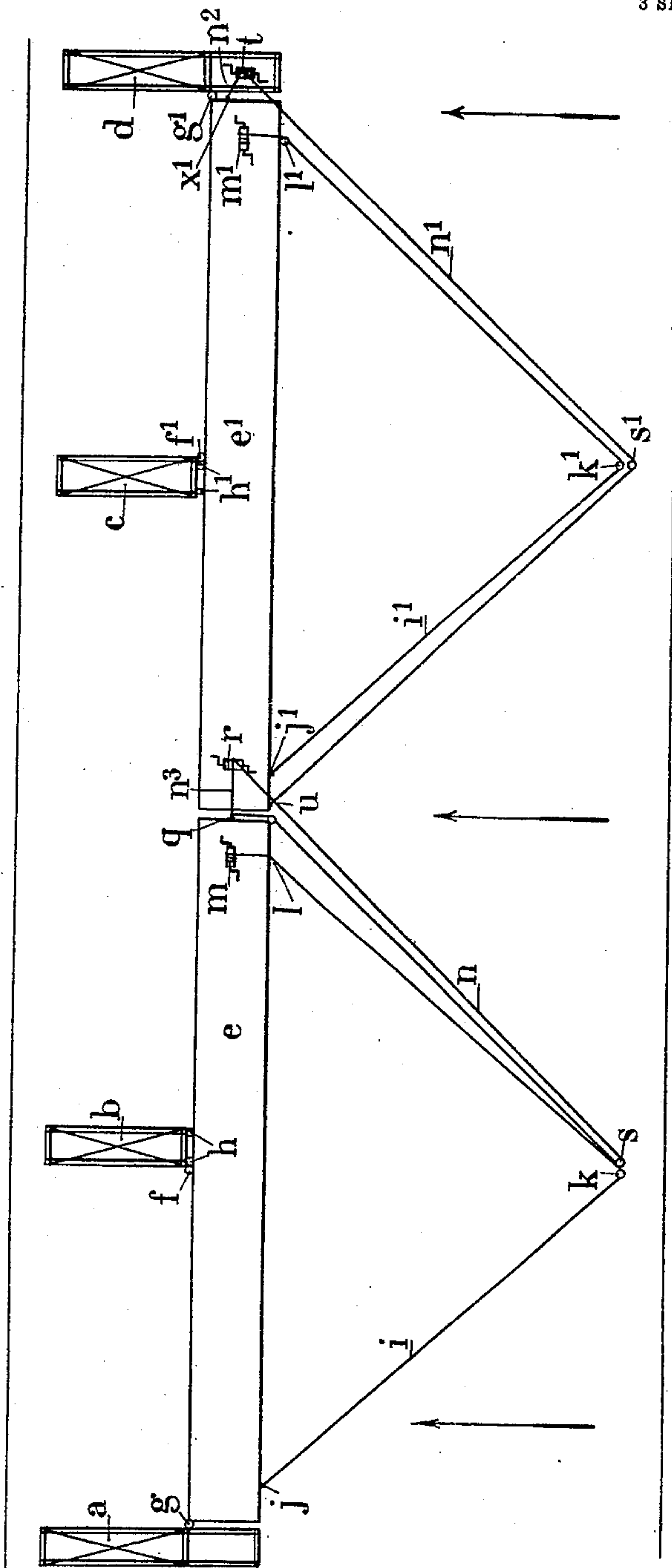


E. M. AUDOUIN.
MOVABLE BARRAGE HAVING ROTARY SLUICE PONTOONS.
APPLICATION FILED JUNE 26, 1907.

907,437.

Patented Dec. 22, 1908.
3 SHEETS—SHEET 1.

Fig. 1.



