J. LÖFFELHOLZ.

PNEUMATIC FLOATING DOCK.

APPLICATION FILED JUNE 5, 1907.

916,736. Patented Mar. 30, 1909.

Fig. 1.

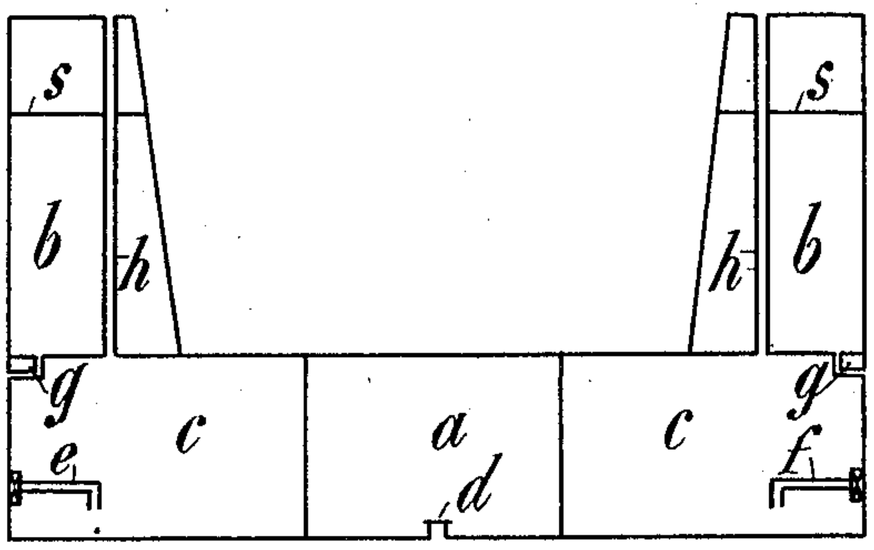
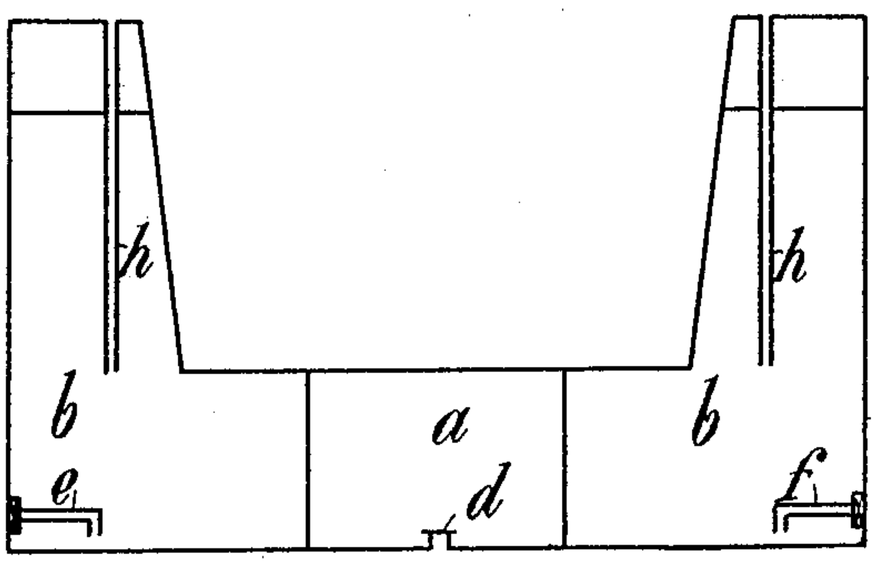


Fig. 2.



WITNESSES

W. M. Avery

J. P. Davis

INVENTOR

Josef Löffelholz

BY

Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

JOSEF LÖFFELHOLZ, OF STERKRADE, GERMANY, ASSIGNOR TO GUTEHOFFNUNGSHÜTTE, AKTIENVEREIN FÜR BERGBAU UND HÜTTENBETRIEB, OF OBERHAUSEN, II, GERMANY.

PNEUMATIC FLOATING DOCK.

No. 916,736. Specification of Letters Patent. Patented March 30, 1909.

Application filed June 5, 1907. Serial No. 377,356.

To all whom it may concern:

Be it known that I, JOSEF LÖFFELHOLZ, engineer, a subject of the Grand Duke of Hessia, residing in the city of Sterkrade, Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Pneumatic Floating Docks, of which the following is a specification.

