G. E. HOFFMAN.

SUBMARINE VESSEL.

APPLICATION FILED OCT. 24, 1916.

1,313,534.

Patented Aug. 19, 1919.

3 SHEETS—SHEET 1.

FIG. 1

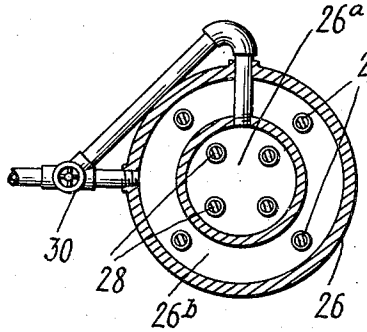


FIG. 8

FIG. 2

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3 SHEETS—SHEET 2.

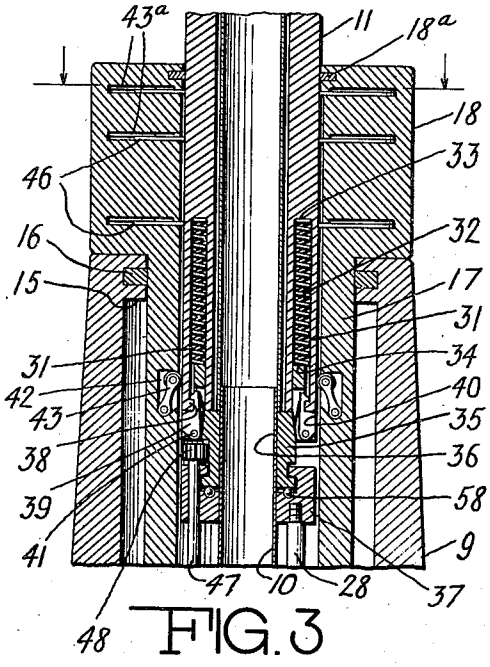


FIG. 3

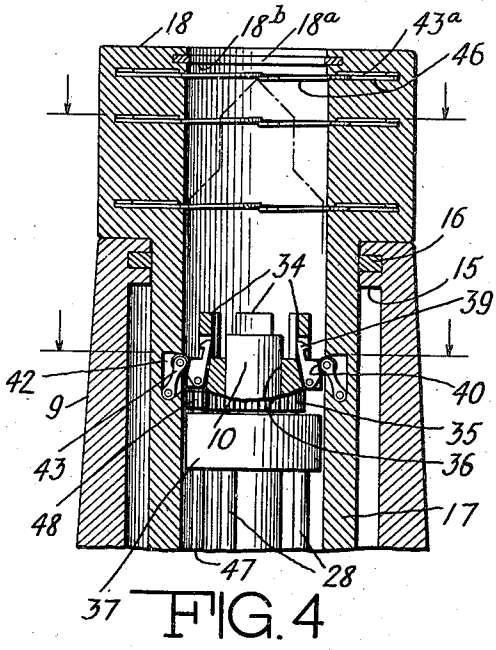


FIG. 4

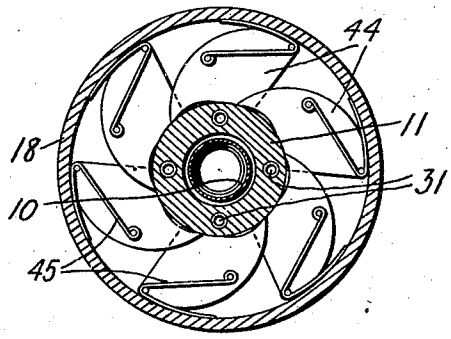


FIG. 5

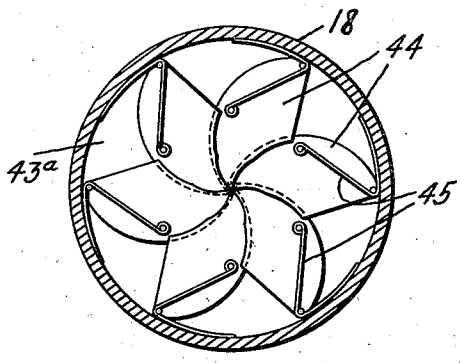


FIG. 6

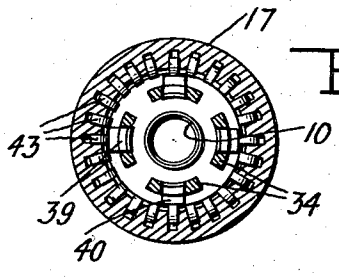


FIG. 7

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3 SHEETS—SHEET 3.

