A. MEHLHORN & P. VON KLITZING.

FLOATING DOCK.

APPLICATION FILED JULY 30, 1904.

903,215. Patented Nov. 10, 1908.

Fig. 2

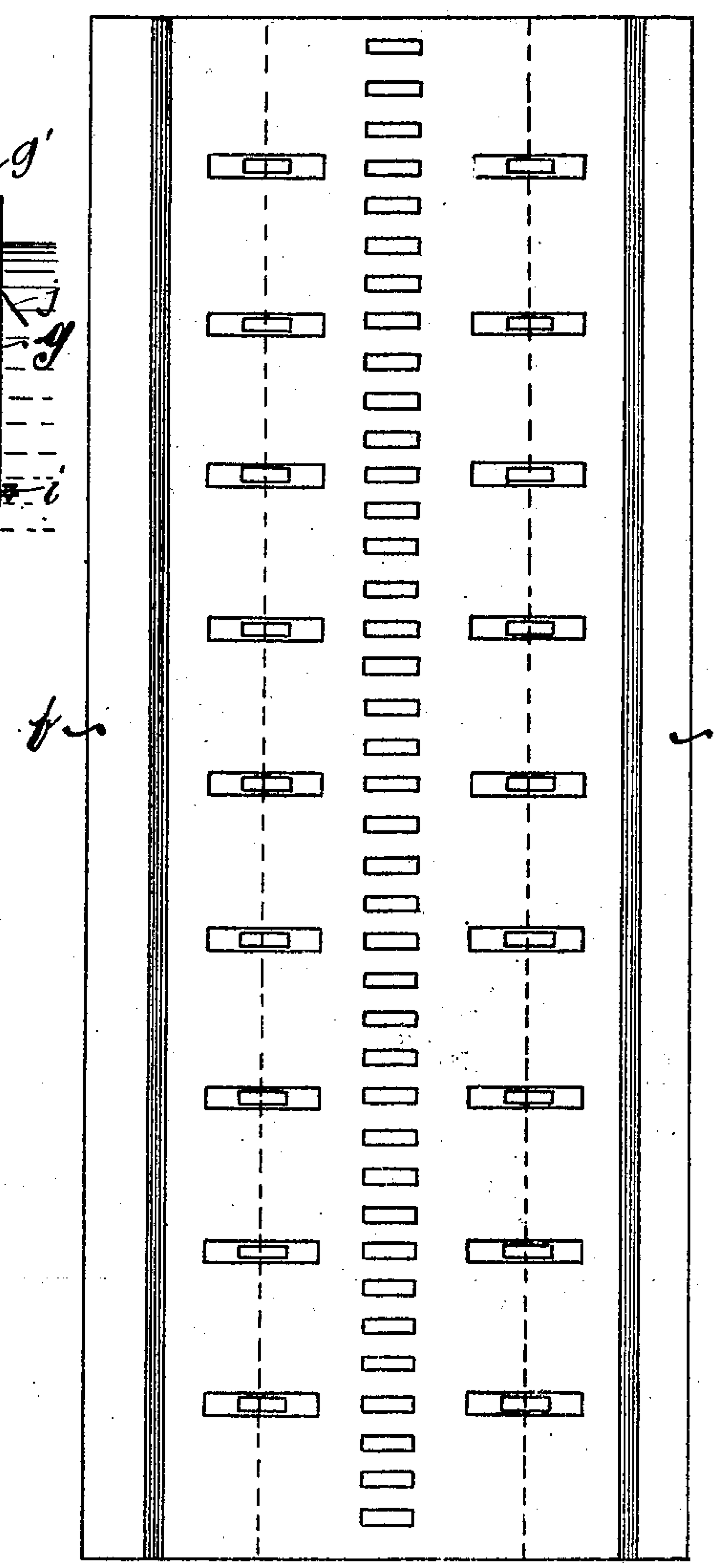
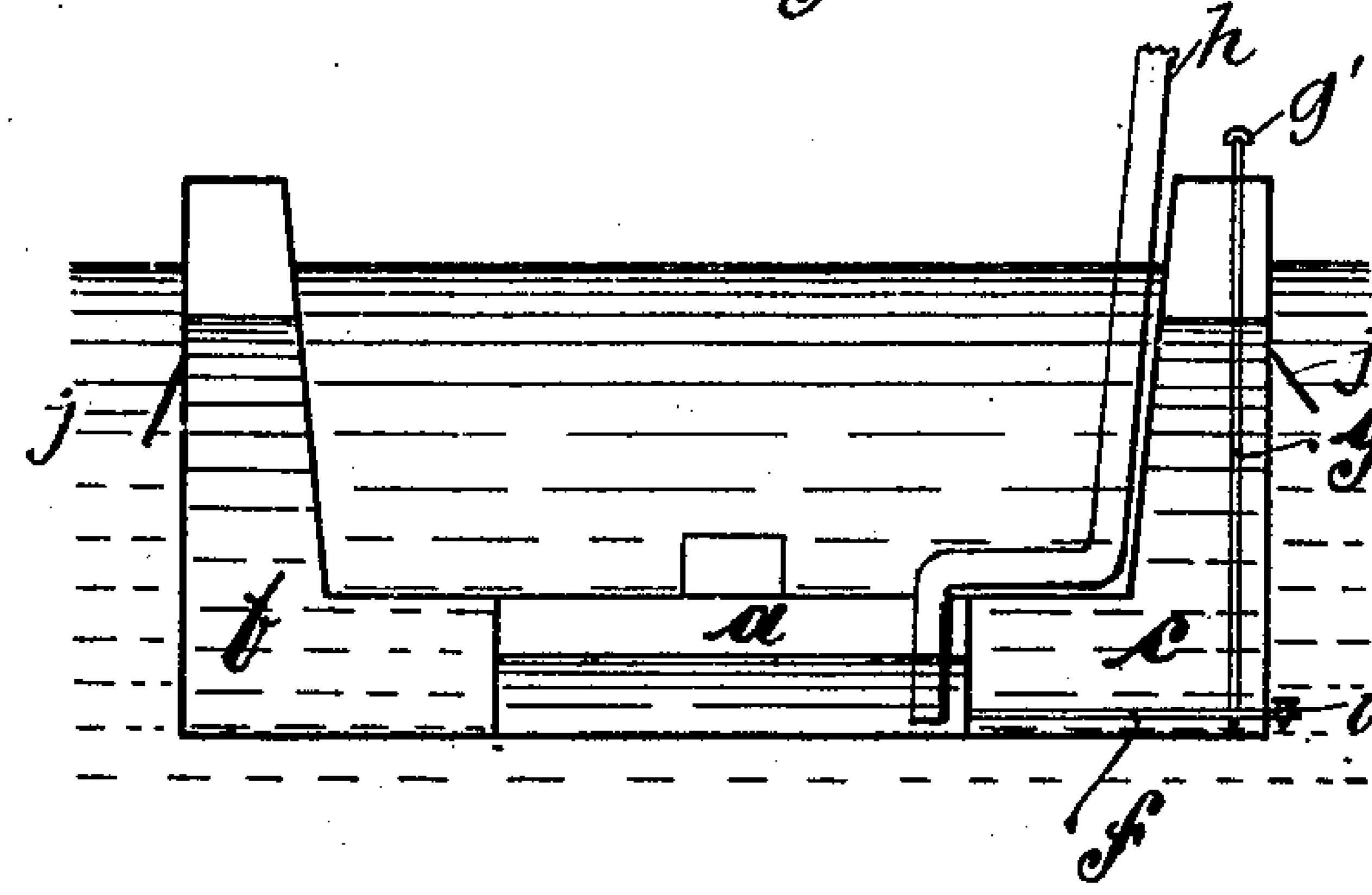


