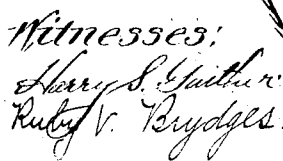


1,037,396.

6 SHEETS-SHEET 1.



Inventor:
M. M. Good

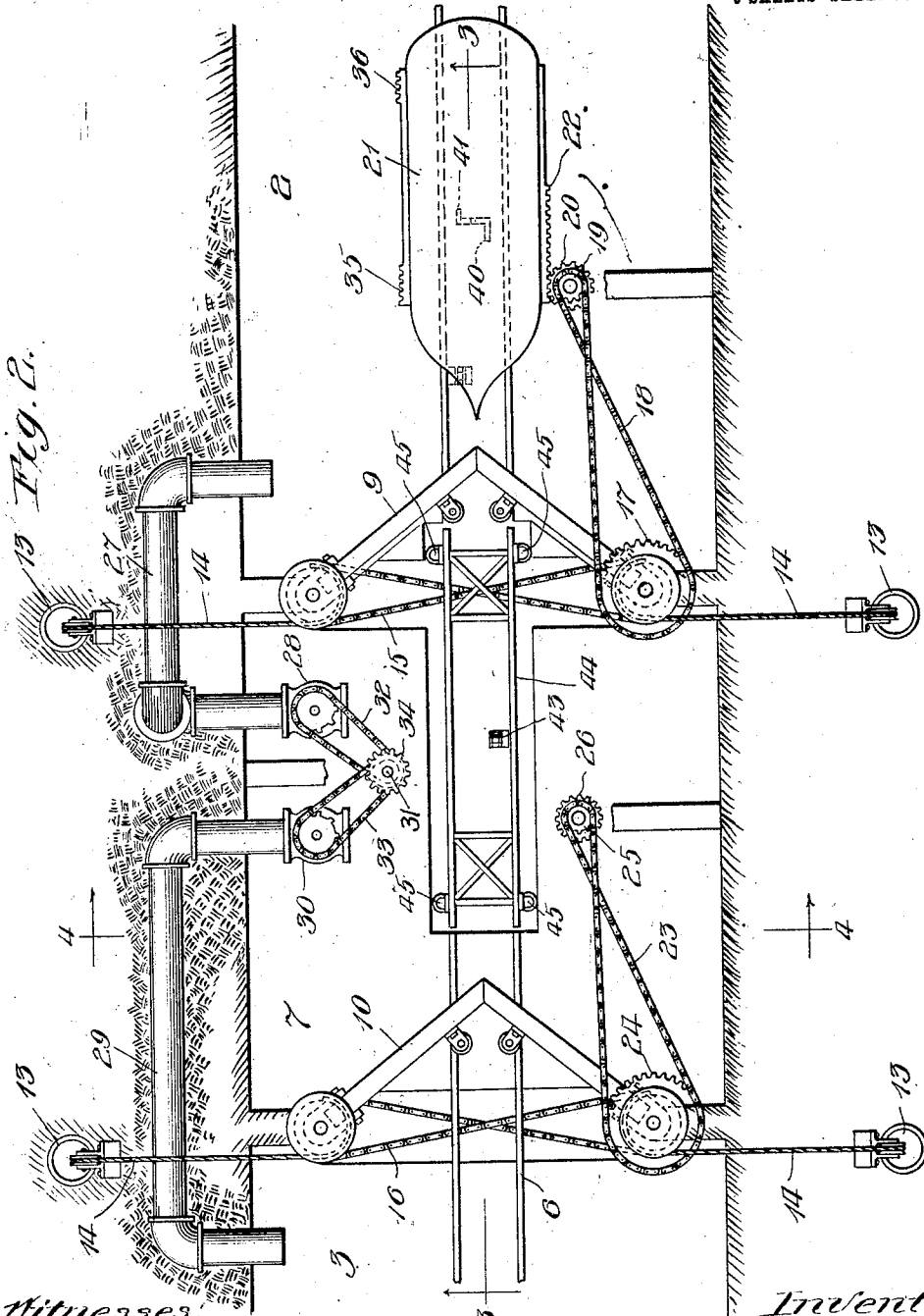
Chamberlain & Audenreth
Atty's

M. M. WOOD,
AUTOMATIC CANAL SYSTEM.
APPLICATION FILED JULY 17, 1911.

1,037,396.

Patented Sept. 3, 1912.

6 SHEETS—SHEET 2.



Witnesses:

Larry S. Gaither
Rufus V. Bydges.

