

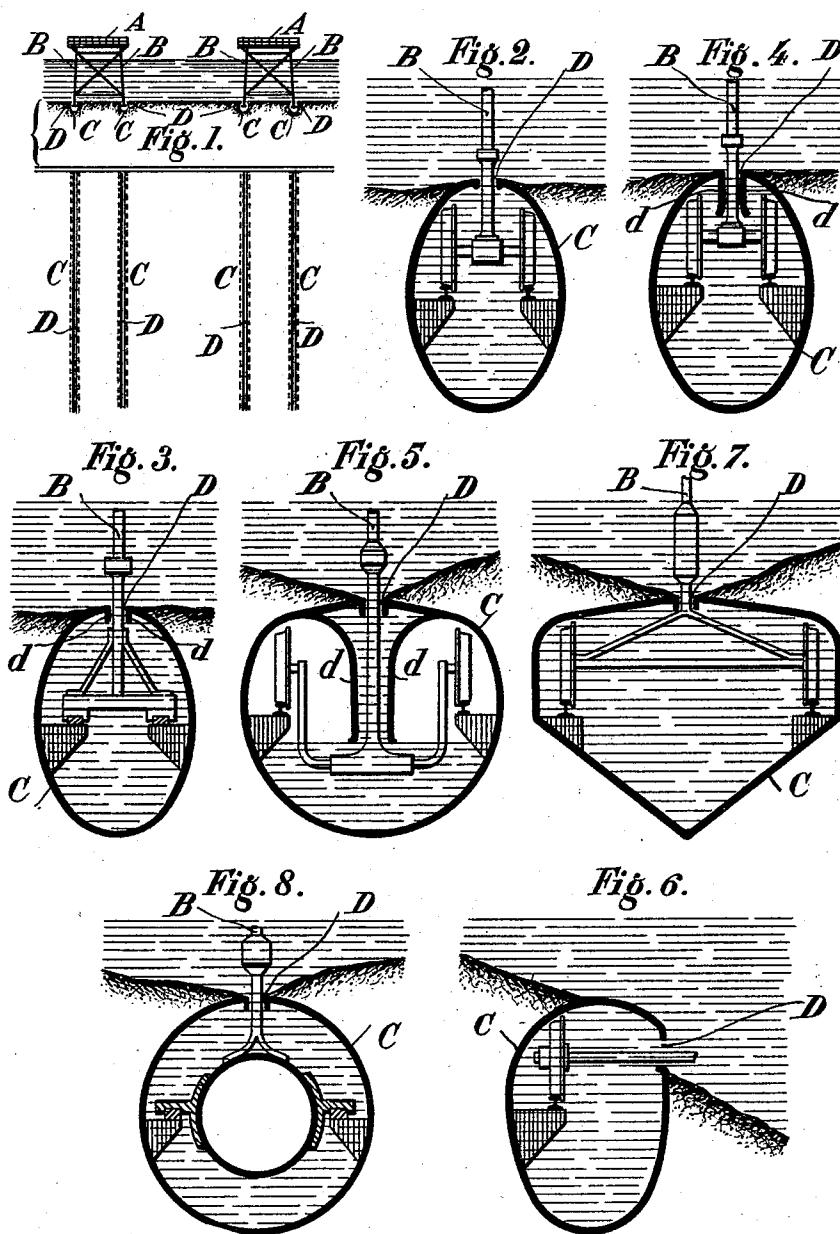
(No Model.)

3 Sheets—Sheet 1.

M. A. DE PALACIO.
SUBMERGED WAY.

No. 536,357.

Patented Mar. 26, 1895.



