

C. WILLIAMSON.

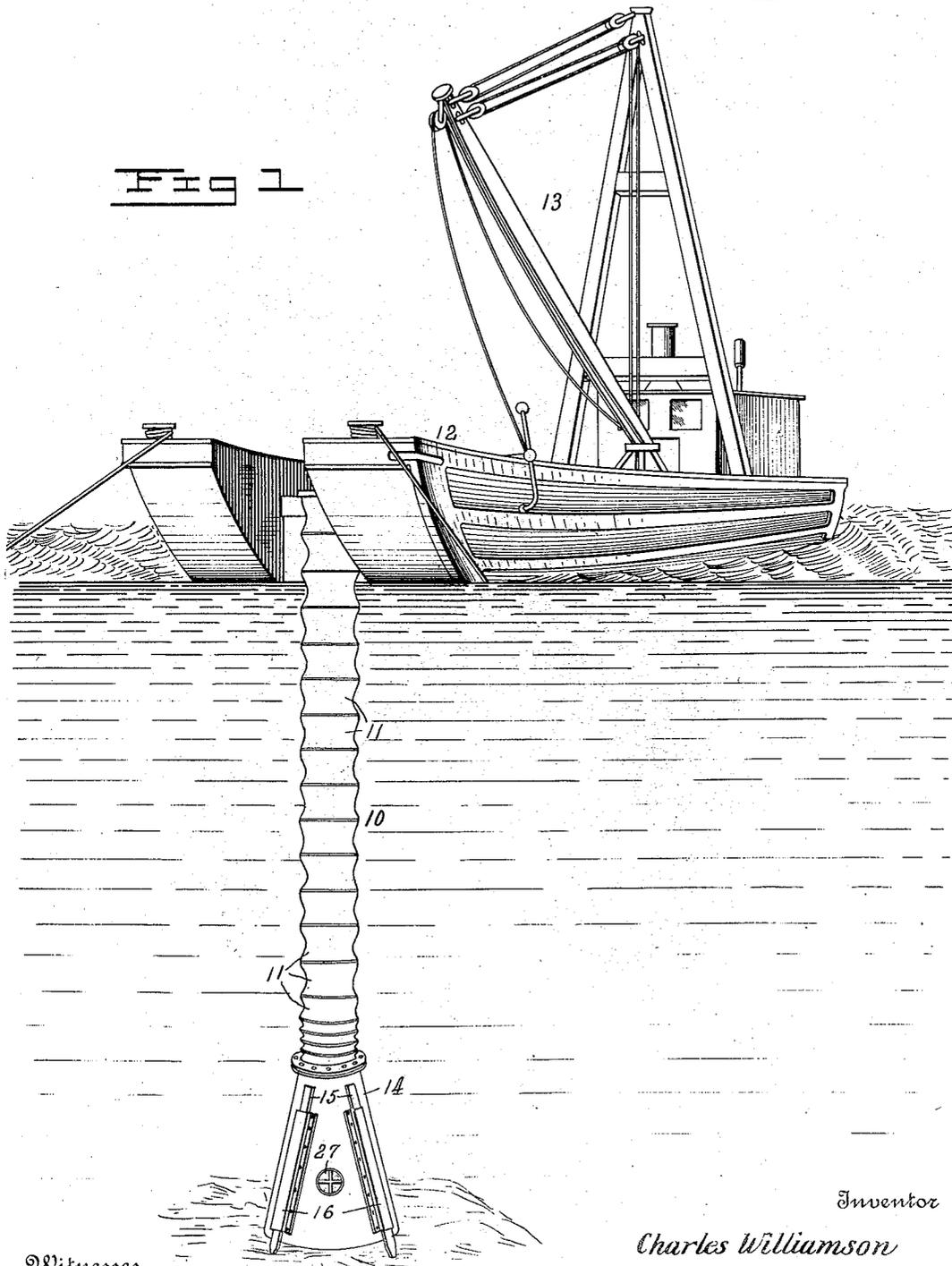
SUBMARINE OPERATING APPARATUS.