FIG. 9

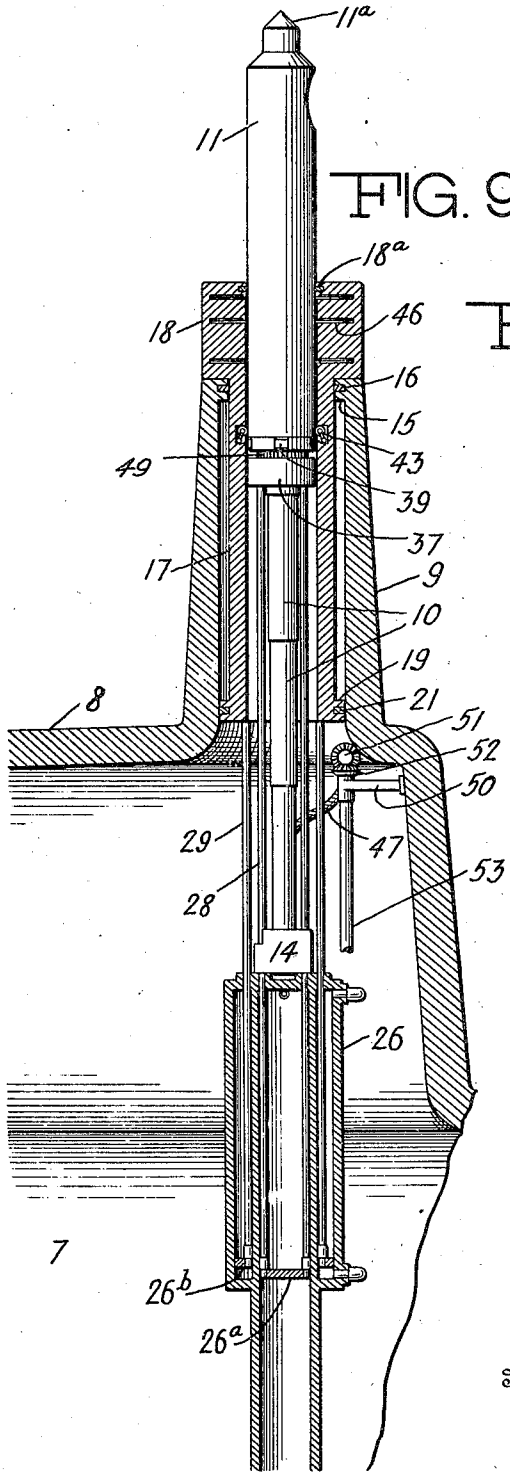
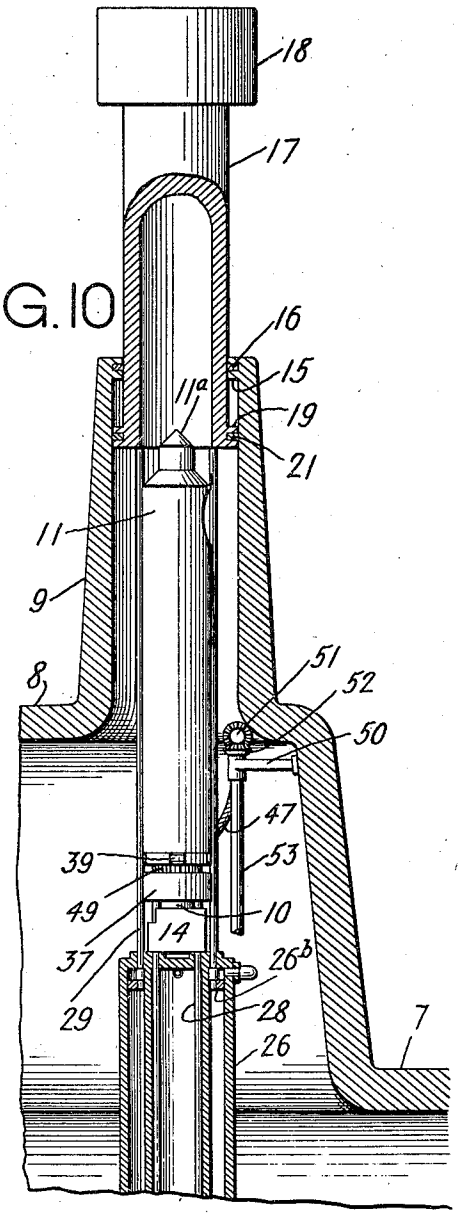


