No. 737,968. PATENTED SEPT. 1, 1903.

F. SCHNAPP.

METHOD OF CONVEYING VESSELS OR THE LIKE FROM ONE WATER LEVEL TO ANOTHER IN WATERWAYS.

APPLICATION FILED SEPT. 13, 1901.

NO MODEL. 3 SHEETS—SHEET 1.

FIG. 1.

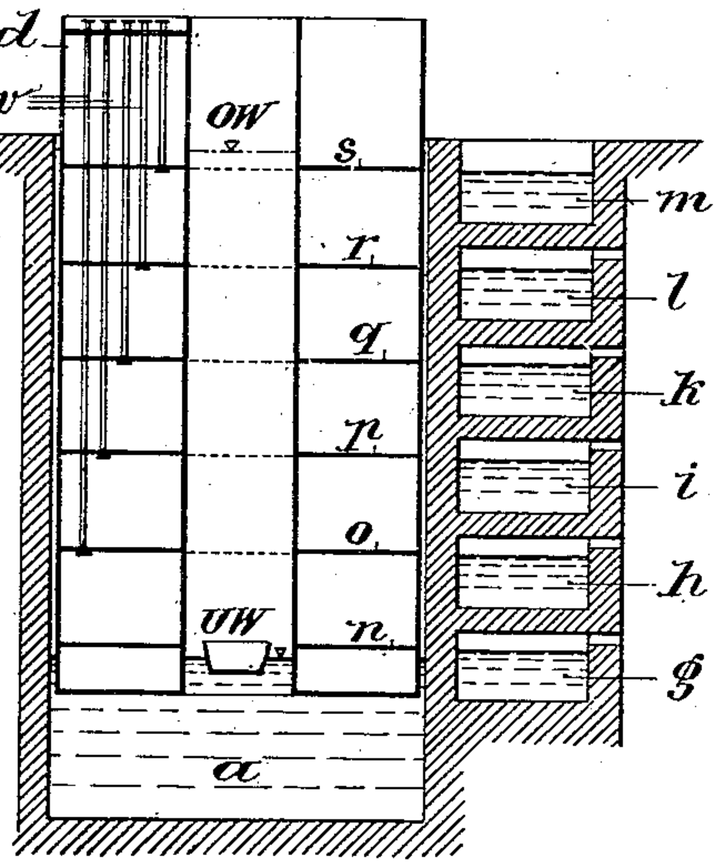
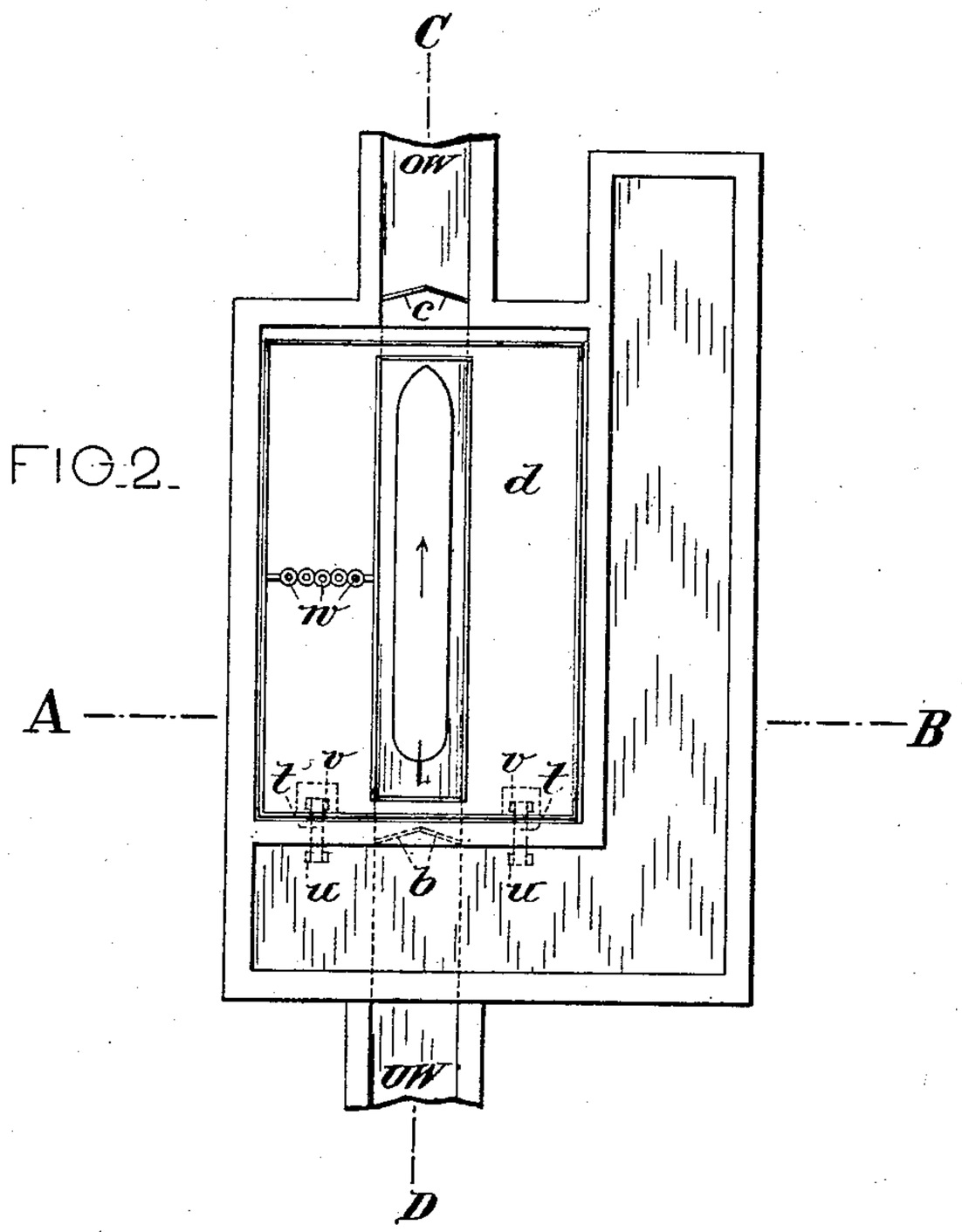


