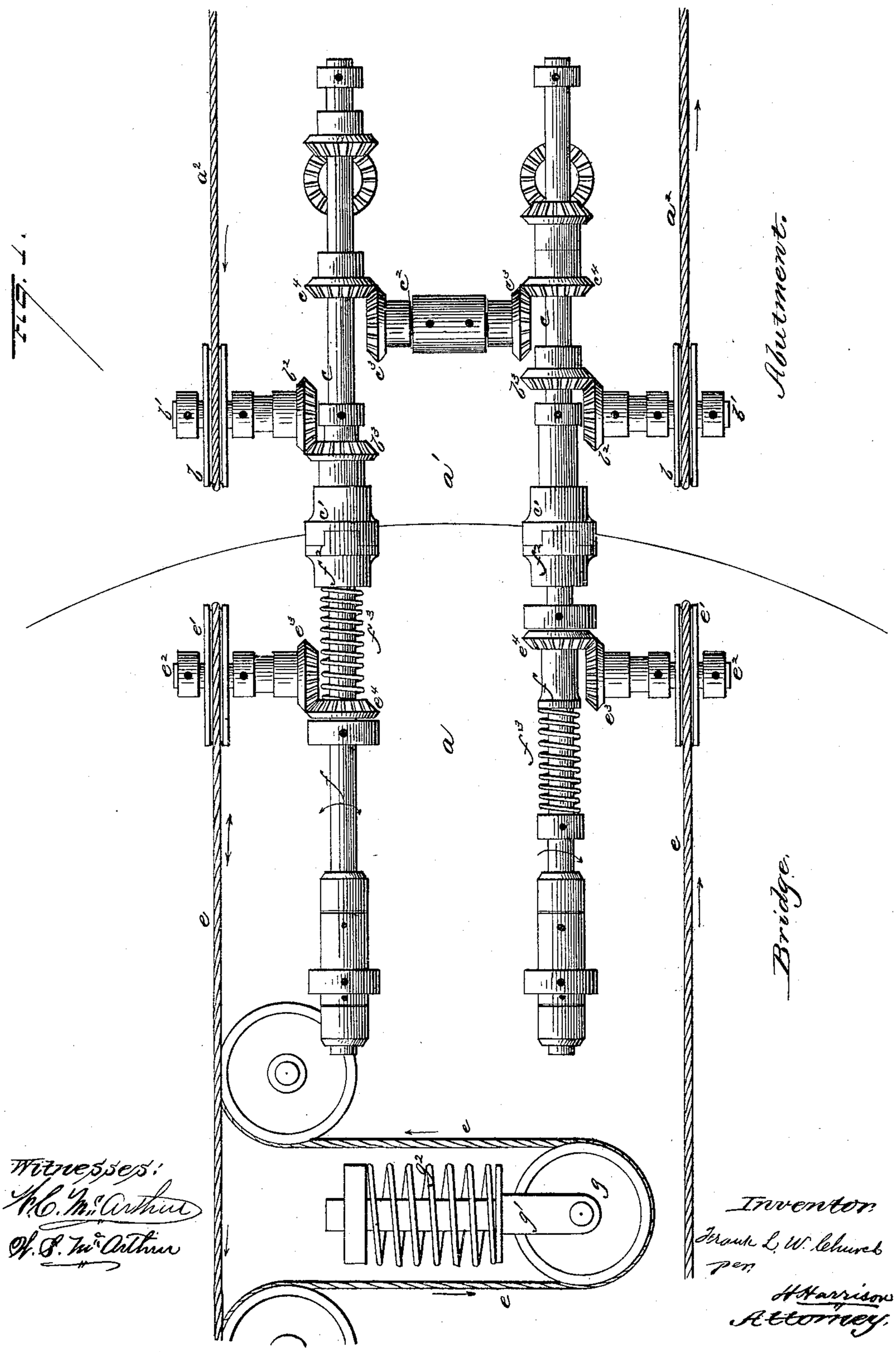
(No Model.) 4 Sheets—Sheet 1.

F. L. W. CHURCH.

TRACTION CABLE DEVICE FOR BRIDGES.

No. 372,402. Patented Nov. 1, 1887.



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(No Model.)

