No. 683,219. Patented Sept. 24, 1901.

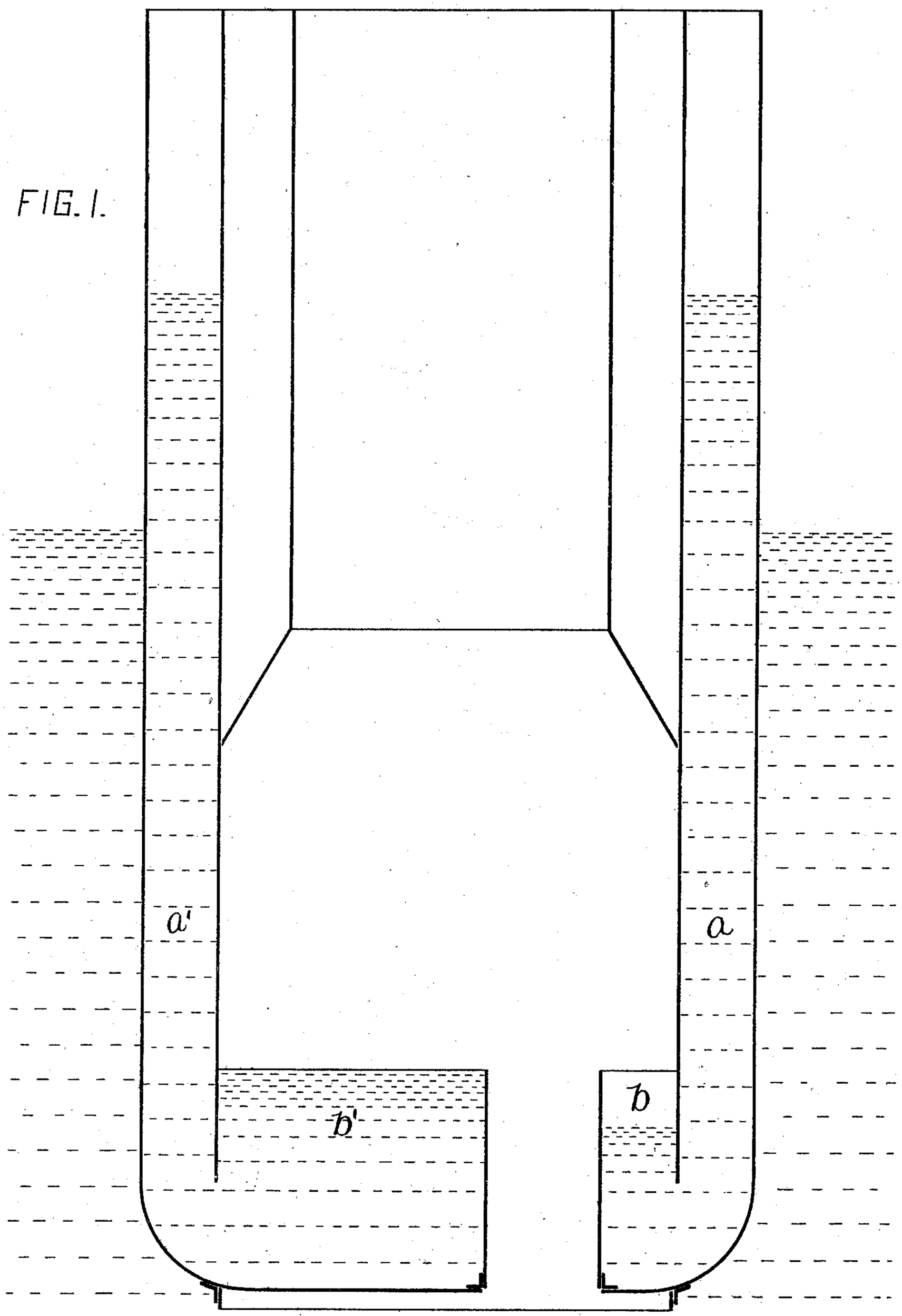
W. H. McFADDEN.

CAISSON.

(Application filed Apr. 19, 1901.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.



WITNESSES:

F. M. Dappen.

Herbert Bradley.

INVENTOR

William H. McFadden

by Dennis S. Wolcott Att'y.

