Oct. 7, 1930. H. B. PRATT 1,777,416

LAYING OF MOORED MINES FROM SUBMARINES

Filed Dec. 26, 1929 4 Sheets-Sheet 1

Fig. 1.

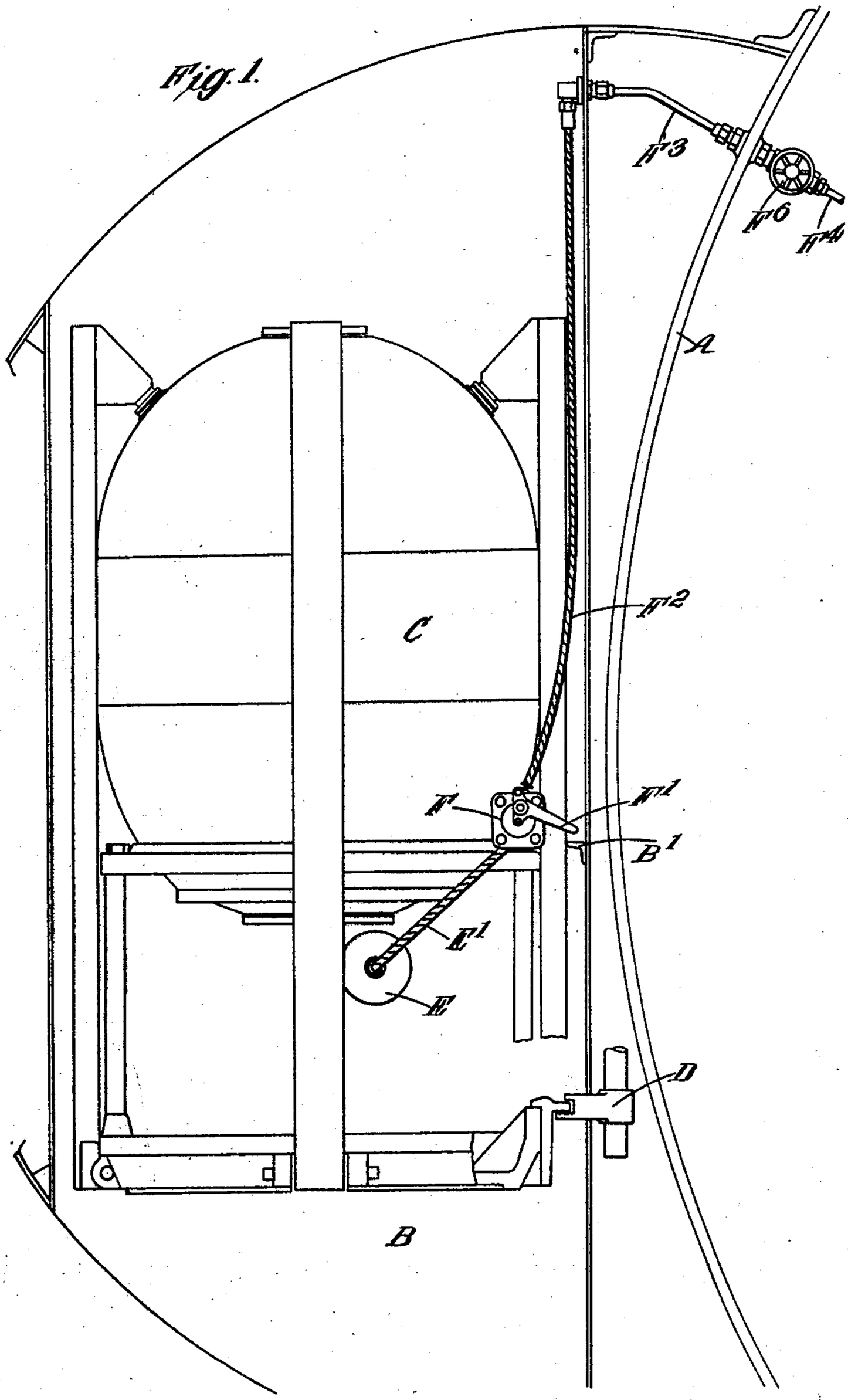

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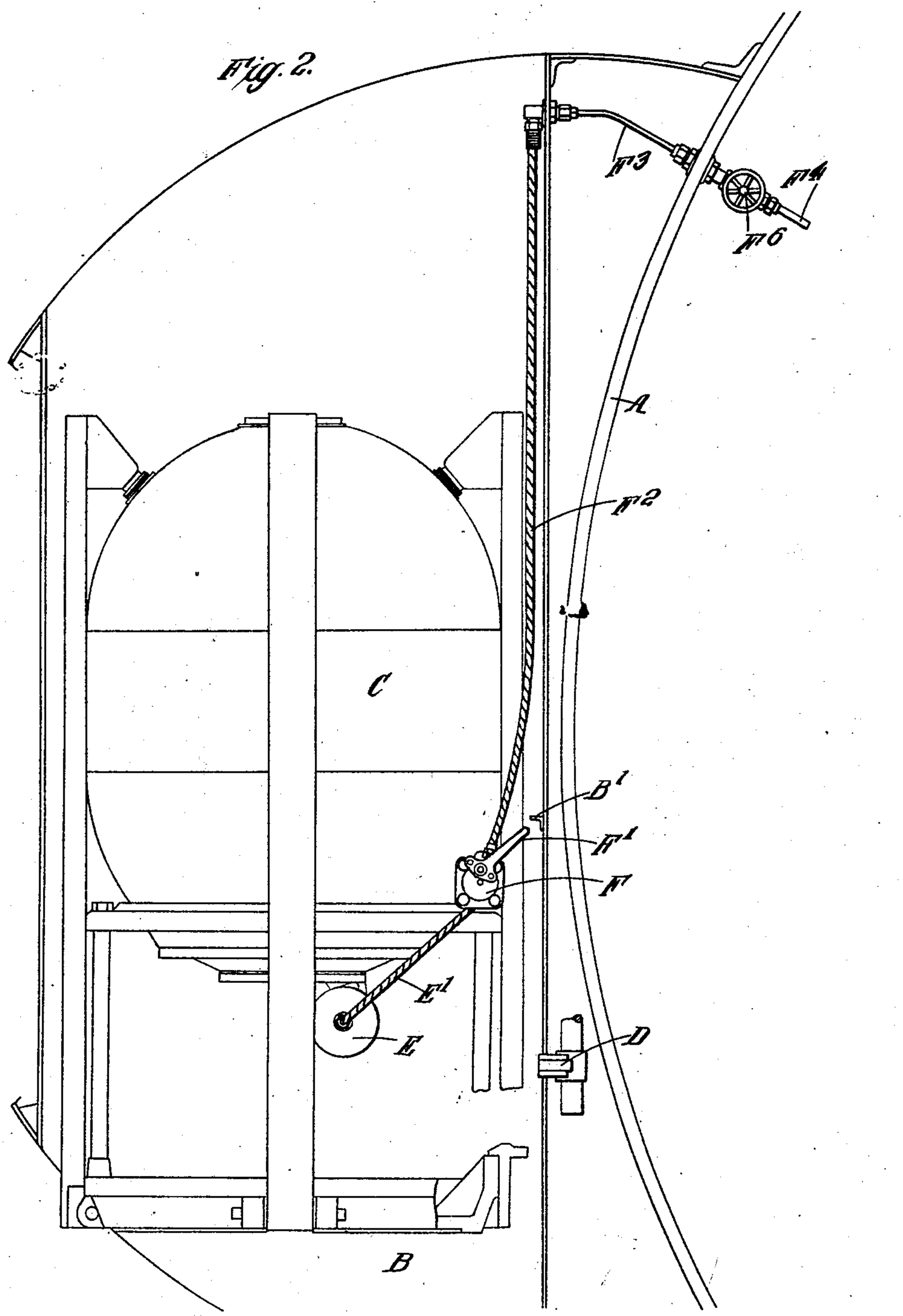
Fig. 2.



