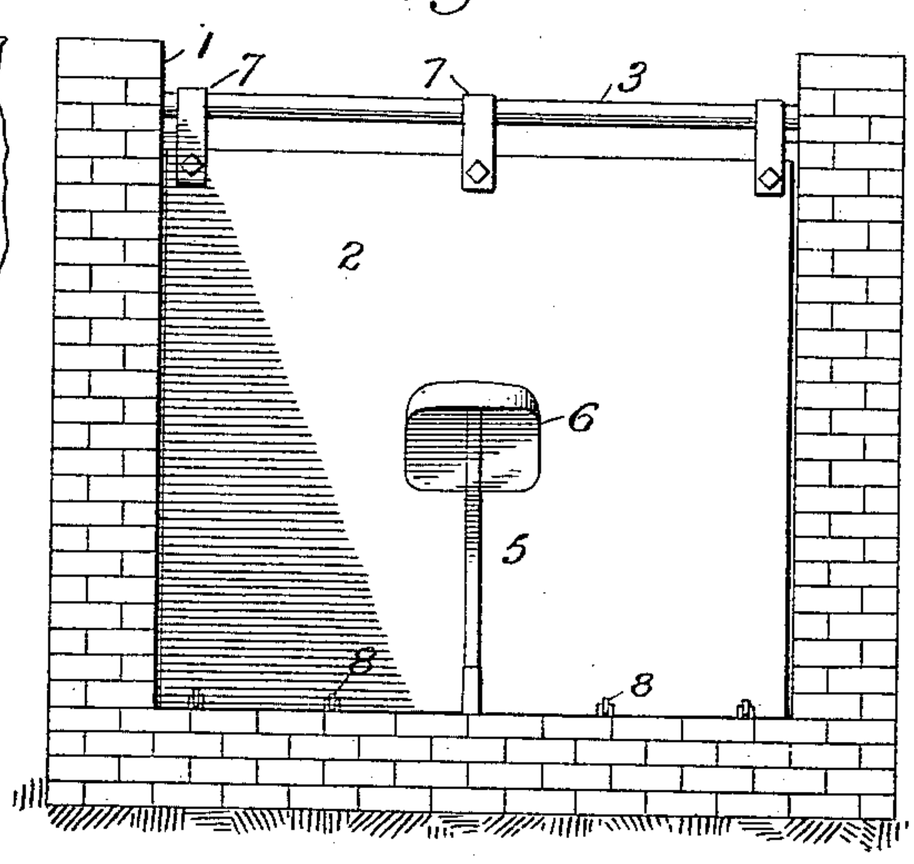
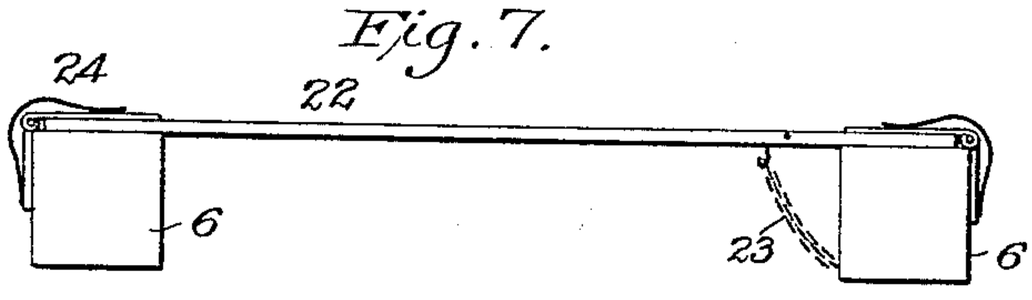


Fig. 7.



Witnesses
James F. Dillard
Victor J. Evans

Inventor,
JOHN C. McGOWAN,
By John Wedderburn.
Attorney

UNITED STATES PATENT OFFICE.

JOHN C. McGOWAN, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR, BY MESNE ASSIGNMENTS, OF ONE-HALF TO S. M. BRYAN, OF SAME PLACE.

GATE FOR SEWERS OR THE LIKE.

SPECIFICATION forming part of Letters Patent No. 616,486, dated December 27, 1898.

Application filed August 21, 1897. Serial No. 649,057. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. McGOWAN, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Gates for Sewers, Conduits, or other Channels; 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.

