No. 747,836. PATENTED DEC. 22, 1903.

J. ANDERSON.

FERRY BRIDGE.

APPLICATION FILED SEPT. 12, 1903.

NO MODEL. 4 SHEETS—SHEET 1

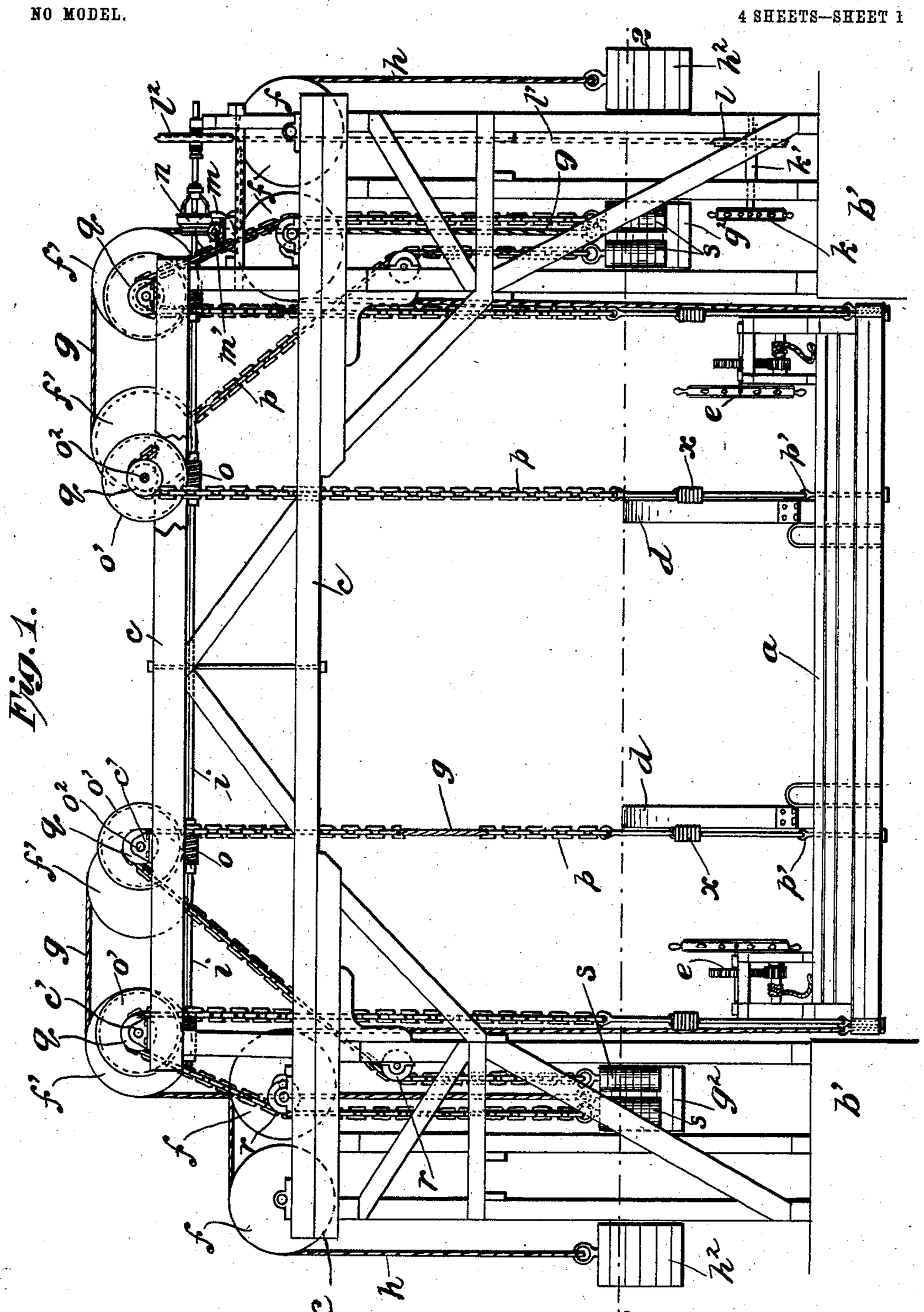

Fig. 1.