FIG. 10



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UNITED STATES PATENT OFFICE.

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SUBMARINE VESSEL.

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To all whom it may concern:

Be it known that I, GEORGE EARL HOFFMAN, a citizen of the United States, residing at Pensacola, in the county of Escambia and State of Florida, have invented certain new and useful Improvements in Submarine Vessels, of which the following, taken in connection with the accompanying sheets of drawings, is a full, clear, and concise description thereof.

The present invention relates in general to submarine vessels of the type customarily employed for naval purposes, and is more especially directed to improvements in the construction and operation of the periscope, by means of which observations on and above the surface of the water may be taken when the craft is submerged.

The fundamental function of the periscope and its method of employment are matters of common knowledge, especially as adapted for submarine purposes, and as is well known the periscope is usually of a tubular construction having an ocular member embodied in its head. The tubular portion of the periscope must necessarily extend downwardly into the interior of the submarine vessel and is of a rigid construction forming substantially an integral part of the conning tower of the vessel. Under the present methods of construction and modes of operation of submarine craft, it has been found that one of the most vital defects, serving to limit the usefulness of such craft, has been in the vulnerability of the periscope. This element must necessarily protrude above the surface of the water when it is desired to take observations while the craft is submerged and presents a fair target for shell fire. Owing to its rigidity and its formation as a substantially integral part of the conning tower, if the projecting portion of the periscope is struck by a shell and blown away, the submerged vessel must either at once rise to the surface or founder by reason of the water entering through the conning tower at the opening left by the destruction of the periscope. It will be readily understood from the foregoing that the necessary exposure of the periscope and the comparative ease in rendering a submarine *hors de combat* by its destruction has presented a serious problem in utilizing submarine vessels for offensive purposes, particularly in making attacks in well-guarded waters.

The principal object of the present invention is to overcome or eliminate the disadvantages and dangers heretofore pointed out with relation to periscope construction as it now exists and to provide an observation element of such a construction and mode of operation as will render it possible for a submerged vessel to continue in active service after the destruction of its periscope. This is accomplished by providing for the substitution of one periscope after another as they may be destroyed, whether the vessel is operating submerged or awash, without in any way affecting the serviceability or efficiency of the craft and its crew.

A further object of my present invention is to provide a periscope sectionally constructed which may be automatically or manually elevated or lowered with dispatch and a minimum amount of power, and in which the ocular or head member is detachable from the supporting or main portion of the device to permit of the substitution of one head member after another as the necessity may arise.

My invention also comprehends an improvement in periscope construction, as hereinbefore pointed out, in which the ocular or head portion is automatically detached from the supporting part upon the former being rendered unserviceable, regardless of the position of the vessel on which the periscope is carried, means being provided to coöperate with the observation element and its operating mechanism to effectively seal the periscope tube when the ocular member is detached therefrom, so as to prevent the inflow of water to the interior of the submarine when the vessel is submerged.

My invention furthermore contemplates means and mechanism for detaching the ocular member from its support by releasing stored or controlled energy to act thereon in such a manner as to effect a rapid or sudden movement of the said member in an upward direction, virtually resulting in the expulsion of said member, so that it will be thrown clear of the contiguous parts of the supporting structure and vessel.