4 Sheets—Sheet 2.

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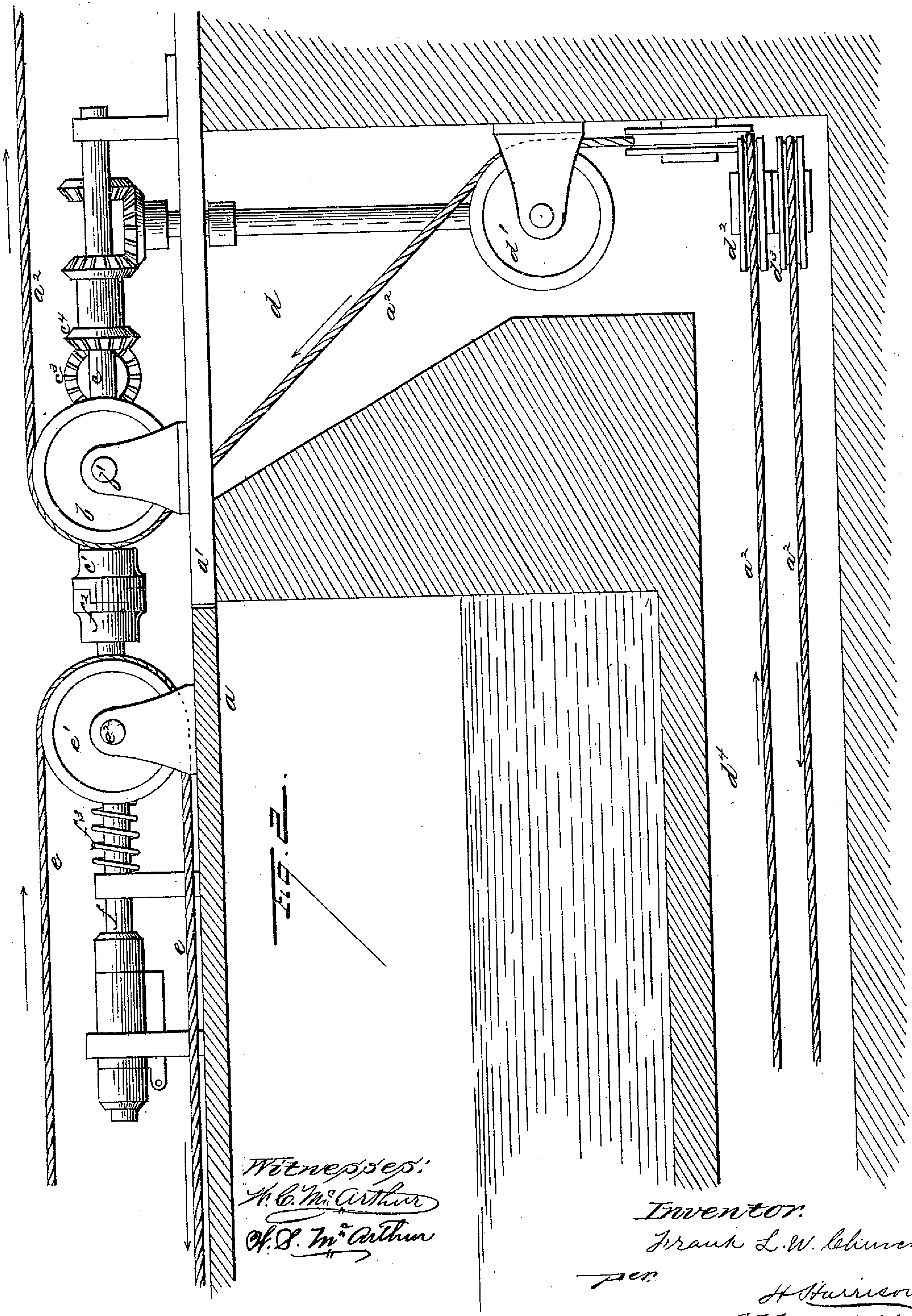

Fig. 2.

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TRACTION CABLE DEVICE FOR BRIDGES.

