(No Model.) 2 Sheets—Sheet 1.

C. N. DUTTON.

LOCK GATE FOR CANAL LOCKS, &c.

No. 557,565. Patented Apr. 7, 1896.

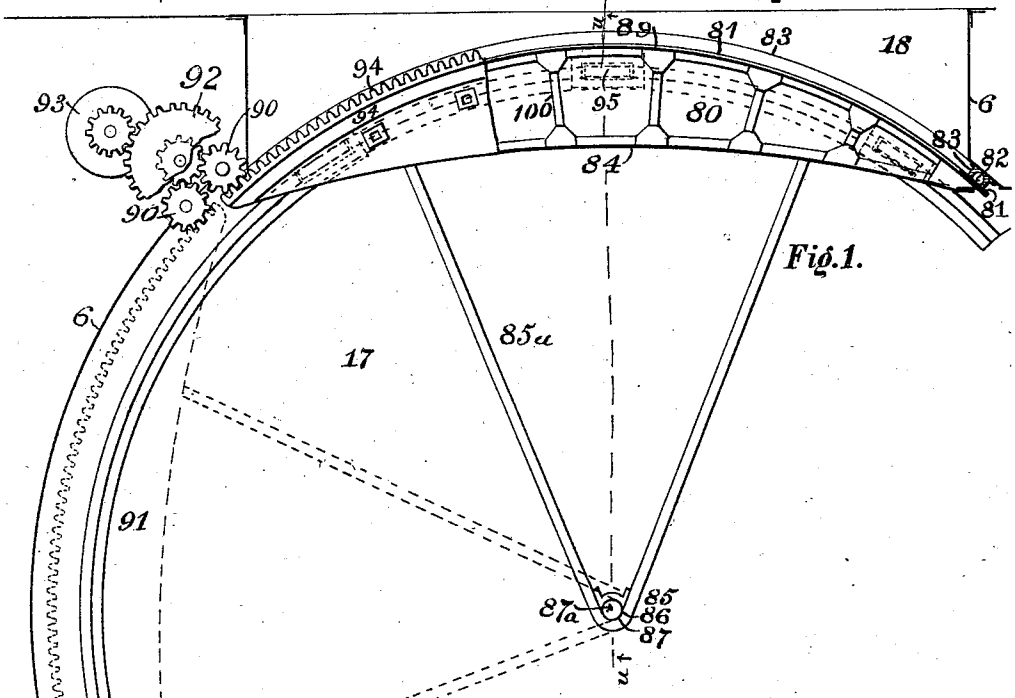

Fig. 1.

Fig. 2.

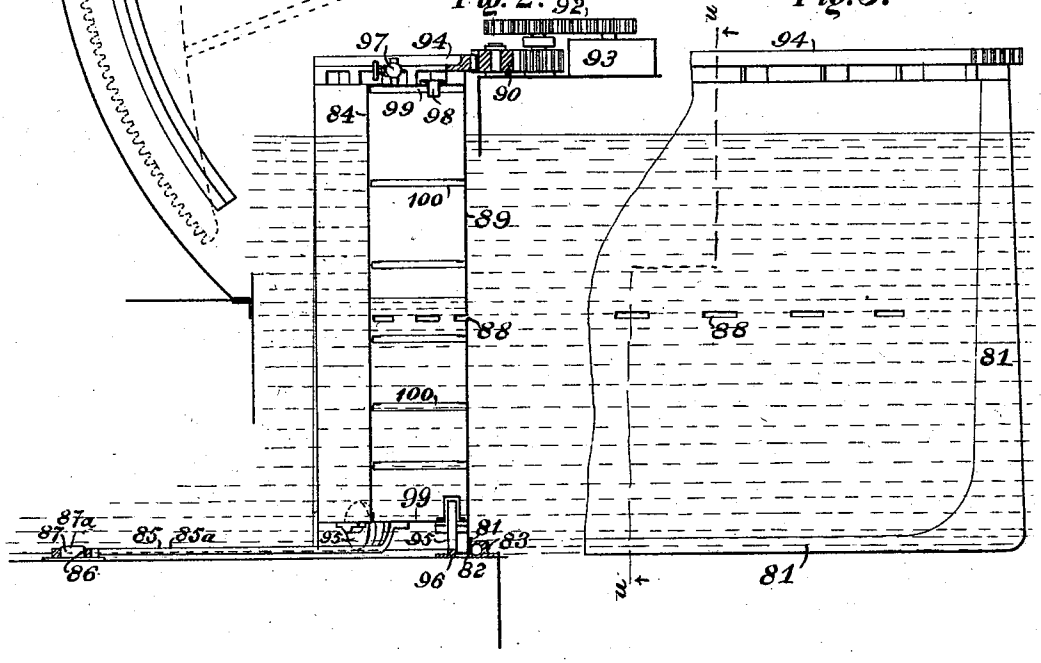

Fig. 3.