APPLICATION FILED JAN. 19, 1910. RENEWED APR. 28, 1911.

1,010,559.

Patented Dec. 5, 1911.

2 SHEETS—SHEET 1.



Witnesses

H. L. Robinson
G. W. Stucker

Inventor

Charles Williamson

By

Jugens Leuchman
Attorney

C. WILLIAMSON.
 SUBMARINE OPERATING APPARATUS.
 APPLICATION FILED JAN. 19, 1910. RENEWED APR. 28, 1911.

1,010,559.

Patented Dec. 5, 1911.

2 SHEETS—SHEET 2.

FIG 3

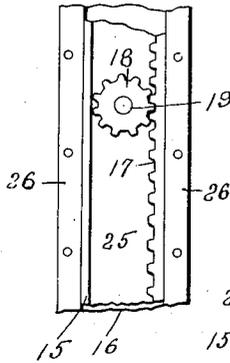


FIG 4

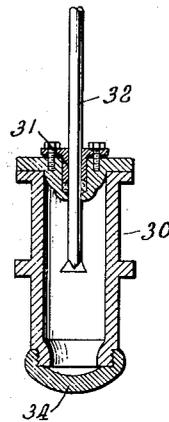
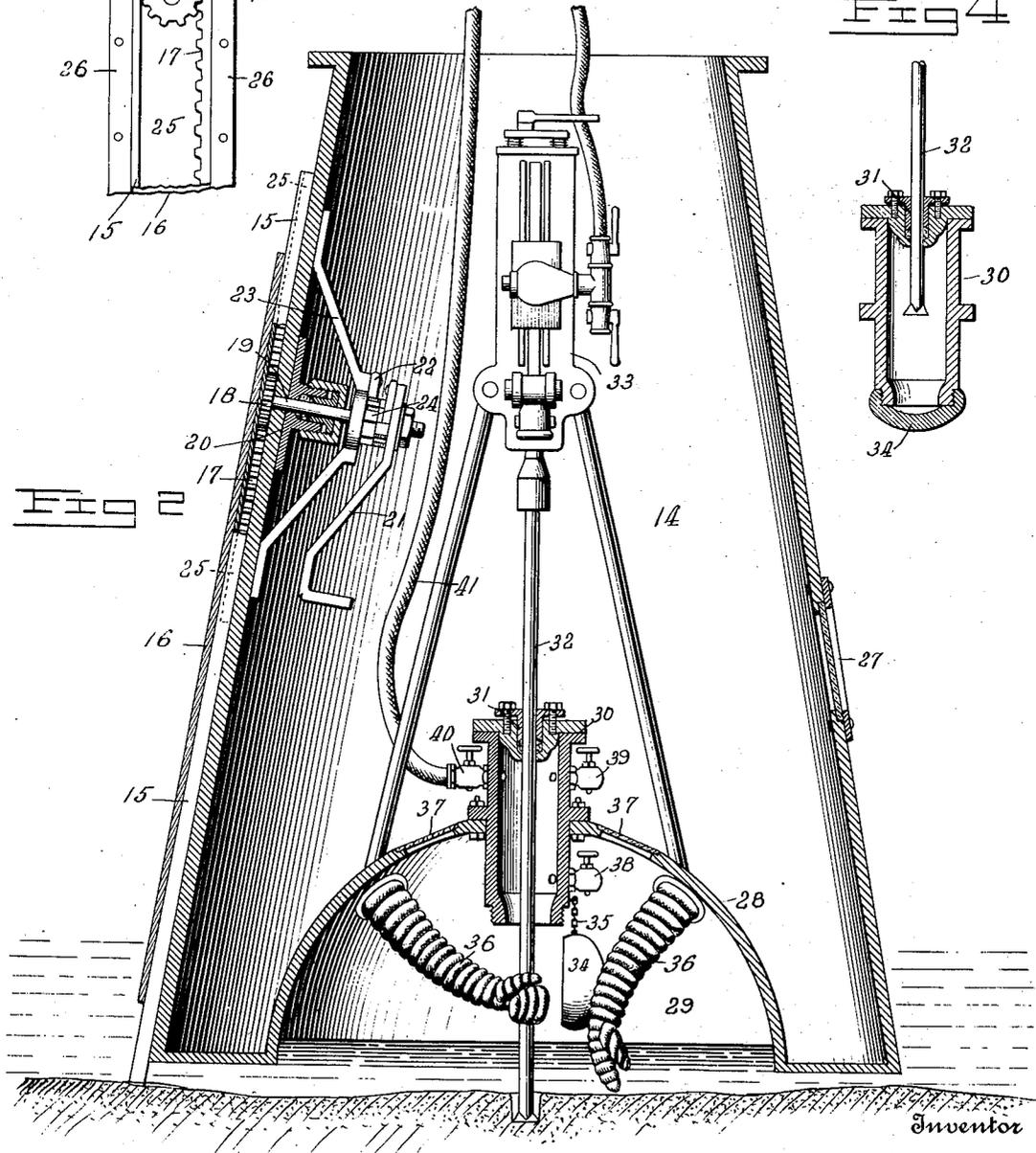