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NO MODEL. 4 SHEETS—SHEET 2.

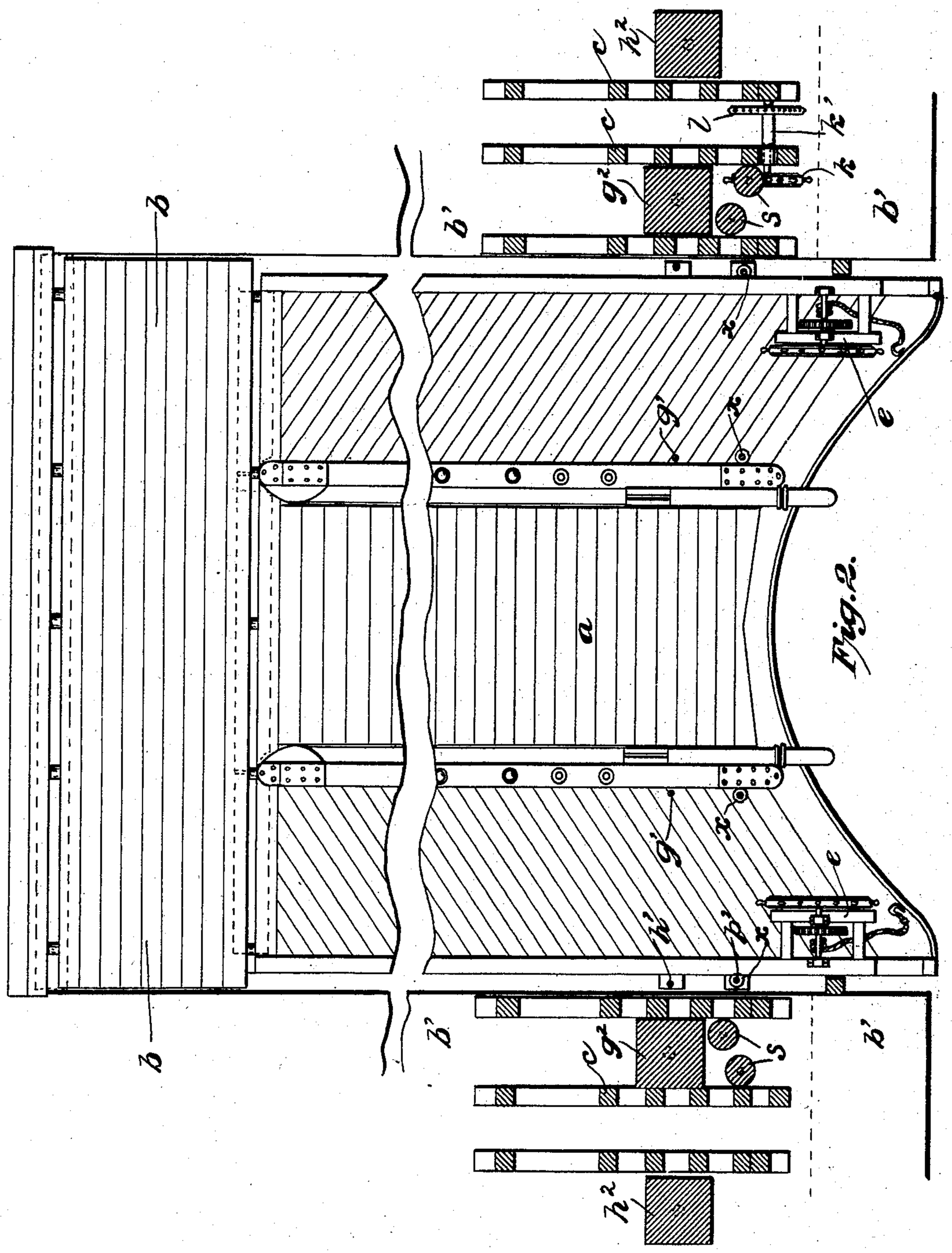

Fig. 2.