Witnesses.
T. J. Hogan.
J. E. Gaither

Inventor
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(No Model.) 2 Sheets—Sheet 2.

C. N. DUTTON.

LOCK GATE FOR CANAL LOCKS, &c.

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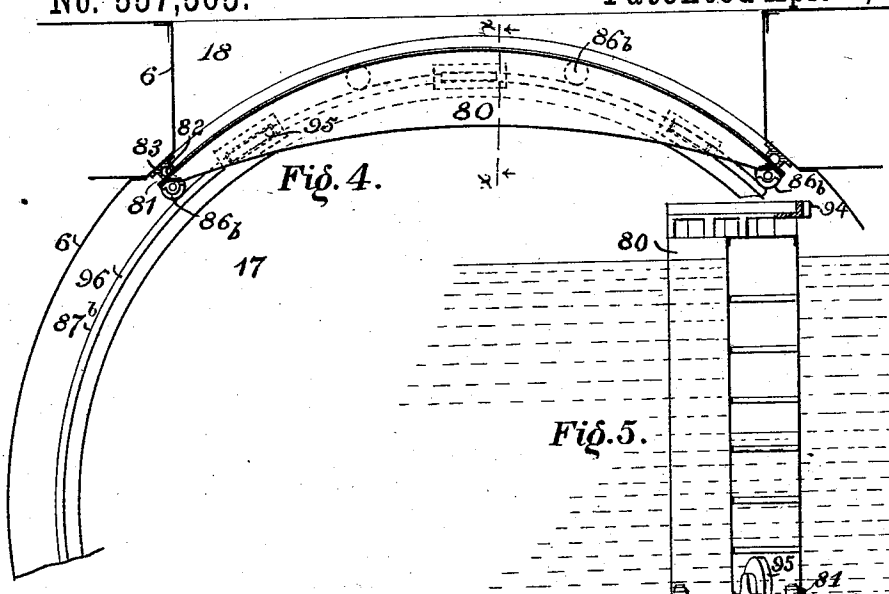

Fig. 4.

Fig. 5.

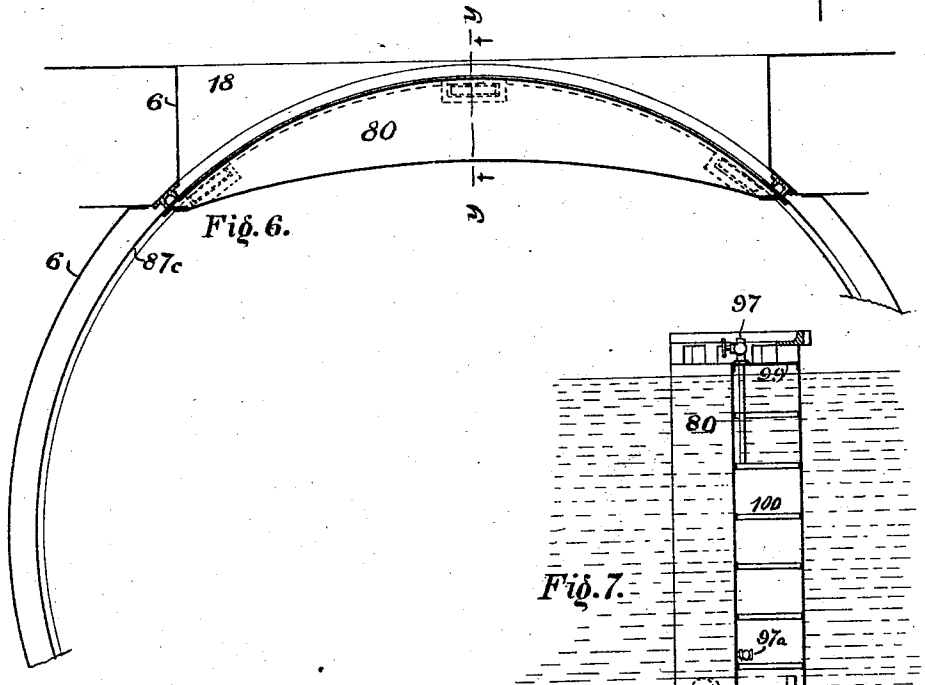

Fig. 6.