Fig. 1



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FLOATING DOCK.

No. 903,215. Specification of Letters Patent. Patented Nov. 10, 1908.

Application filed July 30, 1904. Serial No. 218,784.

To all whom it may concern:

Be it known that we, ALFRED MEHLHORN, a subject of the King of Prussia, and resident of Dietrichsdorf, near Kiel, in the Kingdom of Prussia and German Empire, and PHILIPP VON KLITZING, a subject of the King of Prussia, and resident of Neumühlen, near Kiel, in the Kingdom of Prussia and German Empire, have jointly invented a new and useful Improvement in Floating Docks, of which the following is a specification.

In the floating docks hitherto generally used the following serious drawbacks occur: 1. The pumping work is considerably in excess of that required to raise the ship. 2. Considerably greater stresses occur in the structure at one stage of the lifting operation than after the whole load has been raised. 3. The power used in lifting is lost in the lowering operation. The first mentioned drawback, that is the excessive pumping power, arises owing to the great difference between the internal and external water levels, since the water flowing into the dock with unnecessarily great power in lowering, must be forced out again at the expenditure of the same power during the lifting operation. The second drawback, that is the great stresses occuring in the structure, is due to the fact that the stresses present in lifting are increased by the high water pressure simultaneously occurring.

By first emptying the side chamber, as is usual in many existing docks, the lifting forces are removed from the point of support of the load, and this drawback is considerably increased, inasmuch as, in this case, the moment of the greatest stresses mostly corresponds with the maximum water pressure.