The invention forming the subject of this application relates to sewers, conduits, and other channels, and has for its object to provide means for retaining the water above a certain point and then at intervals to suddenly release this dammed water to permit it to flow with a rush through the channel and toward the mouth thereof for the purpose of scouring a channel, for draining low lands situated adjacent to tide-waters, for dredging, and for other purposes.

Further objects are to provide means for accomplishing this automatically by utilizing the ebb and flood of the tide or another water-supply, or by manual attention, where such water-supply is inconvenient or in view of other conditions.

The invention consists in the features of construction hereinafter fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a longitudinal section showing a sewer provided with this invention and in which an auxiliary gate is shown in dotted lines. Fig. 2 is a transverse section taken on the line 2 2 of Fig. 1. Fig. 3 is a vertical section taken on the line 3 3 of Fig. 2, the parts being illustrated on an enlarged scale. Fig. 4 is a perspective view on the same scale and illustrating a fragment of the lower end portion of the gate. Fig. 5 is a longitudinal section similar to Fig. 1 and illustrating this invention as employed for the purpose of draining low lands or marshes. Fig. 6 is a transverse section of the same, taken on the line 6 6 of Fig. 5; and Fig. 7 is an end elevation illustrating a plurality of floats and coupling-rods for holding them together.

As above referred to, the invention is designed for the purpose of scouring channels, such as sewers and conduits, either automatically or by manual attention, or for the purpose of draining low lands that are situated adjacent to tide-waters. In accordance with the principle involved by this invention in scouring channels it is proposed to dam the channel at intervals until a sufficient quantity of water accumulates, whereupon the dam is suddenly removed to permit this dammed water to rush toward the mouth of the channel. In this way the suddenly-released body of water passing rapidly through the channel effectually carries off the sediment and organic matter that may be deposited within the channel by the sewage or water that ordinarily passes therethrough. When used for this purpose, the invention can be employed in various ways—for instance, in creating and releasing the dam by utilizing the flood and ebb of the tide to automatically make the dam, supply water thereto in addition to that which would ordinarily accumulate by reason of the sewage, and remove the dam, and in connection with sewers having a fall or where there is no fall.

The invention is also applicable for scouring sewers that do not empty into tide-waters, and in this connection the gate can be operated automatically by having a water-supply to act in the same manner as the tide or can be hand-controlled. The sediment accumulating in conduits and aqueducts can also be removed and these channels kept clean by the employment of this invention.

Another use to which this invention is applicable is in natural dredging. It is obvious that in scouring sewers the sewage is carried some distance from the mouth thereof, and this in itself is manifestly advantageous; but the invention is useful in dredging a channel in a river. To illustrate, suppose there is a river having a four-foot tide and a six-foot sewer emptying into the river. At every tide a large body of water is dammed in the sewer and then suddenly released, and therefore a forcible current of this kind acting upon the bed of a river approximately twice in every twenty-four hours complies with the require-

ments of approved natural dredging. It is manifest also that upon the same principle it can be used in enlarging a channel or creek by placing the gate in the channel or creek itself.

The invention is also useful in draining low lands and marshes that are situated adjacent to tide-waters. In this connection channels are made leading from the tide-water into the low land or march, into which the water can drain and then flow into such tide-water, it being noted that the gate forming part of this invention can be employed to dam such channel and prevent the inflow of the water when the tide is high enough for this purpose, so that the water accumulating within the channel is that draining from the low land or marsh. When the tide ebbs, however, this gate is automatically opened to allow the water due to drainage and which accumulates within the channel to flow into the adjacent tide-water body. In this way it is seen that the land can be drained and the drainage-water removed, while at the same time the tide-water is kept back.