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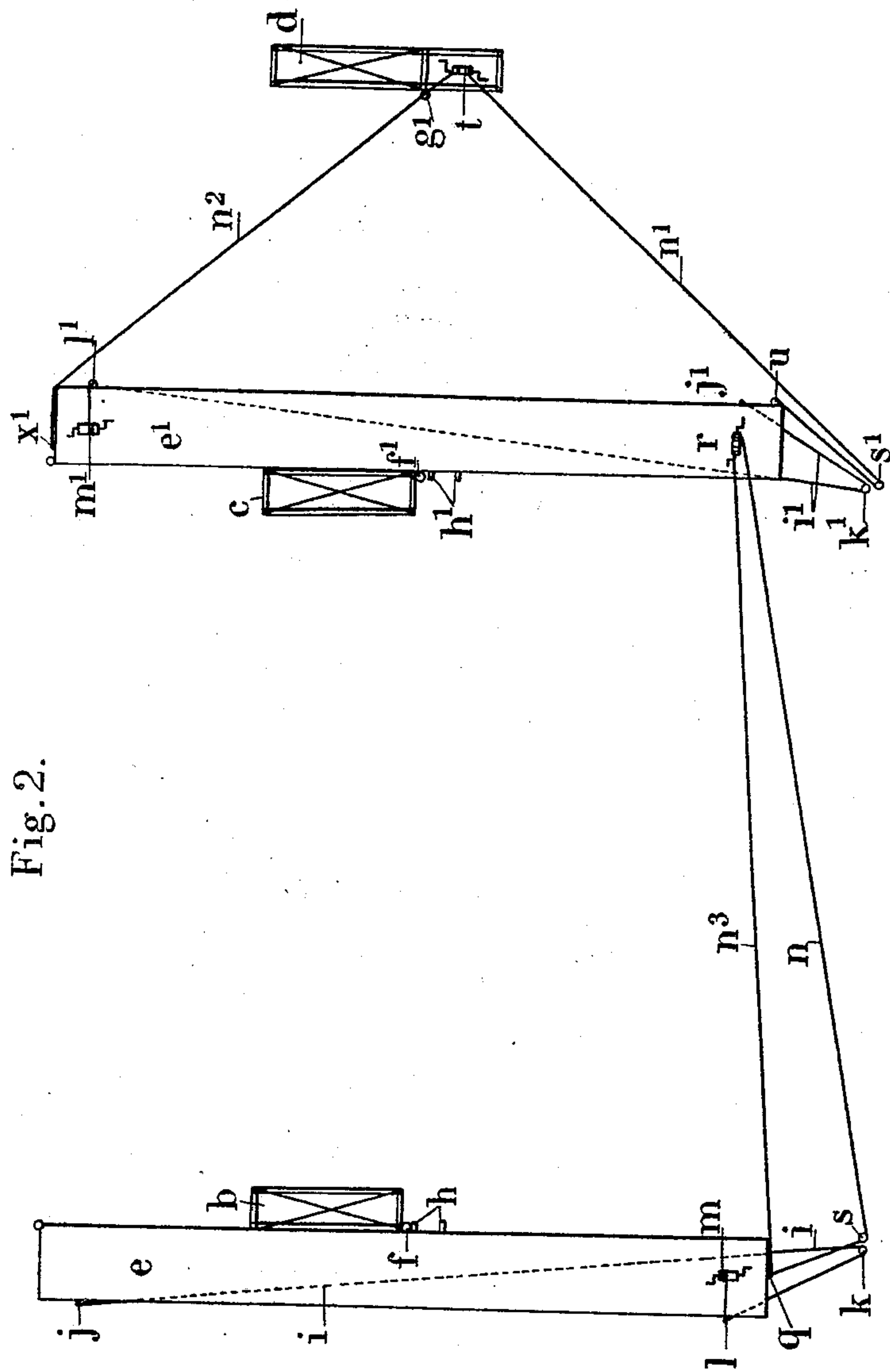
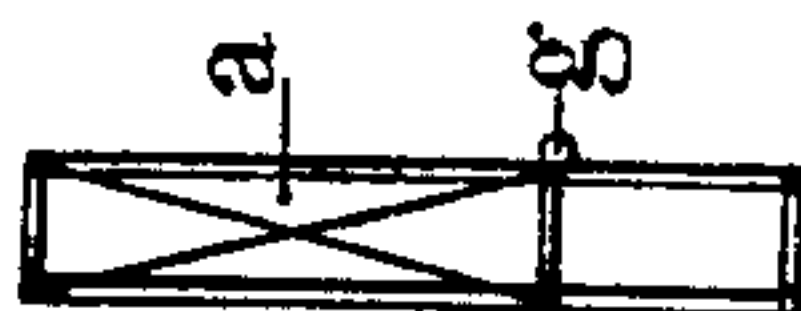


Fig. 2.