Inventor

M. M. Wood

By Chamberlain & Hendenreich
Attys

1,037,396.

6 SHEETS—SHEET 3.



WITNESSES.
Harry S. Gaither
Ruby V. Brydges.

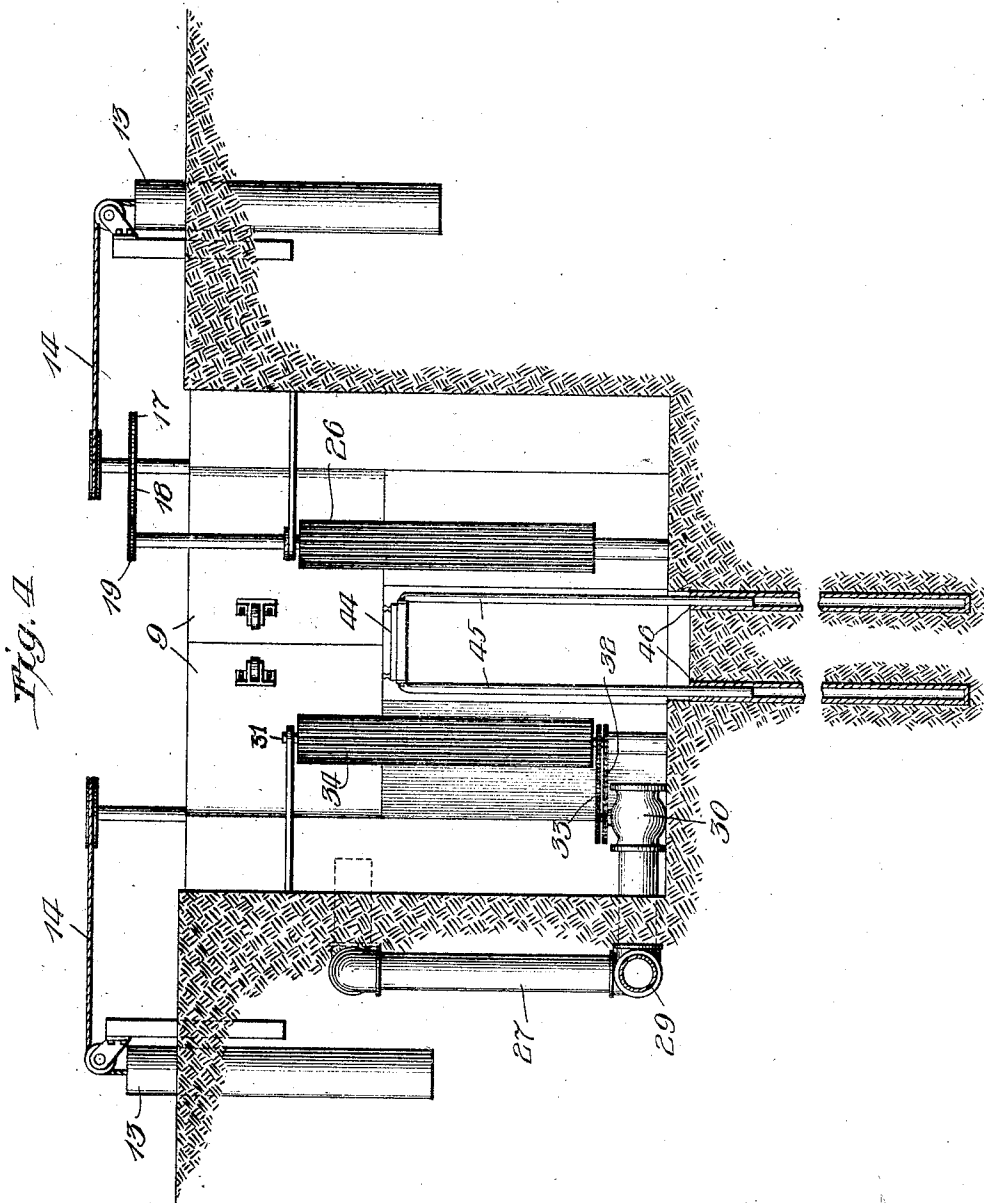
by *M. M. Hood*
Chamberlain & Breckenridge
Attys

M. M. WOOD.
 AUTOMATIC CANAL SYSTEM.
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1,037,396.

Patented Sept. 3, 1912.