FIG. 2.



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NO MODEL. 3 SHEETS—SHEET 2.

FIG. 3.

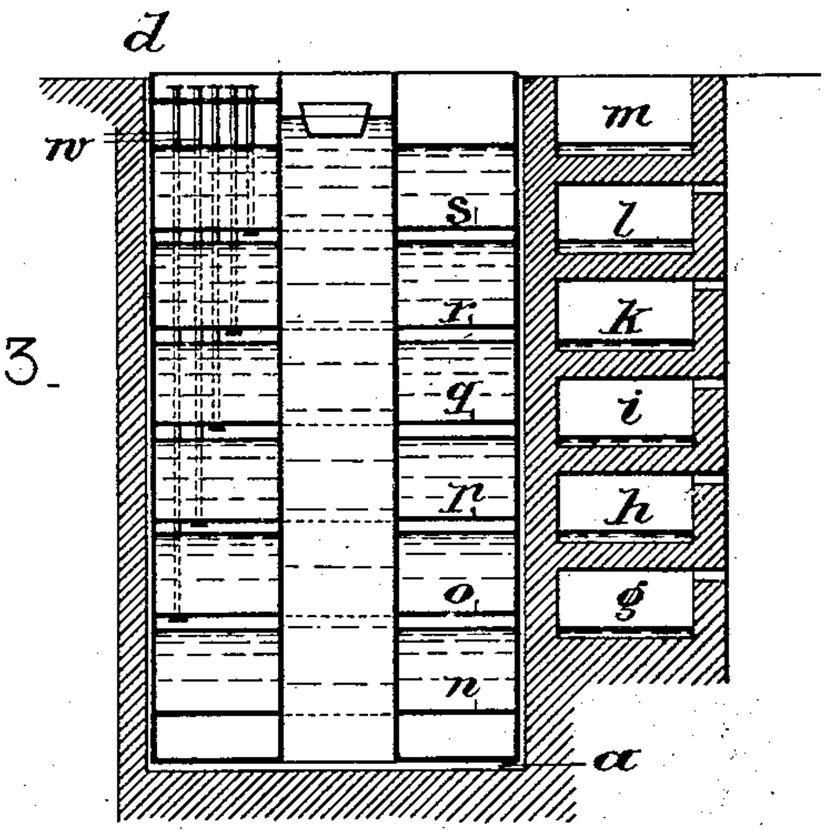
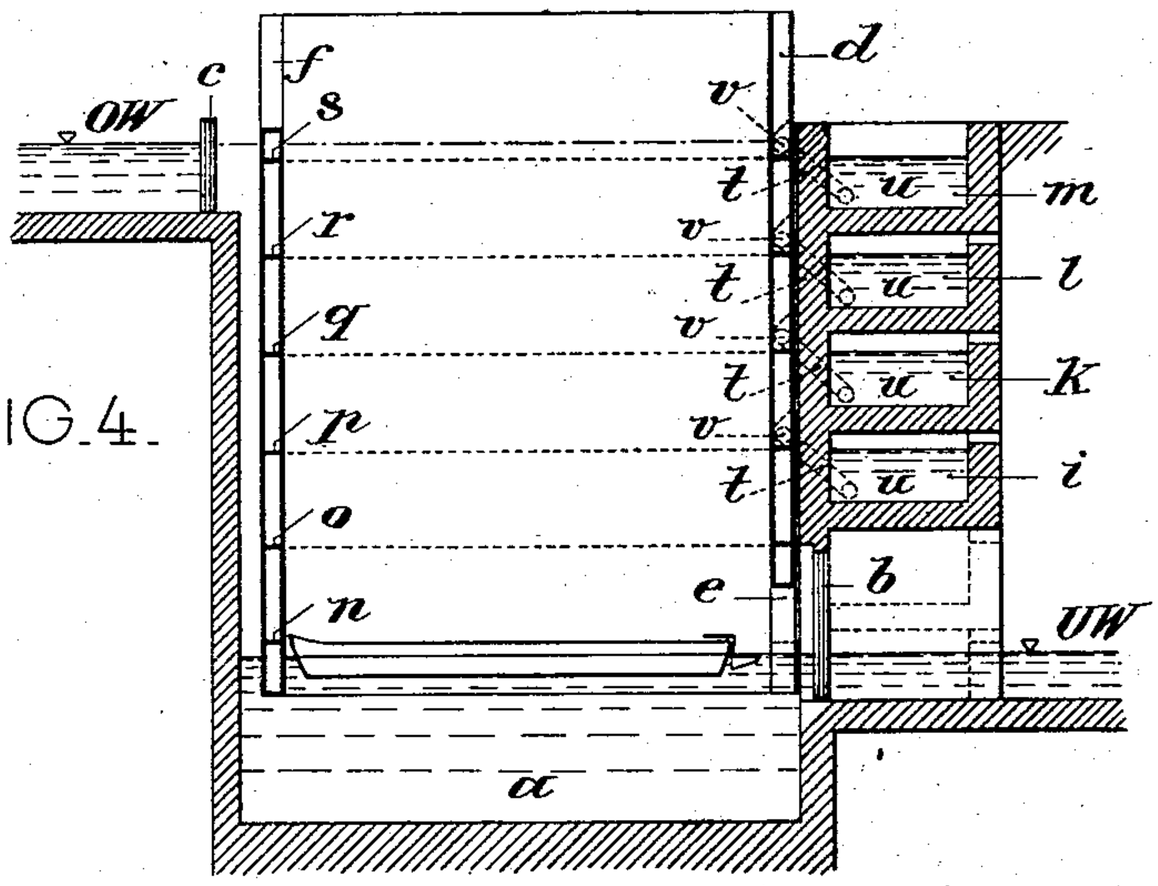


FIG. 4.