FIG 2



Witnesses
H. B. Pollock
J. M. Stricker

Charles Williamson

Wm. C. Cushman
 Attorney

UNITED STATES PATENT OFFICE.

CHARLES WILLIAMSON, OF NORFOLK, VIRGINIA.

SUBMARINE OPERATING APPARATUS.

1,010,559.

Specification of Letters Patent.

Patented Dec. 5, 1911.

Application filed January 19, 1910, Serial No. 538,949. Renewed April 28, 1911. Serial No. 623,962.

To all whom it may concern:

Be it known that I, CHARLES WILLIAMSON, a citizen of the United States, residing at Norfolk, in the county of Norfolk and State of Virginia, have invented new and useful Improvements in Submarine Operating Apparatus, of which the following is a specification.

My invention relates to submarine operating apparatus of the caisson type, wherein use is made of a water-tight box or column structure which rests on the bottom of a bed of water or in engagement with the body being worked upon. Workmen enter this water-tight structure, whose bottom is usually open, and the body of which is usually filled with compressed air, and accomplish the work desired in the compressed atmosphere, working through the open bottom of the caisson. Other caissons there are which have closed bottoms, certain operating members of various types being provided for the accomplishment of the work from within the caisson body. In this case the air pressure is varied within wide limits. The uses of such an apparatus are many and varied, chief among them, may be said to be the operation of submarine drilling and mining. The apparatus also finds use in exploring of the bottoms of bodies of water, in the filling of submarine foundations, in the recovery of wrecked ships and their cargoes, in the cleaning of hulls of ships, in the cleaning of the floors of reservoirs which it is impractical to drain, and in other uses quite numerous.

The type of apparatus at present in use, is what is known as the pneumatic caisson, the caisson being a water-tight structure with a closed top and open bottom, similar to the well known diving bell. This structure is sometimes made of wood, but now-a-days made mostly of steel, and is very heavy and bulky, having to be manipulated by extremely heavy cables or chains, and it is not very easily moved from one point to another. Air under a pressure depending upon the depth at which the apparatus is operated is forced into the caisson from the top to expel the water within the caisson, and workmen enter through airlocks and accomplish the operations such as excavating and laying foundations in the compressed atmosphere. To work in the compressed air one necessarily must have a most hardy

physical constitution, and before one can work efficiently for any length of time, he has to be gradually accustomed to it. Great physical endurance is necessitated.