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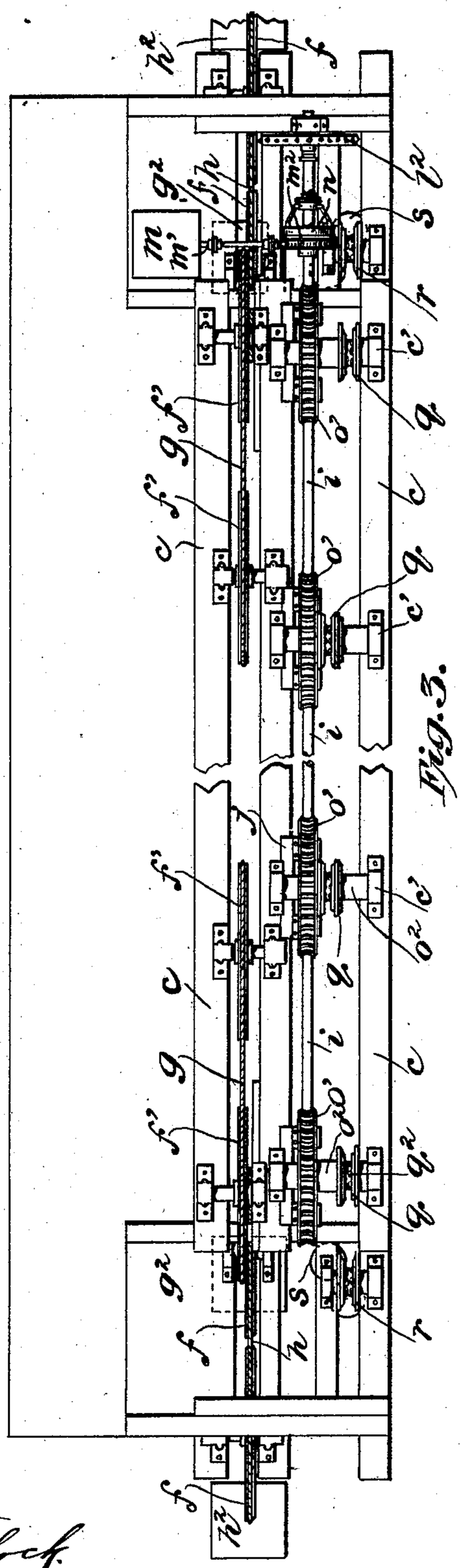
NO MODEL. 4 SHEETS—SHEET 3.



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NO MODEL. 4 SHEETS—SHEET 4.

Fig. 8.

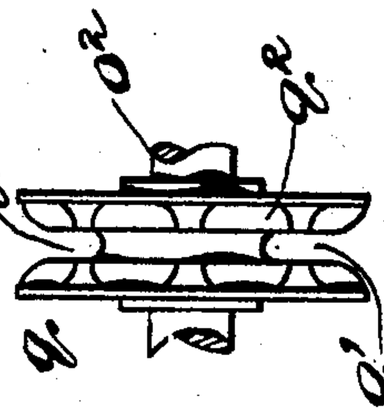


Fig. 7.

