March 24, 1931. C. C. TOMKINSON 1,797,808

OPERATING AND CONTROL MECHANISM FOR FERRY BRIDGES

Filed July 11, 1927 2 Sheets-Sheet 1

Fig. 1.

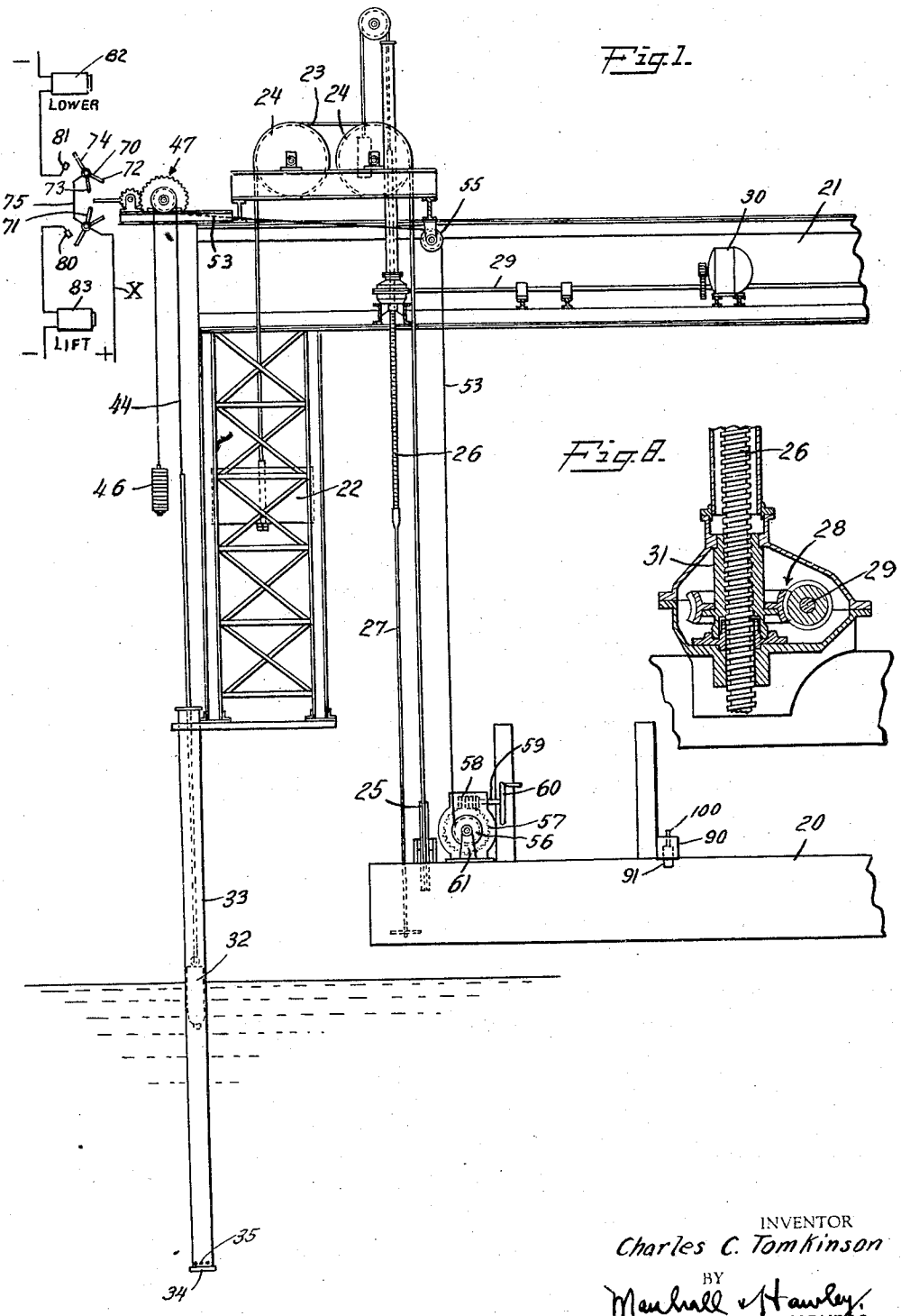


Fig. 8.