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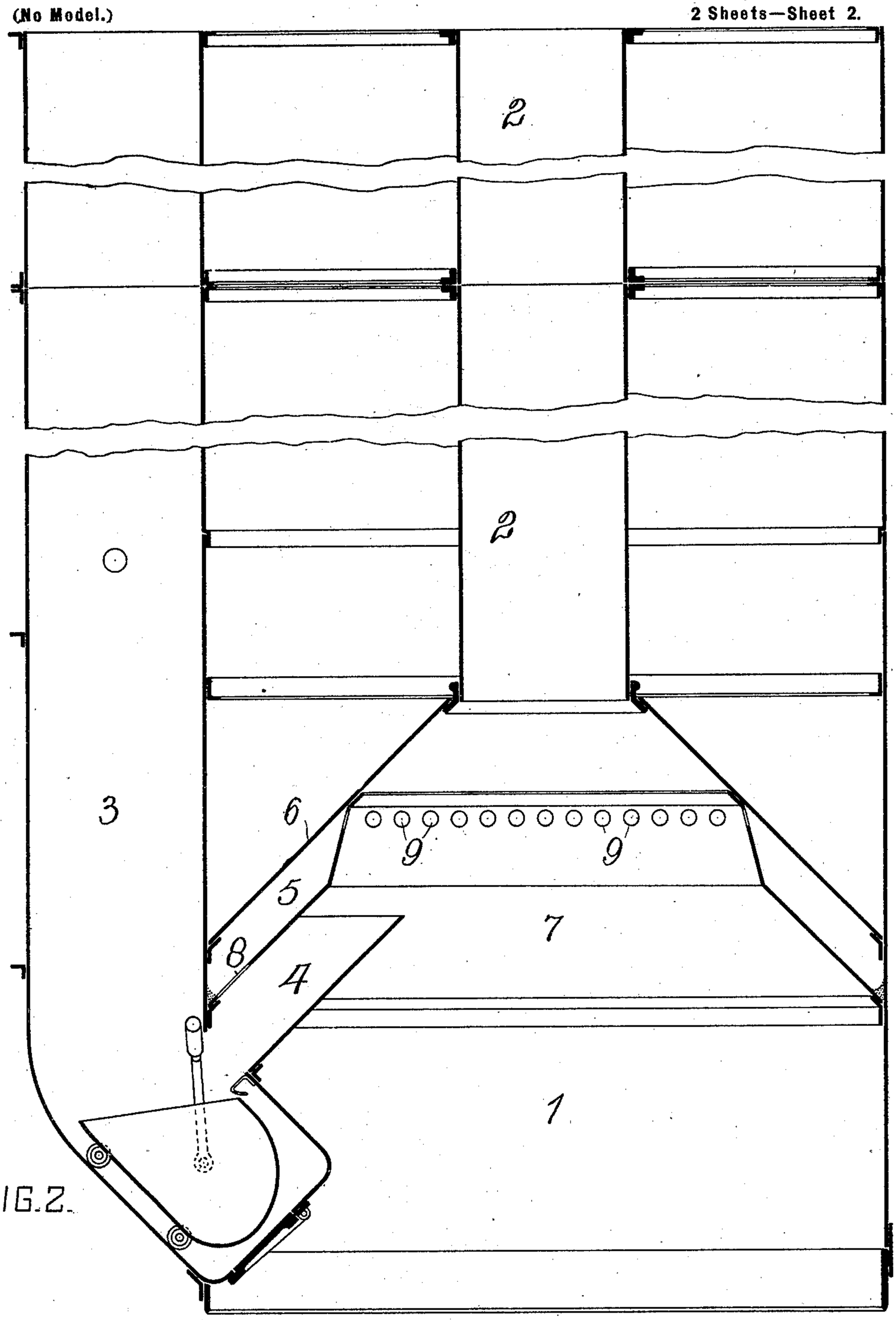

FIG. 2.

WITNESSES:
F. M. Dapper.
Herbert Bradley.

INVENTOR
William H. McFadden
by Dennis B. Wolcott Att'y.

UNITED STATES PATENT OFFICE.

WILLIAM H. McFADDEN, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE CONSOLIDATED MINING AND DREDGING COMPANY, OF SAME PLACE.

CAISSON.

SPECIFICATION forming part of Letters Patent No. 683,219, dated September 24, 1901.

Application filed April 19, 1901. Serial No. 56,588. (No model)

To all whom it may concern:

Be it known that I, WILLIAM H. McFADDEN, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Caissons, of which improvements the following is a specification.

In Letters Patent No. 11,873, reissued to me November 20, 1900, I have described and claimed a construction of caissons having a water-sealed shaft or tunnel extending from the working chamber for the removal of material from and the delivery of material to the working chamber. Some difficulty is encountered in the use of such class of caissons in maintaining the water seal under variations of pressure in the caisson, for the reason that the branch of the auxiliary or tunnel must of necessity be comparatively short, so that a slight increase of pressure in the working chamber will force the water out of the branch, and thereby destroy the seal.