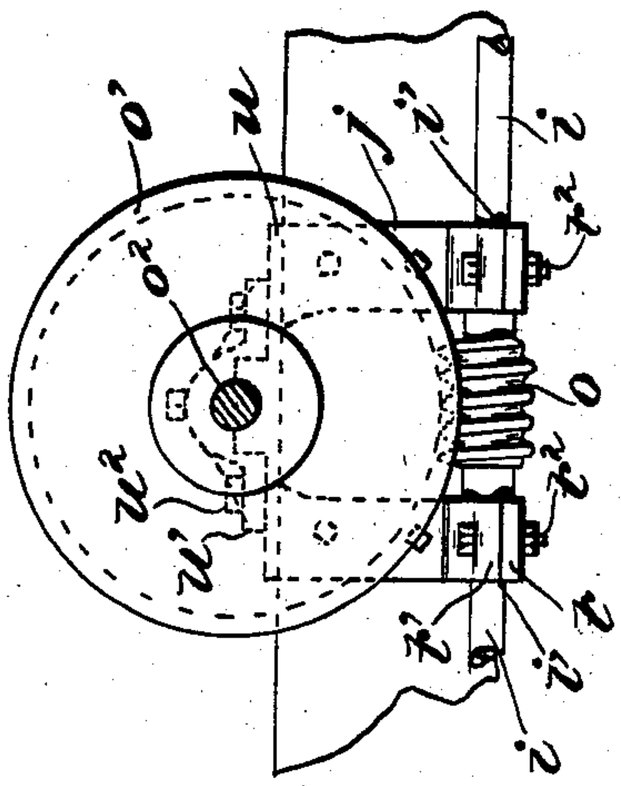


Fig. 6.

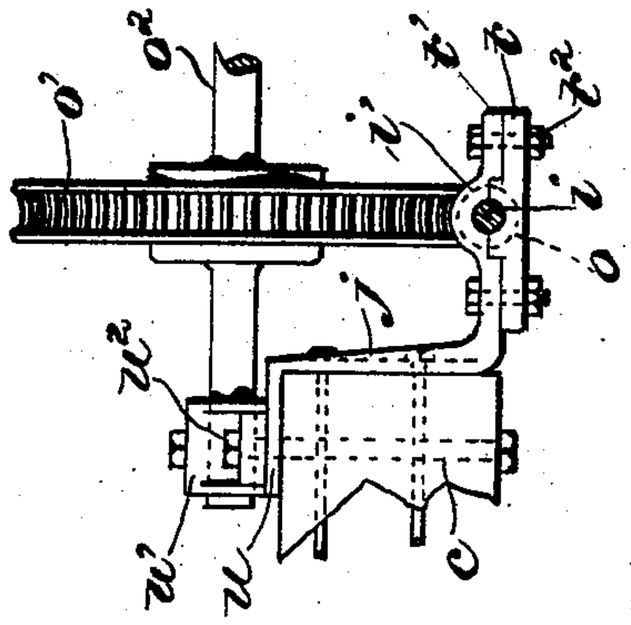


Fig. 5.