6 SHEETS—SHEET 4.



Witnesses:
 Harry S. Gailher
 Ruby V. Bydges

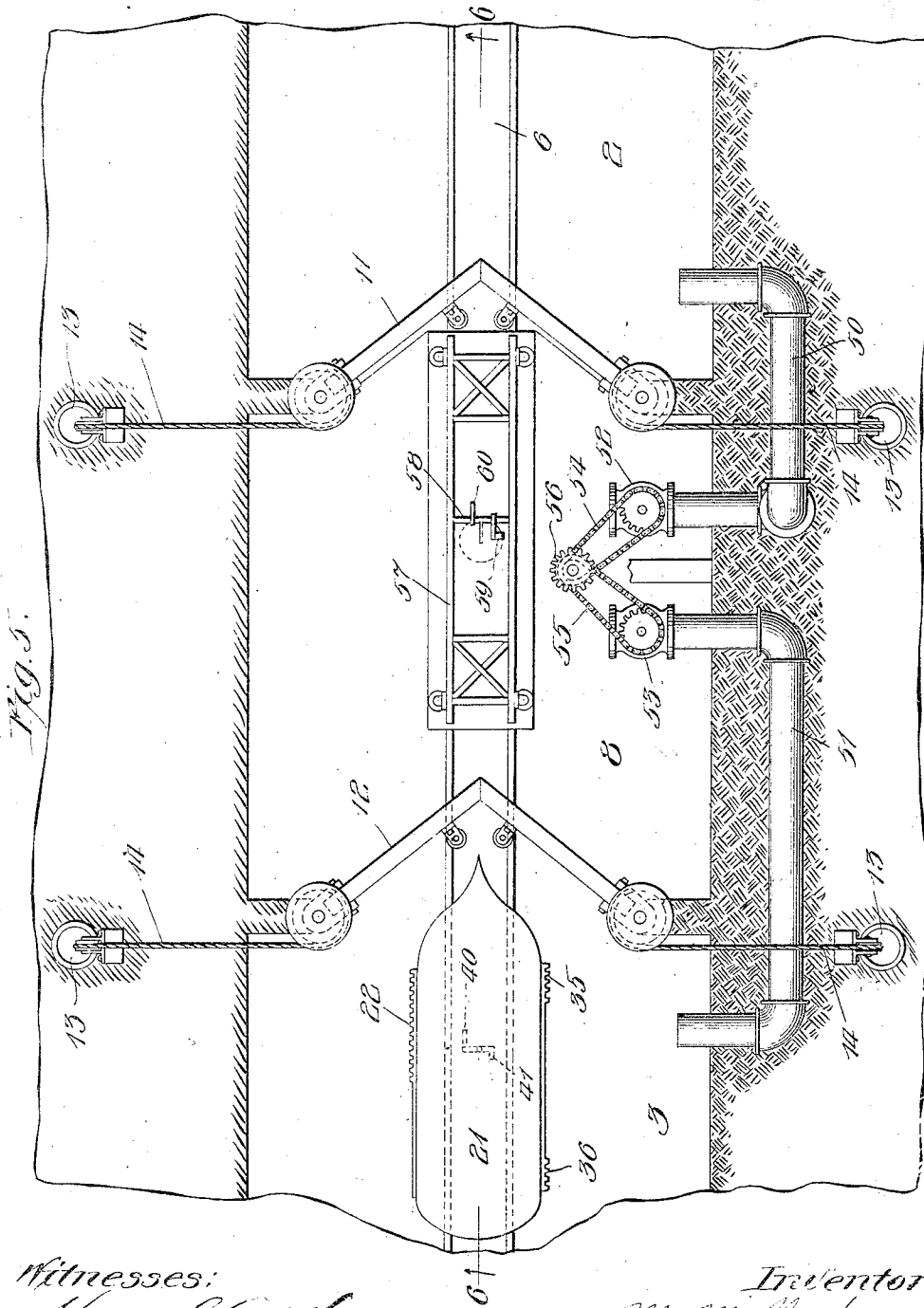
Inventor:
 M. M. Wood
 by Chamberlain, Brenden & Atty's

M. M. WOOD.
 AUTOMATIC CANAL SYSTEM.
 APPLICATION FILED JULY 17, 1911.

1,037,396.

Patented Sept. 3, 1912.