The object of the present invention is to provide for an increase in the height of the column of water in the long arm of the auxiliary shaft inversely proportional to the decrease in the height of the column in the short branch when pressure is increased in the working chamber—as, for example, to provide for an increase of one foot in the height of the column in the long branch for a decrease of one inch of the column in the short branch under increased pressure.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a diagrammatic view illustrating the theory of my improvement, and Fig. 2 is a sectional elevation of the lower portion of a caisson having my improvement applied thereto.

To the right in Fig. 1 is shown an auxiliary shaft or tunnel having the branches *a b* of equal horizontal dimensions, the branch *b* entering the working chamber A of the tunnel and the branch *a* extending above the level of the water. If with such a construction the pressure should be increased somewhat in the working chamber, thereby depressing the column of water in *b*, the height of the column in *a* would be increased the same amount—as, for example, if the height of column in *b* be decreased by an increase of pressure of one pound in the working chamber two feet the height of the counterbalancing column in *a* will be increased only two feet. Hence as the branch *b* cannot be made very long a small increase of pressure would effect a forcing of the water entirely out of *b* and the destruction of the seal. To the left of Fig. 1 the branch *b'* within the working chamber is made of the same height as the branch *b*, but with a much larger area than the branch *a'*, which has the same horizontal dimensions as the branch *a*. It will be supposed for purposes of illustration that the area of *b'* is twelve times the area of *a'*. Hence if the pressure be increased, say, one pound in the working chamber the height of column in *a'* will be raised; but as the water thus forced into branch *a'* is derived from branch *b'* and as such branch has twelve times the horizontal capacity of the branch *a'* the height of the column in *b'* will be reduced only two inches to produce the necessary counterbalancing height in branch *a'*—that is to say, by the reduction of two inches in the height of the column in *b'* enough water is forced into *a'* to raise the column therein two feet. It will be observed from the foregoing that this construction will permit of a large variation in pressure in the working chamber without liability of destroying the seal in the auxiliary shaft or tunnel.

In Fig. 2 I have shown a desirable construction for carrying out the improvement theoretically described above. The working chamber 1 of the caisson is open at its lower end, as is usual, and is connected at its upper end with the shaft or tunnel 2, extending to an air-chamber. In addition to the tunnel 2 an auxiliary shaft or tunnel is provided, consisting of the main branch 3 outside of the caisson and a branch 4, opening inside the caisson. These branches need not necessarily be of equal horizontal dimensions. A water-chamber 5 is so located on the caisson that the water therefrom can flow into the branch 4 at some point between its upper open end and its point of junction with the main branch. This chamber, which is virtually an enlargement of the

branch 4, can be conveniently located and constructed as shown in the drawings. The chamber is formed by the top wall 6 of the working chamber and a metal plate 7 secured at its lower edge to the side walls of the working chamber and extending continuously around the working chamber or so much thereof as is necessary to furnish the desired capacity to maintain a seal in the auxiliary shaft or tunnel. This chamber is connected by a port or opening 8 with the branch 4, and openings 9 are formed through the inner walls of the chamber at a point above the water-level therein, so that the water in this chamber will be subjected to the same pressure as the water in the branch 4. The capacity of the chamber and branch 4 is so proportioned relative to the cross-sectional area of the branch 3 that an increase of pressure in the working chamber, whereby the water in the branch 4 and the chamber will be lowered, will produce a much greater increase in the height of the column of water in the branch 3. If, for example, the capacity of the chamber and branch 4 be made such that a lowering of the water in the chamber and branch of two inches will force sufficient water into the branch 3 to raise the height of the column therein two feet, then by making the branch 4 two or three or more feet long a very wide range of pressures in the working chamber would not have any dangerous effects as regards breaking the water seal in the auxiliary shaft or column. It will be understood that the water in the branch 4 and in the chamber are necessarily on a level, as both are subjected to the same pressure in the working chamber, and that the chamber and branch are practically an enlarged branch of the auxiliary shaft or tunnel.

I claim herein as my invention—

1. A combination of a caisson, a U-shaped shaft or tunnel having one branch opening into the working chamber of the caisson and the other branch extending above the water-level and the reservoir connected to the tunnel at a point below the level of water in the branch opening into the working chamber and subjected to the same pressure of air as is maintained in the working chamber, substantially as set forth.

2. The combination of a caisson, a U-shaped shaft or tunnel having one branch opening into the working chamber, and the other branch extending above the water-level, and a reservoir connected to the branch opening into the working chamber and having air-inlet ports above the normal level of the water therein, substantially as set forth.

In testimony whereof I have hereunto set my hand.

WILLIAM H. MCFADDEN.

Witnesses:
DARWIN S. WOLCOTT,
F. E. GAITHER.