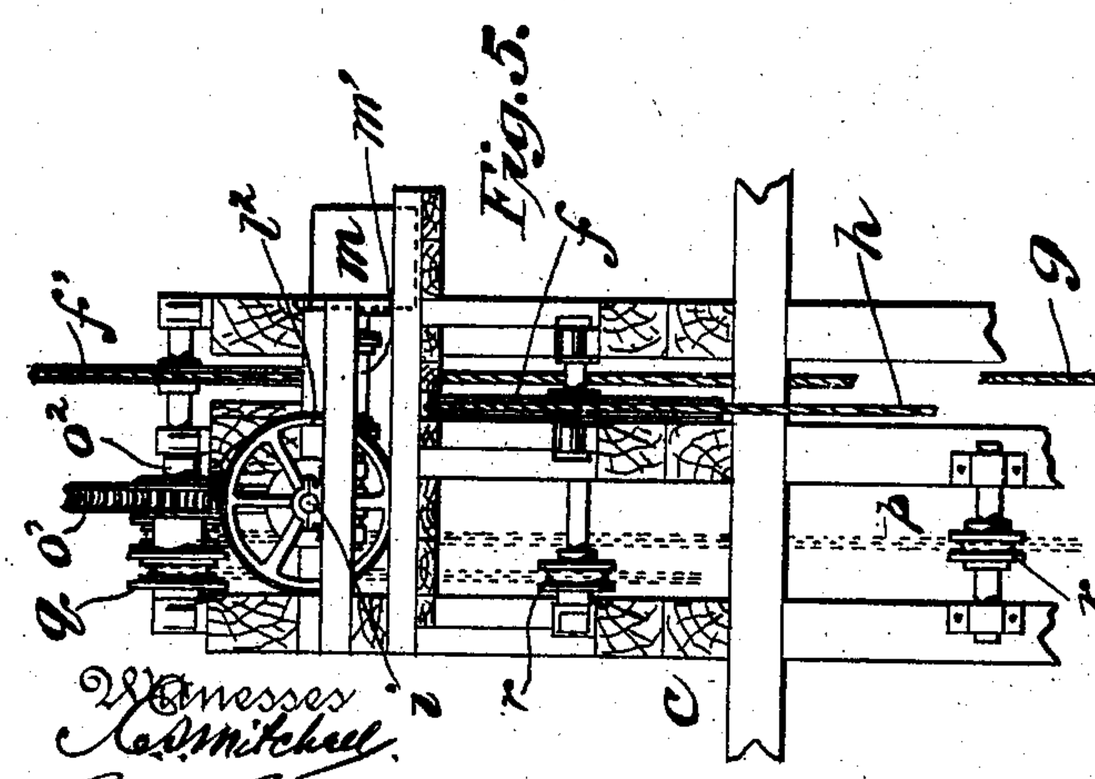
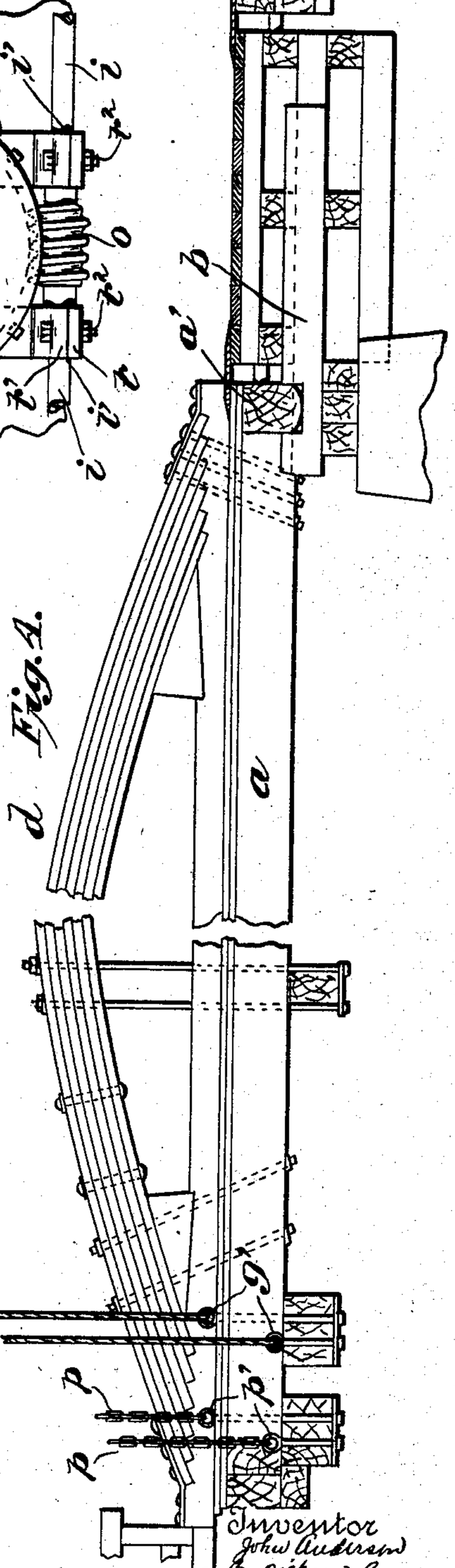


Fig. 4.



Witnesses
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No. 747,836. Patented December 22, 1903.

UNITED STATES PATENT OFFICE.

JOHN ANDERSON, OF NEW YORK, N. Y.

FERRY-BRIDGE.