The various embodiments of which this invention is susceptible are too numerous to illustrate and vary according to the particular circumstances and the work and object in view. In the accompanying drawings two embodiments are selected—namely, in Figs. 1 to 4 a sewer is illustrated, while in Figs. 5 and 6 an open channel for drainage purposes is shown. The main structural characteristic of the invention is a quickly-opening gate that fits closely within the channel and closes the same when locked and means for locking and unlocking the same. The most approved form of gate for this purpose is one that swings freely at its upper end—that is to say, it is hinged or pivoted at its upper end, extends across the channel, and when locked in an upright position closes or dams the channel. This gate opens toward the mouth of the channel, and its movement in the opposite direction is controlled by a suitable stop. The gate normally hangs in an upright position and is closed tight against the stop that limits its rearward movement by water coming in contact with the side thereof adjacent the mouth. When the gate is locked, it is seen that water will accumulate above the same; but when it is unlocked this dammed water quickly opens the gate and passes through the channel with a rush. The lock is controlled by the height of the water below the gate—that is to say, when the level of the water below the gate rises it serves to close and lock the gate, and, on the contrary, when the level of the water below the gate falls it unlocks the gate. The locking and unlocking of the gate are independent of the height or level of the water above the gate and are controlled only by the level of the water below the gate and without reference to the dammed water above the gate—that is to say, if the accumulation of the water above the gate is greater or less than that which is normally expected it will have no effect whatever upon the locking mechanism. The water above the gate serves only to open the gate when it is unlocked, and, to illustrate, it is seen that to accumulate water above the gate it is necessary to lock the latter, and as this takes place owing to the rise of the water below the gate the accumulation of water above the gate in such quantities as to flow over the same would not of course have any effect upon the lock, as it would simply raise the level below the gate, as is obvious. Again, as it is necessary to unlock the gate that the level of the water below the gate should descend, it is obvious that the lowering of the level in the rear of the gate cannot have the effect of locking the same.

Referring now to Figs. 1 and 4 of the drawings, 1 indicates a sewer of ordinary construction, and 2 the gate. This gate is pivoted at its upper end upon a transverse bar 3, that is supported at its ends to the wall of the sewer. The walls of the sewer are provided with a stop 4 to meet the edge of the gate and to limit its rearward movement, in the instance illustrated such stop comprising flanges or sills that provide shoulders facing toward the mouth of the sewer. In this way the gate can only swing from an upright position toward the mouth, and although in the accompanying drawings the stop is arranged so that the gate when locked stands in a vertical position it will be understood that the locked provision of the gate can vary and yet come within the scope of this invention—that is to say, the gate can stand slightly inclined and yet in upright position, with the lower end of the gate nearer the mouth of the sewer. The said gate is provided with devices for locking it in this upright position, whereby the channel is closed, and in accordance with the broad principle involved by this invention the channel is provided with means for supplying water to the same above the gate, and therefore it will be seen that when it is desired to scour the channel it is necessary only to lock the gate to create a dam, supply sufficient water behind the gate to accomplish the scouring, and then suddenly open the gate to allow this dammed water to rush out through the channel below the gate and by its current to carry off the sediment and organic matters that may be deposited therein.

The expressions "above" and "below" the gate are used in a general manner—that is to say, they do not indicate always that the channel is higher above the gate, for, as above pointed out, the gate can be used with sewers having no fall.

It is understood that various means can be employed for locking and unlocking the gate, and for the purpose of illustration an automatic locking and unlocking device that is controlled by the height of the water below the gate is shown in the accompanying draw-

ings. This locking mechanism contemplates pivoting the gate 2 upon said bar 3, so that the gate can move in an upright direction, as well as pivotally, and employing a pivoted rod 5, having a float 6 at its outer end and its inner end arranged to raise the gate or to permit it to descend under the control of said float. The said gate is provided at its upper end with the loops 7, through which the rod 3 extends, and it is so arranged that when the gate is suspended by said loop its lower edge is in contact with the bottom of the channel. The extent to which the gate can move in an upright direction is controlled by the length of the loop 7, and situated at the bottom of the channel are a plurality of antifriction-rollers 8 to engage the lower edge of the gate when the latter is resting against the stop 4. The inner end of the lever 5 is mounted upon a bracket 9 at the bottom of the channel, and the connection between said lever and the bracket permits the inner end of the lever to rise and descend, the particular construction embodying the laterally-projecting pins 10 upon said lever that are situated within the slots 11 in the upright lugs of the bracket. The gate 2 is provided at its lower edge with a slot 13 and in which the bracket 9 and inner end of the lever 5 are situated when the gate is locked, as clearly shown in Figs. 3 and 4. Secured to the bottom of the channel and in front of the bracket 9 is a projection 12, that forms a fulcrum for the lever 5.