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Fig. 2.

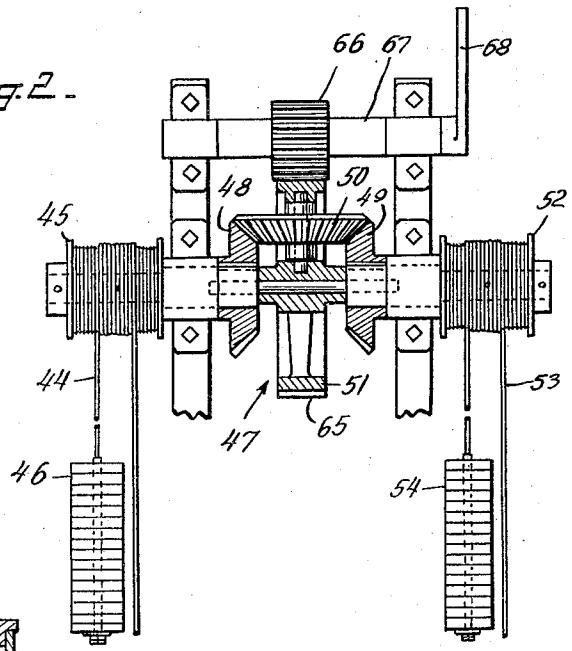


Fig. 3.

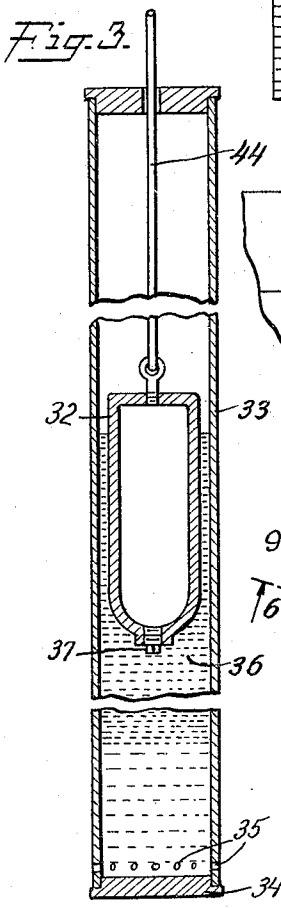


Fig. 7.

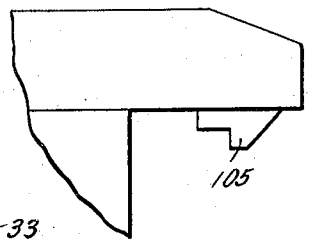


Fig. 4.

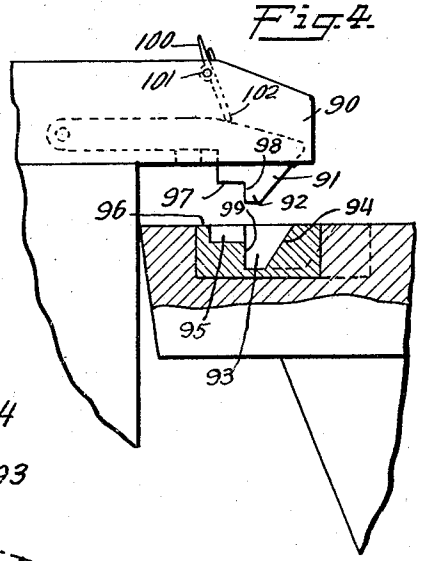


Fig. 5.

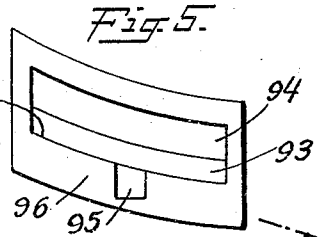
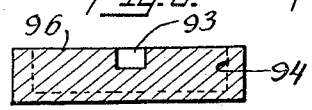


Fig. 6.



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UNITED STATES PATENT OFFICE

CHARLES C. TOMKINSON, OF PLAINFIELD, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO J. EDWARD OGDEN COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY

OPERATING AND CONTROL MECHANISM FOR FERRY BRIDGES

Application filed July 11, 1927. Serial No. 204,820.