SPECIFICATION forming part of Letters Patent No. 747,836, dated December 22, 1903.

Application filed September 12, 1903. Serial No. 172,893. (No model.)

To all whom it may concern:

Be it known that I, JOHN ANDERSON, a citizen of the United States, residing in the borough of Richmond, city and State of New York, have invented certain new and useful Improvements in Ferry-Bridges, of which the following is a specification.

Bridges are known which have been assisted in the act of raising and lowering them by means of counterweights. Bridges are also known which have dispensed with pontoons. All the bridges of this class of which I am aware are either improperly constructed or else not properly counterbalanced. None of the ferry-bridges of which I am aware are adapted for the large slips for use with the large ferry-boats of to-day.

One of the main objects of my invention is to particularly adapt the bridge to localities where there is insufficient depth of water to permit the use of a pontoon, more particularly if the bottom be rock, necessitating a large expenditure upon it to blast out a sufficient depth to allow the use of a pontoon.

Another object of my invention is to permit the same to be operated by steam, by a gasolene-engine, also by hand-power, raising it independent of the conditions of the tide and the usual difficulties resulting from ice in the slips.

My improved bridge can also be raised and lowered independent of the tide, so that it can be adapted to ferry-boats of varying heights of deck-line, and it also avoids the difficulty experienced by ferry-boats in getting into slips due to the packing of the ice up against the usual pontoon. This bridge being no pontoon, the ice is simply forced under it and out through the sides into the water.

Another object of the invention is to avoid the abandonment of the bridge for repairs to pontoons, as repairs may be made without interfering with the traffic. Also by reason of the operating machinery and counterbalances, such as shown and described, the bridge can be built in sizes required.

Other objects I have secured is a bridge which shall be durable, effective, economical, and substantial and wholly satisfactory in use.

In the accompanying drawings, Figure 1 is a front elevation of my improved counterbalanced ferry-bridge as viewed when looking toward the slip. Fig. 2 is a transverse section on the line 2 2 of Fig. 1, parts being broken away. Fig. 3 is a plan view of the superposed operating mechanism. Fig. 4 is a sectional side elevation of the bridge, parts being broken away. Fig. 5 is a detail view, in side elevation, of parts of the operating mechanism. Fig. 6 is a sectional side elevation of one of the worm-gears and its supporting-brackets. Fig. 7 is a view of the same worm-gear when seen from the right of Fig. 6. Fig. 8 is a detail view of one of the chain or sprocket wheels.

The bridge *a* is provided at its rear end with a roller-log *a'*, which fulcrums or takes bearing in the framework *b* between the bridge and the mainland.

b' b' indicate the walls at the sides of the bridge, and *c* the trestle-work, which is supported on the side walls *b'* and which supports the operating mechanism for the bridge. The trestle-work is provided with ladders or other suitable means for obtaining access to the overhead machinery for the purpose of operation, for repairs, oiling, &c. The longitudinal trusses *d* form the rails of the bridge to provide two passage-ways for passengers and a gangway for traffic. Suitable means are also provided for tying the boat to the bridge—as, for instance, the mooring devices of well-known type.

The bridge *a* does not rest upon a pontoon, but is supported from above by devices to be described. At opposite sides of the upper part of the trestle-work *c* pulleys *f f'* are supported in suitable bearings, there being a pair of pulleys *f* and a pair of pulleys *f'* at each side of the structure. Over the pulleys *f'* are trained flexible connections *g* in the form of ropes or cables. There are two of the cables *g*, which are run downwardly over the innermost pulleys *f'* and are anchored to the bridge at *g'* at points located adjacent the opposite sides of the gangway. The other ends of the cables *g* support ponderous counterbalance-weights g^2. Other flexible connections *h* in the form of ropes or cables are trained over the pulleys *f*. There is also a pair of these cables *h*, one of them being

anchored at h' at each side of the bridge. The opposite ends of the cables h support ponderous counterweights h^2, corresponding with the counterbalance-weights g^2. It will be seen, therefore, that at each side of the bridge there is a pair of heavy counterbalance-weights and that at each side of the bridge a pair of cables is attached, so that the points of attachment of the four cables extend in a transverse line across the bridge. The weight of the bridge is therefore taken up and divided between the four cables, thus distributing the strains. The counterbalances g^2 h^2 are heavy enough to almost counterbalance the weight of the bridge; but it is evident that they may be of equal weight with the bridge. They do not take the load which is imposed upon the bridge by traffic and passengers.