It is the object of my invention to overcome the above-mentioned disadvantages of working with and in the pneumatic caisson, and to provide a readily manipulated caisson, which may be readily adjusted to any depth for working, which may be readily moved from place to place, and in which the workmen can perform the operations while in a normal, or substantially normal atmosphere, thus enabling workmen of ordinary physical ability to do submarine work. I also avoid the use of the large high pressure airlocks through which workmen and materials are admitted, and which are more or less troublesome to keep air-tight, and avoid the use of large and expensive pumping systems.

In the accomplishment of my invention I use a caisson of low pressure, preferably atmospheric pressure, associated with a caisson of high pressure, making the low pressure caisson the main body and operating caisson of the apparatus, and the high pressure caisson the working caisson of the apparatus. Suitable devices and means of communication are provided between the low pressure and high pressure caissons, whereby workmen in the low pressure caisson may operate with tools and materials in the high pressure caisson.

Of the several specific embodiments known to me at the present time, I shall describe that delineated in the accompanying drawings, in which,

Figure 1 is a general view of my improved apparatus in operation; Fig. 2 is a vertical section of the operating chamber at the foot of the low pressure caisson; Fig. 3 is a section of one of the adjustable stakes used in connection with the apparatus; and Fig. 4 is a view of an airlock between the low pressure and high pressure caissons.

In this particular embodiment I make use of a low pressure or a main caisson of the flexible and collapsible type. This caisson is made up of collapsible and flexible sections 11; whose weight is preferably, though not necessarily equal to the weight of the water displacement by them when the caisson is extended. As shown, this main low pressure caisson is supported from a scow

or other boat 12 provided with a hoisting and power equipment 13 for raising and lowering the caisson, for loading and raising materials within the caisson, and for pumping air and water. If desired, this scow may be provided with means for self-propulsion. At the lower end of the low pressure caisson 10 is a cone shaped operating chamber 14. This operating chamber has a closed bottom which is water-tight, and its weight, together with the weight of the apparatus carried by it, may, like the weight of the caisson 10 of which it is an extension, be made of substantially equal to the weight of the water displaced by it. Sliding stakes or spuds 15 are mounted in guide channels 16 on the sides of the operating chamber and are movable up and down by a rack and pinion 17 and 18, the pinion being operable from within the chamber 14 by means of a shaft 19 passing through a stuffing box 20 in a wall of the chamber, and provided with a crank 21 on its inner end. A pawl 22 mounted on a fixed part 23 engages a ratchet 24 on the shaft 19 and serves to hold the stakes 15 in any adjusted position against upward thrust. As shown in Fig. 3, the stakes 15 are cut away as at 25 for the accommodation of the pinions 18, the rack 17 being formed on the reduced end. The channels 16 are, in this embodiment, formed by a flanged channel iron 26 bolted to the sides of the operating chamber. Lights 27 of glass in the side walls of the chamber are provided for the convenience of operators in making observations of their surroundings. The bottom wall of the operating chamber 14 is reëntrant and in the shape of a dome, as shown at 28. A chamber 29 is thus formed, and this chamber I use as a high pressure pneumatic working caisson. It is preferably of relatively small dimensions as compared to the low pressure main caisson 10 and is located at any suitable point.

Between the operating chamber 14 and the working chamber 29 I provide a lock 30 for the introduction of tools and materials, and if occasion should require this lock may be made large enough for the admission of workmen. I prefer, however, for reasons previously stated, to make this air-lock large enough only for the admission of materials and tools, as in this manner less air is lost in transfers, and the lock is more easily manipulated and kept air-tight. At its upper end it is provided with a stuffing box 31 through which a power operated tool may be projected, the motor for the tool being located within the operating chamber. I have shown a drill 32 in operation, the drilling machine 33 being mounted within the operating chamber 14. At the lower end of the lock I provide a cap 34 for closing the lower end of the lock during transfer of tools

and materials. This cap I prefer to attach to the lock by a chain 35 in such manner that it can not be lost, but will always be at hand. Projecting within the working chamber 29 from the operating chamber 14 I provide a number of flexible arms and mittens 36, by the use of which the tools and materials within the chamber can be manipulated. Lights 37, preferably located above the arms and mittens, admit free observations of operations within the chamber 29.