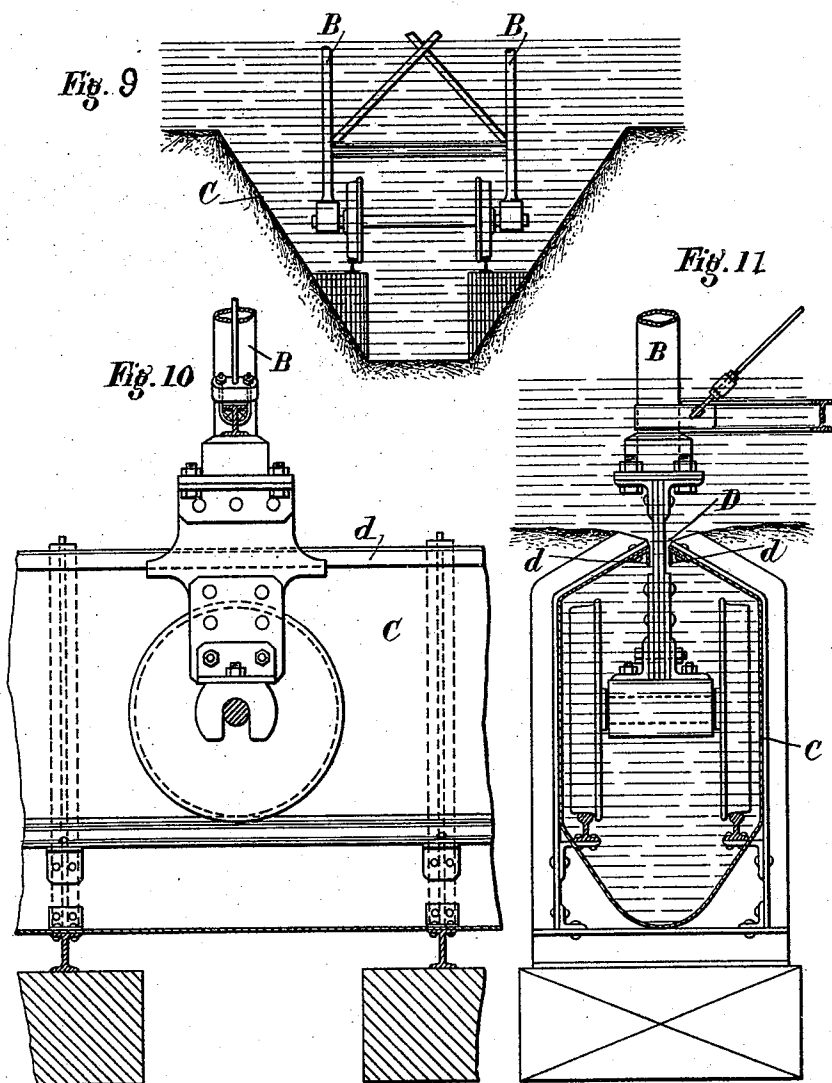
Witnesses:-
Frederick Hays
George Barry-

Inventor:-
Martin Alberto de Palacio
by attorneys
Brown & Howard

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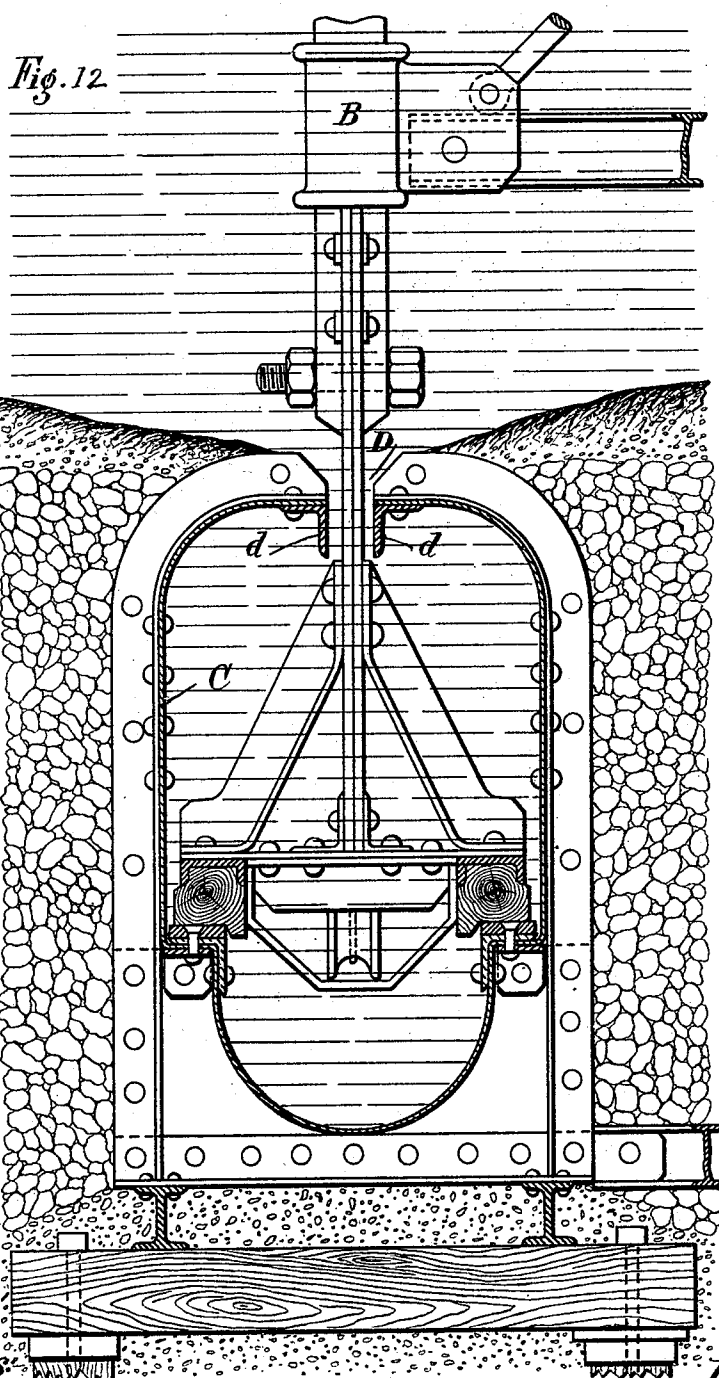
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3 Sheets—Sheet 3.