Fig. 7.

Witnesses.
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UNITED STATES PATENT OFFICE.

CHAUNCEY N. DUTTON, OF NEW YORK, N. Y.

LOCK-GATE FOR CANAL-LOCKS, &c.

SPECIFICATION forming part of Letters Patent No. 557,565, dated April 7, 1896.

Application filed March 14, 1895. Serial No. 541,815. (No model.)

To all whom it may concern:

Be it known that I, CHAUNCEY N. DUTTON, of the city, county, and State of New York, have invented a certain new and useful Improvement in Lock-Gates for Canal-Locks, &c., of which improvement the following is a specification.

My invention relates to gates of what is known as the "pontoon" type, which as ordinarily heretofore constructed and operated have involved undesirable features in their construction and application to the lock, and have also been slow and inconvenient in manipulation.

The object of my invention is to provide a pontoon-gate of simple and comparatively inexpensive construction which shall be capable of application without involving objectionable or complicated structural features or accessories and which may be operated with facility and precision.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a plan view, partly in section, of a lock-gate illustrating an application of my invention; Fig. 2, a vertical section through the same on the line *u u* of Figs. 1 and 3; Fig. 3, a partial front view; Fig. 4, a plan view illustrating modifications in detail; Fig. 5, a vertical section on the line *x x* of Fig. 4; Fig. 6, a plan view of a gate, showing other modifications in detail; Fig. 7, a vertical section on the line *y y* of Fig. 6.

As shown in the drawings, I prepare the lock-chamber 17 for the reception of the gate 80 by suitably forming its mouth or opening 18 and by curving its wall 6, so as to form a recess or pocket 91, in which the gate 80 can be out of the way when open. The gate 80 has its contact or seating face 81 formed in a surface of revolution about a vertical axis, preferably in a segment of a cylinder concentric with the front of the gate, which is preferably a quadrant, as nearly as may be, and the recess or pocket 91 is correspondingly formed in order that there may be no space wasted or obstruction presented in the lock-chamber when the gate is opened. The contact or seating face 82 on the seat 83, against which the gate 80 fits to make a water-tight joint, is a corresponding surface—*i. e.*, the seating-face 81 of the gate is convex and that 82 on the lock is concave.

Preferably the gate has a concave back wall 84, forming a body crescent-shaped in plan and at once light, strong, and easy to move.

The gate might be built of wood or other material, but I consider steel plates to be best adapted to its construction. In building a steel gate I provide a seating-piece 81, suitably curved, either in one or several parts, according to the size of the gate, a similarly-curved plate or plates 89 for the front wall, a plate or plates 84, segments of a cylinder of larger radius for the back wall, flanged plates 99 for the horizontal top and bottom members, and as many intermediate horizontal members 100 as the structure may require. The members are united by riveting and the joints are calked and made tight. The gate so constructed forms a hollow box-girder.

The vertical parts of the seating-face 81 on the gate at the ends thereof may have their sides battered from the bottom to the top, as shown in Fig. 3, so that when the gate is moved the seating-faces 81 and 82 on the gate and on the lock-wall can pass one another with a shearing motion and so avoid the possibility of catching upon one another.

To secure a tight joint between the seating-face 81 on the gate and 82 on the lock, I may provide an expansible rubber tube, which is distended with compressed air, this being a well-proved and satisfactory device for such uses.

I provide wheels 95 in the bottom of the gate and a suitably-curved track or tread 96 for them to run on, so that the gate 80 may be readily moved, and to lighten the load on the wheels 95 I confine a sufficient quantity of air within the hollow body of the gate 80 to displace therefrom a body of water equal in weight to, say, ninety or ninety-five per cent. of the weight of the gate. Thus the gate has buoyancy equal to ninety or ninety-five per cent. of its weight and the load on the wheels 95 is merely sufficient to keep it steady, so that it will not rise and fall with fluctuations of level in the water. In case the gate were built of wood the same result would be obtained by ballast. The gate moves circularly in a horizontal orbit about the vertical axis of the seating-faces 81 and 82. To retain the gate in its

circular path, I provide a guiding apparatus, the essential element of which is a member rigidly attached to the lock and having a guiding-surface 87 axial with the seating-faces 81 and 83 of the joint, and a member 85 attached to the gate and provided with a guiding-surface 86 corresponding with and bearing against the guiding-surface 87 of the member attached to the lock.