The operation of my invention as thus organized is apparent. When it is desired to drill on a rock ledge, for instance, the apparatus is transferred in collapsed form, to the point where it is desired to operate. The apparatus is then lowered by extending caisson 10 until the chamber 14 strikes the bottom. The stakes or spuds 15 are then adjusted by means of the operating crank 21 until the chamber 14 is level. If the bottom on which the chamber 14 rests is soft, the stakes 15 may be shoved into the bottom a suitable distance, in which case they act to accurately position the apparatus and hold it in position during operations. If desired, a certain number of sections of the caisson 10 may be collapsed upon the operating chamber 14 as shown in Fig. 1, and the weight of the chamber 14 on the bottom thus increased, as desired, thus accomplishing a self-anchorage of the apparatus, the pointed stakes 15 being forced more firmly into the bottom by this means. This done, and the cap 34 being applied to the lower end of the lock 30, the stuffing box 31 with the drill 32 may be applied to the upper end of lock as shown in Fig. 4, and the cap 34 thereafter removed, as shown in Fig. 2, and the drill 32 projected into the working chamber 29, and operated by the machine 33. The drill may be easily guided and manipulated, as well as other tools which may be admitted through the airlock 30, by the use of the flexible arms and mittens 36, the operations being followed by observation through the lights 37. In case the drill does not strike at the proper point, the apparatus may be very easily shifted by manipulation of the stakes 15, or by a movement of the entire apparatus. Likewise charges of dynamite introduced through the lock 30 may be placed with ease. Throughout the drilling or other operations, the operators or workmen are working in air at atmospheric pressure and are not subjected to any of the inconveniences or hardships of working in compressed air, and the operations can be performed in a most efficient manner. Any desired operations can be carried on by hand from the operating chamber by the use of the flexible arms and mittens, and with facility. These facts, taken in connection with the adaptability of my apparatus, brought about by

the aforementioned features of easy transportation, positioning and anchorage for all depths and on irregular surfaces, make my apparatus most advantageous for use, and most efficient in use.

While I have chosen to describe this particular embodiment, it is evident that my invention is susceptible of many other embodiments without departing in any wise from its generic spirit. I prefer to make the chamber 29 a pneumatic high pressure caisson chamber, and to further its free use I provide equalizing valves 38 and 39, one opening into the chamber 29 and the other opening into the chamber 14. High pressure air may be thus admitted to the lock to facilitate the removal of cap 34, and this air may be likewise reduced in pressure after the cap 34 has been put on and before the removal of the stuffing box 31. Clearly I may make use of gates for the lock 30 other than the cap 34 and the stuffing box 31, as may be found desirable. For the replacement of air lost in the chamber 29 through leakage or through operation of the lock, I provide a supply through conduit 41 and valve 40 opening into the chamber 29. I have shown the lock 30 cylindrical and in the center of the dome 28, which is located at the bottom of the chamber 14. Clearly I may change the shape and location of these parts at will, depending upon the use to which my apparatus is to be put. In working on an incline it may be very desirable for the chamber 29 to be inclined, or located upon the side of the chamber 14 instead of upon the bottom. Likewise, the shape and proportion of the parts of my invention may be changed without in any wise departing from its generic spirit. I desire to cover all such modifications, as well as the new features above mentioned, in the annexed claims.

Having thus described my invention, what I claim is:

1. An apparatus for submarine operations comprising a flexible caisson, an operating chamber connected with said caisson, and a work chamber associated with said operating chamber.

2. An apparatus for submarine operations comprising a collapsible caisson, an operating chamber connected with said caisson, and a work chamber associated with said operating chamber.

3. An apparatus for submarine operations comprising a caisson open to the atmosphere, an operating chamber connected with said caisson and at atmospheric pressure, and a work chamber at high pressure associated with said operating chamber.