This invention relates to operating and control mechanisms for ferry bridges.

As is well known, when a ferry boat enters the slip, the bridge at the landing or dock must be lowered on the boat. At the present time it is customary to use a motor for lifting and lowering the ferry bridge, the motor being manually controlled as by means of a switch or a plurality of switches, it being the duty of an attendant to maintain the bridge normally at an elevation higher than the deck of the highest unloaded ferry boat.

When the boat has entered the slip, the operator or attendant will cause the motor to be set in operation to lower the bridge until the toggles thereon rest upon the deck of the ferry boat.

When a ferry boat is ready to leave the dock, the bridge must be raised to the aforementioned normal position so as to be free from the deck of the boat. As the tide rises and falls, the attendant must continually operate the motor so as to raise or lower the bridge in order to maintain it at approximately its proper elevation.

Difficulty has been experienced in carrying out the foregoing method of operation since it sometimes happens that the operator has failed to lift the bridge to the required height before the ferry boat enters the slip in which case the boat rams the ends of the toggles and damages the bridge.

In order to avoid this difficulty it has been proposed to provide float control means in combination with the lifting and lowering means whereby the bridge will be automatically maintained normally at a predetermined level above the water, such level being preferably slightly above the deck level of the highest unloaded ferry boat. Such mechanism is illustrated and described in Patent No. 980,522 granted January 3, 1911, to Haywood.

This invention has for its salient object to provide an improved and simplified construction for automatically and manually controlling the raising and lowering of ferry bridges whereby the bridge will be normally maintained in a position higher than the deck of the highest unloaded ferry boat and can be easily and quickly lowered to operative position in engagement with the deck of the boat.

Another object of the invention is to provide automatic control means for a ferry bridge so constructed and arranged that when the bridge has been lowered into operative position on the boat, it will be automatically maintained in such position regardless of the condition of the tide.

Another object of the invention is to provide a float control device for automatically maintaining a ferry bridge at the desired elevation so constructed and arranged that the control device and system controlled thereby will not be obstructed by subaqueous growths, such as barnacles or by ice and the cables and attachments therefor will not be subject to corrosion.

Another object of the invention is to provide float control mechanism of the character described so constructed and arranged that the float will respond readily to tide movements but will be sluggish and nonresponsive to wave movements.

Further objects of the invention will appear from the following specification taken in connection with the drawings, which form a part of this application, and in which

Fig. 1 is an elevation showing ferry bridge control and operating mechanism constructed in accordance with the invention;

Fig. 2 is an enlarged sectional elevation of differential switch operating mechanism used in connection with the electrical devices;

Fig. 3 is an enlarged sectional elevation showing the float chamber and float device for automatically maintaining the bridge at a predetermined elevation;

Fig. 4 is an elevational view showing the end of the ferry bridge and toggle and the end portion of the boat adapted to be engaged thereby;

Fig. 5 is a top plan view of a portion of the boat shown in Fig. 4;

Fig. 6 is a transverse sectional elevation taken substantially on line 6—6 of Fig. 5;

Fig. 7 is an elevational view broken away showing another form of construction of the

end of the ferry bridge engageable with the boat; and

Fig. 8 is an elevation partly in section showing the elevating screw for raising and lowering the bridge.

The invention briefly described consists of operating and control mechanism for raising and lowering ferry bridges comprising automatic float control means for maintaining the bridge at a predetermined elevation or, in other words, at an elevation higher than the highest deck of an unloaded ferry boat. The float control means is enclosed within a casing partially filled with a suitable liquid and preferably oil and the float is partially submerged in this liquid and is suitably counterbalanced so that as the tide rises and falls, the float will also rise and fall. This mechanism is so constructed that the float control system will not be obstructed by subaqueous growths, such as barnacles or by ice and, furthermore, the oil used in the casing will fill the pores of the submerged float chamber and prevent leakage. Also, the oil will prevent corrosion of the cables and attachments connected to the float and submerged in the liquid.

The operating mechanism is so constructed and arranged that a manually controlled device on the bridge can be manipulated by the operator or attendant to lower the bridge to the boat when the boat enters the slip. Furthermore, the bridge is provided with indicating means so that the operator can tell whether the bridge toggle is properly engaged with the boat.