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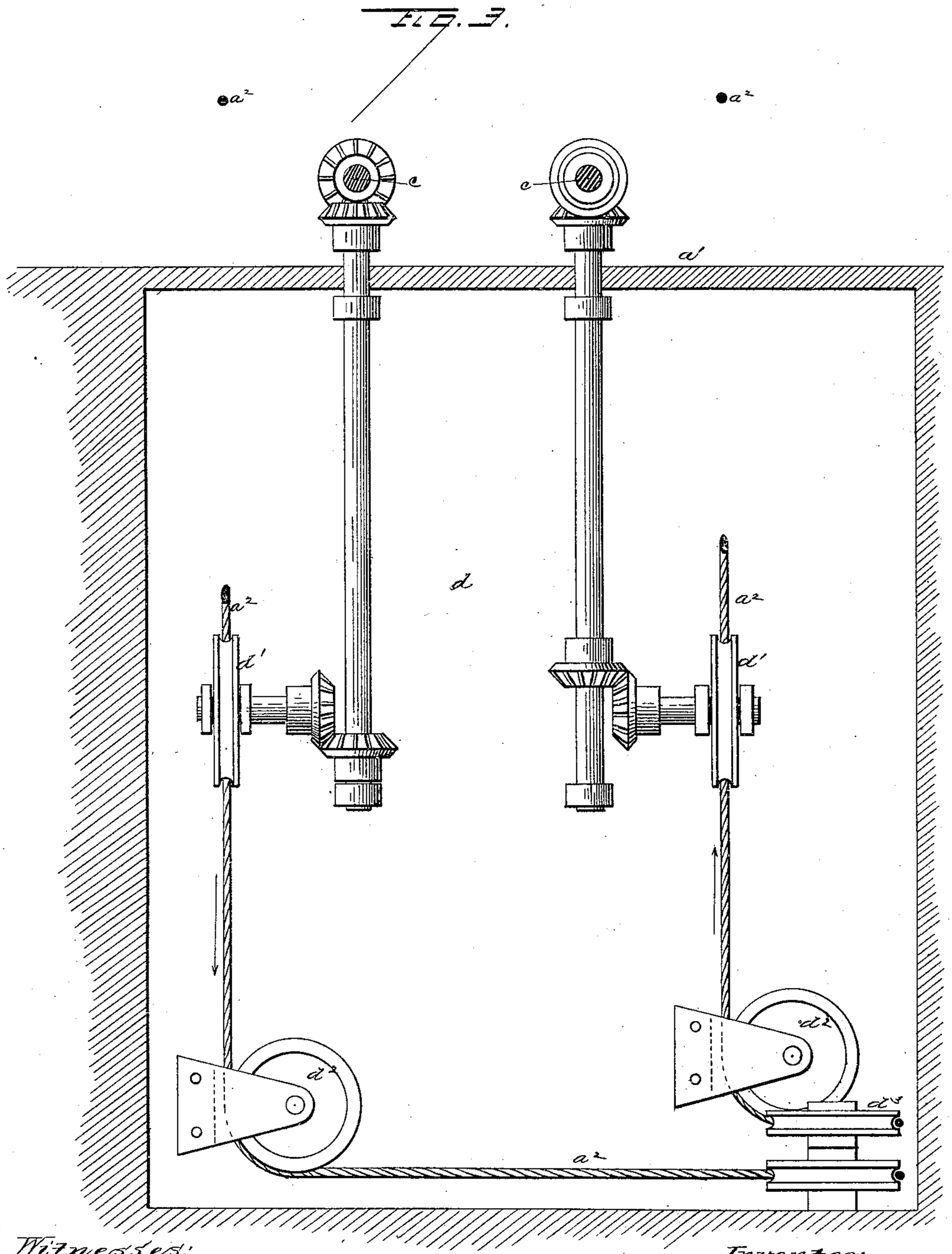
Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

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TRACTION CABLE DEVICE FOR BRIDGES.