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Patented Mar. 26, 1895.



Witnesses:

Fred Haynes
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Inventor:

Martin Alberto de Palacio
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Ernest Seward

UNITED STATES PATENT OFFICE.

MARTIN ALBERTO DE PALACIO, OF MADRID, SPAIN.

SUBMERGED WAY.

SPECIFICATION forming part of Letters Patent No. 536,357, dated March 26, 1895.

Application filed October 30, 1894. Serial No. 527,427. (No model.)

To all whom it may concern:

Be it known that I, MARTIN ALBERTO DE PALACIO, residing at Madrid, Spain, have invented a new and useful Improvement in Submerged Ways, of which the following is a specification.

Means of transportation consisting of vehicles running upon ways submerged in water have been known for many years; but ways of this kind such as have been heretofore constructed afford no security because they are not protected either against currents or against sedimentary deposits or other obstacles which have the effect of hindering the movement of vehicles or of derailing them. It thus results that it has not been practicable up to the present time to apply this system of transportation except for short distances and in shallow water.

The object of the present improvement is the construction of ways of this kind in such manner that they present sufficient security to permit their application even at great depths and for long distances. For this purpose I construct the way in such manner that it will be protected not only against the action of currents but against silting and all other causes of obstruction. This problem for the protection of submarine ways is somewhat difficult to resolve because in two ways or even in the successive sections of one way, such absolutely different conditions may have to be met that the constructor must provide means sufficiently varied to meet all exigencies of practice. Thus the way may have to follow in one place the bottom of waters subject to heavy sedimentary deposits requiring a special protection against such deposits. Thence it may pass to a place subject not only to deposits but to strong currents requiring a special construction; and then in other places it may be necessary to construct the way at a certain distance above the bottom, to avoid steep inclinations for example, or for any other reason, and there a special construction must be adopted.

My invention consists in the means hereinafter described for surmounting these practical difficulties in the construction of submerged ways.

I will first describe my invention with ref-

erence to the accompanying drawings and afterward point out its novelty in the claims.

Figure 1 represents a transverse vertical section and a plan view on a very small scale, of a double track way built according to my system. Figs. 2 to 9 are transverse sectional views of several modifications of the mode of building and protecting a way which may be required to meet different cases in practice. Figs. 10 and 11 represent respectively transverse and longitudinal vertical sections of another modification. Fig. 12 represents a transverse section of still another modification.

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

As may be understood by reference to Fig. 1, the way protected according to my system is intended to be employed for vehicles in which the platform A, which is in the air or above the water, is carried by supports B resting upon the way by means of wheels or sliding runners.

In the most unfavorable cases, that is to say, when the way requires a secure protection against currents and sedimentary deposits and other causes of obstruction, I employ a covered way of which Figs. 1 and 2 give a general idea. The way is established in a tube or conduit or preferably in two parallel tubes or conduits separated at convenient distances, such as C, constructed at a greater or less depth under water or even under ground at the bottom of the water and of which the upper parts present a longitudinal slot D just wide enough to allow the passage of the supports B of the platform. At the place where the supports B pass through the slot D they are made as thin as possible laterally and the slot is made very narrow in order to exclude as much as possible sand and fine pebbles from the tube or conduit. Such of the latter as may get into the tube or conduit may be easily removed at the extremity thereof by an appropriate rake with which it is easy to furnish the vehicle. As to fine sand and mud, they may be drawn out by a small suction tube or driven out by the injection of air or water into the tube or conduit or by any other appropriate means. In short, the heavy bodies which may be deposited above the slot

D, are turned aside by the vehicles at the time of their passage. For this purpose the vehicles may be furnished with obliquely arranged blades conveniently arranged and analogous to the snow plows or cow-catchers of locomotives.