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No. 737,968. PATENTED SEPT. 1, 1903.

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METHOD OF CONVEYING VESSELS OR THE LIKE FROM ONE WATER LEVEL TO ANOTHER IN WATERWAYS.

APPLICATION FILED SEPT. 13, 1901.

NO MODEL. 3 SHEETS—SHEET 3.

FIG. 5.

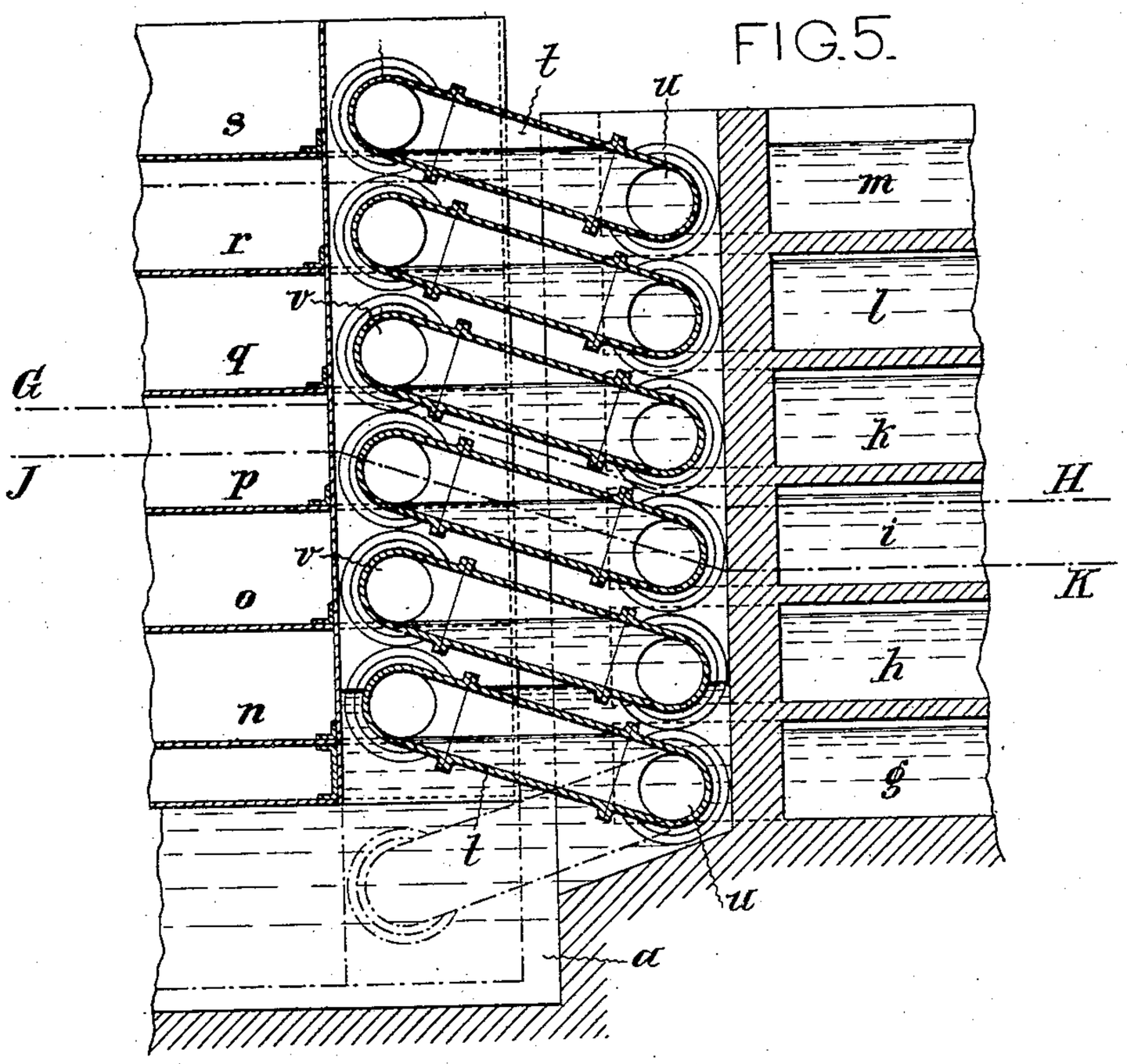
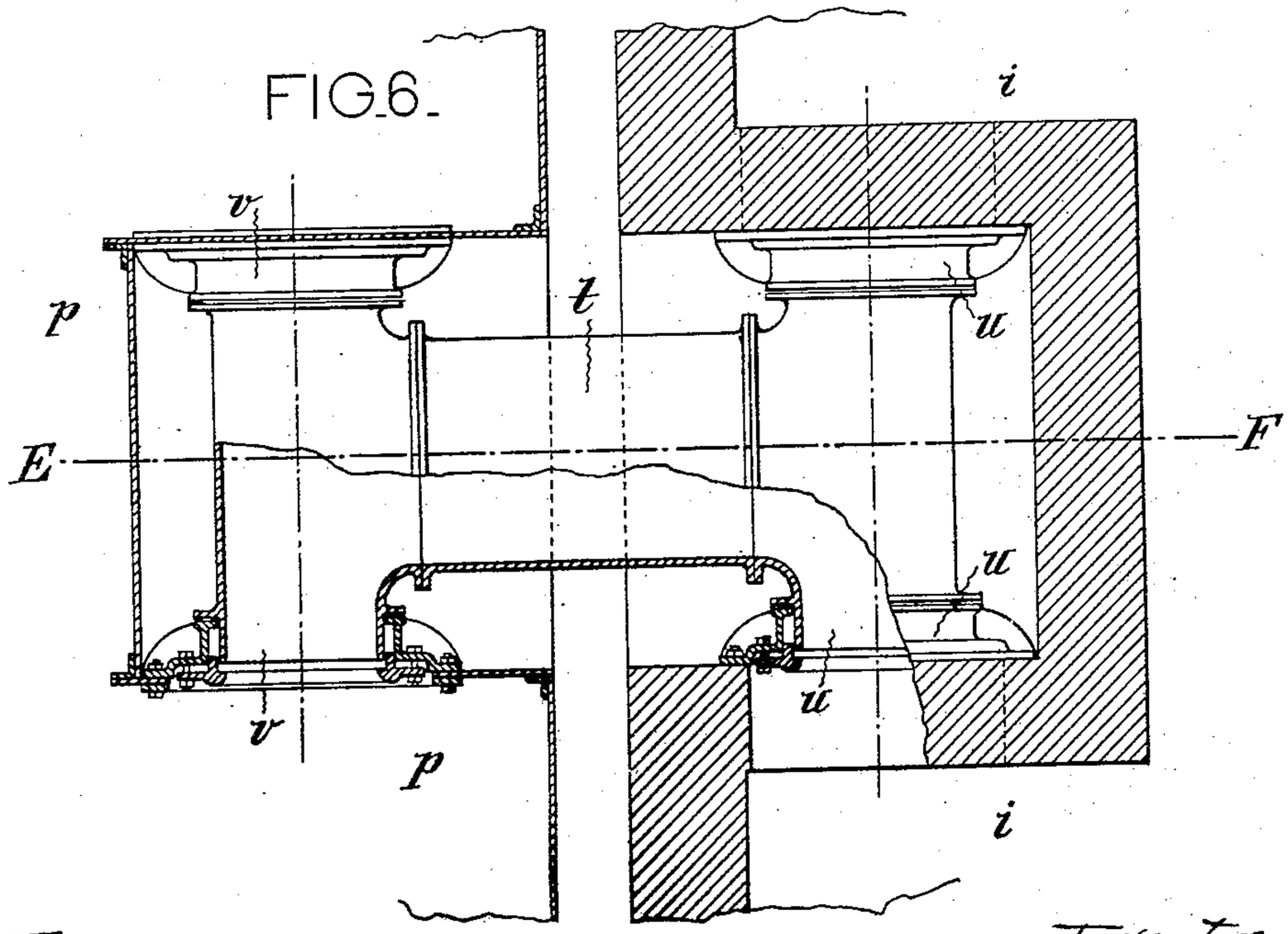