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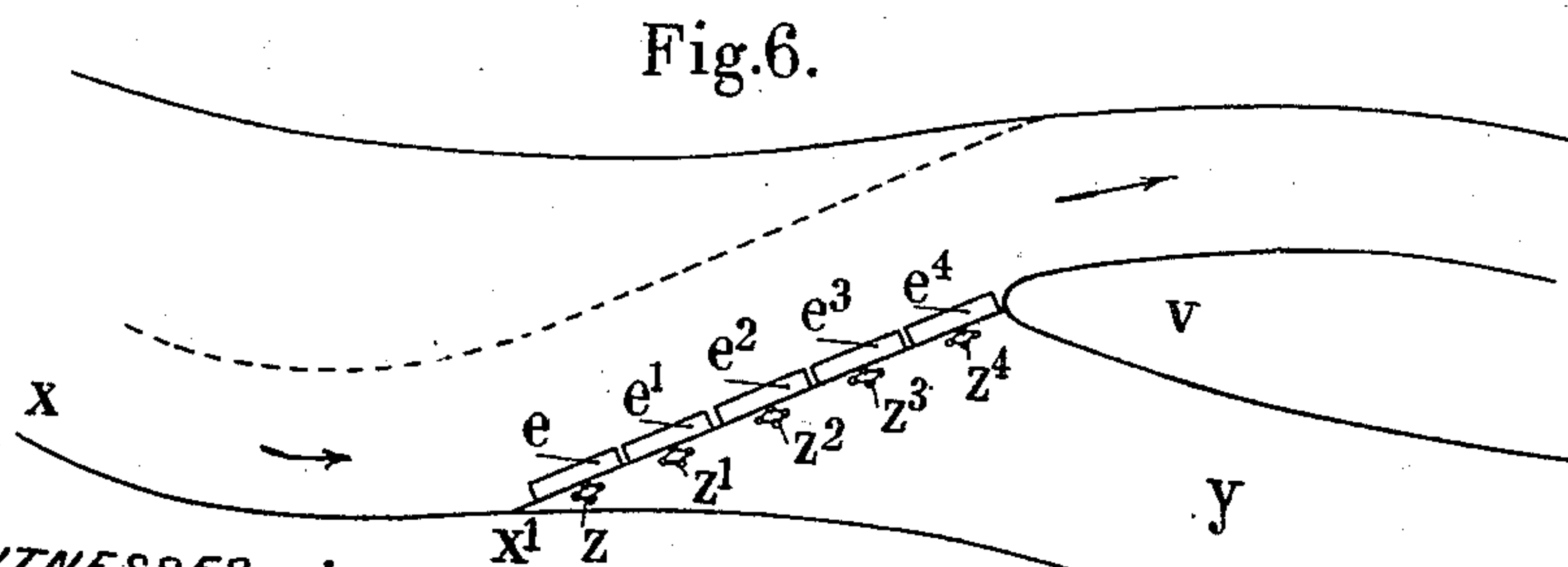
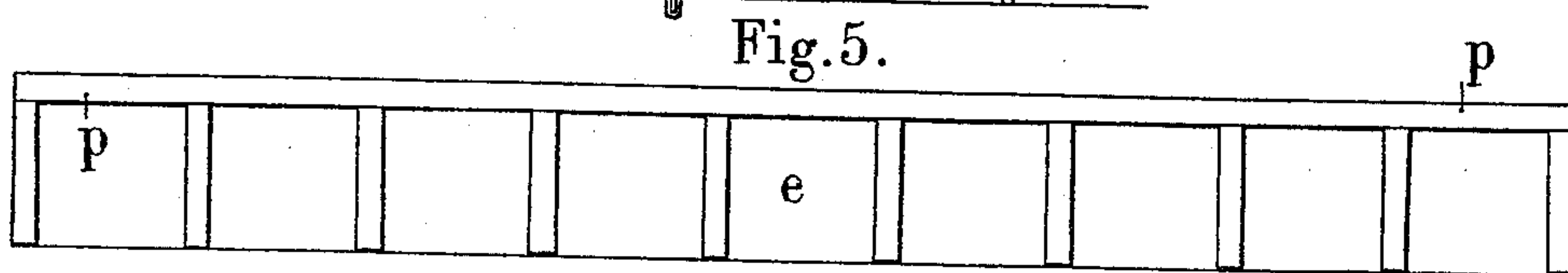