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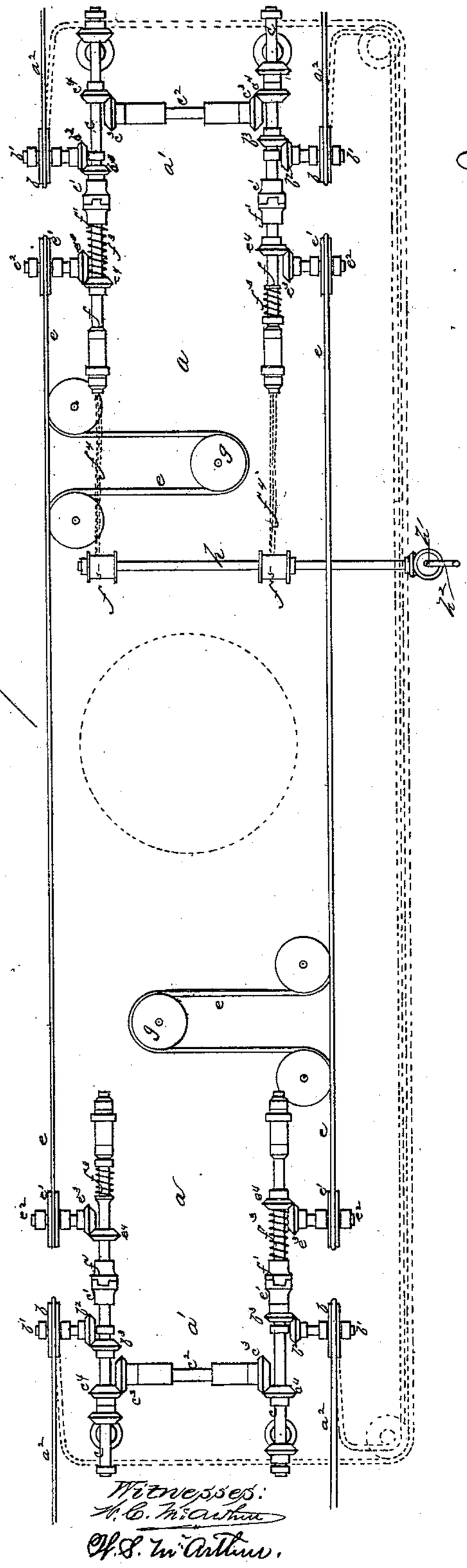

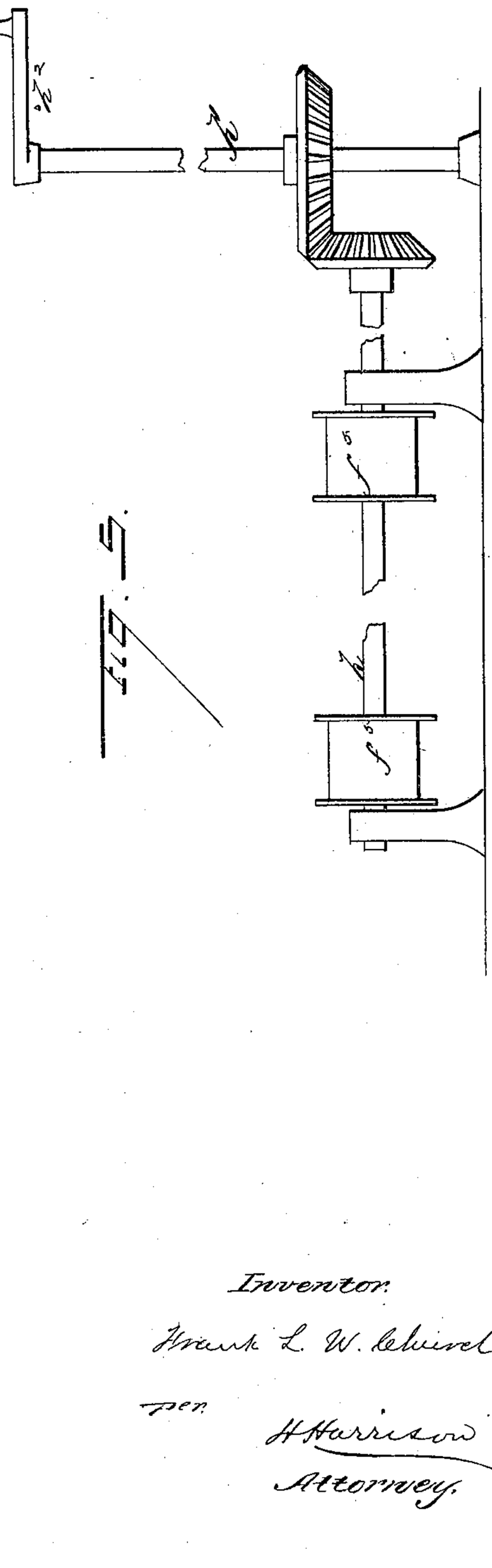

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UNITED STATES PATENT OFFICE.