FIG. 6.



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No. 737,968. Patented September 1, 1903.

UNITED STATES PATENT OFFICE.

FRIEDRICH SCHNAPP, OF BERLIN, GERMANY.

METHOD OF CONVEYING VESSELS OR THE LIKE FROM ONE WATER-LEVEL TO ANOTHER IN WATERWAYS.

SPECIFICATION forming part of Letters Patent No. 737,968, dated September 1, 1903.

Application filed September 13, 1901. Serial No. 75,282. (No model.)

To all whom it may concern:

Be it known that I, FRIEDRICH SCHNAPP, a subject of the Emperor of Germany, residing and having my post-office address at Alvenslebenstrasse 2, Berlin, Germany, have invented an Improved Method for Conveying Vessels or the Like from one Water-Level to Another in Waterways, of which the following is a specification.

The methods hitherto used for conveying vessels from one water-level to a higher or lower water-level during their passage over waterways differ very widely. The most usual method consists in causing the vessel to pass from that part of the waterway already traversed into a lock having the same water-level and is then conveyed to the following higher or lower part of the waterway by raising or lowering the water-level in the lock after closing the entrance thereto. With large falls this method entails the use of a large quantity of water—a disadvantage which is removed by the present invention, which consists in the fact that after the vessel to be raised has passed into a lock-chamber filled with water to the height of the lower water-level and the said chamber has been closed the water in the shaft receiving the vessel is forced upward by weighting a float until the vessel has reached the height of the upper water-level and can pass on to the higher part of the waterway when the upper lock-gate has been opened. For the purpose of weighting the float the latter is provided with a number of water-tight compartments connected with a corresponding number of reservoirs, from which when the movement has begun the water required to weight the float is supplied by external means, the said water returning to the respective reservoirs when the float is raised in order to convey a vessel from the higher to the lower level, so that the same water is always used for raising and lowering vessels.

The annexed drawings represent an example of the application of the method described.

Figure 1 is a vertical section perpendicular to the direction of travel with the float in its highest position on the line A B of Fig. 2. Fig. 2 is a plan view of Fig. 1. Fig. 3 is a vertical section on the same line as Fig. 1, but with the float in its lowest position. Fig. 4 represents a longitudinal vertical section on the line C D of Fig. 2. Fig. 5 is a vertical longitudinal section through the one series of the tubes, connecting the float with the stationary basins on an enlarged scale and on the line E F of Fig. 6. Fig. 6 is a horizontal section through one of said series of tube connections, the upper part of the figure on the line G H and the lower part on the line J K of Fig. 5.

For the horizontal section of the float rectangular, circular, or other shapes can be used.