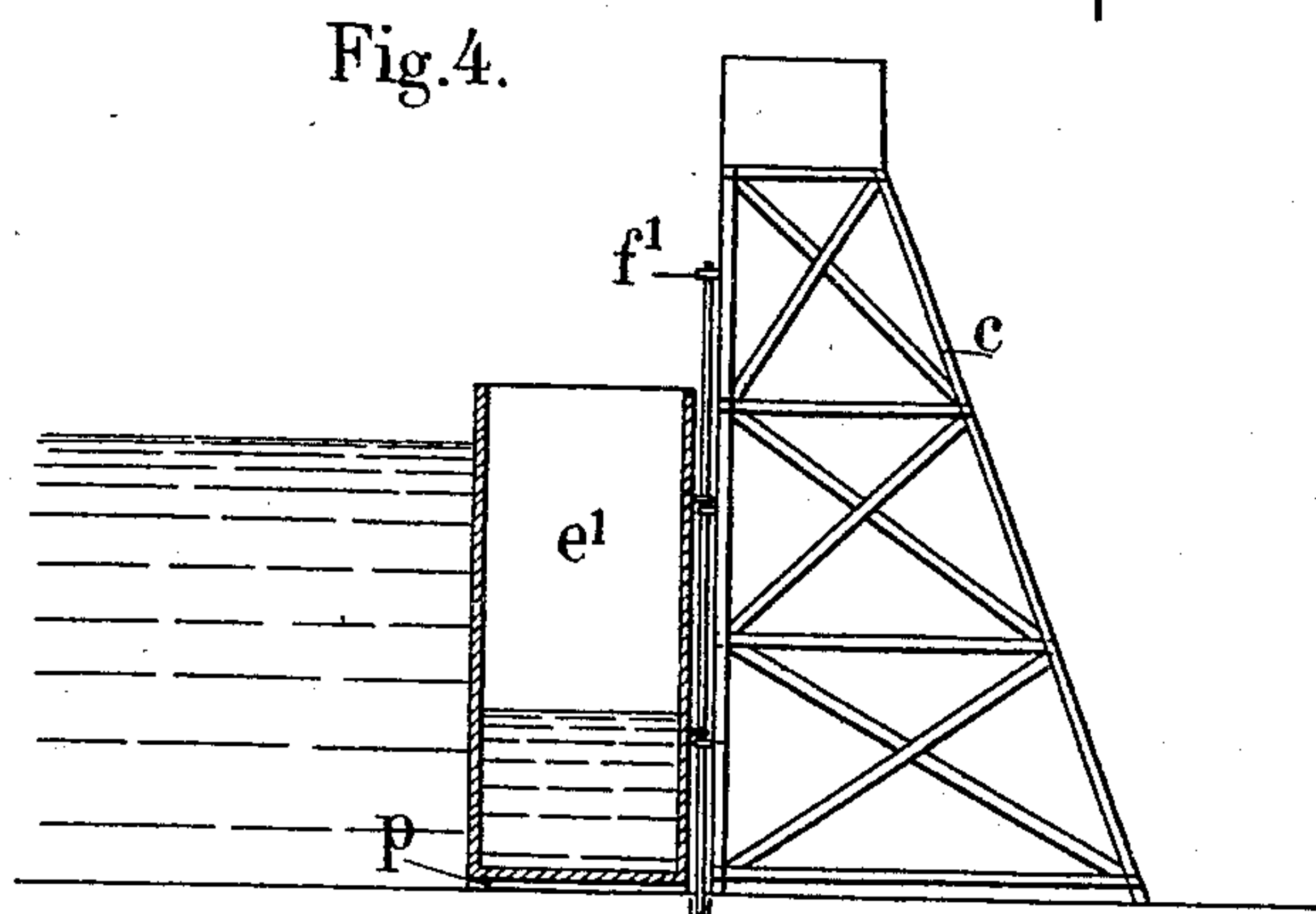
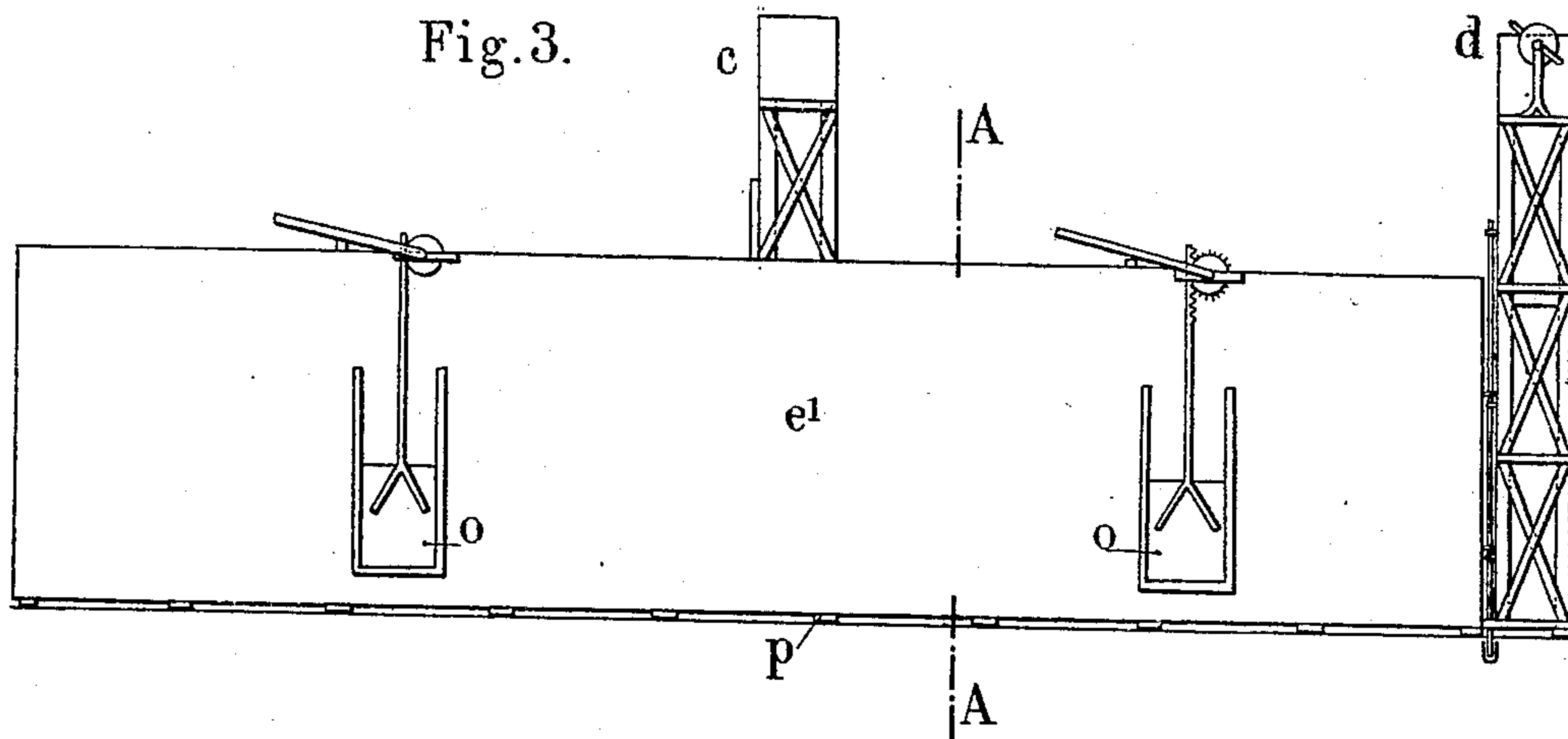