FRANK L. W. CHURCH, OF CHICAGO, ILLINOIS.

TRACTION-CABLE DEVICE FOR BRIDGES.

SPECIFICATION forming part of Letters Patent No. 372,402, dated November 1, 1887.

Application filed February 12, 1886. Serial No. 191,694. (No model.)

To all whom it may concern:

Be it known that I, FRANK L. W. CHURCH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Traction-Cable Devices for Bridges, of which the following is a specification, to wit:

This invention relates to traction-cable devices for bridges; and it consists in certain peculiarities of the construction and arrangement of the same, substantially as will be hereinafter more fully set forth and claimed.

In order to enable others skilled in the art to which my invention pertains to make and use the same, I will now proceed to describe its construction and operation, referring to the accompanying drawings, in which—

Figure 1 is an enlarged plan view of one end of the bridge and its adjoining abutment. Fig. 2 is a vertical longitudinal section of the same, showing the cable mechanism in elevation. Fig. 3 is a vertical transverse section through the abutment. Fig. 4 is a plan view, on a smaller scale, of the whole bridge and its connecting street-abutments, showing more fully the mode of connecting the cable on both sides of the stream; and Fig. 5 is a detail view of the means for withdrawing the clutches.

a represents a draw-bridge of the usual swing variety, and *a'* are the street approaches or abutments, in which are laid traction cables a^2 in any of the usual or desired ways, as the means employed for laying and operating this cable is no part of my invention and may be varied indefinitely.

It is desirable in the operation of a cable system to run the cars across bridges and out upon both sides of the stream without the necessity for more than one driving-engine, and this has always been difficult in the case of draw-bridges, the opening of which will break the continuity of the street, and a continuous cable cannot therefore be passed across the draw. I avoid this difficulty as follows:

At the end of the abutment or street approach, and as close to the end of the draw as is found proper and convenient, I place two rollers or pulleys, *b*, over which the two parts of the endless cable run in opposite directions, as usual. These pulleys are secured upon short transverse shafts *b'*, suitably supported in brackets, and each of these shafts is also provided with a bevel-gear, b^2, which engages and operates a similar gear, b^3, secured upon longitudinal shafts *c*, as clearly seen in Fig. 1. These shafts are supported in any desired and suitable way, and are upon their ends, at the junction of the bridge and its abutment, provided with a clutch-faced disk, *c'*.

It will be at once understood that the motion of the main cable around the pulleys *b b* drives these pulleys, and hence their connected shafts and clutches, in opposite directions, according to the direction of the main cable, which thus acts as a driving-belt, for a purpose presently seen.

In rear of the grooved pulleys I have connected the shafts *c* by a cross-shaft, c^2, and gears c^3 c^4, so that they are compelled to run at the same speed, and this connection also serves to impart some of the power of one shaft to the other, should the adjacent driving-cable be so lifted away from its pulley by a passing car as to lessen its driving-power over said pulley.

By reference to Fig. 2 it will be seen that after passing over the pulleys *b* the two parts of the cable are carried downward and rearward in an excavation, *d*, formed in the approach, and around guide-pulleys *d' d²* d^3, which are properly located to direct the cable to and through a tunnel or shaft, d^4, which is formed beneath the bed of the stream, as shown. After passing entirely across, the arrangement of pulleys, &c., just described is exactly duplicated, to again lift the cable to the street, when it passes off in the same way it reached the opposite side. The geared shafts *c* and pulleys *b* are also duplicated here, and it will thus be at once seen that the cable actuated from any point by a stationary motor is passed beneath the stream and then out upon the opposite side as readily as it could be continued directly across if no break in the streetway were formed by the draw-bridge.

Upon the bridge are arranged two endless cables, *e e*, one for each track and running over suitable supporting-pulleys, *e' e'*, those at its ends being upon shafts e^2, which are run transversely of the track, and each provided with a gear, e^3, engaging a similar one, e^4, upon an adjacent longitudinal shaft, *f*, the forward ends of these shafts being also provided with clutch-

disks f^2, which engage with and are operated by the similar shafts upon the approach, which are aligned with those on the bridge. The shafts $f\,f$ are arranged to slide endwise in their supports, and are each provided with springs f^3, which hold them in engagement with their connections on the streetway.