The automatic control mechanism is so arranged that after the bridge has been lowered on the boat, the bridge and boat will maintain relative inter-engaging positions regardless of the rise and fall of the tide.

Further details of the invention will appear from the following description.

In the form of the invention illustrated and referring particularly to Fig. 1, there is shown a ferry bridge 20 and a gallows frame 21 on which is mounted the operating means for the bridge. For convenience of illustration, there is shown only a portion of the ferry bridge and gallows frame, approximately one-half of the frame being shown. The other half is practically a duplicate of the portion shown and it is believed that the portion shown is sufficient for the purposes of illustration.

The ferry bridge is counterbalanced by means of heavy counterbalancing weights 22, there preferably being provided two sets of such weights, but only one set is illustrated in the drawings. Each set of weights 22 has connected thereto a cable 23 which passes over guide pulleys 24, 24 and downwardly beneath a pulley 25 carried by the bridge, the end of the cable being brought upwardly again and connected or anchored to the gallows frame.

The bridge is raised and lowered by means of a screw 26 shown in detail in Fig. 8. Screw 26 is connected by a rod or other suitable connecting means 27 to the bridge and is operated by a worm and worm wheel connection 28 from a worm shaft 29 driven by an electric motor 30. The elevating screw is preferably counterbalanced by the weight and cable connection illustrated in Fig. 1 in order to save wear and tear on the screw and upon the driving nut 31 which is driven by the worm wheel 28. It will be understood that as the motor 30 is operated in one direction or the other, the bridge will be raised or lowered by the screw 26.

In order to maintain the bridge at a predetermined elevation with respect to the surface level of the water and preferably at an elevation disposed above the deck of the highest unloaded ferry boat, there in provided a float 32 positioned within a casing or tube 33 which is partially submerged in the water and is provided with a closed bottom 34 and radial constricted openings 35 therein adjacent the bottom. The float chamber in the tube or casing 33 is preferably filled or partially filled with a heavy oil 36 and the float 32 illustrated is preferably formed of metal, such as cast iron and is hollow, the bottom of the float being closed by a plug 37. The tube 33 extends downwardly below the low tide level a sufficient extent to retain the fluid therein.

The constricted openings 35 near the bottom of the float chamber cause the liquid in the float chamber to respond to variations in the tide level, but wave movements will not materially affect the float because of its weight and because of the constricted openings through which the chamber communicates with the water.

The float 32 has connected thereto a cable 44, the upper end of which is passed several times around a drum 45, the free end of the cable having connected thereto a counterbalancing weight 46 preferably adustable as shown. The weight is so adjusted that the float which is normally biased to sink in the oil or liquid in the float chamber will be partially submerged as shown in the drawings. The drum 45 constitutes a portion of differential switch operating means 47 shown in detail in Fig. 2. This means comprises two bevel gears 48 and 49 which are arranged to face each other with their axes in alinement, the teeth of the gears 48 and 49 meshing with a complementary bevel gear 50 having its axis disposed at right angles to the gears 48 and 49. Gear 50 is mounted to rotate in a differentially operated wheel 51 mounted on an axis in alinement with the axis of the gears 48 and 49. Gear 48 is fixed with respect to the drum 45 and gear 49 is fixed with respect to a similar drum

52. A cable 53 is wound around the drum 52 and has secured to one end thereof a counterbalancing weight 54. Cable 53 passes from the drum 52 around a guide pulley 55 and is secured to a drum 56 having connected thereto a worm wheel 57 driven by a worm 58 carried by a shaft 59 on the outer end of which is secured an operating crank or wheel 60. The drum 56 and the operating parts therefor are carried by a bracket 61 mounted on the bridge 20.