In order to decrease the force heights, docks have been constructed with closed air chambers at the bottom. The desired effect however is only obtained in a very small degree, and for the following reasons: The air chambers can only be comparatively small in practice, not more than about $\frac{2}{3}$ of the weight of the dock, because, in the event of the air chambers being too large, the excess pressure of the water entering, which is required to regulate the lowering operation of the dock is not sufficient. The advantage aimed at, that is the increase of the water level in the interior and decrease of the force heights, is only apparent, when the dock is already lowered, or on beginning to raise the same, because, on continuing to lift the dock, the internal water level sinks much more quickly than the external water level, so that during the further lifting process the force height increases, and the desired technical effect is lost. For this reason and for the further reason that the quantity of water to be pumped out remains the same, an economy of pumping work is scarcely obtained by such constructions. The second drawback above mentioned is present in both the older docks and in those just mentioned, as both the air chambers and the other immerging parts are exposed to great water pressure in rising and sinking.

According to the present invention not only are these drawbacks overcome, but in sinking the loaded dock, power is automatically stored, which can be used in lifting the dock. For this purpose chambers are provided in the dock, into which water enters during the sinking operation, so that the air contained therein is compressed. This air expands again when the dock is lifted. By this arrangement the air chambers are automatically decreased in sinking, and enlarged in raising the dock.

A dock of this kind is shown by way of example in the accompanying diagrammatical drawing, Figure 1 being a vertical section, and Fig. 2 a plan view.

Referring to the drawing: the reference letter *b* designates one of the side pontoons, and *c* the corresponding pontoon upon the other side which pontoons communicate through openings or valves, such as *j*, with the exterior water, while *a* designates the central bottom pontoon located between the side pontoons *b* and *c*. The central bottom pontoon is connected with the pumping devices (not shown) by a pipe *h* in communication therewith adjacent to the bottom. A pipe *f* also communicates with the pontoon *a* near to the bottom, which pipe *f* is provided with the valve *i* and communicates with the pipe *g* which connects with the air by way of an automatic air-valve *g'*, which while admitting air to the chamber *a*, will be shut by the water pressure when the water is forced up in such pipe *g*.

In sinking the dock the chambers *b* and *c* are filled with water and the outside water flows automatically through the pipe *f* into the chamber *a*, until the air contained in

the same compresses to such an extent as to balance the external pressure.

While sinking the dock the internal air of the chamber *a* is automatically cut off from the external air by the water entering said pipe *f*, as before stated, while on completely emptying the chamber *a* through the pipe *h* to raise the dock and on closing the valve *i* of the pipe *f*, the external air can again enter the chamber *a* through the pipes *g* and *f*, as before stated.

It is unnecessary to regulate the chambers in communication with the water, because only so much water can enter that the internal air pressure and the pressure of the water entering balance each other.

The automatic compression of the air contained in the dock by water entering from the outside can take place in all chambers of the dock, also including the side chambers. In the latter however the above mentioned drawbacks of the older constructions of docks would not be overcome for the following reasons:

The force height would only be reduced on commencing to pump, while the quantity of water to be pumped out remains the same. Further, the walls of the side chambers would be very unfavorably strained by the compressed air, as the internal pressure of the air would not be balanced by the outside water. In such arrangement a small leak, owing to the velocity of the escaping air would occasion a great loss of power. These drawbacks are avoided by the arrangement shown in the drawing according to which the air is compressed in a chamber contained in the bottom pontoon, which is separated both from the remaining parts of the pontoon and from the side chambers.

The advantages obtained by the present invention are as follows:—1. Owing to the automatic increase in the size of the air chambers on raising the dock, the lifting force is simultaneously, automatically augmented and this force partially balances the increasing load of the ship. 2. The force heights remain permanently low, because, owing to the continuously enlarging air chambers the water levels in the interior are continuously increased. 3. At the same time, the external water pressure on the walls of the air chambers, on sinking the dock, owing to the pressure of the compressed air, is in part neutralized, and in the other parts of the dock is quite essentially decreased, by the continuous increase of the water level in the interior. Owing to the essentially decreased force height an economy in pumping is effected, while, owing to the decrease and partial neutralization of the water pressure, the shell of the dock and the iron construction used to stiffen said shell are less strained. Further, owing to the automatic augmentation of the lifting force under the supporting point of the load, when raising the dock, a much more favorable distribution of forces is obtained than in older construction. By such arrangement both the working and installation expenses are reduced.

What we claim and desire to secure by Letters Patent is:—

A floating dock comprising side chambers, a bottom central pontoon forming an air-chamber, a valved pipe communicating with said pontoon and leading through a side chamber to the exterior, and an air-tube communicating with said valved pipe and provided with an air-valve.

In testimony, that we claim the foregoing as our invention, we have signed our names in presence of two subscribing witnesses.

ALFRED MEHLHORN.
PHILIPP VON KLITZING.

Witnesses:
OTTO STEINITZ,
WILHELM DEETJEN.