7 Sheets—Sheet 1.

J. POUCHET & G. SAUTEREAU.

Lock and Lock Gate for Canals, &c.

No. 227,831. **Patented May 18, 1880.**

Fig: 1

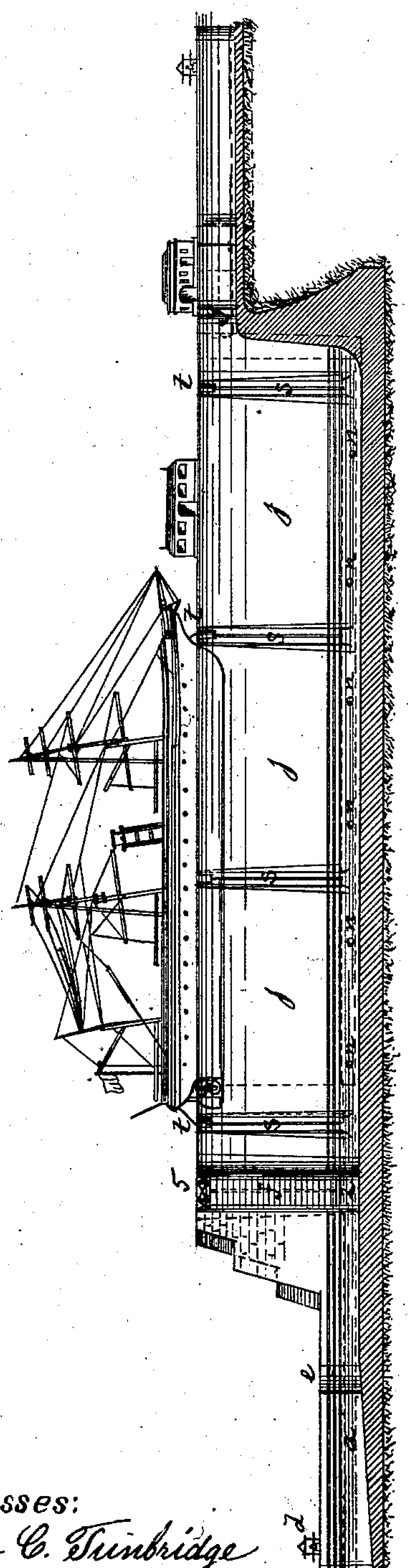
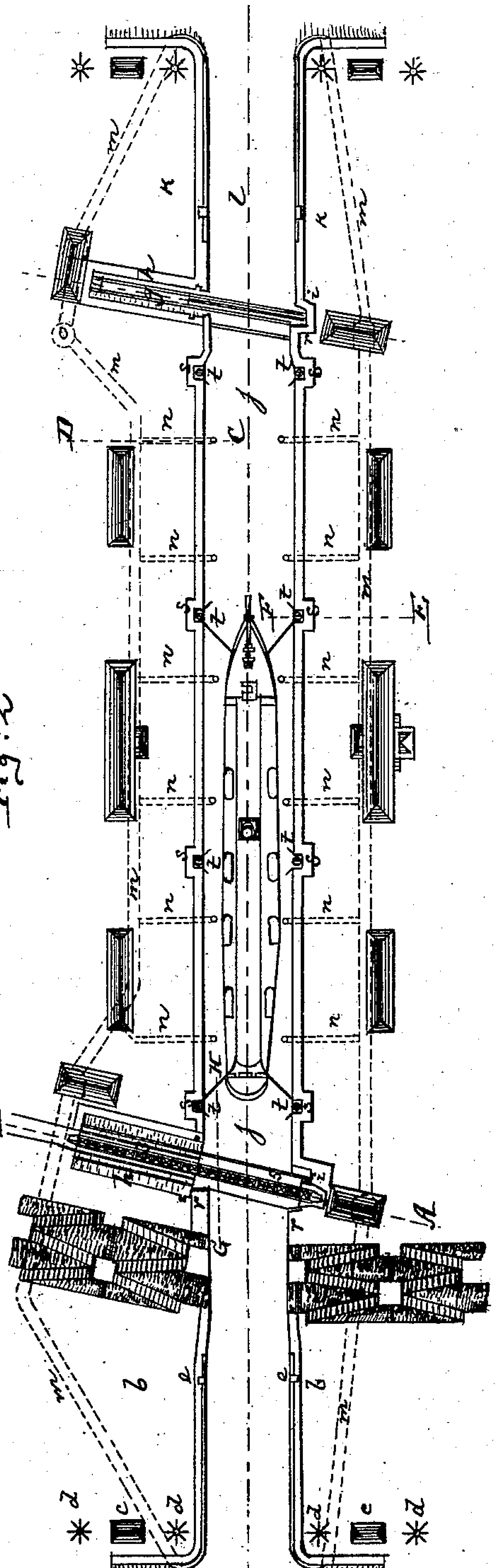