The wheel 51 has formed on the periphery thereof gear teeth 65 which mesh with a spur gear 66 carried by a shaft 67, the shaft having secured to one end thereof an arm 68. Arm 68 has its outer end positioned between a pair of switches 70 and 71. These switches are preferably Y-shaped as shown, each switch having a pair of arms 72 and 73 and a single arm 74 disposed on the opposite side of the pivot from the arms 72 and 73. The switches are connected to a positive power main X and the two switches are connected by a wire 75. The arms 74 of the switches 70 and 71 are adapted to engage contacts 80 and 81 connected respectively to raising and lowering switches 82 and 83 which control the operation of the motor to raise or lower the screw 26. The details of switches 82 and 83 are not illustrated since they are common in the art and it is sufficient for the present description to state that when the motor control switch 82 is closed, the motor will operate to lower the bridge and when the switch 83 is closed, the motor will operate to raise the bridge. When neither of these switches is closed, the motor will remain stationary and the bridge will be held against movement.

Figs. 4, 5 and 6 illustrate the coacting portions of the bridge and boat. In Fig. 4 it will be seen that the bridge has an overhanging projection or toggle beam 90 in which there is pivotally mounted an arm 91 termed in the art a toggle. The arm 91 has a hook or lug 92 at the lower end thereof and the end of the boat adapted to be engaged by the bridge has a mooring plate provided with an arcuate recess 93 concentric with the curved end of the boat, having an inclined portion 94. A second recess 95 communicates with recess 93 and extends laterally therefrom. A shoulder 97 on the toggle is adapted to enter the recess 95 and the lower end or hook 92 on the toggle is adapted to rest in the bottom of the recess 93 on surface or portion 94 when the toggle is properly positioned.

An indicator 100 is pivoted at 101 on the bridge and has its lower end 102 adapted to rest on the upper surface of the toggle. When the toggle is properly centered and is in engagement with the boat or, in other words, is depressed, the indicator will project above the overhanging projection 90 of the bridge, thus indicating to the operator that the bridge is properly locked to the boat. When, however, the toggle is not properly positioned on the boat, the toggle will swing upwardly on its pivot, thus depressing the indicator 100 and showing the operator that the bridge is not properly positioned on the boat.

When the bridge is lowered to the boat if the boat is in approximately but not exactly in correct position the shoulder 97 will rest on the surface 96 of the mooring plate and the hook portion 98 of the toggle will engage the mooring plate wall 99. Then when the boat manipulated by the captain by means of the propeller and rudder is properly centered, the toggle will drop into the depression 94 and recess 95 and the boat will be held in central position. The indicator will then rise showing the captain that the toggle is in correct position on the boat.

Assuming the tide to be falling and no automatic control on the bridge, the boat would be released, whereas with the automatic system the bridge falls the same amount as the boat falls and the mooring device is held in constant engagement with the boat. When the bridge operator lands the bridge upon the boat, he will slack off the cable 27 several inches so that the weight of the bridge is on the boat. The slackness in the cable will take care of any slight difference in movement of the bridge and the boat.

Instead of providing a pivoted toggle in the overhanging projection 90 of the bridge, the projection may have fixedly secured thereto and depending therefrom a hook 105 adapted to enter the recess in the mooring plate. Two toggle locks and mooring plates are preferably provided, one at each side of the center of the bridge and boat.

Operation of ferry bridge operating and control mechanism

As has been explained in the above description, the float 32 will automatically maintain the bridge in a normal position above the highest deck of an unloaded ferry boat so that when any of the boats enters the slip, the bridge will be out of the path of the boat and will not be engaged thereby but can be moved to operative position by lowering the bridge. The flat operates by means of the drum 45 which is rotated as the float rises and falls and with the drum, the gear 48 will be rotated. Since the gear 49 is stationary when the float begins to rise and fall, the gear 50 will rotate and will cause the gear 51 to rotate gear 66 and swing the arm 68 in one direction or the other as the case may be. If the tide is falling, the arms 68 will swing in a clockwise direction and engage the arm 72 of the switch 70, closing the contact between the switch plate 74 and contact 81 and thereby closing the circuit through the lowering

switch 82 to cause the motor to rotate in a direction to depress the screw 26 and lower the bridge. If, on the other hand, the tide is rising, the circuit will be completed through the switch 83 and the motor will be caused to lift the screw 26 and the bridge controlled thereby. In either case when the motor starts to move the bridge, drum 52 begins to rotate and returns the arm 68 to the neutral position between the switches and thus stops the motor when the bridge has moved a distance equal to the movement of the float.