In operation it is seen upon reference to Fig. 1 that when the gate is locked it stands in an upright position, with its lower edge situated between the stop 4 and the antifriction-rollers 8 and suspended by the loops 7. The float 6 is in an elevated position, as shown. It is supposed that the water is dammed above the gate and also that the level below the gate is sufficient to raise the float 6. When the level below the gate descends, the float falls also, and when the lever 5 comes in contact with the fulcrum 12 the inner end of the lever engages the top wall of the slot 13 in the gate and lifts the latter, it being noted that the antifriction-rollers 8 serve to reduce the friction, since the gate is pressed against these rollers by the dammed water. It is noted that the lever tends to move without affecting the gate until it reaches the fulcrum 12, and the parts are so arranged that when this takes place the float is near the bottom of the sewer, so that the gate is not unlocked and released until the level of the water below the gate is very low. When the lever raises the gate sufficiently to pass over the rollers 8, the pressure of the dammed water swings the gate quickly toward the mouth of the channel, so that the water can pass with a rush through the sewer, as is obvious. As a further improvement the fulcrum is adjustable, so that the opening of the gate can be regulated—that is to say, with reference to the height of the float 6. To accomplish this, the said fulcrum 12 is provided with a screw-threaded shank 14, that enters a screw-threaded opening in a plate 15 in the bottom of the channel, it being noted that by unscrewing this shank 14 the upper end of the fulcrum is raised, it being understood, of course, that in such case suitable washers are placed between the bottom of the projection 12 and the plate 15.

The means for supplying the water to the channel above the gate and for raising and lowering the float below the gate may be a water-supply pipe from the water system of a community or may be the tide-water, where the sewer enters into such a body, and it is contemplated also to supply water to the channel above the locked gate from below the same—for instance, when the tide floods, whereby the inflowing tide closes and locks the gate and then passes to the channel above the same. For this purpose suitable means are employed that permit the water to pass to the channel above the locked gate, but prevents it from flowing in the opposite direction, which comprise, broadly, a passage or opening establishing communication between points above and below the locked gate and so constructed that it permits the water to pass only from below to above. These means are advantageously made a part of the gate itself, and the construction of the gate when the operation is to be automatic and controlled by the ebb and flood of the tide and when the means for supplying water to the channel above the gate are a part thereof will now be described. The said gate 2 is provided with an opening having a valve 16, that opens toward the upper end of the channel or oppositely to the opening of the gate 2. This valve 16 is pivoted at its upper end so as to close the opening in the gate, and is free to swing upon its pivot, its opening and closing being controlled by the flood and ebb of the tide. The side of the gate to which this valve 16 is pivoted is provided with an inclined valve-seat 17, extending around the opening in the gate and against which the valve 16 rests when it is closed. The inclination of this valve-seat is such that when the valve is closed against the same said valve stands inclined—that is to say, the upper end of the valve is inclined toward the mouth of the channel. In building a sewer with a scouring-gate of this construction it is preferable to make the lower end of the gate about the same height as the mean low tide and the upper end of the gate about the height of the mean high tide.

To illustrate the operation of the scouring-gate, it is supposed that the tide is low, and therefore the float 6 is resting upon the bottom of the channel and the gate unlocked. When the tide floods, it comes in contact with the lower end of the gate and closes it against the stop 4, it being noted that the float 6 is depressed and holds the gate elevated, so that its lower edge passes over the rollers 8, whereupon it drops, so that its lower edge is situ-

ated between the rear stop 4 and front stop or rollers 8 and is locked. The water is then prevented from flowing above the gate until it reaches the valves, it being noted that a gate may have a plurality of these valves, as shown. The water raises these valves and flows into the channel above the gate. As long as the tide floods the level of the water above and below the gate is practically the same for obvious reasons; but as soon as the tide begins to ebb the valves 16 close, so that while the level of the water below the gate descends the level above the gate remains practically the same as at high tide, and until the level of the water below the gate descends sufficiently to lower the float 6 and bring the lever upon the fulcrum 12 to raise the gate, as above described, said gate remains locked. The operation of raising the gate and releasing the dammed water has been described above. It will be seen, therefore, that in connection with a sewer emptying into tide-water the sewer is automatically flushed and scoured approximately twice a day. The advantages of a scouring-gate of this construction will be readily appreciated when it is known that in most of the sewers of large cities there is only a slight fall and infrequent and insufficient flushing. Even the flushing by flooding the sewer with water is not sufficient to cleanse the sewers of the sediment and organic matters deposited and which in time it is found by reason of the fermentation creates a gas capable of destructively attacking iron pipes. It is known that the most efficient manner of cleansing a channel is by the rush of a large amount of water and not a regular current. A current will to a certain extent keep the sides clean; but even from the water of the current there will be a deposit of sediment and organic matters which can only be effectually and practically removed by suddenly flooding the sewer with a large body of water, which rushes through the same at a high rate of speed.