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3 SHEETS—SHEET 3.



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EDOUARD MARIE AUDOUIN, OF POITIERS, FRANCE.

MOVABLE BARRAGE HAVING ROTARY SLUICE-PONTOONS.

No. 907,437.

Specification of Letters Patent.

Patented Dec. 22, 1908.

Application filed June 26, 1907. Serial No. 380,942.

To all whom it may concern:

Be it known that I, EDOUARD MARIE AUDOUIN, of 12 Rue du Jardin des Plantes, Poitiers, Vienne, France, professor, have invented a Movable Barrage Having Rotary Sluice-Pontoons, of which the following is a full, clear, and exact description.

This invention has for its object to provide a system of movable barrage constituted by rotatable pontoons, for the canalization and the regularization of rivers and permitting the hydraulic pressure to be utilized.

The various movable barrage systems hitherto employed for this purpose, have proved unsatisfactory owing to their failure to comply with certain conditions of which the following are of prime importance: 1. Ease and rapidity of working in opening and closing the barrage; 2. Security of the movable parts, especially during floods and frost; 3. Perfect barrage (*i. e.*, freedom from leakage); 4. Possibility of varying at will the level of the water held back; 5. Cheapness of construction.

The present invention relates to a barrage designed to meet these requirements. The barrage is constituted by pontoons in the form of closed tanks capable of being floated or sunk to the bottom according to the quantity of water let into them.

According to the present invention the pontoons are adapted to rotate about hinges situated midway of their length (or in some cases at one of their extremities) and secured to piers so as to be capable of vertical displacement within certain limits, in order that they may be sunk by introducing water into them through sluices provided on the up-stream side of the pontoons, and raised by allowing the water to escape through sluices on their down-stream side. When the pontoons are in the raised position they are capable of being rotated so as to extend either parallel with or transversely of the stream, in which two positions they respectively open and bar the passage. In the latter case the pontoons are held stationary by the piers to which they are pivotally secured.

The invention is illustrated by way of example in the accompanying drawings wherein it is shown as applied to the closing of a channel.

In the drawings Figure 1 is a plan view of the barrage in the closed position. Fig. 2 is a plan view showing the barrage in the open position. Fig. 3 is an elevation looking from

the up-stream side of a pontoon, showing the sluices. Fig. 4 is a transverse section on the line A—A of Fig. 3. Fig. 5 is an underside view of the pontoon and Fig. 6 shows a modification.

As shown in Figs. 1 and 2, the navigable waterway is divided into three channels by the four piers *a*, *b*, *c*, *d* each constituted by two vertical trussed armored beams firmly anchored to foundations. The dam is constituted by two flat pontoons *e e'* respectively pivoted to the piers *b* and *c* by the hinges *f f'* and also, if desired, connected to the piers *a*, *d* by means of the hinges *g g'*. These hinges are constituted by sockets fixed to the floor bottom and eyes fixed respectively to the pontoons and to the piers. Each hinge has an iron pintle (solid or hollow) extending through the eyes and resting on the socket and retained by a key which traverses it below the upper eye. These eyes are so placed as to permit of the pontoons rising and sinking, the eyes on the pontoons then sliding on the hinge pin between the eyes fixed to the pier. In order to permit of the vertical displacement of the pontoons, the latter bear against the piers through the medium of friction rollers *h* with which the pontoons are provided. Similar rollers are placed between the exterior extremities of the pontoons and the piers *a* and *d* and between the two contiguous extremities of the pontoons. The function of these rollers is to lessen friction when the pontoons are being raised and lowered upon their hinges in the course of operations by contact with the piers and with one another.

The pontoons are held in position by the piers *b* and *c* against which they abut and by the cables *i* and *i'*. These cables are fastened at *j* and *j'* to one extremity of each pontoon, their length extending on the up-stream side thereof at about the level of the center of pressure or a little above it: they pass around pulleys *k* and *k'* attached to supports situated at a certain distance up-stream in alinement with the piers *b* and *c* and anchored firmly to foundations: the other ends of these cables pass to the points *l l'* (symmetrically placed with respect to *j* and *j'*) and are wound round winches *m*, *m'*. *n* and *n'* are other cables which also serve to operate the pontoons as will be hereinafter seen.