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LAYING OF MOORED MINES FROM SUBMARINES

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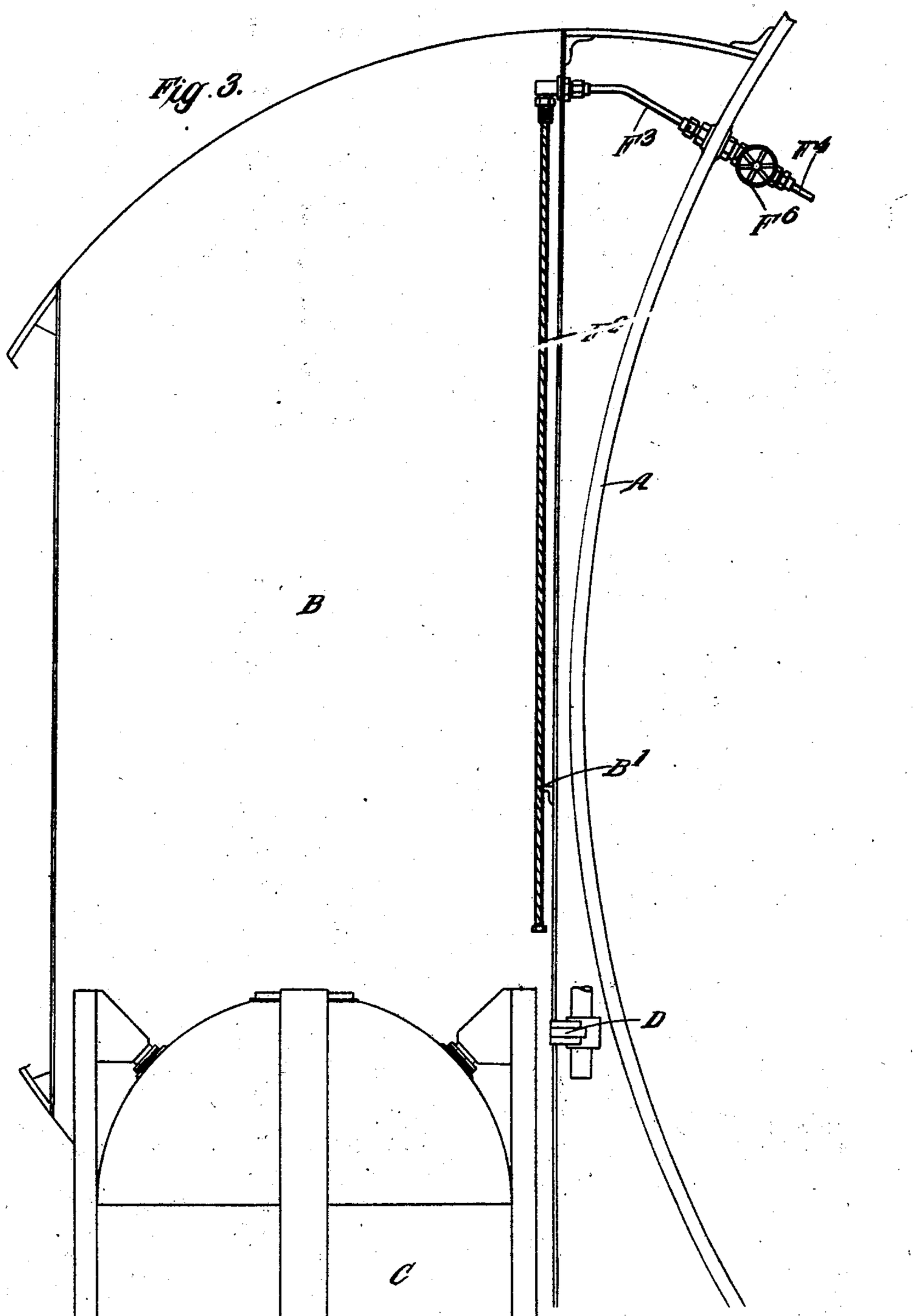
Fig. 3.