6 SHEETS—SHEET 5.



Witnesses:

Harry S. Gaither
 Ruby V. Bridges

Inventor

M. M. Wood
 by Chamberlind Breckenridge
 Attys

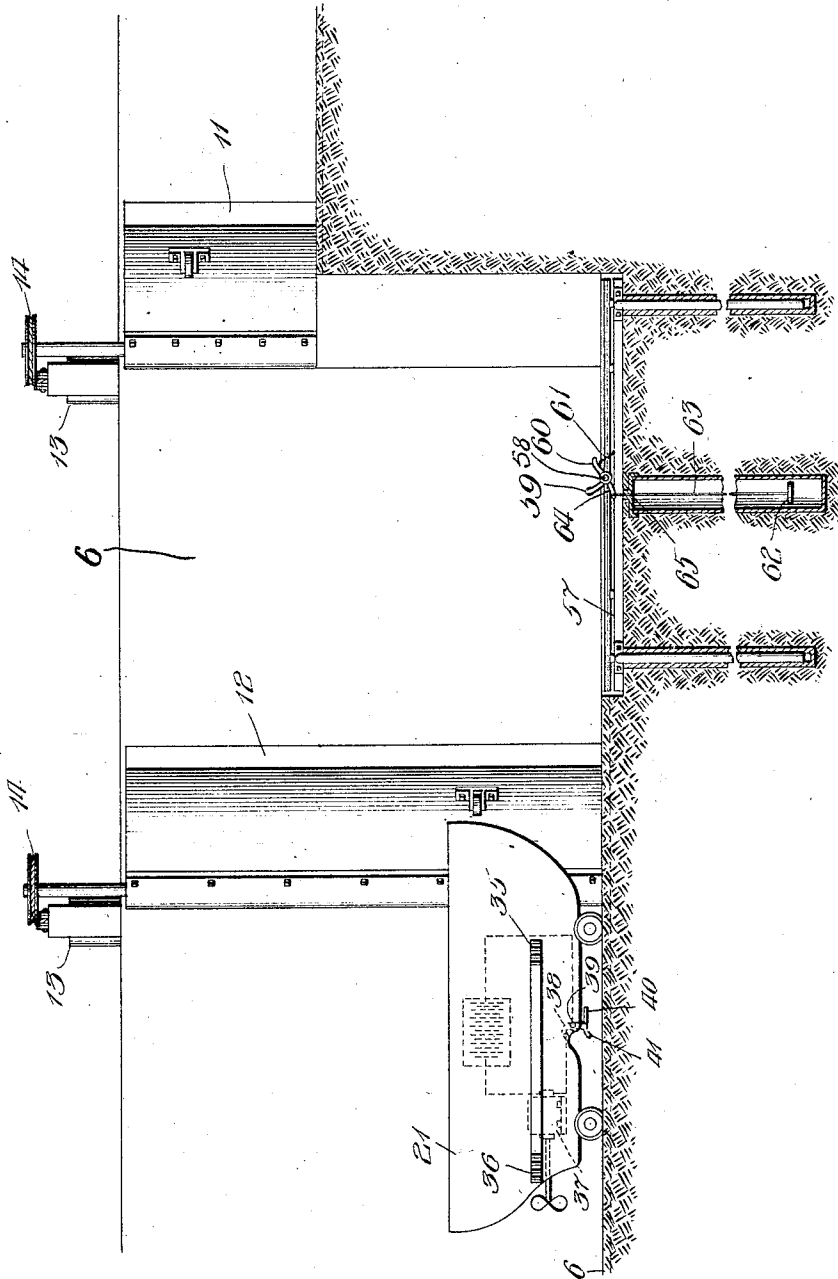
M. M. WOOD.
 AUTOMATIC CANAL SYSTEM.
 APPLICATION FILED JULY 17, 1911.

1,037,396.

Patented Sept. 3, 1912.

6 SHEETS—SHEET 6.

Fig. 6.



Witnesses:

Harry S. Gaither
 Ruby V. Bridges

Inventor:

M. M. Wood.

by Chamberlain & Breidenreich
 Attys

UNITED STATES PATENT OFFICE.

MONTRAVILLE M. WOOD, OF BERWYN, ILLINOIS, ASSIGNOR TO LOUIS E. MYERS, OF CHICAGO, ILLINOIS.

AUTOMATIC CANAL SYSTEM.

1,037,396.

Specification of Letters Patent.

Patented Sept. 3, 1912.

Application filed July 17, 1911. Serial No. 638,963.

To all whom it may concern:

Be it known that I, MONTRAVILLE M. WOOD, a citizen of the United States, residing at Berwyn, county of Cook, State of Illinois, have invented a certain new and useful Improvement in Automatic Canal Systems, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

The object of my invention is to produce a miniature canal system in which boats will travel along the canal and pass through locks in the same in a realistic manner.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its object and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a plan view of a system arranged in accordance with a preferred form of my invention, the ends of the canal and one set of locks being illustrated and the remainder of the canal being broken away; Fig. 2 is a plan view on an enlarged scale of the upper lock in Fig. 1; Fig. 3 is a central longitudinal section approximately on line 3—3 of Fig. 2; Fig. 4 is a transverse section on line 4—4 of Fig. 2; Fig. 5 is a top plan view of the lower lock in Fig. 1, on an enlarged scale; and Fig. 6 is a central longitudinal section approximately on line 6—6 of Fig. 5.