The pontoons are provided on the up-stream side with sluices *o* operated in the

well-known manner (Fig. 3) and with similar sluices (not shown in the drawing) on the opposite or down-stream side. The bottom of the pontoons is provided externally, as is shown in Fig. 5, with a sill p formed of madriers constituting a continuous closure, below the down-stream side of the pontoon, and of madriers placed perpendicularly to the former. By this construction, when the pontoon is in its sunken position a thin layer of water is left beneath the bottom of the pontoon communicating with the body of water held back by the barrage. This barrage is positioned in the following manner:

The pontoon e' having been first brought into the position which it is to occupy in the barrage, the vertical hinge-pin of each of the hinges $g' f'$ is caused to engage with the eyes and with the socket. Thereupon for the purpose of sinking and grounding the pontoon, water is admitted into the tanks by opening the sluices c on the up-stream side so as to fill the reservoirs to the required extent (see Fig. 4). When the closure is thus effected the pressure of the water retained acting upon one pontoon is distributed between the pier corresponding to the middle of the pontoon and the fixed body to which the chain is attached, so that the pontoon is supported at three points. When, the barrage being thus positioned, it is necessary to open the channel, the tanks of the pontoons are evacuated by opening the sluices on the down-stream side and allowing the water to escape. The pressure of the water can act on the bottom of the pontoon, when the latter is grounded owing to the disposition of the sill p .

When the pontoons have been raised sufficiently, the hinge-pin of the hinge g is raised as well as the neighboring sliding door or sluice and the train of rollers between the left-hand extremity of the pontoon e and the pier a , together with the train of rollers and the sliding door or sluice which separate the two pontoons. The tension of the cable i is then relaxed by operating the winch m . The lock-keeper in charge of the barrage then crosses over on to the pontoon e' for the purpose of opening the pontoon e . To this end the cable n is provided, the same being attached to the right-hand extremity of the pontoon e at the point q and wound on a winch r placed at the left-hand extremity of the pontoon e' after passing around a pulley s secured to the same fixed object as is the pulley k .

By turning the winch r the pontoon e is easily caused to rotate above the hinge f , the two halves of the pontoon being in equilibrium under the pressure of the water on the up-stream side. The pontoon e is thus brought into the position shown in Fig. 2. Next, in order to similarly rotate the pontoon e' the lock-keeper passes to the pier d , where

a winch t is provided upon which the cable n' is wound and which is secured to the point u at the left-hand extremity of the pontoon e' , and is passed around a pulley s' attached to the same fixed object as is k' (Fig. 1). The pontoon is thus brought into the position shown in Fig. 2. A passage is thus afforded whose breadth may equal that of river locks capable of allowing vessels of the largest size to pass; and in addition two side passages of one half size. The barrage being open, in order to close it, the lock-keeper stations himself on the pier d (which communicates with the bank of the river) and operates the winch t upon which, after having released the end of the cable n' , a cable n^2 secured at x' to the right-hand extremity of the pontoon e' has been wound. When the pontoon e' is in position, the lock-keeper gets on to it (it being now in contact with the pier d) and winds the winch r upon which, after the extremity of the cable n has been released, a cable n^3 connected at q to the right-hand extremity of the pier e is wound. The pontoon then rotates about its pivot and takes up a position in alinement with the pontoon e' . This arrangement of the apparatus permits of the easy manipulation of the pontoons, whereby the opening and closing of the barrage is expeditiously effected. These appliances which, in times of flood or frost, may at once be brought in a position parallel with the stream, are not in the least liable to suffer deterioration as are those which are rendered inoperative by being allowed to be folded on the bottom. Moreover, they are almost absolutely watertight, a condition unobtainable when a multiplicity of sluices, etc., are employed. The elasticity of a movable barrage thus constituted is as great as can be desired and permits of the height of the water arrested being regulated at will. This regulation of height is automatic, since as soon as the level of the water up-stream exceeds a certain limit, the pontoons (whose weight has previously been regulated by the admission of water into their reservoirs, so that their ballast corresponds to the height of the water to be maintained) rise of themselves and thereby allow the excess of water to escape. Furthermore, the escape of water takes place along the bottom instead of by overflow, particularly in rivers with shifting of sedimentary beds, for the material which is swept down by such a river along its bed is not arrested by a barrage constructed according to my invention but carried past it, instead of forming deposits which encumber the bed.