In addition, my invention is designed to provide means which will automatically function upon the expulsion of the ocular member to close the opening thereby created and prevent the entrance of water to the interior of the vessel, said means being so arranged as to coöperate with an ocular member, which may be substituted for that

destroyed, to maintain the seal during the operation of effecting the substitution, while elevating the substituted member and when the observation member is in normal position.

Other objects and advantages of the employment of my invention will become manifest as the description proceeds and I would have it understood that I do not limit myself to any specific object herein set forth or to the details of construction and methods of operation of the various parts of my invention as herein shown and described, reserving unto myself the full range of equivalents in operation and structural details to which I may be entitled under my invention in its broadest aspect, together with all uses wherein the employment of my invention may be found to be advantageous.

I shall now proceed to describe my invention with reference to the specific embodiment shown in the drawings, wherein I have elected to illustrate certain details of structure in order to afford a clear and comprehensive understanding thereof, then point out with more particularity the essential features or elements of novelty in the appended claims.

In the drawings: Figure 1 is an elevation, partly in section of a portion of the conning tower of a submarine vessel and my improved periscope.

Fig. 2 is an enlarged sectional detail of the ocular member of the periscope and the coöperating sealing means for the periscope tube.

Fig. 3 is an enlarged detail sectional view showing means employed for expelling the ocular member and for locking the latter in its normal position.

Fig. 4 is an enlarged sectional view, illustrating the relative position of the locking parts when the ocular member has been detached or expelled.

Figs. 5 and 6 are detail views of the construction of the means for sealing or closing the opening in the periscope tube after the ocular member has been detached.

Fig. 7 is an enlarged detail of the locking and releasing means shown in Figs. 3 and 4.

Fig. 8 is a horizontal sectional view, taken on the line A—A of Fig. 1, showing the apparatus for effecting the raising of the periscope members.

Fig. 9 is a sectional elevation of a modified construction of my invention, showing the periscope in raised or normal position, and

Fig. 10 is a similar view, illustrating the relative position of the parts when the ocular member has been inserted and prior to its elevation to its observation position.

Referring now to the drawings in detail, in which like characters of reference are employed to designate similar parts throughout the several views, 7 indicates the hull of a submarine vessel of the generally accepted type, which is provided with a conning tower 8, usually positioned amidship. 9 is an extension carried by the conning tower 8, which forms a housing for the periscope, consisting of the telescoping tubes 10 and the headpiece or ocular member 11, provided with a lens 12 and a prismatic reflector 13 which coöperates with a reflector (not shown) in the base of the periscope and the eyeglass 14. The specific construction and functioning of the means for transposition of the light beams are well-known in periscope construction and hence need not be explained herein, as they do not form an essential feature of the present invention.

The extension 9 is provided with an inwardly directed flange 15, surrounding its mouth, which flange is recessed to receive a packing ring 16. This forms one bearing for a telescoping or sliding member 17 having an enlarged head portion 18, the lower end of said member being outwardly flanged at 19 to form a second bearing surface. Said flange 19 is recessed at 20, similarly to the flange 15, to provide a seat for the packing 21. It will be observed from this construction that these bearing surfaces provide a most substantial support for the member 17, and by reason of their construction permit of the movement of the member 17 within the extension 9 with very little effort.

For elevating the periscope to the position shown in Fig. 1, I may employ compressed air or any other suitable power for the purpose. In the present instance, I admit compressed air to the cylinder 26 from a suitable source of supply 23, connected to the cylinder by the pipes 24 and 25, the flow of the air being controlled by suitable valves, such as illustrated at 27 and 30, whereby the pistons 26^a and 26^b may be raised or lowered, the air acting upon the opposite surfaces of the pistons in the well known manner. Connected to the pistons 26^a and 26^b are the rods 28 and 29 which are fastened respectively to an enlargement or shoulder 37 adjacent to the upper end of the topmost tube 10 and the telescoping member 17. It will, therefore, be obvious from the construction just described, that, as air is admitted to the cylinder 26 by the proper valve, the piston 26^a will be forced upwardly, effecting the elevation of the ocular member 11 by the extension of the telescoping tubes 10 to their normal positions, as shown in Figs. 1 and 9. Similarly, the admission of air to the cylinder 26 to impinge against the piston 26^b will effect the raising of the telescoping member 17 by means of the rods 29 connected to said piston. The ocular member 11 and its connecting parts and the telescoping member 17 may, of course, be low-