In the form of construction illustrated the apparatus is arranged as follows: The chamber or basin *a*, consisting of concrete, brickwork, or iron, can be cut off from communication with the lower and upper water-levels *ow* and *uw*, respectively, by the lock-gates *b* and *c*, respectively. In the said chamber a float is arranged having cut-out portions *e* and *f* in line with the lower and upper gates to permit the entrance and exit of vessels into the shaft within the float when the latter is in its highest and lowest positions, respectively. This space for the vessels may be outside the float, if desired. At the side of the basin *a* a number of outer reservoirs *g h i k l m* are arranged, the number of these latter depending upon the fall of the lock. These reservoirs are filled with water to a certain level. At the lower water-level of the reservoir *a* the float *d* floats freely in equilibrium. The said float is divided into compartments by horizontal partitions *n o p q r s* at heights equal to the water-levels in the outer reservoirs, the number of compartments corresponding to the number of outer reservoirs. The ground plan of the float is a multiple of the ground plan of the vessel's hull and the lateral space in the chamber and increases in size with the number of outer reservoirs. The compartments of the float communicate independently of the lock-chamber with the respective outer reservoirs. In the construction illustrated this communication is supplied by pipes *t*, which communicate with the respective compartments by means of tubes *v* and with the respective outer reservoirs by tubes *u* in such a manner that while the float is rising or falling the said pipes have free movement on the tubes. The arrangement may be made either so that the float executes the lateral move-

ment necessary to permit the movement of the pipes or the tubes connected with the latter may be arranged to move where they enter the reservoirs or the compartments. The former construction is shown by Figs. 5 and 6, in which the tubes *u* and *v* rotate within stuffing-boxes provided at the openings of the float and the reservoir through which the water streams during the raising or lowering of the float. When pressure is brought to bear on the float, which may be effected by means of a pressure-cylinder or the like, it descends to a certain extent, whereupon water passes from the outer reservoirs into the compartments in the float, so that owing to its increased load the latter continues to descend and the water-level in the lock-chamber rises at a speed the ratio of which to the speed of descent of the float is as the ratio of the surface of the float to the surface of the water in the chamber.

The surface of the lock-chamber, float, and reservoirs are in such relation to each other that in any position of the float the equilibrium will be restored as soon as the external pressure is removed. According to the means of communication between the outer reservoirs and float-compartments the said surfaces will be equal or otherwise throughout the whole height. In consequence of the constant equilibrium of the float equilibrium will also be produced while the external pressure is in operation as soon as the speed of the liquid in the pipes corresponds to the superload of the said pressure, so that the float will descend with uniform speed. Simple lateral guides for the float, such as rollers or the like, are therefore sufficient. When the water-level in the basin falls, the action is reversed, negative external upward pressure being applied. The water then returns to the outer reservoirs until the compartments in the float are completely empty and the float has reached its highest position. The movement of the float can also be initiated by allowing a quantity of water to pass out of the lock-chamber when it is desired to raise the water-level in the latter, whereupon the float will automatically descend with the use of external pressure, and, vice versa, the float can be caused to ascend by allowing a quantity of water to enter the lock-chamber. When machine power is used for raising and lowering the float, the quantity of water used and wasted is *nil*. For permitting the air to escape from the compartments in the float the said compartments are provided with pipes *w*, which may also serve to pump out water and the like therefrom.

What I claim is—

In combination, a lock-chamber, two lock-gates for separating said chamber from a lower and a higher water-level respectively, a float within said lock-chamber, the ground plan of such float being smaller than the respective plan of the lock-chamber by an amount equal to the ground plan of a vessel to be transported through the lock-chamber, an hermetically-sealed chamber provided at the bottom of the float, the displacement of such chamber being equal to the weight of the float, one or several water-chambers above said bottom chamber, tubes connecting said water-chambers with the outer air, one or several stationary water-reservoirs provided laterally of the lock-chamber, the number of such stationary water-reservoirs corresponding with the number of water-chambers of the float, and movable tubes connecting each of the water-chambers of the float with the respective adjacent stationary water-reservoir, substantially as described.

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

FRIEDRICH SCHNAPP.

Witnesses:
WOLDEMAR HAUPT,
HENRY HASPER.