Fig: 2



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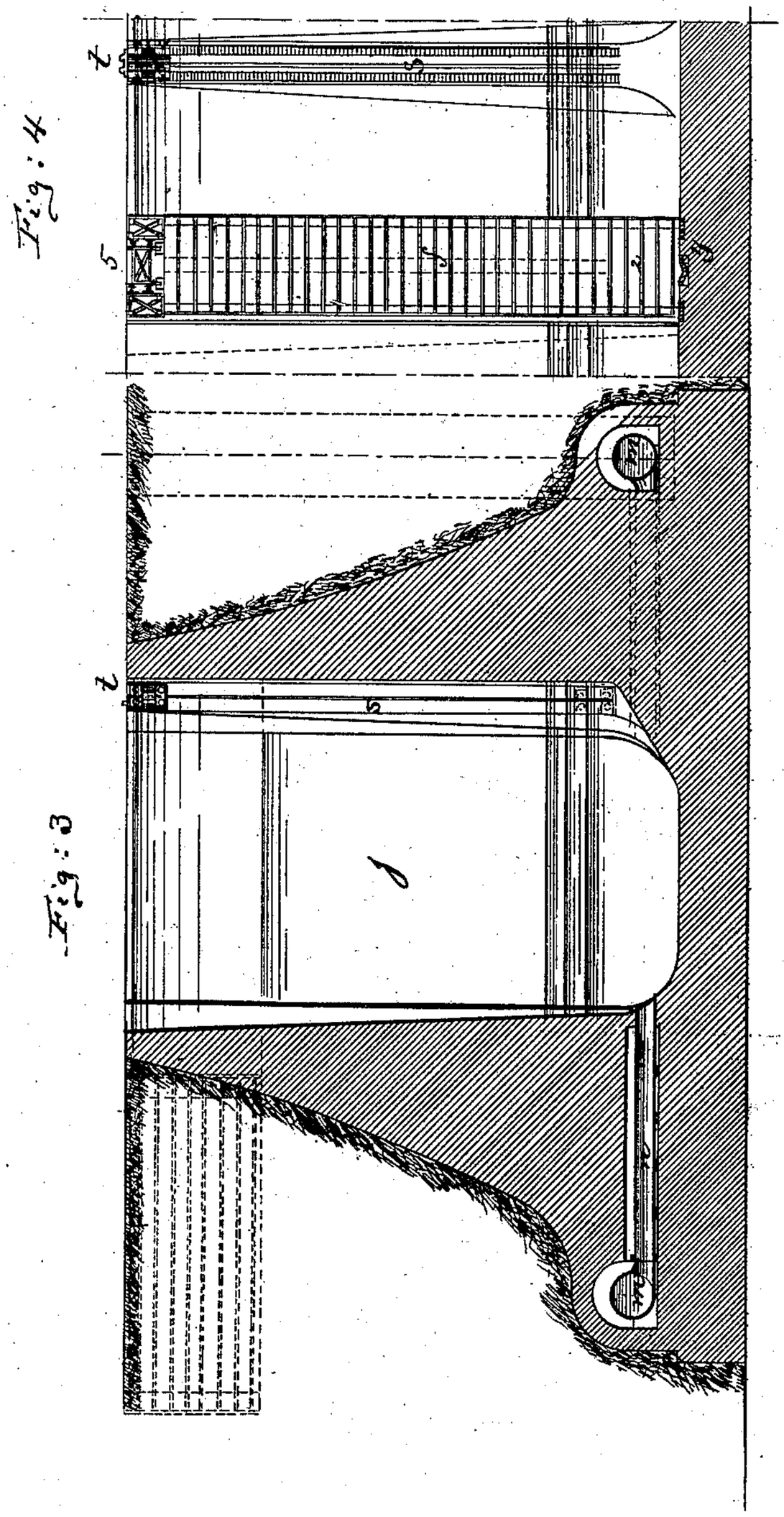

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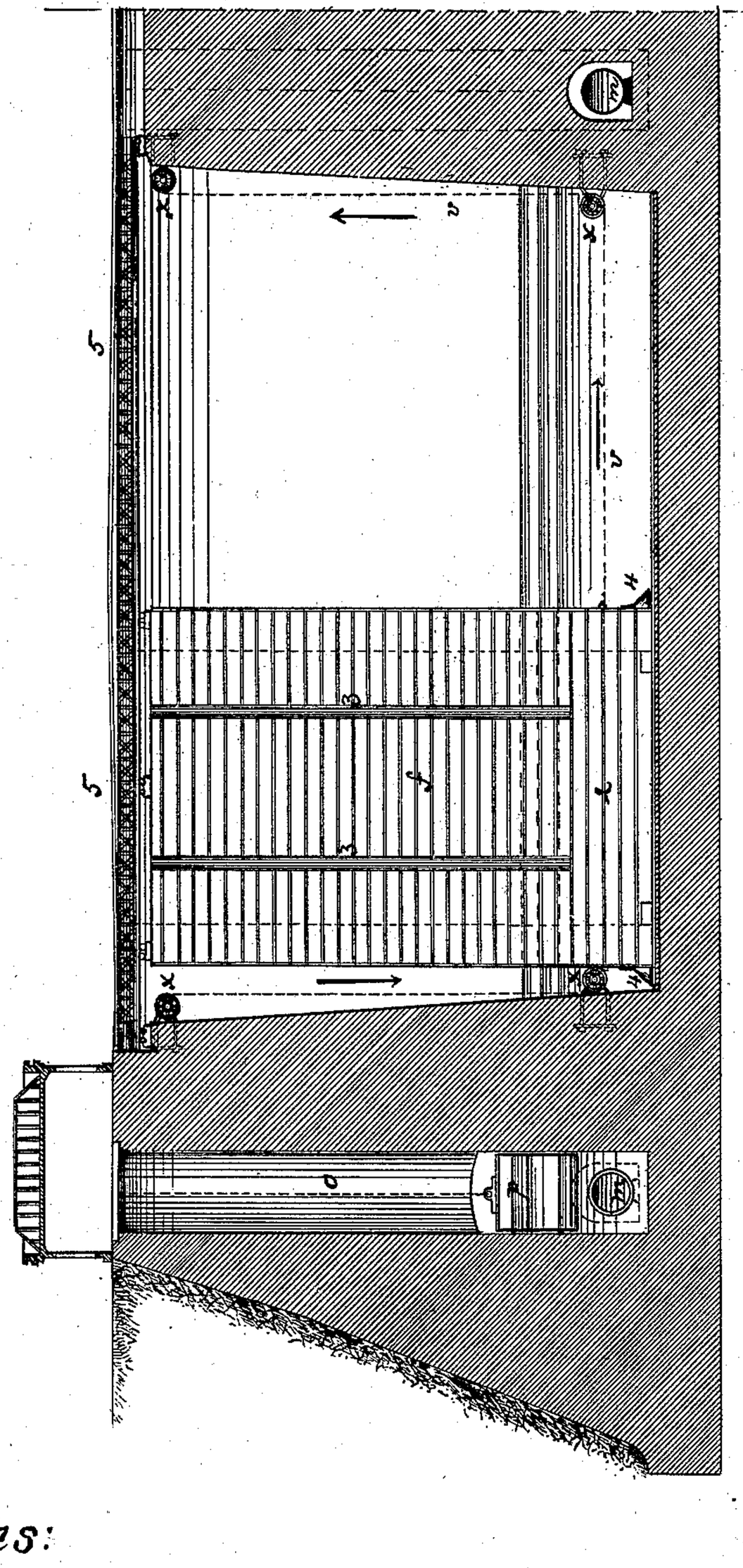
Fig. 5.