As hereinbefore set forth, the float 32 floats in oil and is partially submerged and the interior of the float casing communicates with the water surrounding the casing through restricted openings 35, thus the float although responsive to the rise and fall of the tide will not be responsive to wave movements. Furthermore, the submerging of the float in oil seals the pores of the float and the oil also tends to prevent corrosion of the cable and float attachments.

When a boat enters the slip and the operator desires to lower the bridge to the boat, he will rotate the crank handle 60 in the proper direction and thereby rotate the drum 52 and gear 49. During this operation the gear 48 will remain substantially stationary under the control of the float 32 and, therefore, the gear 50 will be rotated by the gear 49 and will cause the gear 51 to rotate, thus rotating the gear 66 and arm 68. Arm 68 will then cause the switch 70 to close the contact between the switch blade or arm 74 and contact 81, thus completing the circuit through switch 82 and causing the motor to operate in a direction to lower the bridge to the deck of the boat. When the motor starts to lower the bridge, the arm 68 is returned to neutral position by the movement of drum 52 and the motor stops. After the bridge has been lowered to the deck, it will be automatically retained in position thereon by the float 32 regardless of the rise and fall of the tide since the automatic control maintains the bridge a definite distance above the water level which is the height of the boat deck.

When the boat is about to leave the slip, the operator will rotate the crank handle 60 in the opposite direction, thus reversing the motor and raising the bridge.

Although one specific embodiment of the invention has ben particularly shown and described, it will be understood that the invention is capable of modification and that changes in the construction and in the arrangement of the various cooperating parts may be made without departing from the spirit or scope of the invention, as expressed in the following claims.

What I claim is:

1. Mechanism for controlling and operating ferry bridges comprising a motor, a bridge, operative connections between the motor and bridge for raising and lowering the bridge, switch mechanism for controlling said motor, float controlled means for operating the switch mechanism, and manually controlled means on the bridge for operating the switch mechanism, said float controlled means being in operating condition at all times.

2. Mechanism for controlling and operating ferry bridges comprising a motor, a bridge, operative connections between the motor and bridge for raising and lowering the bridge, switch mechanism for controlling said motor, float controlled means for operating the switch mechanism to maintain the bridge at a predetermined level relative to the surface of the water, and manually controlled means on the bridge for operating the switch mechanism, said float controlled means being in operating condition at all times.

3. Mechanism for controlling and operating ferry bridges comprising a motor, a bridge, operative connections between the motor and bridge for raising and lowering the bridge, switch mechanism for controlling said motor, a float chamber having a constricted vent communicating with the water above which the ferry bridge is located and a float in said chamber operative to control said switch mechanism, to cause the motor to raise or lower the bridge as the tide rises and falls.

4. Mechanism for controlling and operating ferry bridges comprising a motor, a bridge, operative connections between the motor and bridge for raising or lowering the bridge, switch mechanism for controlling said motor, a float chamber having a constricted vent communicating with the water above which the ferry bridge is located, said chamber having therein a liquid of less specific gravity than the specific gravity of the water with which the constricted opening establishes communication and a float in said chamber operative to control said switch mechanism, to cause the motor to raise or lower the bridge as the tide rises and falls.

5. Mechanism for controlling and operating ferry bridges comprising means for raising and lowering the bridge, a float chamber communicating adjacent its lower end with the water in which the boat to be moored is located, said float chamber being partially filled with a liquid adapted to float in said chamber and means controlled by the float for causing said raising and lowering means to raise and lower the bridge.

6. Mechanism for controlling and operating ferry bridges comprising a motor for raising and lowering the bridge, differential gearing, means operated by the gearing for controlling the operation of the motor to raise and lower the bridge, a float controlling said gearing and manually operatable means on the bridge for controlling the gearing.

7. In combination, a ferry beam, a toggle pivoted theron, and means controlled by the

toggle for indicating whether the bridge is properly positioned on the boat.

8. In combination, a ferry beam, a toggle pivoted thereon, and pivoted means controlled by the toggle for indicating whether the bridge is properly positioned on the boat.

9. In combination, a ferry bridge, a toggle pivoted thereon, and means on the bridge controlled by the toggle for indicating whether the bridge is properly positioned on the boat.