The operating machinery for raising and lowering the bridge comprises a shaft i, which is arranged transversely at the upper part of the trestle-work and journaled in bearings i' of suitable brackets j. The operating-shaft i may be driven by hand or by machinery. As shown in the drawings, it can be driven by either. For operating by hand the hand-wheel k is provided, which is mounted on a shaft k', journaled in suitable bearings in the lower part of one side of the trestle-work and provided with a sprocket-wheel l, over which is trained a sprocket-chain l', which extends upwardly and is trained over the sprocket-wheel l^2, mounted upon the said shaft i. For turning the shaft i by machinery an electric motor m may be provided, which is preferably supported in the upper part of the trestle-work adjacent the shaft i, so that the said shaft may be more directly driven. The motor-shaft m' is connected by the worm-gear m^2 with the said shaft i, the worm-wheel of said gear being loose and adapted to be connected with the shaft by means of a suitably-operated clutch n, as shown in Figs. 1 and 3. Located on the shaft i at suitable points are worm-gears o, (shown in detail in Fig. 7,) which mesh with worm-wheels o', that are mounted on suitable shafts o^2, journaled in bearings of the said brackets j and in bearings c' in opposite portions of the trestle-work. It will be seen that the main bearings for the shafts o^2 and for the drive-shaft i are located on the same brackets. Preferably there are four brackets and four corresponding worm-gears o o'. For the purpose of raising and lowering the bridge from the said operating mechanism suitable chains or cables p are employed, these being connected at their lower ends by suitable anchors p' with the bridge. Preferably there are four of these chains or cables, the points of connection of which with the bridge extend in a line transverse thereof, so as to share in taking up the strains. The chains or cables p lie in front of the cables g h when viewed from the water side. In Fig. 1 one of the left-hand chains or cables p is broken away, so as to show the cable g behind it. Chains are shown and are preferably used in practice; but it is evident that cables may be employed instead. The chains p are trained at points directly above their connecting-anchors p' over chain-wheels q, which are mounted on the short shafts o^2 alongside of the gear-wheels o'. One of the chain-wheels is shown in detail in Fig. 8, where it will be clearly seen that the said wheel is provided with an annular groove q', which receives alternating links, the planes of which pass vertically or transversely of the short shafts, while pockets or recesses q^2 are formed at the sides of said groove, so that the other links of the chain which pass in horizontal planes may be properly guided and may be afforded a hold, as by means of teeth. The ends of the chain p, which are led over the wheels q, are also led over idlers r, supported in suitable bearings at the side of the trestle-work, and from these ends of the cables are suspended suitable weights s. There are two of the weights s at each side of the trestle-work, corresponding with the two main counterbalances at each side.

It will be seen that upon the operation of the motor m the bridge may be raised or lowered, as desired, and will be held in its adjusted position by the worm-gears o o' and by the chains p, led over the wheels q. When the bridge is being lifted, chain-wheels q engage the chains p and act to pull the bridge up to the desired height. In lowering the bridge the slack which would otherwise be caused by the reverse turning of the wheels q is taken up by the weight of the bridge. The counterweights s assist in raising the bridge when the driving mechanism is turned for raising. At any rate they raise those pending portions of the chains lying immediately below the wheels q. Another and an important function of the counterweights s is to relieve the gear-teeth of the worm-wheels o' of strains tending to break them.

There are preferably inserted at points near the lower ends of the chains p elastic connections x, which may be in the form of heavy metallic springs or any other form of elastic connections, so that when the traffic suddenly takes place on the bridge the shock will not be suddenly transmitted to the overhead driving mechanism.