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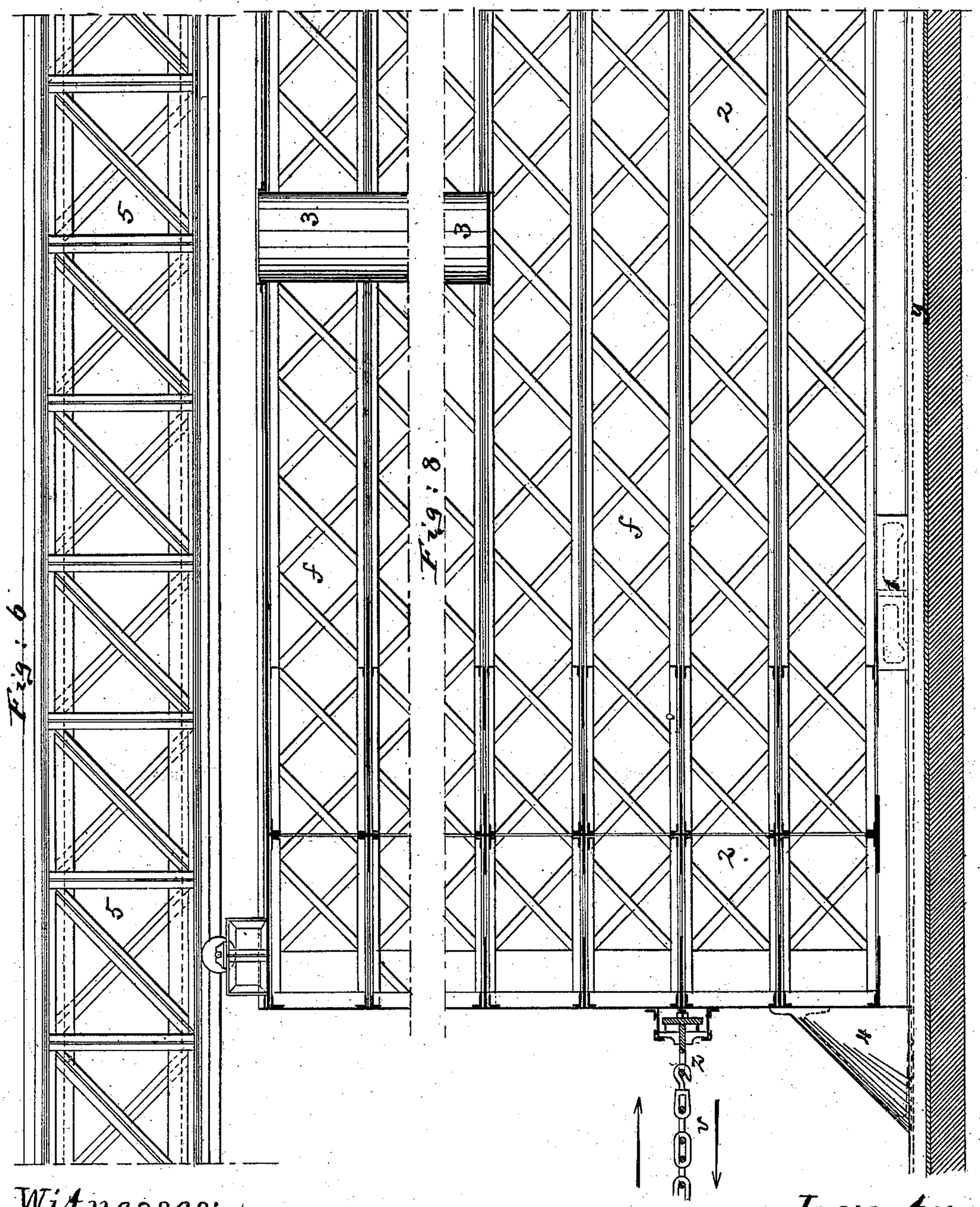

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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Fig: 7