10. In combination, a ferry bridge, a boat adapted to be engaged thereby, a toggle beam, a toggle locking member on the beam, and a mooring plate on the boat having a recess adapted to receive said locking member.

11. In combination, a ferry bridge, a boat adapted to be engaged thereby, a toggle locking member on the bridge, a mooring plate on the boat having a recess adapted to receive said locking member, and an indicator for indicating to the operator when the toggle locking member is disposed in said recess.

12. In combination, a ferry bridge, a boat adapted to be engaged thereby, a toggle locking member on the bridge, and a mooring plate on the boat having a recess adapted to receive said locking member, said recess having an arcuate ledge and a laterally projecting depression for centering and receiving the end of the toggle locking member.

13. Means for controlling and operating a ferry bridge comprising a motor for raising and lowering the bridge, a lifting switch therefor, a lowering switch therefor, a float controlled switch for controlling the lifting and lowering switches, and means including a manually operable device on the ferry bridge for controlling the float controlled switch.

14. In combination, a ferry bridge, a boat adapted to be engaged thereby, a toggle beam on the bridge, a toggle locking member on the beam, a mooring plate on the boat having a recess adapted to receive said locking member, and float controlled means for maintaining the toggle locking member in locking engagement with the mooring plate.

15. In combination, a ferry bridge, a boat adapted to be engaged thereby, a toggle locking member on the bridge, a mooring plate on the boat having a recess adapted to receive said locking member, float controlled means for maintaining the toggle locking member in locking engagement with the mooring plate, and an indicator for indicating to the operator when the toggle locking member is disposed in said recess.

16. In combination, a ferry bridge, a toggle pivoted thereon, means on the bridge controlled by the toggle for indicating whether the bridge is properly positioned on the boat, and float controlled means for maintaining the toggle locking member in locking engagement with the mooring plate.

17. Mechanism for controlling and operating ferry bridges comprising a motor, a bridge operative connections between the motor and bridge for raising and lowering the bridge, a float, differentially operated means connected with the float and bridge for starting and stopping the motor, and manually controlled mechanism on the bridge connected with the differentially operated means for starting and stopping the motor.

18. Mechanism for controlling and operating ferry bridges comprising a motor, a bridge, operative connections between the motor and bridge for raising and lowering the bridge, a float, means operated by the float to start the motor, and manually controlled means on the bridge for operating said means to start the motor.

19. Mechanism for controlling and operating ferry bridges comprising a motor, a bridge, operative connections between the motor and bridge for raising and lowering the bridge, a float, means operated by the float to start the motor, and manually controlled means on the bridge for operating said means to start the motor, said float operated means being operatable at all times.

20. Mechanism for controlling and operating ferry bridges comprising a motor, a bridge, operative connections between the motor and bridge for raising and lowering the bridge, switch mechanism including a single switch control member for controlling said motor, float controlled means for operating the switch control member and controlling said switch mechanism, and manually controlled means on the bridge for controlling said switch control member and operating the switch mechanism, said float controlled means being operatable at all times.

21. Mechanism for controlling and operating ferry bridges comprising a motor, a bridge, operative connections between the motor and bridge for raising and lowering the bridge, a pair of switches for controlling the operation of the motor to raise and lower the bridge, a single member operatable to throw one or the other of said switches, a float operatively connected to actuate said member, and manually controlled means on the bridge for actuating said member.

22. Mechanism for controlling and operating ferry bridges comprising means for raising and lowering the bridge, a float chamber communicating adjacent its lower end with the water in which the boat to be moored is located, said float chamber being partially filled with a non-corrosive liquid adapted to float on the water, a float in the chamber and means controlled by the float for causing said raising and lowering means to raise and lower the bridge.

23. Mechanism for controlling and operating ferry bridges comprising means for raising and lowering the bridge, a float chamber communicating adjacent its lower end with the water in which the boat to be moored is

located, said float chamber being partially filled with a non-freezing liquid adapted to float on the water, a float in the chamber and means controlled by the float for causing said raising and lowering means to raise and lower the bridge.

In witness whereof, I have hereunto set my hand this 1st day of July, 1927.

CHARLES C. TOMKINSON.