The system which I have illustrated comprises a canal having separate locks for the two directions of travel, the boats traveling along parallel tracks in the canal and passing from one track to the other over loops connecting the ends of the tracks together. In this way the boats are able to pass continuously from one end of the canal to the other and back again, circling about in a harbor or bay at each end of the canal before starting on a return journey. I prefer to make the control of the locks automatic so that the gates will automatically open when a boat approaches, the water level in the locks will rise or fall to the level of the outlet side of the lock, and then the outlet gates will open and permit the boat to pass out of

the lock. In the drawings I have illustrated only enough of my system to make its operation clear, it being of course understood that the number and the location of the locks is a matter of choice, as is also the specific arrangement of the terminals of the canal.

Referring to the drawings, 1 represents a canal as a whole, 2 a high level and 3 a low level.

4 and 5 are the ends or terminals of the canal and these may take any suitable form so as to have the appearance of a harbor, bay or gulf. In the bottom of the canal is an endless track 6 on which the miniature boats are adapted to run, the tracks being submerged so that the boats traveling along the same will have the appearance of floating.

7 and 8 are two locks, one of which is adapted to permit boats to pass from the high level to the low level while the other permits passage in the opposite direction. The lock 7 has gates 9 and 10 at its ends while the other lock has similar sets of gates 11 and 12. The gates of the lock 8 may be opened by direct contact with a boat while some means must be provided for opening the gates of the other lock in advance of the boats. All of the gates may be closed automatically by any suitable means such as weights 13 which are hung on the ends of cables 14 connected with the gates. When the gates are opened the weights are lifted and thereafter, when the gates are otherwise free, the weights descend and swing the gates into their closed positions. The two gates at each end of the lock 7 are connected together in any suitable way as, for example, by means of sprocket chains 15 and 16 so that they will move in unison with each other. One of the gates of the set 9 has a sprocket wheel 17 surrounding its pivotal axis, and a chain 18 passes around this wheel and around another wheel 19 at a suitable distance in advance of the gates. The sprocket wheel 19 has a pinion 20 secured thereto. Each of the boats 21 has at one side thereof a rack 22 which is so located that it will engage with the pinion 20 as the boat approaches the lock 7, turning the pinion and causing the gates 9 to open. The gates 10 at the back end of the lock 7 are controlled in the same manner, a sprocket chain 23 passing over a sprocket wheel 24 secured to one of the gates and over a

sprocket wheel 25 arranged at a suitable distance in advance of the gates; the sprocket wheel 25 having secured thereto a pinion 26 similar to the pinion 20. Consequently a
 5 boat passing through the lock will turn the pinion 26 and will cause the gates 10 to open so as to let the boat move out of the lock.

It is necessary to produce a change in the height of the water in the lock so as to permit the boat to enter the lock at one level
 10 and leave at a different level. To this end I have provided means under the control of a boat for automatically lowering the level of the water in the lock when the boat enters
 15 and then causing the lock to fill again after the boat has departed. This may conveniently be accomplished by connecting the lock with the upside or high level of the canal by means of a conduit 27 having a
 20 suitable valve 28, and providing a similar conduit 29 between the lock and the low side; the conduit 29 having a valve 30 similar to the valve 28. The details of the valves are not illustrated since any ordinary
 25 form of valve, preferably that of the butterfly type, may be employed. Each of the valves is connected to a vertical driving shaft 31 arranged within the lock at the
 30 side of the path of travel of boats passing through the lock, this being suitably accomplished by means of sprocket chain connections 32 and 33. Secured to the shaft 31
 35 is a long pinion 34, the axial length of the pinion being at least as great as the difference between the water levels on the high and low sides of the canal. Each boat is
 40 provided with two racks 35 and 36, the one preferably being located near the front end of the boat and the other near the rear end, and the arrangement being such that these
 45 racks will successively engage with the pinion 34 as the boat enters into and passes through the lock. Normally the valve 28 is open and the valve 30 closed so as to keep
 50 the water level in the lock the same as on the upside of the canal. When the boat enters the lock the rack 35 engages with the pinion and shifts the two valves just as the
 55 gates close behind the boat. Consequently communication is opened between the low level of the canal and the lock and communication between the high level and the lock is closed. The water now flows out of the
 60 lock until the level of the downside of the canal is reached and then as the boat starts forward again the valves are once more shifted so that the lock will become filled so as to bring the water to the high level and be in condition for the reception of another boat.