In flushing and scouring channels that do not lead into tide-waters, such as the sewers of inland cities and water conduits or aqueducts, it is necessary to substitute some other means for locking and unlocking the gate. It is obvious of course that when the float is employed for the purpose of controlling the lock it will be necessary to employ a body of water below the gate, and in Fig. 1 is shown in dotted lines an auxiliary gate 18, situated in the channel a little distance below the gate 2 and only high enough to dam sufficient water to hold the float high enough to keep the gate locked. This auxiliary gate 18 is pivoted at its upper end by means of the pivots 19, extending into the walls of the channel, and is held in place to close the channel by means of the bolt or catch 20, operated by means of the rod 21. Although it will be understood that the gate 2 can be operated by hand, yet the means afforded by the auxiliary gate is considered a convenient and effective construction for this purpose and, it will be seen, is entirely independent of the tide-water. The manner in which this construction operates is apparent, and therefore will not be specifically described.

It may be necessary to employ a plurality of gates to close a channel—for instance, where the channel is so wide that a single gate is not practicable—and when several gates are employed it is found preferable to employ means to prevent the float-rods from vibrating laterally as the dammed water rushes out, which is apt to occur. For this purpose coupling-rods 22 are employed that are connected with the floats by a chain 23. These coupling-rods 22 are to be removably fastened to two adjacent floats. It is obvious that if these rods 22 are rigidly fastened to the floats they are liable to be damaged and to damage the float, since they catch floating matter, and an accumulation thereof when the rush of the dammed water takes place would be sufficient to break the parts. To obviate this, these coupling-rods 22 are removably secured to the floats by means of spring-catches 24. These spring-catches 24 consist of a plate held against the float by a spring and between which and the float the ends of the coupling-bars 22 are placed. This construction allows a slight lateral play of the floats and their rods and prevents undue vibration, while the connection between the coupling-rods and the floats is such that an overstrain upon the rods will pull the ends from their catches. The chain 23 serves to retain the rod, whereby it can be readily replaced in its catches.

In employing this invention for draining low lands and marshes the rearwardly-opening valves 16 are dispensed with and the gate and locking means situated as shown in Figs. 5 and 6, which is the same as that above described if the valves 16 are omitted. In draining low lands that are situated adjacent to tide-waters it is obvious that the elevation of the land is not sufficient to permit drainage-channels to be constructed that empty into the body of water in view of the fact that at high tide these channels are filled by the tide. With this gate, however, a channel can be made in the land to be drained which can be carried to the body of water, so that at low tide the channel is open and water that drains therein can flow to its mouth. When the tide begins to flood, this gate is closed in a manner heretofore described, whereby the tide is prevented from entering the drainage-channel, which permits the land to be drained continually and prevents the tide-water from reaching it. When the tide ebbs and is below the level of the drain-channel, the gate is again unlocked to permit the drain-water that may accumulate to pass into the body of water into which it is to be drained.

It is seen from the foregoing description that I provide means whereby sewers, conduits, and channels can be efficiently and ef-

fectually cleaned and kept in this condition automatically or by manual attention, that waterways or channels can be dredged by natural dredging either when the gate is in a sewer leading into the channel or is in the channel itself, and that low lands and marshes can be drained.

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

1. A channel having a movably-supported gate opening toward the mouth thereof and adapted to close the channel when it stands in an upright position, means for raising the same when it is in an upright position, and stops to engage the lower edge of the gate when the same descends in an upright position.

2. A channel having a movably-supported gate opening toward the mouth thereof and adapted to close the channel when it stands in an upright position, means controlled by the height of the water in front of the gate for raising the same when it is in an upright position, and stops to engage the lower edge of the gate when the same descends in an upright position.