The present invention relates to the type of floating dock, in which air is compressed in chambers, reserved for that purpose in the pontoon and side walls, by means of water entering those chambers from below while the dock is being submerged. The compressed air is afterward utilized, so as to save power in the working of the pumps while raising the dock. In the docks of this type known up to the present the air compression chambers in the pontoon communicate freely with those of the side walls. The air pressure in the pontoon compression chambers, as measured by the difference between the water level in these chambers and the outside water level, is thus transmitted to the air in the side wall compression chambers; consequently when the dock is deeply submerged, a considerable air pressure is developed in the side wall compression chambers, this pressure on the plating being only partly counteracted by the pressure of the outside water and in such a manner, that the excess pressure on the inner side diminishes with the distance under the outside water level, while attaining its greatest value on a line with and above the outside water level. If the side wall compression chambers are not at least in the upper parts of a cylindrical shape, but straight or level, strengthening will have to be resorted to, as the bonds of the side walls would otherwise be unable to withstand the excess pressure on the inside.

The object of the present invention is therefore to compress the air in the side wall compression chambers of docks with straight side walls in such a manner, that the air pressure developed in those chambers becomes considerably smaller than with the methods employed hitherto. Such extensive strengthening as formerly necessary can then be dispensed with. To realize this, the compression of the air in the side walls is not to be effected as formerly by means of the water entering the compression chambers in the pontoon; the compression chambers in the pontoon have on the contrary no communication whatever with the compression chambers of the side walls. The compression of the air in the side wall chambers is only to be effected by the water entering those chambers directly from the outside.

Figure 1 is a section through a floating dock constructed in accordance with the invention; and Fig. 2 is a similar view of a modified form.

The drawing shows a section through a floating dock constructed according to the invention; *a* is the air compression chamber in the pontoon, *b* are the compression chambers in the side walls, in which the air is compressed by means of the water entering those chambers through the valves *g* directly from the outside.

s indicates a safety chamber in which no water is allowed to enter, and which, as is well known, serves to prevent the dock from sinking completely. The chambers *b* therefore do not communicate with the chamber *s*. To submerge the dock, water is allowed to enter at first into the chambers *c* and *a* of the pontoon by means of the inlets *e*, *f* and *d*. The air in the chambers *c* escapes in the usual way through the pipes *h*, while the air contained in the chamber *a* is compressed by the inflowing water. As soon as the top of the pontoon sinks below the outside water level, the water also enters through the inlets *g* into the air compression chambers *b* of the side walls and compresses the air contained in those chambers. The chambers *b* and *c* need not necessarily be separated from each other, as the pressure on both sides of the horizontal separation floor, is always the same; should this horizontal separation floor be dispensed with, then the compression of the air in the side wall compression chambers is nevertheless obtained in the same manner and with the same result as formerly. The water then enters the chambers *c* of the bottom pontoon, situated underneath the air compression chambers of the side walls while the air, that is not to be compressed, escapes through the pipes *h*, until the water, rising in the chambers *c*, reaches and obturates the pipes *h*, the air is then compressed in the side wall compression chambers *b* in precisely the same way as formerly.

Generally the whole of the side-wall compartments cannot be used for the air compression, as the submerging of the dock,

especially if unburdened, would otherwise be rendered impossible by the great volume of air contained in the dock inside, even though the well known method of pumping water into higher lying compartments were employed, consequently chambers similar to the chambers *b*, but out of which the air is allowed to escape, have also got to be provided in the side walls. If the water in these latter compartments is to remain on a level with the outside water, then the volume of the air lying below the outside water level must be just sufficiently large to carry the dock and its load in conjunction with the water displacement of the dock walls, keel blocks etc. Consequently for the submerged dock the volume of the compressed air lying below the outside water level must always be the same, whether the air is compressed only in an isolated chamber of the pontoon, or whether the compression takes place in a compartment communicating with other compression chambers situated in the side walls or outside the dock. This proceeding differs from the other known methods for compressing air in floating docks only through part of the compressed air, namely, the air in the side wall compression chambers, being obtained under a lesser tension, than the tension it would have if the compression were effected through the water entering the pontoon only. As the amount of energy obtainable from the same volume of compressed air grows with the tension of the air, it follows that the saving in energy, which is the object of the compression of air through the entering water, is in this case considerably smaller than with the other known methods. Yet in certain cases, for instance when transforming an existing dock for the application of the new method, or when for some reason or other the compression chambers in the side walls can not be given a cylindrical shape, while strengthening of the straight or even side walls be not desired, the reducing of the air pressure in the side wall chambers would outweigh the consideration of the loss of energy caused thereby.

If it is intended to sink the dock without the use of auxiliary means, such as lifting or pumping up water, then the air compression chambers must, as in the other known methods, be made small enough, so that the inclosed air does not prevent the automatic sinking of the dock.

Having now particularly described the nature of my invention, as well as its mode of action I declare that what I claim is:

A floating dock with independent air compression chambers in the side walls, and in the bottom pontoon, and with means for admitting water directly into said chambers from the outside to compress the air therein, said chambers having no communication with each other.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

JOSEF LÖFFELHOLZ.

Witnesses:

ALFRED POHLMEYER,

R. M. Y. SIEBER.