ered by the actuation of the controlling valves, whereby the air will force the pistons 26^a and 26^b downwardly.

As before stated, one of the principal objects of the present invention is to provide for the expulsion of the ocular or head member 11 of the periscope in case of injury thereto, as so to maintain the vessel in service. To attain this end, the said ocular or head member 11 is formed with recesses 31 at its base to provide housings for a plurality of expansion springs 32, the upper ends of these springs bearing against the upper walls 33 of the recesses 31, while the lower ends abut against the shoulders 34 supported on a collar 35 surrounding the upper end 36 of the topmost tube 10. The base or lower end of the ocular member 11 is formed with an annular inwardly directed flange 38 which is adapted for engagement by the hooks 39, said hooks being pivotally mounted at 41 on the collar 35, as clearly shown in Figs. 3 and 4 and turned by triggers 43 engaging them at 40. It will be apparent from the construction so far described that when the ocular member is inserted so that the springs 32 will be under compression by abutting against the shoulder 34 and the walls of the recesses 31, the heads of the hooks 39 will engage the flange 38 and firmly hold the ocular member on the seat provided therefor by the upper surface of the collar 35. Any suitable number of the hooks 39 may be employed, but I have found it sufficient for my purposes to position four of them diametrically opposite to each other as shown in Fig. 7. Adjacent to the base of the ocular member 11, when in normal elevated position and locked to the collar 35, I form an annular recess 42 in the wall of the telescoping member 17 within which I position a plurality of spring pressed triggers 43 pivotally mounted in recess 42. Assuming that the ocular or head member 11 of the periscope is destroyed, and it is desired to effect the substitution of a new member, the shoulder 37 is elevated through the medium of the rods 28, as heretofore explained, until the triggers 43 engage at 40 on the hooks 39, this rocks the hooks on their fulcrum points moving them to the position shown in Fig. 4, thereby throwing them out of engagement with the annular flange 38, whereby the expansion of the springs 32, which are held under considerable tension, will expel the ocular member 11 from the telescoping member 17, sufficient force being exerted thereupon to throw it clear of all adjacent portions of the submarine vessel.

It is obvious that, if the submarine vessel is running submerged, as the head or ocular member 11 is expelled from the telescoping member 17, means must be provided to prevent the entrance of water to the interior of the vessel through the tubes 10 and the bore of the member 17. This is accomplished by the employment of a plurality of closures or shutters positioned in the enlarged portion 18 of the telescoping member 17. These shutters or closures may be of any type suitable for the purpose, but, in the present embodiment, I have shown them as of the form commonly known as the iris shutter, similar to shutters used in the practice of photography. Each shutter is housed in a recess 43^a provided therefor in the enlarged portion 18 of the telescoping member 17 and consists of a plurality of segmental leaves or sections 44 adapted to be actuated by the springs 45 to close and effect an overlapping of the sections or leaves, so as to form a complete closure in the well known manner. As the ocular member 11 is expelled, these shutters, under the action of their springs as just described, close in sequence, the lowermost first and the remaining ones in rapid succession, thereby effectively sealing the orifice produced by the exit of said member. To substitute an ocular member for that which has been expelled, the piston 26^a is functioned to contract or telescope the tubes 10, so that the new ocular member may be positioned upon and locked to the collar 35 under tension in the manner heretofore described. It is obvious that when this substituted member is elevated to its normal position, that during the elevating period and until it reaches such normal position, the entrance of water to the interior of the submarine must be guarded against, and I have found it desirable to make the top of the ocular member of a conformation such as illustrated in Fig. 1, comprising a plurality of zones of graduated circumferential areas and embodying perpendicular and inclined surfaces such as indicated at 11^b and 11^c. The leaves or sections of the shutters 46 are so formed as to register with the various zones of the top portion 11^a of the ocular member 11, so that the inner peripheries of at least two of the shutters, when in partially closed position during the elevating period, will be in close contact or engagement with a specific zone and absolutely prevent seepage of water between the wall of the ocular member and the inner edges of the shutters bearing thereagainst. In the present showing, all of the shutters will, of course, bear against the wall of the ocular member, but as is well known from the construction of iris shutters, it is impossible to conform their leaves so as to obtain true circles of different diameters in a single device, and it is to overcome this feature in the employment of these shutters that I have deemed it advisable to use a series of shutters as specifically shown in Fig. 2. In Figs. 9 and 10 I have illustrated another form of head 11^a for the ocular member,