3. A channel having a movably-supported gate opening toward the mouth thereof and adapted to close the channel when it stands in an upright position, means controlled by the height of the water in front of the gate for raising the same when it is in an upright position and arranged to raise the gate as the level of the water falls, and stops to engage the lower edge of the gate when the same descends in an upright position.

4. A channel having a movably-supported gate opening toward the mouth thereof and adapted to close the channel when it stands in an upright position, a float situated in front of the gate and connected with devices for raising the gate when it is in an upright position, and stops to engage the lower edge of the gate when the same descends in an upright position.

5. A channel having a movably-supported gate opening toward the mouth thereof and adapted to close the channel when it stands in an upright position, a lever having one end arranged to engage the lower edge of the gate and extending below the gate and provided with a float, and stops to engage the lower edge of the gate when the same descends in an upright position.

6. A channel having a movably-supported gate opening toward the mouth thereof and adapted to close the channel when it stands in an upright position, a lever movably supported near one end, said end being arranged to engage the gate, the other end of said lever extending below the gate and provided with a float, a projection situated below said lever and adjacent the upper end thereof, and stops to engage the lower end of the gate when the same descends in an upright position.

7. A channel having a movably-supported gate opening toward the mouth thereof and adapted to close the channel when it stands in an upright position, a slot at the lower edge of said gate, a rigid bracket situated within said slot and having slotted lugs, a lever having laterally-extending pins situated within said slots of the lugs, said lever extending below the gate and provided with a float, a projection below said lever and near the upper end of the same, and stops to engage the lower edge of the gate when the same descends in an upright position.

8. A channel having a gate opening toward the mouth thereof and adapted to close the channel when in an upright position, a lever having one end situated to engage the gate and its other end extending below the gate and provided with a float, an adjustable projection situated below the lever near its upper end, and stops to engage the lower edge of the gate when the same descends in an upright position.

9. A channel having a transverse bar, a gate provided with loops at its upper end through which said bar passes, means for raising said gate when it stands in an upright position, and stops to engage the lower edge of the gate when the same descends in an upright position.

10. A channel having a gate opening toward the mouth thereof and adapted to close the channel when in an upright position, an upright stop for limiting the movement of the gate toward the upper end of the channel, means for raising said gate when it is in an upright position, and stops to engage the lower edge of the gate when the same descends in an upright position, said stops consisting of antifriction-rollers.

11. A channel having a movably-supported gate opening toward the mouth thereof and adapted to close the channel when it stands in an upright position, an oppositely-opening valve in said gate, means for raising the gate when it is in an upright position, and stops to engage the lower edge of the gate when it descends in an upright position.

12. A channel having a swinging gate opening toward the mouth thereof, an opening in said gate, an inclined valve-seat around said opening on the rear face of the gate, a valve pivoted at the upper end of said valve-seat, and means for locking and unlocking said gate.

13. A channel having a plurality of gates opening toward the mouth thereof, means for locking and unlocking said gates, movable rods in front of said gate controlling said unlocking devices, floats upon said rods, and flexible connections between said floats.

14. A channel having a plurality of gates opening toward the mouth thereof, means for locking and unlocking said gates, movable rods in front of said gate controlling said unlocking devices, floats upon said rods, and coupling-rods removably connected with said floats.

15. A channel having a plurality of gates opening toward the mouth thereof, means for locking and unlocking said gates, movable rods in front of said gate controlling said unlocking devices, floats upon said rods, and coupling-rods removably held at their ends to said floats by spring-clamps.

16. A channel having a gate opening toward the mouth thereof, means for locking and unlocking said gate controlled by the height of the water in front of the same, an auxiliary gate in front of said gate, means for supplying water to the channel between the gates, and means for opening and closing said auxiliary gate.

17. A channel having a gate opening toward the mouth thereof, means for locking and unlocking said gate controlled by the height of the water in front of the gate, means for permitting the water to pass only to the channel above the gate from the channel below the gate when said gate is locked, an auxiliary gate in front of said gate, means for supplying water to the channel between said gates, and means for opening and closing said auxiliary gate.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOHN C. McGOWAN.

Witnesses:
J. H. BRADLEY,
O. G. McCALL.