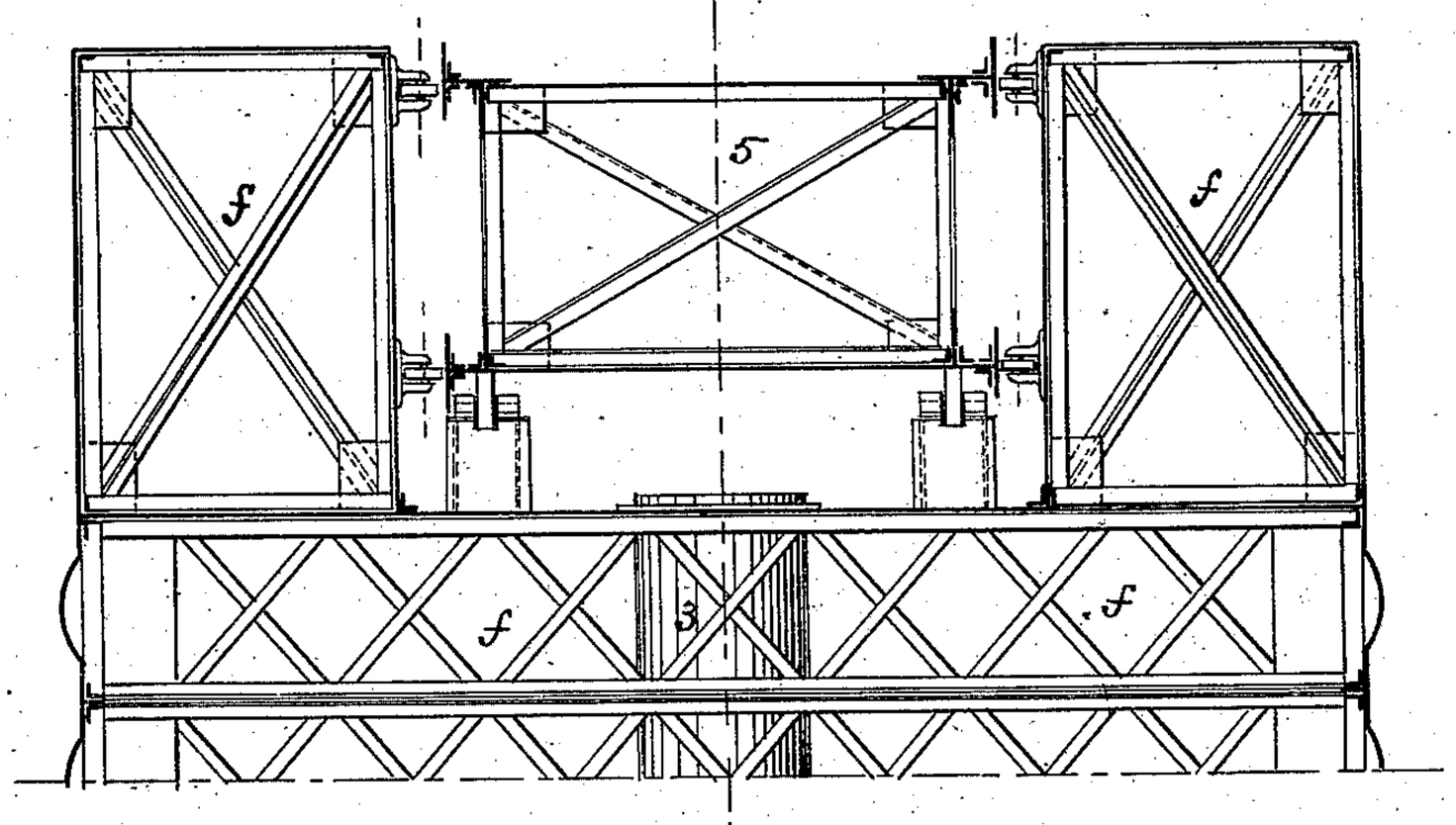
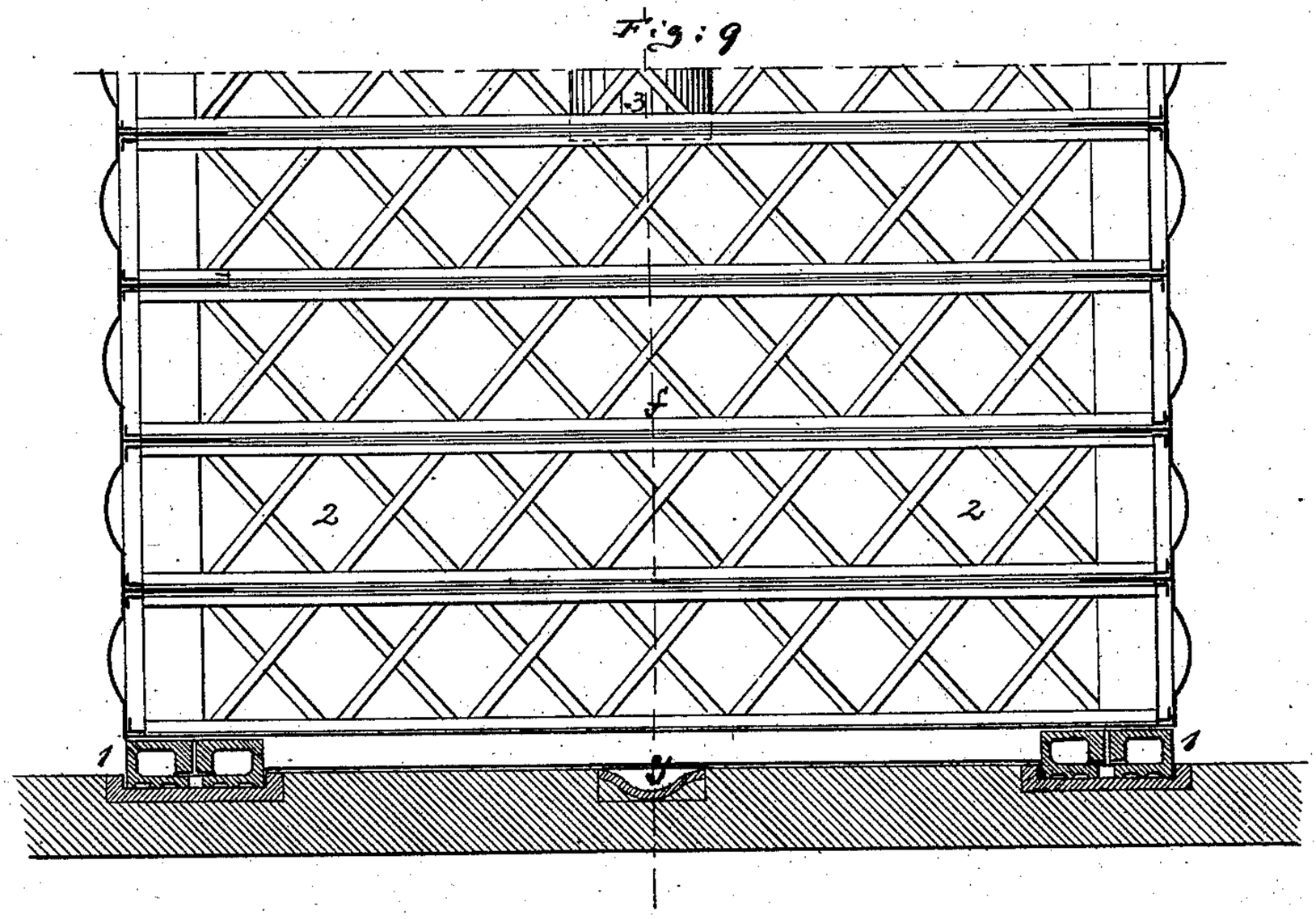