I will further mention that in case of very great sedimentary deposits the slot D may be closed by means of a shutter opened by the passage of the vehicles. For this purpose a flexible shutter made of strips of leather for example, may be employed in such manner that the supports B of the platform will open them in their passage and will close them in the rear.

In the example illustrated by Fig. 2, the way is constituted by two or more tubes, channels or conduits C and each of the upright supports B supporting the platform is terminated by a pair of wheels rolling upon two rails supported on consoles which are attached to the interior of the lateral walls of the tube, channel or conduit.

In Fig. 3 the wheels are replaced by sliding runners and the slot D is furnished with turned-in lips d which render more difficult the entrance of foreign matters into the tube, channel or conduit.

In Fig. 4 the lips d are more developed and the supports B are mounted upon wheels.

It may be desirable that the way constructed in the interior of the tube or channel should not be submerged but dry. For that, it suffices to close the extremities of the tube or channel, to carry the lips or lateral walls d or the slot D below the level of the way as is shown in Fig. 5, and to confine in the tube or channel C a body of air which displaces the water by lowering its level below the way.

To render more difficult the introduction of foreign matters into the tube or channel, the slot D at the summit of the tube or channel may be replaced by one or more lateral slots. This is represented in Fig. 6 by a way with two tubes or channels, only one of which is shown. In this example each tube or channel only protects one line of rails and the supports of the platform are carried by axles extending from one tube or channel to the other through the slots D.

I have said that the supports B which carry the platform may be mounted upon wheels or upon sliding runners. I will add that in either case the vehicle may be balanced wholly or in part by a submerged float. This float being lighter than the water exercises a pressure from below upward which diminishes or annuls the pressure exercised by the vehicle upon the way. This is represented in Fig. 8 in the case in which the supports B are mounted upon sliding runners. It may be seen that these supports B rest upon a closed receptacle, of which the weight is much less than that of the volume of water which it displaces, in such manner that the pressure exercised by the runners upon the way is very

slight and consequently the displacement of the vehicle requires but a minimum of force.

It may be remarked that generally in cases in which the way does not require to be covered because of its being neither likely to be silted nor to be obstructed by any obstacle whatever, it may even be laid at the bottom, especially in still water. The tube or channel C then becomes unnecessary and it is sufficient to lay the way in an open protective channel C as shown in Fig. 9.

The preceding description will be sufficient to make it understood what are the means which I employ to protect submerged ways in different cases in practice and to permit and to enable others skilled in the art to construct a way according to my system. The details of construction may be varied according to cases and the will of the constructor. Nevertheless for greater perspicuity I have represented in Figs. 10 and 11 a practical mode of constructing a tube or channel C of sheet iron and of angle-iron. In these figures I have supposed the way to be constructed for the employment of wheeled vehicles.

Fig. 12 represents a transverse section of an analogous tube or channel constructed especially for the employment of sliding vehicles. It is evident moreover that the tube or channel may be constructed in any other way and, for example, in masonry.

The three last described figures show also how the supports B of the platform may be braced together and mounted upon wheels or runners. It may be mentioned besides that at the place of the slot D the supports B are simply made of two thicknesses of sheet iron in order that the slot may be very narrow.

It is evident that the system of submerged ways hereinabove described is applicable not only for the passage of vehicles but also for the establishment of movable bridges in places where navigation is not very active. In fact by supporting upon the ways of my system the movable sections of a bridge, the bridge may be opened by sliding said sections on their respective ways. If for example the bridge is composed of two sections the way may be established in such a way that the bridge may be opened by drawing one of the sections up to the adjacent shore or by causing the two sections to slide toward their respective shores. By the employment of circular or curved ways turning bridges may be built or even bridges which open by being displaced according to more or less irregular curves depending on local circumstances.

What I claim as my invention is—

1. A submerged way constituted by a track for wheels or runners laid in one or more tubes or channels constructed at the bottom of water, substantially as herein described.

2. A submerged way constituted by a track for wheels or runners laid in one or more closed tubes or channels each presenting one or more longitudinal slots for the passage of

the supports of the platform of the vehicle intended to run on such way, substantially as herein described.

5 3. A tube or channel for a submerged way presenting a longitudinal slot of which the edges *d* are turned inward below the level of the track laid in said tube or channel in order that by the introduction of air the level of the water in the tube or channel may be made to

descend therein below the said track, substantially as herein described.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

MARTIN ALBERTO DE PALACIO.

Witnesses:

CHARLES ASSI,

HENRY THRESSE.