An appreciable time must be allowed for the emptying of the lock after a boat has entered it and therefore some means must be provided for arresting the progress of
 65 the boat while the water in the lock is low-

ered. In the arrangement shown the boats are driven by electric motors 37 (see Fig. 3) and the boats are controlled by a suitable switch 38 in the motor circuit. Each
 70 switch is pivoted near the bottom of the boat on which it is placed and has an arm extending down beneath the boat. On the lower end of the arm are fingers 40 and 41, the first of which projects forward from the arm and the other backward. The
 75 fingers 40 and 41 are preferably spaced apart transversely of the boat as will be seen most clearly in Fig. 2. A stop 42 projects up from the bottom of the canal in position to engage with the underside of the
 80 finger 41 as the boat passes through the gates, causing the finger to be lifted and the switch to be opened. The momentum of the boat and the pressure of the gates against the rear thereof is sufficient to carry
 85 the boat completely into the lock and to effect the shifting of the valves 28 and 30. However, the momentum of the boat is insufficient to carry it beyond the point necessary to complete the shifting of the valves
 90 and therefore the boat comes to rest in the lock and cannot proceed again until the motor circuit is again closed. The closing of the motor circuit is effected by means of
 95 a second stop, 43 projecting up from the bottom of the lock in the proper position for engaging with the underside of the finger 40 when the water in the lock reaches the same level as that shown on the down-
 100 side of the canal, and cause the controlling switch to be thrown back into its closed position. The boat now starts to move and causes the gates 10 to be opened and the valves to be shifted in the manner heretofore described.

I prefer to provide means for switching the boats positively from the tracks on one side of the lock to those on the other so as
 105 to prevent the boats from accidentally getting off the tracks as they pass through the lock. This may conveniently be accomplished by placing in the lock a floating track section 44 which rises and falls with
 110 the water in the lock so as to be in the plane of the tracks in the highest level when a boat enters the lock and in the plane of the tracks in the lower level at the time the boat passes out of the lock. The floating track section may be guided by rods or
 115 plungers 45 which extend downward into wells 46 in the bottom of the lock and thus prevent the movable section from coming out of alinement with the stationary tracks. The descending boats in the locks may be
 120 steadied by making the pinion 26 elongated so as to be similar to the pinion 34. With this arrangement the racks 22 and 35 will engage respectively with the pinions 26 and 34 and will remain in mesh therewith
 125 whenever a boat descends in the lock.

After a boat passes through the lock 7 it travels toward the left, as viewed in Fig. 1, circles around the harbor or terminal 5, and then returns through the canal in the opposite direction from that in which it passes through the lock. When the lock 8 is reached, the boat enters it automatically, is lifted, and then passes out into the high level. The height of the water in the lock 8 is controlled in the same way as in the other lock; the lock being connected with the high level, 2, by a conduit 50 and with the low level by a conduit 51.

52 and 53 are valves in the conduits 50 and 51, these valves being similar to the valves 28 and 30 in the other lock. Driving connections 54 and 55 between an elongated upright pinion 56 and the valves 52 and 53, respectively, permit the valves to be opened and closed by a passing boat. In this instance the valve 53 is normally open and the valve 52 normally closed, thus maintaining the water in the lock normally at the same level as on the low side of the canal and keeping the lock ready to receive boats approaching from the low side of the canal.

The lock 8 contains a floating track section 57 similar to the section 44 in the other lock. The gates of the lock 8 are so arranged that they may be pushed open through direct contact with a boat and therefore the opening-gearing employed in the other lock may be omitted. A somewhat different arrangement is required for opening and closing the controlling switch on the boat in connection with this lock than that employed at the other lock because the vertical movement of a boat in one lock is the opposite from that in the other lock. In the arrangement shown, (see Figs. 5 and 6) the controlling stops for the switch are carried by the boating track, there being a transverse oscillatory shaft 58 having arms 59 and 60 projecting therefrom in opposite directions lengthwise of the track. The member 59 is normally in position to engage with the underside of the finger 41 on the boat so as to lift the same and throw the switch open when the boat enters the lock, thus arresting the progress of the boat. The member 60 is normally held out of operative relation to the finger 41 by a spring 61. When water enters the lock and the track section 57 rises, a stop 62 on the lower end of a cable or chain 63 secured at its upper end to an arm 64 on the shaft 58, engages with a stationary shoulder or abutment 65 and oscillates the shaft so as to throw the arm 60 against the finger 41 and thus close the controlling switch when the boat is at the proper level to pass out of the lock.