whereby the number of shutters may be decreased, the principle of operation being, of course, the same as that described with reference to the construction shown in Figs. 1 and 2.

When the ocular member is elevated to its normal position, and all of the shutters are open, their inner peripheries abut against the wall of said member and an hermetic joint is formed between the wall of said member and the mouth of the enlargement 18 of the member 17 by the employment of suitable packing 18[a] positioned in an annular recess 18[b].

For revolving or rotating the periscope so as to take observations from different points of the compass any of the well known means may be used, or this may be accomplished through the medium of a flexible shaft 47 connected to a pinion 48 meshing with the teeth 49 formed on the periphery of the collar 35, the lower end of said shaft being journaled in a suitable bearing on the bracket 50 and having a beveled gear 51 meshing with a beveled gear 52 keyed to a spindle 53 journaled in bearings 54 and 55 on the brackets 50 and 56. It is obvious that rotary movement may be imparted to the ocular member 11 by the rotation of the crank or handle 57 keyed to the spindle 53, the revolution of the ocular member being facilitated by the provision of suitable ball or roller bearings 58 on which the collar 35 is supported, these roller or ball bearings operating in a race within the enlargement or shoulder 37 as clearly shown in Fig. 3.

It is manifest that other means than compressed air may be used for elevating or lowering the periscope, and its coöperating members, and that, in lieu of the springs 32 I may employ other forms of energy for effecting the ejection of the ocular or head member 11; also that other forms of sealing or closing means for the orifice left by the expulsion of the ocular or head member 11 may be provided and that the locking and releasing means for the ocular member may be so constructed as to be automatically operable upon the destruction of said member, without departing from the spirit and scope of my invention, which is broadly directed to the fundamental idea of having the ocular or head member of the periscope detachable from its supporting medium without affecting the efficiency of the submarine vessel of which it normally forms a part.

While I have described my invention with particular reference to its adaptability to submarine navigation, my invention readily lends itself to application to various other uses, such for instance as a medium for taking observations on land, with especial reference to the requirements of the so-called trench warfare.

Having thus described my invention, what I claim as new herein and desire to secure by Letters Patent, is:

1. A periscope having an ocular member formed with means for the storage of energy, whereby said member may be forcibly detached from its supporting medium.

2. A periscope having a head member, supporting means therefor, and means for locking said head member in engagement with said supporting means, said locking means being capable of actuation to release said head member from engagement with said supporting means.

3. A periscope having an ocular member, supporting means therefor, and means for effecting a sudden movement of said ocular member away from said supporting means.

4. A periscope having an ocular member and supporting means therefor, means for locking said member to said supporting means, and means for detaching said member from said supporting means, said latter means operating upon said locking means to effect such detachment.

5. A periscope having a head member and supporting means therefor, means for normally locking said head member in engagement with said supporting means, means for actuating said locking means to effect the release of said member from said supporting means, and means for accelerating the disengagement of said member from said supporting means.

6. A periscope having a head member, supporting means therefor, said head member being detachably connected to said supporting means, and means for imparting a sudden movement of said member away from said supporting means when detached therefrom.