Fig: 9



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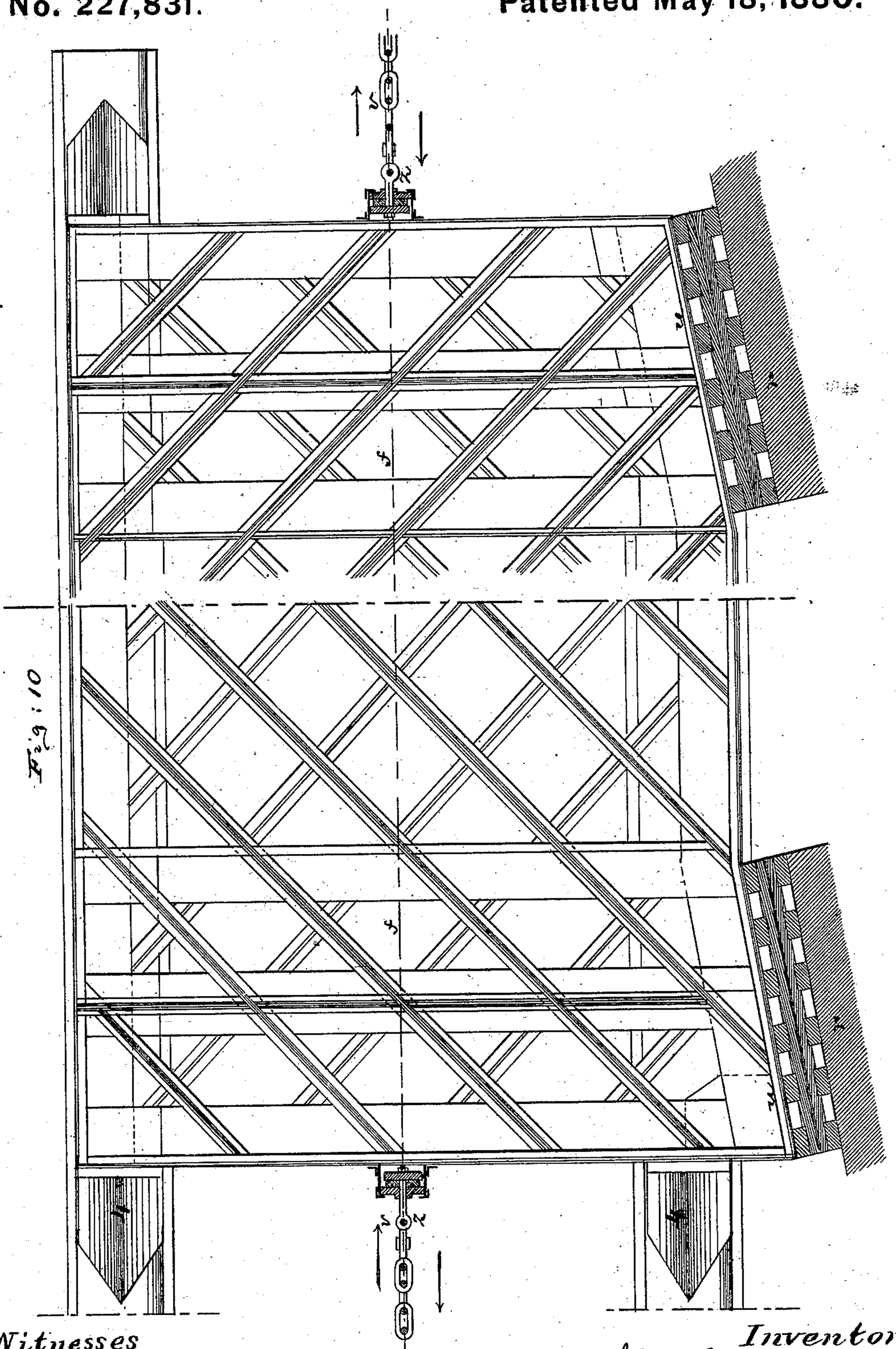