The smaller the common diameter of the guiding-surfaces the less will be the moment of their friction and the force required to overcome it in manipulating the gate. Where there is no objection to such a device, therefore, I prefer to use the form of guiding apparatus shown in Figs. 1 and 3, in which the guiding-surface is formed on a small stud 87^a, secured to the lock-floor, and the guiding-surface 86 of the gate 80 is formed at an end of an arm 85^a, attached to the bottom of the gate. There are cases in which this form of apparatus is undesirable, and in such cases I must resort to a modification which will have the same function, but in which the radius of the guiding-surface is greater and the moment of the friction correspondingly increased.

The modification which I consider second in merit is shown in Figs. 4 and 5, in which the guiding-surface 87^b on the lock is formed on the convex side of a rail or flange attached to the floor of the lock, which may be the rail 96, provided for the wheels 95, attached to the gate to run on, and the guiding member on the gate consists in a series of wheels 86^b, with their axes vertical and attached to the gate 80, the wheels 86^b guiding the gate by their engagement with the guiding-surface 87^b on which they run.

In some cases no member can be allowed to project above the floor of the lock. In such cases I may use the form of guiding apparatus shown in Figs. 6 and 7, in which the guiding member on the lock is in the form of a channel 87^c, let into the floor, and the guiding-surface on the gate is formed on a projecting member 86^c, which may be a lip or flange which engages with the channel 87^c.

To move the gate rapidly, I provide a wheel-segment 94 on the top thereof and a suitably-rotated meshing member, as a pinion or pinions 90, on the lock-wall 6, said pinion being connected by a gearing 92 with a suitable motor 93; or the pinion may be turned by manual power. For moving the gate in case of accident to the above-described operating mechanism I provide sockets 98, in which bars or levers may be inserted for the convenient direct application of manual or other power. Ordinarily the buoyant air charge within the gate will be under quite a moderate compression, and I provide for capturing the air in the upper part of the gate by means of perforations 88 in the wall 89 of the gate 80, which are so placed that in the manipulation of the gate the perforations are alternately covered and uncovered by the water in the lock. When they are uncovered, any water in the gate above them will run out and air will enter, and when water is subsequently admitted to that part of the lock toward which the plate 89 of the gate faces the perforations 88 will be covered by the water and air will be trapped within the gate and give it the desired buoyancy. For cases in which such a construction would be unsuited I provide a valve 97, connected with a suitable air-space within the gate, so that connection can be readily made with a source of compressed air and air can be forced in, if necessary, to expel undesired water from within the gate and restore its buoyancy. To permit water to be forced out of the interior of the gate when the compressed air is forced in through the valve 97, I provide a check-valve 97^a, of ordinary construction, which permits water to be forced out, but prevents it entering the air-chamber in the gate. Such a modification of structure is especially desirable where the level of the water varies greatly—as, for instance, in guard-gates and the lower gates of miter-sill locks—for in such cases the construction first described might result in great variations in the buoyancy of the gate and interfere with its successful manipulation.

The gate is moved by starting the motor 93, which drives the pinion 90, and by the engagement thereof with the wheel-segment 94 moves the gate to one side, such motion being circular in a horizontal orbit about the vertical axis of the seating-faces 81 and 82.

The quadrant pontoon-gate herein set forth possesses marked advantages in practice over the types of lock-gates heretofore constructed or proposed, which have been of two general types, to wit: leaf-gates and those which slide over a seat.

The advantages of the quadrant gate over the leaf-gate are, first, it requires no clearance, and therefore adds from eight to ten per cent. of the effective length of the lock; second, it can be much more easily operated; third, it is stronger with a given amount of material, as it constitutes a simple box-girder; fourth, inasmuch as the leaf-gate closes against its seat in the manner of a door any obstruction prevents it from seating properly. Small objects washed into the lock by the water or ice, which in cold weather forms upon the seating-faces of the gate and the lock, will prevent the closure of the leaf-gate until removed, and frequently cause considerable delay. My improved gate exerts a shearing action in closing and will shear off any small object which may be in its way and scrape off ice or other obstructions which may adhere to the seating-faces.