7. A periscope having a detachable head member, and means for applying a form of energy to said member to impart a sudden movement thereto in a direction away from its supporting medium.

8. A periscope having a head member and a supporting means, and means for automatically detaching said head member from said supporting means.

9. In combination with a submarine vessel, a periscope having an ocular member, supporting means connected thereto and positioned within the vessel, means for detaching said ocular member from said supporting medium, and means for preventing the entrance of water to the interior of the vessel upon the disconnection of said member from its support.

10. In combination with a submarine vessel, a periscope having a detachable head portion, and means for sealing the remaining portion of said periscope when said head portion is detached therefrom.

11. In combination with a submarine vessel, a periscope having a detachable head

portion, and yielding means for effecting the sealing of the remaining portion of said periscope upon the disconnection of said head member therefrom so as to prevent the entrance of water to the interior of said vessel.

12. In combination with a submarine vessel, a periscope having a detachable head portion, and spring actuated means for effecting the sealing of the remaining portion of said periscope upon the disconnection of said head member therefrom so as to prevent the entrance of water to the interior of said vessel.

13. In combination with a submarine vessel, a periscope having a detachable head portion, means for sealing the remaining portion of said periscope upon the disconnection of said head portion therefrom, and means for effecting the substitution of a second head portion upon the disconnection of said first named head portion, the functioning of said sealing means to prevent the entrance of water to the interior of said vessel being constant.

14. In combination with a submarine vessel, a periscope having a detachable head portion, means for expelling said head portion away from said vessel, means for sealing said periscope upon the detachment of said head portion, means for inserting a second head portion, and means carried thereby adapted to coöperate with said sealing means to prevent the entrance of water to the interior of said vessel upon the substitution of said last named head portion.

15. In a periscope, the combination of a plurality of extensible members, a head portion detachably supported thereby, means for rotating said head member, and means for automatically detaching said head member from said extensible portions and effecting a sudden movement thereof in a direction away from its supporting medium.

16. In combination with a submarine vessel, a periscope having a detachable head portion, means for elevating and lowering said periscope, means for rotating said head portion, means for automatically detaching said head portion from the remainder of said periscope, and means for maintaining a constant seal between said periscope and its supporting medium, said means being operable to effect the sealing of the periscope opening independently of said head portion.

17. In combination with a submarine vessel, a periscope, means for elevating and lowering said periscope, an ocular member detachably connected to the extensible portions of said periscope, a telescoping support for said ocular member, said member sliding within said support, and means for maintaining a constant seal between said telescoping member and said ocular member to prevent the entrance of water to the interior of the vessel, means for automatically releasing and expelling said ocular member from said telescoping member, said sealing means functioning independently of said ocular member and forming a water-tight closure.

18. In combination with a submarine vessel, a periscope, means for elevating and lowering said periscope, a telescoping member having bearings in a portion of said vessel, means for elevating and lowering said telescoping member, an ocular member detachably connected to the extensible portions of said periscope and sliding within said telescoping member, means for rotating said ocular member, means carried by said telescoping member and coöperating with said ocular member to seal said telescoping member against the entrance of water to the interior of the vessel therethrough, means for detaching said ocular member from its support and expelling it out of engagement with said telescoping member, and means automatically operable to seal said telescoping member upon the expulsion of said ocular member.

19. In combination with a submarine vessel, a periscope, means for elevating and lowering said periscope, a telescoping member having bearings in a portion of said vessel, means for elevating and lowering said telescoping member, an ocular member detachably connected to the extensible portions of said periscope and sliding within said telescoping member, means for rotating said ocular member, means carried by said telescoping member and coöperating with said ocular member to seal said telescoping member against the entrance of water to the interior of the vessel therethrough, means for detaching said ocular member from its support and expelling it out of engagement with said telescoping member, and means automatically operable to seal said telescoping member upon the expulsion of said ocular member, said latter means being formed to coöperate with an ocular member during its movement to normal position to maintain a constant water-tight joint between said ocular member and said telescoping member.

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