4. An apparatus for submarine operations comprising a low pressure operating caisson, a relatively high pressure working chamber associated therewith, and means

whereby operations may be carried on within the high pressure caisson by operators in the low pressure caisson.

5. An apparatus for submarine operations comprising a low pressure operating caisson, said caisson communicating with the atmosphere, and a relatively high pressure pneumatic working caisson associated therewith, and means whereby operations may be carried on in the working caisson by operators in the operating caisson.

6. A submarine operating apparatus comprising in combination, and in the same right line, a collapsible flexible caisson, an operating chamber at the bottom of the caisson, a work chamber at the bottom of said operating chamber, and power operated tools passing through a wall of said work chamber and operated by a power device in said operating chamber.

7. A submarine operating apparatus comprising a caisson, an operating chamber connected with said caisson, a working chamber associated with said operating chamber and separated therefrom by a wall, a drilling apparatus in said operating chamber, and means whereby a drill may be passed through said wall and operated in said working chamber.

8. A submarine operating apparatus comprising a caisson open to the atmosphere, an operating chamber connected with said caisson, a work chamber associated with said operating chamber and separated therefrom by a wall, a power device in said operating chamber, and means connected with said separating wall for permitting a tool to be operated in said working chamber by said power device.

9. A submarine operating apparatus comprising a caisson, an operating chamber connected with said caisson, said chamber and caisson having a closed bottom and being open at the top to atmospheric air, and a pneumatic working chamber formed in the bottom wall of said operating chamber.

10. A submarine operating apparatus comprising a caisson open to the atmosphere at its upper end and closed at its bottom end, a working chamber associated with said caisson and separated therefrom by a wall, a tool operable within the working chamber from within the caisson, and means whereby said tool may be manipulated from within the caisson.

11. A submarine operating apparatus comprising a caisson open to the atmosphere at its upper end, and closed at its bottom, a working chamber associated therewith, an airlock between said caisson and said chamber.

12. A submarine operating apparatus comprising a caisson, whose upper end is open to the atmosphere and lower end of which is closed, a working chamber associated

therewith and separated therefrom by a wall, and an airlock between said caisson and said chamber, said airlock having a stuffing box on the caisson end and a cap on the chamber end.

13. A submarine operating apparatus comprising a caisson whose upper end is open to the atmosphere and the lower end of which is closed, a working chamber associated therewith and separated therefrom by a wall, an airlock between said caisson and said chamber, said airlock having a stuffing box on the caisson end and a cap on the chamber end, and means whereby a tool may be operated through said stuffing box when the cap is removed.

14. A submarine operating apparatus comprising a caisson open to the atmosphere at one end and closed at the other, a pneumatic work chamber associated therewith, means whereby working material may be introduced to said chamber, and means comprising flexible arms and mittens attached to the wall of the working chamber and opening into the caisson for the manipulation of said materials.

15. A submarine operating apparatus comprising a low pressure operating chamber closed at its bottom end, a relatively high pressure working chamber associated therewith, flexible arms and mittens extending into said working chamber and communicat-

ing with said low pressure chamber, and lights in the walls of said working chamber above said arms and mittens.

16. A submarine operating apparatus comprising a caisson, vertically movable side stakes secured to said caisson, and means for operating said side stakes from within the caisson.

17. A submarine operating apparatus comprising a caisson, slidable side stakes for positioning said caisson, a portion of said stakes being cut away, a rack on said cut-away portion, and a pinion operable from within the caisson engaging said rack.

18. A submarine operating apparatus comprising a caisson, slidable stakes secured to said caisson for positioning the same, and channeled members which secure the stakes to said caisson.

19. In a submarine operating apparatus, a caisson, stakes attached to said caisson, and means for increasing the effective weight of said caisson whereby said stakes may be forced into the body adjacent the caisson.

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

CHARLES WILLIAMSON.

Witnesses:

J. F. BENSON,
CHRISTINE S. TYNAN.