The sliding gates heretofore known have been of three classes or descriptions, to wit: (*a*) those which slide at a right angle to the center line of the lock into a recess formed at the side thereof; (*b*) those which slide vertically in ways, and (*c*) those which swing about a horizontal axis working on trunnions fixed

to the lock-walls and descending into a recess formed in the floor of the lock. Gates of class *a* add to the length of the lock-wall an amount equal to twice the opening of the lock. Gates of class *b* involve the necessity of overhead structures, which interfere with the passage of masted vessels or those having upper works substantially higher than the deck-load of ordinary canal-barges, and counterbalance weights and gearing, which are liable to derangement. They must be lifted out of their seats and swung to one side to permit the passage of large or masted vessels and are applicable, practically, only to barge-canals, even in which case they are not advantageous. Gates of class *c*, while illustrated in Letters Patent, have never, so far as my knowledge and information extend, been put into actual practice, and obviously involve serious disadvantages. Thus, for example, mud and other obstructions tend to accumulate in the pocket in the lock-floor into which the gate descends when open, and the gate is liable to stick so that it can be closed only with great difficulty, if at all. The operator cannot see the gate when it is open, as it is beneath the water, and he may signal to a boat to go ahead when the gate is only partly down, with the result of a collision between the boat and the partly-opened gate, which may injure one or the other and perhaps both. The trunnions also may get out of alinement, and in case repairs are necessary the water must be drawn off and navigation stopped while they are being made.

As compared with gates as above referred to the quadrant pontoon-gate moving about a vertical axis neither adds to the length of the lock-wall nor weakens it. It requires no overhead structures or counterbalance or other apparatus, injury to which would interfere with the operation of the lock or which would be in the way of tow-lines or other apparatus used to manipulate the vessels using the locks. Its operation cannot be interrupted by accumulations of mud or other objects. It is always in sight and the boatmen have only to look to see that the way is clear. Should a careless boatman run into the gate from the down side, he will merely upset it and it can be picked up and restored to position. Should he run into it from the up side, the elasticity of the gate as a girder, if it be properly proportioned, will compensate for the blow struck by the boat. In case of accident to the gate it can be floated out of position and a new gate put in place in a very short space of time, and if the wheel-segment and driving-gear should get out of order the gate can be manipulated by man or animal power until the necessary repairs are made.

I claim as my invention and desire to secure by Letters Patent—

1. The combination, with a lock or dock, of a gate having its seating-face a surface of revolution about a vertical axis, and being adapted to move horizontally about the said axis, and a concentric seating-face on the lock, substantially as set forth.

2. The combination, with a lock or dock, of a gate having its seating-face a surface of revolution about a vertical axis, a concentric seating-face on the lock; and a positive mechanical guiding apparatus connected with the gate and controlling its motion in a horizontal orbit about the axis of the seating-surface, substantially as set forth.

3. The combination, with a lock or dock, of a gate having its seating-face a surface of revolution about a vertical axis, a concentric seating-face on the lock and concentric guiding-surfaces on the gate and on the lock which guide the gate in its motions in a horizontal orbit about the common axis, substantially as set forth.

4. The combination, with a lock or dock, of a gate formed with its seating-face a surface of revolution about a vertical axis, a concentric seat on the lock, a positive guiding apparatus connected with the gate, and a wheel-segment and meshing pinion, one on the lock, the other on the gate and adapted to move the gate, circularly in a horizontal orbit about the common vertical axis, substantially as set forth.

5. The combination, with a lock or dock, of a gate formed with its seating-face a surface of revolution about a vertical axis, a concentric seat on the lock, the edges of the seating-faces on the lock and on the gate being inclined one to the other, and guiding apparatus connected with the gate and confining it in a horizontal orbit, substantially as set forth.

6. The combination, with a lock or dock, of a gate formed with its seating-face a surface of revolution about a vertical axis, a concentric seating-face on the gate, a guiding apparatus confining the gate in an orbital motion about its axis, an air-space within the gate adapted to give it buoyancy nearly equal to its weight, and wheels upon which the gate runs, substantially as set forth.

7. The combination, with a lock or dock, having a segmental recess or pocket in one of its sides, of a segmental gate adapted to move horizontally about a vertical axis and to fit said recess or pocket when opened, substantially as set forth.

8. The combination, with a lock or dock having a segmental recess or pocket in one of its sides, of a segmental gate adapted to move horizontally about a vertical axis, and having its front substantially in the form of a quadrant of a cylinder, so as to fit said recess or pocket when opened, without waste of space in, or projection into, the lock-chamber, substantially as set forth.

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

CHAUNCEY N. DUTTON.

Witnesses:
A. M. TURNER,
W. M. BROWN.