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LAYING OF MOORED MINES FROM SUBMARINES

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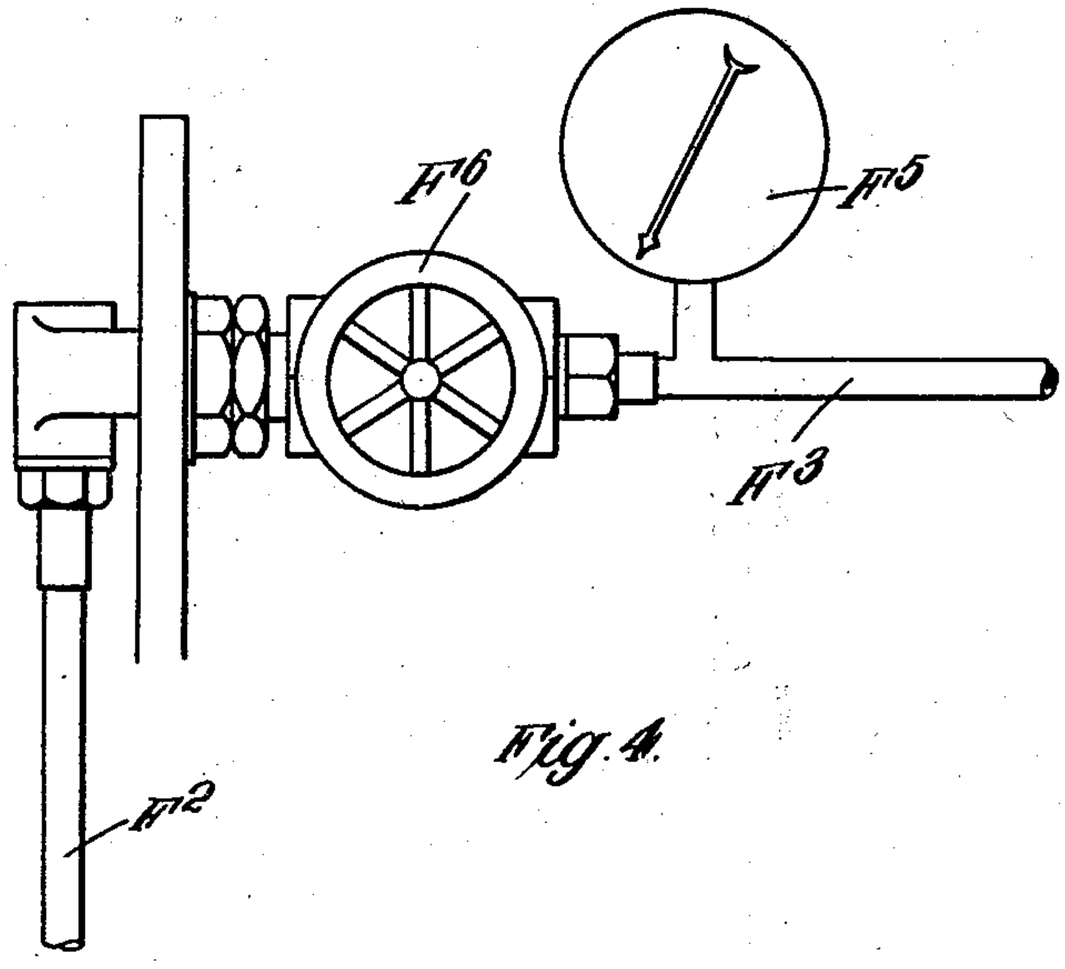
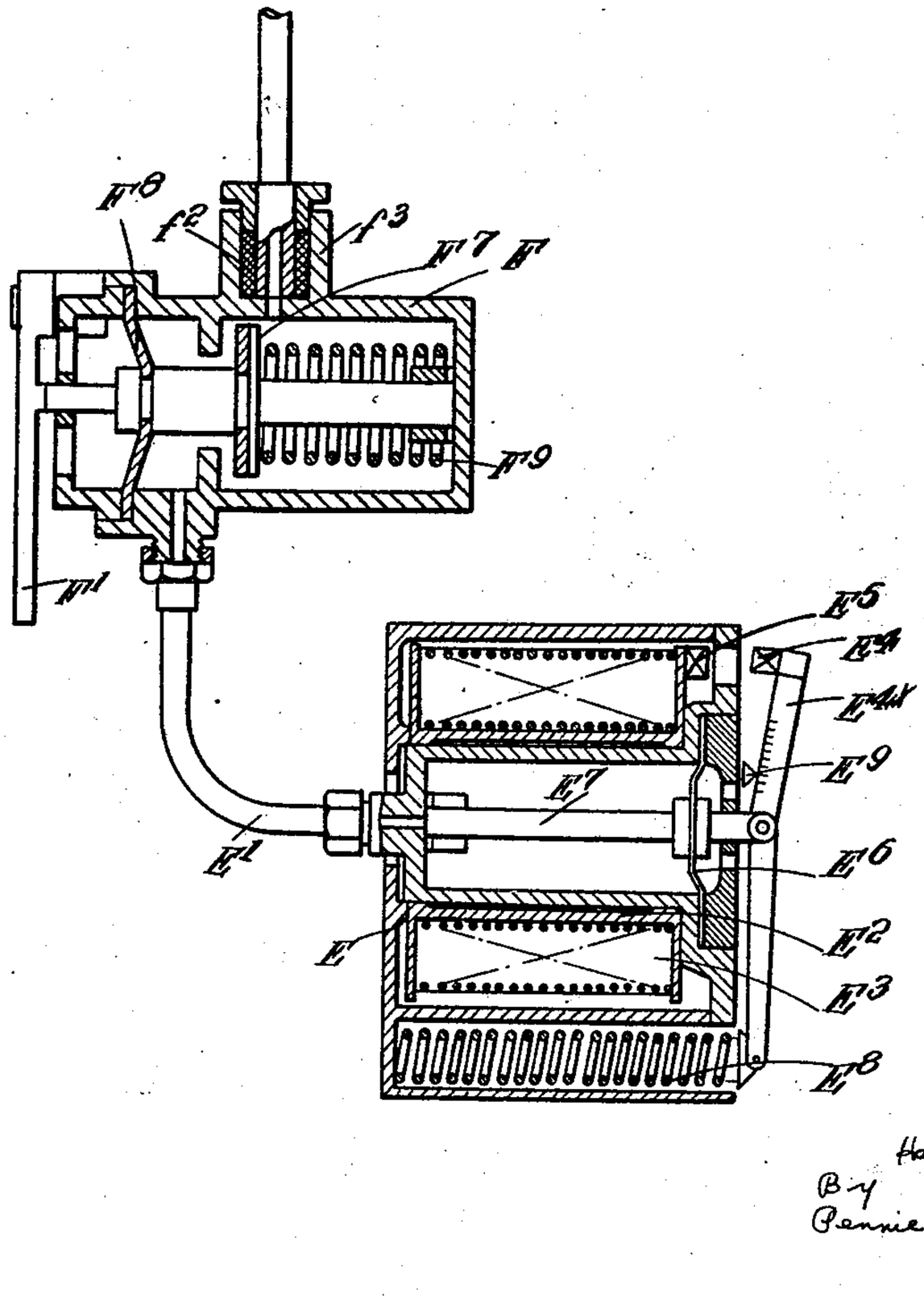


Fig. 4.



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UNITED STATES PATENT OFFICE

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LAYING OF MOORED MINES FROM SUBMARINES

Application filed December 26, 1929, Serial No. 416,539, and in Great Britain March 16, 1929.