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Fig: 11

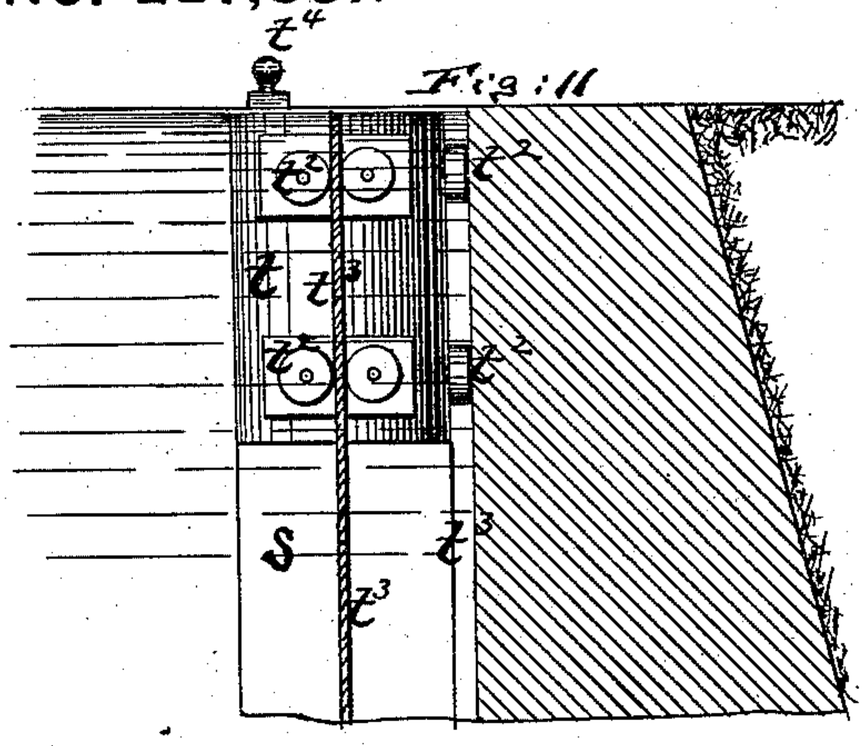


Fig: 12

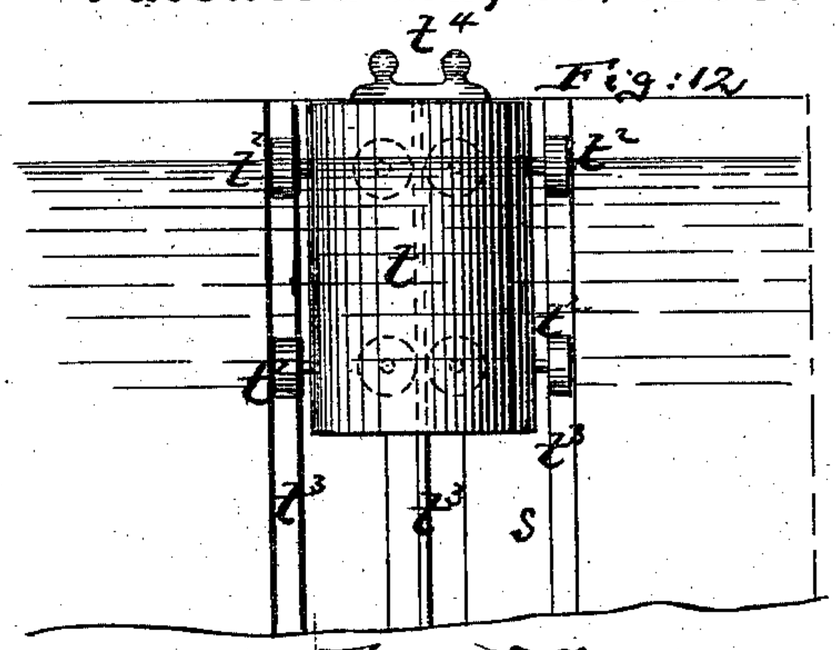


Fig: 13

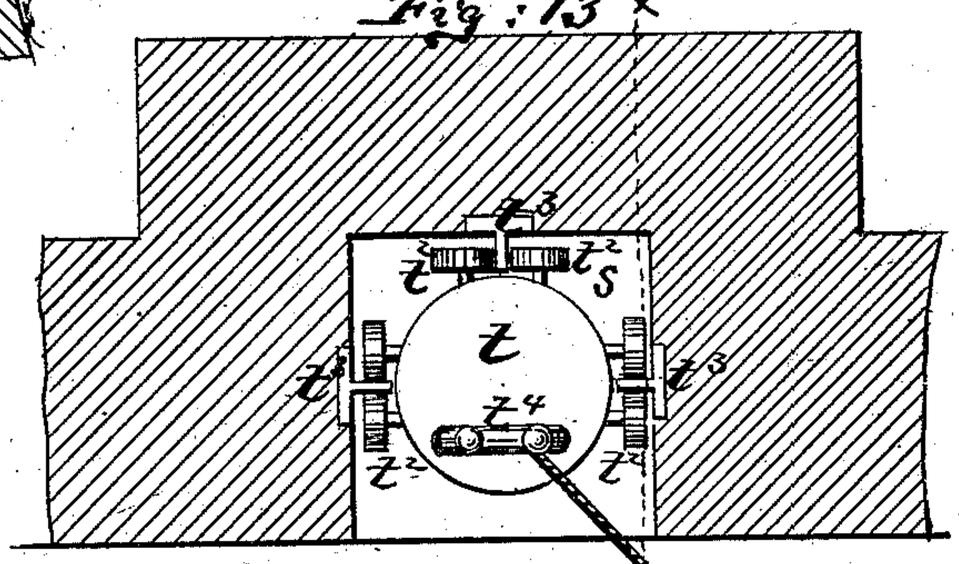


Fig: 14

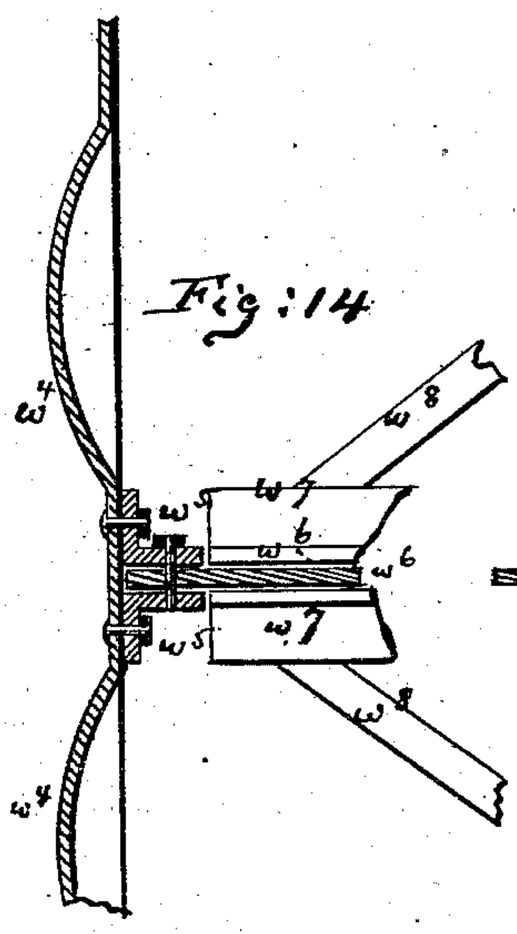
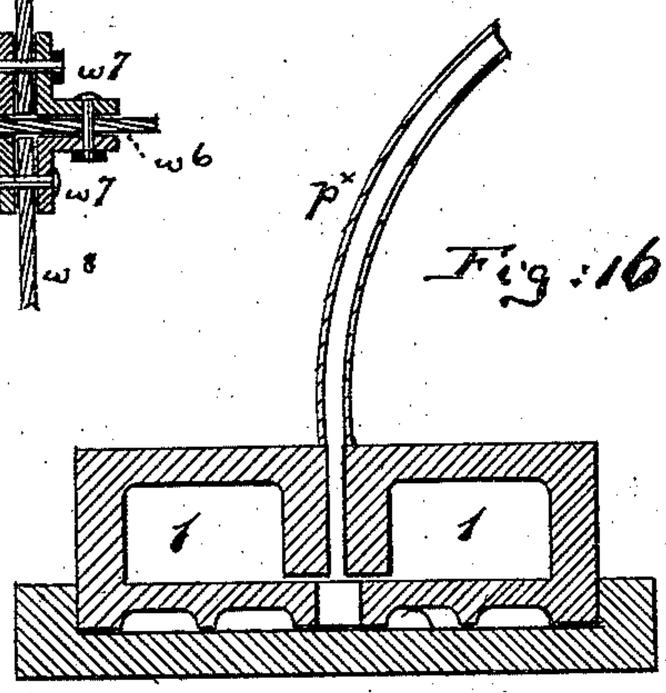
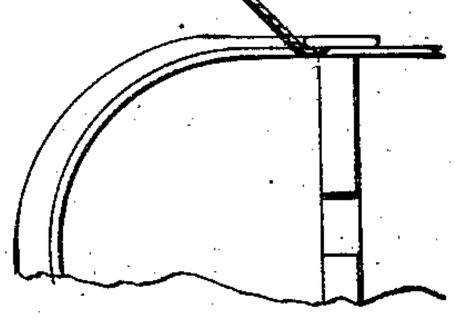