As to the cost of production, this is necessarily much lower than that of movable barrages now in use, such as those constructed with an upper bridge or footway which, while possessing the advantage of not leaving any movable part in the bed of the river, which is liable there to suffer deterioration, are

extremely costly to build in consequence of the necessity of raising piles or piers to a great height above the level of the deepest waters. There is no such necessity with a movable

5 barrage having rotary sluice-pontoons.

The piers herein referred to need not exceed the height of the water held back by more than 2 meters 50 centimeters, while the pontoons need only stand 50 centimeters

10 above the level of the water held back. The piers not exceeding 1 meter in breadth and being hollow would not impede the flow of water which would, during great floods, pass over them. The space between them is sufficiently large to permit the passage of floating

15 bodies. Some of these piers might moreover be constituted by a pair of strong flaps which might be folded down to the bottom, especially in the case of ice floes. The intervening space between the piers would be sufficiently great to allow of them being folded without superposing them, as is frequently

20 done, not without danger, in the case of ordinary flaps.

25 In the example shown in the drawing, the masonry foundation has been made of a size sufficient to permit of the fixed bodies being anchored thereto as also the piers. This foundation is otherwise always preceded and

30 followed by rockwork whose summit is level with that of the masonry foundation. In the foundation itself the interval between the piers would not require to be constructed as solidly as the foundations of the bands corresponding to the piers or fixed bodies, since

35 the sill would only be exposed to a minimum pressure. For up-river reaches or for weirs, the piers might be placed closer together than for navigable streams, and the pontoons

40 be shorter. A similar arrangement might be employed for oblique barrages, for use either in barring a false branch or directing the current at the inflections of a channel in the passage from one mooring to the other (Fig. 6).

45 In this case there would be no need of foundations and the pontoons e , e' , e'' , etc. placed along an oblique line either towards the head of an island v or following a concave bend x x' , will always float in such manner as to

50 give passage to material swept down the bed of the river, which will be evacuated by the false arm y or will be deposited along the convex bank down stream.

The piers against which the pontoons abut

55 at their middle portion or extremities might be constituted simply by a row of piles z' , z'' , z''' , etc., the head of water being much less considerable with an oblique barrage than with a transverse one.

60 The head of water would be regulated in

the manner above described by the admission of the necessary quantity of water. When it is desired to evacuate this water-ballast in order to augment the thickness of the bed of water passing under the pontoons,

65 it might be necessary to have recourse to a pump, the fall being too weak along an oblique barrage to allow of the ballast escaping entirely unaided upon the mere opening of the sluices down stream.

The above arrangements have been given only by way of example; the forms, dimensions and details being capable of variation according to circumstances without altering the principle of the invention.

Claims:

1. A movable barrage for the canalization and regularization of rivers and the utilization of the hydraulic power, comprising piers, pontoons supported on the piers by their centers and rotating in a horizontal plane, substantially as described.

2. A movable barrage for the canalization and regularization of rivers and the utilization of the hydraulic power, comprising piers, pontoons supported by their centers on the piers and rotatable in a horizontal plane, and means for filling and emptying the pontoons of water whereby to lower and raise the same.

3. A movable barrage comprising piers spaced apart from each other, pontoons pivoted by their centers to the piers and adapted to swing thereon in a horizontal plane, the ends of the pontoons abutting when in alignment, means for filling and emptying the pontoons with water, and means for swinging the pontoons on the piers.

4. A movable barrage comprising piers spaced apart from each other, pontoons pivoted by their centers to the piers, and adapted to swing thereon in a horizontal plane, the ends of the pontoons abutting when in alignment, said pontoons having their sides provided with openings, gates for closing the openings, and means for swinging the pontoons.

5. A movable barrage comprising pontoons arranged with their ends abutting and mounted to swing on their centers in a horizontal plane, means for swinging the pontoons, and means for filling and emptying the pontoons of water.

The foregoing specification of my movable barrage having rotary sluice-pontoons signed

115 by me this 11th day of June, 1907.

EDOUARD MARIE AUDOUIN.

Witnesses:

LOUIS AUDOUIN,
EUGENE SECHANIT.