The operation at the lock is as follows: A boat traveling along the low level of the canal toward the lock strikes the gates 12 and passes into the lock. As the gates close

behind the boat the rack 35 operates the valves so as to let water flow into the lock from the high level. Before the boat reaches the gates 11 the motor switch is opened and the boat arrested. As the water in lock rises the floating track section and the boat also rise and, when the floating track section has reached the plane of the track in the high level, the motor switch is automatically closed and the boat starts forward. The gates 11 are pushed open by the boat and, just before the boat passes entirely out of the lock, the rack 36 operates the lock valves, placing the lock in communication with the low level and shutting off communication through the conduit 50 with the high level. The gates 11 close automatically behind the boat and the lock empties itself so as to permit another boat to run into it from the low level. The boat, after leaving the lock, travels along the canal, around the harbor or terminal 4, and then back through the canal to the down lock 7, through which it passes in the manner previously described. Thus it will be seen that any desired number of boats may run continuously back and forth through the canal, operating the locks automatically as they are reached.

While I have illustrated and described only a single preferred form of my invention, I do not desire to be limited to the particular structural details thus illustrated and described; but intend to cover all forms and arrangements which fall within the terms employed in the definitions of my invention constituting the appended claims.

I claim:

1. A canal having different levels therein, a lock between adjacent levels, means for connecting the lock with either of the adjacent levels, and a controlling device for the said means in position to be actuated by a boat.

2. A canal having different levels therein, a lock between adjacent levels, a connection including a valve between the lock and one of the adjacent levels, and controlling means for the valve in position to be actuated by a boat.

3. A canal having different levels therein, a lock between adjacent levels, a connection having a valve arranged between the higher level and the lock, and valve operating means arranged in position to be actuated by a boat passing from the lock to the lower level.

4. A canal having different levels therein, a lock between adjacent levels, a connection having a valve arranged between the lower level and the lock, and valve-operating means arranged in position to be actuated by a boat passing into the lock from the lower level.

5. A canal having different levels therein, a lock between adjacent levels, a connection

including a valve between the lock and the higher level, means controlled by a boat entering the lock for causing the water to recede to the lower level, and actuating means for said valve arranged in position to be operated by a boat moving in the lock at the lower level.

6. A canal having different levels therein, a lock between adjacent levels, a connection including a valve from the lock to the lower level, means controlled by a boat entering the lock for causing the water to rise to the higher level, and actuating means for said valve arranged in position to be operated by a boat moving in the lock at the higher level.

7. A canal having different levels therein, a lock between adjacent levels having gates at its ends, controlling means for the gates arranged to be actuated by a moving boat approaching the lock and moving through the same, means controlled by the boat for causing the height of the water in the lock to vary from one level to the other and then back again, and means for causing the progress of the boat to be arrested during the time it is moving in the vertical direction in the lock.

8. A canal having different levels therein, a lock between adjacent levels having gates at its ends, controlling means for the gates arranged to be actuated by a moving boat approaching the lock and moving through the same, means controlled by the boat for causing the water level in the lock to change, and means for causing the progress of the boat to be arrested during the time it is moving in the vertical direction in the lock.

9. In combination, a canal having different levels, a lock between adjacent levels provided with gates at its ends, a boat arranged to travel through said lock, means for causing the water in the lock to rise and fall from one level to the other, gate actuating means, and devices on said boat for operating both of the aforesaid means.

10. In combination, a canal having different levels, a lock between adjacent levels, a power boat arranged to travel in said canal, and controlling devices constructed and arranged to stop the boat when it enters the lock at one level and then start the boat again when the water in the lock reaches the other level.

11. In combination, a canal having different levels, a lock between adjacent levels, a power boat arranged to travel in said canal, boat-actuated means for controlling the height of the water in the lock, and controlling devices constructed and arranged to stop the boat when it enters the lock at one level and to start the boat again when the water in the lock reaches the other level.

12. In combination, a canal having different levels, a lock between adjacent levels

provided with gates at its ends, and actuating means for said gates so located as to be successively operated by a boat to open one of the gates when the boat approaches the lock and then to open the other gate to permit the boat to pass out of the lock.

13. In combination, a canal having different levels, a lock between adjacent levels provided with gates at its ends, boat-controlled means for automatically opening said gates when a boat approaches them in entering the lock and in passing out of the lock, and boat-controlled means for automatically varying the height of the water in the lock from one level to the other and back again.