Fig: 15

Fig: 16





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UNITED STATES PATENT OFFICE.

JAMES POUCHET, OF PARIS, AND GUSTAVE SAUTEREAU, OF CHABRIS, FRANCE.

LOCK AND LOCK-GATE FOR CANALS, &c.

SPECIFICATION forming part of Letters Patent No. 227,831, dated May 18, 1880.

Application filed July 28, 1879. Patented in France February 12, 1877.

To all whom it may concern:

Be it known that we, JAMES POUCHET, of Paris, France, civil engineer, and GUSTAVE SAUTEREAU, of Chabris, Department of Indre, France, civil engineer, have invented Improvements in Locks and Lock-Gates for Canals, Docks, Harbors, and Navigable Rivers, of which the following is a specification.

This invention relates to a novel construction of locks used in canal and river navigation, and has for its object, principally, to enable a far greater lift to be obtained with a single lock or small number of locks than was heretofore possible.

The invention consists, first, in replacing the ordinary gates of a canal-lock by a sliding gate or gates of peculiar kind, in combination with a lock-chamber having one or more gate-chambers nearly at right angles to the lock, to receive such sliding gate or gates when opened; also, in combining said sliding gates with draft-chains, and in other details of improvement hereinafter more fully pointed out.

In the accompanying sheets of drawings, Figure 1 is a longitudinal vertical section of a canal-lock provided with our improvement. Fig. 2 is a plan view thereof. These two figures are drawn on a smaller scale than the other figures. Fig. 3 is a vertical transverse section, partly on the line C D and partly on the line E F of Fig. 2. Fig. 4 is a vertical transverse section of the tail-gate on the line G H, Fig. 2. Fig. 5 is a vertical transverse section of the lock on the line A B, Fig. 2, showing the large tail-gate closed. Figs. 6 and 7 are respectively vertical longitudinal and transverse sections, on an enlarged scale, of the upper part of the tail-gate with its girder-guide. Figs. 8 and 9 are respectively vertical longitudinal and transverse sections of the tail-gate and its supports. Fig. 10 is a horizontal section of the end portions of the same.

Similar letters of reference indicate corresponding parts in all the figures.

The letter *a* represents the tail-bay. *j* is the lock-chamber, and *l* the head-bay. *f* is the tail-gate, and *g* the head-gate. Instead of employing but one tail-gate and one head-gate, several such gates may be employed if it is desired to divide the lift.

The gates *f g* may be of the same construction or of different construction. We shall only describe the tail-gate *f;* but it is understood that the head-gate may be constructed similar thereto, or may be a hinged gate of the kind heretofore generally used.

The gate *f* is a sliding gate, which extends across the end of the lock-chamber when closed, while when the lock is to be opened the gate *f* is slid into a chamber, *h*, which is situated at one side of the lock-chamber and projects at nearly right angles therefrom. On that side of the canal-lock which is opposite the gate-chamber *h* is a small chamber or recess, *i*, to receive the end of the gate when the lock-chamber *j* is closed. The gate-chamber *h* is large enough to completely contain the gate *f*, and admits of being closed to form a dry-dock for repairing said gate.

We prefer to place the chamber *h* at an angle of about eighty degrees to the side of the lock-chamber. By beveling the contact-surfaces at an angle of about ten degrees to the gate they will be perpendicular to the longitudinal axis of the lock, and the resultant of the pressure upon the masonry will always be parallel to the said axis.

The gate *f* is made in the form of a rectangular parallelopiped. It is constructed preferably of superposed horizontal lattice-girders alternating with horizontal beams, to which the water-resisting surfaces are firmly secured, as indicated in Fig. 9. The gate contains an air-chamber, 2, at the bottom, to which upwardly-extending cylindrical shafts 3 give access. The gate may be mounted on wheels or rollers; but in the construction shown in the drawings, which is particularly applicable to gates of large dimensions, we have shown the gate to be mounted on four skids or shoes, 1, which are very clearly shown in Fig. 9. These shoes are hollowed underneath to contain water, which is forced into the grooves below at a high pressure, so as to slightly raise the gate before motion is imparted to it and assist in easing its motion.

4 4 are large metallic-pointed scrapers at-

tached to the ends of the gate near the lower edge, to clear the guideways of the skids from stones or matter deposited in the water. The gate should also be provided upon the inner face, above the level of the air-chamber, with apertures for the inlet and exit of water, in order that it may be always sufficiently weighted to prevent its lifting while the lock is being filled.