A very important feature of my invention is the manner in which the worm-gear is supported and will be clearly seen from Figs. 6 and 7. The worm-shaft i is held in position in its bearings by means of removable box-sections t, which are secured to the fixed box-sections t' of the brackets by means of bolts and nuts t^2. These removable sections t permit the sidewise removal of the worm-shaft i without disturbing any other part of the mechanism in case it is desired to remove the same for repairs. The shafts o^2 for the worm-wheels o' are removably held in the same manner, so that each wheel and shaft may be

removed without disturbing any other part. To this end the upper parts of the brackets form fixed box-sections u, while the removable box-sections u' are applied and fixed thereto by means of bolts and nuts u^2. Preferably and from an economical standpoint the box-sections t' and u are formed integral with the brackets. It will be seen, therefore, that by means of this construction it is very easy to repair any part of the worm-gear mechanism without disturbing other parts.

I do not limit myself to details of construction shown and described, as obviously various changes may be made therein by skilled mechanics without departing from the scope and spirit of the invention.

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

1. The combination with a ferry-bridge, of counterbalancing means for taking up the main weight of the bridge, worm-gear mechanism, operating means therefor, and a flexible connection under constant stress between the gear and the bridge and independent of the counterbalancing means, for raising and lowering the bridge and taking strains off the gear, for substantially the purposes set forth.

2. The combination with a ferry-bridge, of counterbalancing means for taking up the main weight of the bridge, worm-gear mechanism, operating means therefor, chain-wheels driven from said worm-gear mechanism, and weighted chains trained over said chain-wheels and attached to the bridge, said weighted chains being independent of the counterbalancing means, for substantially the purposes set forth.

3. The combination with a ferry-bridge, of cables, overhead pulleys over which the cables are trained, counterweights on the cables, worm-gear mechanism, operating means therefor, and a flexible connection independent of the cables and under constant stress between the gear and the bridge for raising and lowering the same, and taking strains off the gear, for substantially the purposes set forth.

4. The combination with a ferry-bridge, of cables, overhead pulleys over which the cables are trained, counterweights on the cables, a worm-gear mechanism independent of the cables and said counterweights, operating means therefor, chain-wheels operated from the worm-gears, and weighted chains trained over said chain-wheels and attached to the bridge, for substantially the purposes set forth.

5. The combination with a ferry-bridge, of operating mechanism, chains connecting the said mechanism with the bridge, means for taking the strain of the bridge through said chains off of the operating mechanism, and counterweighted flexible connections independent of the means for taking the strain off the operating mechanism attached at points extending transversely of the bridge to partake of the strains, substantially for the purposes set forth.

6. The combination with a ferry-bridge, of flexible connections for raising and lowering the said bridge, said connections being provided with springs which are inserted in their lengths, for substantially the purposes set forth.

7. The combination with a ferry-bridge, of means for substantially counterbalancing the bridge, operating mechanism and flexible connections independent of said counterbalancing means and trained over appropriate portions of the operating mechanism, said connections being attached at one end to the bridge, and at the other ends supporting suitable weights, for substantially the purposes set forth.

8. The combination with a ferry-bridge, of means for substantially counterbalancing the same, operating mechanism, and means connected therewith for suspending the bridge for raising and lowering it, said means being independent of the counterbalancing means and under constant stress, tending to raise the bridge, for substantially the purposes set forth.

9. The combination of a bracket provided with fixed box-sections, said box-sections being arranged angularly of the bracket, a worm-shaft, a removable box-section for holding the worm-shaft in its bearing formed by the same and one of the said fixed box-sections, a worm-wheel and shaft, and a removable box-section for holding the shaft of the worm-wheel in its bearing formed by the same and the other said fixed box-section, for substantially the purposes set forth.

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

JOHN ANDERSON.

Witnesses:
S. L. MOODY,
GEO. L. WHEELOCK.