14. In combination, a canal having different levels, a lock between adjacent levels, means for connecting said lock with either of said levels, a device including a pinion for controlling said means, a boat arranged to travel in said canal, and separated rack members on said boat in position to engage successively with said pinion when the boat enters into and passes through the lock.

15. In combination, a canal having different levels therein, a lock between adjacent levels, gates at the ends of said lock, actuating means for said gates including a pinion arranged outside of the lock and a pinion within the lock, a boat arranged to travel through said canal, and a rack on said boat in position to engage with said pinions successively as the boat enters the lock and moves through the same.

16. In combination, a canal having different levels therein, a lock between adjacent levels, gates at the ends of said lock, actuating means for said gates including a pinion arranged outside of the lock and a pinion within the lock, a boat arranged to travel through said canal, a rack on said boat in position to engage with said pinions successively as the boat enters the lock and moves through the same, means including a pinion located within the lock for connecting the lock with either of said levels, and separated racks on the boat in position to engage successively with the latter pinion as the boat enters the lock and passes out of the same.

17. In combination, a canal having different levels, a lock between said levels, a track extending longitudinally through the canal, and a floating track section within the lock, said floating section being constructed and arranged to form a continuation of the track in the higher level when the height of the water in the lock is the same as that in the higher level and to form a continuation of the track in the lower level when the height of the water in the lock is the same as that in the lower level.

18. In combination, a canal having different levels, a lock between adjacent levels

provided with gates at its ends, a power boat arranged to travel through said canal, means for causing the water in the lock to rise and fall from one level to the other, gate actuating means, devices on said boat for operating both of the aforesaid means, a controller for the boat, means for actuating the controller to stop the boat when the boat enters the lock, and means for actuating the controller to start the boat when the water in the lock reaches the level on the outlet side of the lock.

19. In combination, a canal having different levels, a lock between adjacent levels, a power boat arranged to travel in said canal, controlling devices constructed and arranged to stop the boat when it enters the lock at one level and then start the boat again when the water in the lock reaches the other level, and means for automatically producing a variation in the level of the water in the lock when the boat enters the lock.

20. In combination, a canal having different levels, a lock between adjacent levels, a power boat arranged to travel in said canal, means for automatically causing the water in the lock to go to the level on the outlet side of the lock when the boat enters the lock, and controlling devices constructed and arranged to stop the boat when it enters the lock at one level and to start the boat again when the water in the lock reaches the other level.

21. In combination, a canal having different levels, a lock between adjacent levels provided with gates at its ends, a power boat running in said canal, actuating means for said gates arranged to open them automatically when a boat approaches to within a predetermined distance therefrom, means for automatically closing the gates, means for automatically stopping the boat when it enters the lock, means for automatically bringing the water in the lock to the level of the canal on the outlet side of the lock when the boat enters the lock, and means for automatically starting the boat when the water in the lock is at the same level as in the canal on the outlet side of the lock.

22. In combination, a canal having different levels, a lock between adjacent levels provided with gates at its ends, a power boat

running in said canal, boat-controlled means for automatically opening said gates when a boat approaches them in entering the lock and passing out of the lock, boat-controlled means for automatically varying the height of the water in the lock from one level to the other and back again, and means for arresting the progress of the boat during the change of the water in the lock from one level to the other.

23. In combination, a canal having different levels therein, a lock between adjacent levels, gates at the ends of said lock, actuating means for said gates including a pinion arranged outside of the lock and a pinion within the lock, a boat arranged to travel through said canal, a rack on said boat in position to engage with said pinions successively as the boat enters the lock and moves through the same, valved conduits for connecting the lock with either of said levels, a pinion in the lock for actuating said valves, and separated racks on the boat in position to engage successively with the latter pinion as the boat enters the lock and passes out of the same.

24. In combination, a canal having different levels, a lock between said levels, a track extending longitudinally through the canal, a floating track section within the lock, said floating section being constructed and arranged to form a continuation of the track in the higher level when the height of the water in the lock is the same as that in the higher level and to form a continuation of the track in the lower level when the height of the water in the lock is the same as that in the lower level, a power boat arranged to travel through the canal along said track, and means governed by said boat for operating the lock.

25. In combination, a canal having a lock therein, a power boat running in said canal, and means controlled by the boat for automatically operating the lock to permit the boat to pass therethrough.

In testimony whereof, I, sign this specification in the presence of two witnesses.

MONTRAVILLE M. WOOD.

Witnesses:

RUBY V. BRYDGES,
WM. F. FREUDENREICH.