In order to insure the water-tight closure of the lock when the gate is closed, we provide the gate *f* with two beveled contact-faces, *u*, which come against and make tight joints with similarly-beveled seats or surfaces *r* on the side walls of the lock. (See Fig. 10.) These beveled faces allow the gate to slide freely to and fro, and at the same time insure the water-tight closing of the gate. The beveled contact-faces *u r* are preferably provided with wooden planks possessing a certain amount of elasticity.

The gate *f* is moved backward and forward by means of chains *v*, which are attached to its base, Fig. 5, passing around guide-pulleys *x*, and are then connected to a suitable capstan or motor. Such a motor may be set into motion by the water in the head-bay. The gate is opened or closed by hauling one of the chains *v* and slacking the other chain. When the gate is drawn back into its chamber *h* the chain which passes across the lock is slackened, so as to allow it to sink into a gutter or channel, *y*, Figs. 8 and 9, which is sunk into the floor of the lock and extends transversely across the same. In this manner the chain will be protected from damage should the vessel touch the bottom of the lock.

Each of the chains *v* is attached to a swivel, *z*, Fig. 8, which has an enlargement or head that is inclosed within a box. Between this head and the box is an elastic cushion, which serves to diminish the strain while starting and stopping the gate.

5 is a girder-guide extending above the gate *f*, across the lock, and also across the chamber *h*, Fig. 5. The object of this girder is to form a guide for the upper edge of the gate when closing and opening the same. When the gate is to be opened the girder-guide is withdrawn into a chamber forming a continuation of the upper part of the gate-chamber *h*. If the gate is to be closed, the girder-guide is first moved across the lock until its end is received in a niche made in the side wall at the upper part of the recess *i*. By this means the gate can be closed even during a high wind, which would otherwise be liable to upset it.

In order to allow communication to be established between the lock-chamber and either the head or tail bay, or between the head and tail bays, culverts *m m* are embedded within the side walls of the lock-chamber, which connect by branch culverts *n n* with the lock-chamber and the tail and head bays. These culverts are placed on a level with the floor of the lock-chamber, and are laid at a suitable gradient. The main culverts *m m* are each connected with wells *o*, containing sluice-valves *p p*, to which access is had from the quay for filling and emptying the lock or for affording a passage for the water from the head to the tail bay without passing through the lock.

For mooring a vessel in the lock we form in the wall of the lock, at opposite points, eight (more or less) vertical channels or grooves, *s s*, into which are placed vertical guides or ribs, Figs. 1–4. Between these guides floats or pontons *t*, which are hollow floats or blocks of suitable form, lighter than water, are free to move up and down. These floats rest always on the surface of the water, and rise or fall with the varying height of the water.

To the floats *t* are attached the bitts of the mooring-cables, the other end of said cables being attached to the vessel in the lock. In this way, and as the floats *t* will always be on a level with the vessel, the mooring-cables will always be taut, and will never require to be lengthened or shortened during the rising or descent of the vessel, as was heretofore necessary when the bitts of the mooring-cables were attached to fixed holds.

The floats *t* are preferably provided at top and bottom with guide-rollers having the requisite amount of play, so as to prevent jamming, and at the same time to retain the floats in their guides.

In Figs. 1 and 2, *b b* represent the quays. *c* are windlasses, and *d* capstans.

With the above-described canal-lock Lake Nicaragua may be connected with the adjoining oceans by a single lock, while with the system heretofore used from seven to twelve locks would be deemed necessary. For a canal-lock of this magnitude the following dimensions should be employed: Length of lock-chamber, two hundred meters; breadth of gates, twenty meters; mean lift, thirty-two meters eighty centimeters; mean depth of water on the tail miter-sill, eight meters twenty-five centimeters.

In Figs. 11, 12, and 13 we have given enlarged detail views of the grooves *s* with their guides and pontons *t*.

Fig. 13 is a top view of the ponton within the groove *s* of the wall. Fig. 11 is a cross-section on line *x x* of Fig. 13, and Fig. 12 is a face view of the ponton in the groove.

The ponton is represented as of cylindrical form and provided with three sets of friction-rollers, t^2 t^2, that straddle three ribs, t^3 t^3, which are fixed in the grooved portion of the wall. Thus the ponton is free to move up and down, but not permitted any lateral motion.

The moving bitt t^4 is securely affixed to the top of the ponton.

In Fig. 14 we have given an enlarged sectional view, showing the manner of securing the water-resisting surface or plates w^4 of the

gate by inner brackets, w^5, to the horizontal beams w^6, suitable connecting-rivets being employed.

Fig. 15 is an enlarged cross-section of the beam w^6, showing how it connects by the strengthening-brackets w^7 with the trestle-work w^8.

Fig. 16 shows an enlarged section of one of the shoes, 1, and the pipe $p^\times$ for supplying the inner and the grooved lower surface thereof with water under pressure. The pipe leads to a suitable machine for forcing water into and through it and into the grooves below at a high pressure, so as to slightly raise the gate before it is moved horizontally, and thereby to ease the motion.

We claim—

1. In a canal-lock having laterally-projecting gate-chambers *h*, one or more sliding gates, *f g*, combined each with a pair of draft-chains, *v v*, for operation substantially as herein shown and described.

2. In a canal-lock having one or more laterally-sliding gates which are moved by chains, the gutters *y* in the floor of the lock for receiving the slack chains when the gates are opened, substantially as herein shown and described.

3. The sliding canal-gate *f*, constructed with air-chamber 2 and shaft or shafts 3, substantially as herein shown and described.

4. The sliding canal-gate *f*, constructed and combined with the scraper 4, substantially as herein shown and described.

5. The sliding canal-gate *f*, combined with hollow shoes and with air-chamber 2, substantially as herein shown and described.

6. The movable girder-guide 5, combined with the sliding canal-gate *f*, substantially as herein shown and described.

7. In a canal-lock, the lock-chamber *j*, having recesses *s*, in combination with pontons or floats *t*, which carry the bitts for the mooring-cables within said recesses, substantially as herein shown and described.

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