It will be seen that the bridge is provided with the sliding clutch-shafts at both ends, and I prefer so to use them, though this is not necessary, as one set would serve the purpose of imparting motion to the bridge-cables, and two are only used to guard against accident by the breakage of one.

It will be observed that in order to provide for properly taking up the slack or stretch of the bridge-cables and enable them to always retain sufficient traction on their pulleys for proper operation, I carry the lower portion of each of these cables around a tension-pulley, g, which is supported in a forked shaft, g', sliding in suitable guides, and provided with a spring, g^2, which tends to force this pulley out into the bight or bend of the cable and take up any slack, while keeping the requisite tension upon it for proper working, as will be fully understood by reference to Fig. 1.

The sliding clutch-shafts $f\,f$ on the bridge are each connected by chains or ropes f^4 with winding-drums f^5 on a transverse shaft, h, located in any convenient position, preferably near the center of the draw, and this shaft is geared to a vertical operating-shaft, h', provided with a hand wheel or crank, h^2, by means of which the attendant may at any time withdraw the shafts for opening the draw-bridge. It will thus be seen that the main cable is carried beneath the stream and out upon both sides of the same in continuous working shape, while the independent cables on the bridge are driven from the main cable and are connected and disconnected at will. It will also be seen, that both ends of the bridge-abutments, being fitted alike with driving-connections, the draw may be readily swung without the necessity of turning it back again to make a proper connection to the main cable.

The cable-tunnel beneath the river is preferably of sufficient size to permit the passage of a person for its inspection and repair, and the chamber leading from this tunnel to the surface is shown as inclined backward from the face of the abutment, in order that the latter may not be unduly weakened, as will be evident at a glance. This construction of bridge-cables is readily applied to any existing bridge without material change, and does not render necessary the construction of a special bridge, nor in any way interfere with its proper and rapid operation. I have here shown the bridge-cables as geared to run at the same speed as the main one; but in many cases it will be advisable to gear the short ones down to a slower speed, which is of course readily done without change except in the relative size of the gears used.

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

1. In a traction-cable system, a main cable passed through a shaft or tunnel beneath the stream and carried to the surface and extended upon each side of the stream over suitable guide-pulleys, a draw-bridge, an auxiliary cable thereon, and a clutch interposed between the main and auxiliary cables, whereby the latter is detachably connected with and driven by the former, substantially as and for the purpose set forth.

2. In a traction-cable system, the combination, with an endless cable extending continuously on each side of the stream, and a pair of pulleys, over which said cables run, and a draw-bridge carrying a traction-cable thereon, of a spring-actuated tension-pulley, around which said cable is carried to take up slack and insure a proper tension, substantially as and for the purpose described.

3. In a traction-cable system, the combination, with a street or way and a main cable laid therein, of a draw-bridge, an auxiliary cable thereon, and a clutch interposed between the main and auxiliary cables, whereby the latter is detachably connected with and driven by the former, substantially as and for the purpose set forth.

4. In a traction-cable system, a streetway provided with a main cable carried beneath and operated continuously upon each side of a stream, and a pair of driving-shafts geared to and driven by the cable and provided with clutch-faces, in combination with a draw-bridge provided with a pair of auxiliary cables and a pair of driving-shafts geared thereto, and shifting-clutches on said shafts, connected by suitable operating devices with a point upon the bridge in easy reach of the attendant, for throwing these clutches into and out of engagement with those on the streetway, substantially as and for the purpose set forth.

5. In a traction-cable system, the combination, with a bridge and a traction-cable thereon, of a spring-actuated tension-pulley, around which said cable is carried to take up slack and insure a proper tension, substantially as and for the purpose set forth.

6. In a traction-cable system, the combination, with an endless cable extended continuously on each side of a stream, and a pair of pulleys, over which said cable runs, geared to a pair of shafts for operating a separate bridge-cable, of a connecting-shaft between said driving-shafts, whereby the latter are always made to run at an even speed and with precision under varying conditions, substantially as and for the purpose set forth.

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

FRANK L. W. CHURCH.

Witnesses:
W. C. McARTHUR,
W. S. McARTHUR.