This invention relates to the laying of moored mines from submarines in which the mines are carried in laying tubes or chambers open to the sea, the mines being dropped for laying by suitable mechanism operated from the interior of the submarine. In such a system of laying, the hydrostatic depth setting devices of the mines cannot be altered from the interior of the submarine after the mines have been placed in position in the open laying tubes or chambers, so that the depth setting devices must be finally set before the mines are placed in the tubes or chambers and the submarine departs for its objective. It is however very desirable to be able to regulate the depth setting devices after the mines have been placed in position in the tubes or chambers as the tactical objective of the mines may not be known when they are placed in the tubes or chambers or may subsequently be changed, or the mines may require to be laid in a locality where there is a large rise and fall of sea level due to tides in which event it may not be possible to know at the time when the mines are placed in the tubes or chambers the particular state of the tide at the time when the mines will be laid.

According to the present invention the regulation of the hydrostatic depth setting devices of the mines is effected when the latter are in position in the open laying tubes or chambers, by means of compressed air controlled from a position within the submarine.

When the mines are placed in the laying tubes or chambers of the submarine the chambers of the hydrostatic depth setting devices are connected by means of a length of external tubing to a suitable connection which passes through the pressure hull of the submarine and is connected to tubing within the submarine which latter tubing is led to the control position and is supplied with compressed air. It is evident that by raising or lowering the pressure of the air by suitable means at the control position the hydrostatic depth setting devices can be adjusted to regulate the depth setting of the mines within the range of the said devices.

After the pressure in the hydrostatic devices has been adjusted to a degree corresponding to the desired mine depth setting, a valve inside the pressure hull is closed so as to cut off the supply of compressed air. A suitable isolating valve may be fitted on each mine between the hydrostatic device and the aforesaid external tubing so that when a mine is dropped from the laying tube the following actions occur:—(1) After the mine is released and drops a short distance a lever appertaining to the isolating valve engages a projecting piece in the laying tube in order to cause the valve to close and cut off communication to the hydrostatic device and (2) after the mine has dropped a further suitable distance the external tubing is disconnected from the casing of the isolating valve and the mine then drops freely.

The hydrostatic depth setting device on each mine may also have a mechanical setting so that a depth regulation may be made before placing the mines in the laying tube or chamber. In this manner, if the mines are required to be laid in tidal waters and the required depth settings are decided beforehand, the hydrostatic devices can be adjusted mechanically for a depth setting corresponding to the low tide water level at the desired locality. The compressed air system is then only required to be used to give an equal increased depth setting to all the mines corresponding to the height of the actual water level, at the time of laying, above low tide water level.

In order that the said invention may be clearly understood and readily carried into effect, the same will now be described more fully with reference to the accompanying drawings, in which:—

Figures 1, 2 and 3 are end elevations showing diagrammatically a mine in three different positions in the open laying tube or chamber of a submarine, and also showing the present improvements, and

Figure 4 is a sectional elevation showing constructional features of the improvements.

A (Figures 1, 2 and 3) represents part of the pressure hull, B the laying tube or

chamber which is open to the sea, and C one of the mines situated within this chamber and normally supported by a stop member D as shown in Figure 1. When this stop member is moved into its disengaging position (Figures 2 and 3) the mine falls by gravity from the chamber B.

E represents the casing of the hydrostatic depth setting device (details of which will be hereinafter described) which is carried by the mine and is regulated by compressed air admitted through a pipe E^1. This pipe communicates with the casing F of an isolating valve (details of which will also be hereinafter described) controlled by a lever F^1 arranged above a stop member B^1 in the chamber B. The said valve casing F has detachably connected thereto a length of armoured flexible tubing F^2 the upper end of which is attached to a connection F^3 which passes through the pressure hull A and is connected to tubing F^4 within the submarine, the latter tubing being led to the control position and being supplied with compressed air which thus has access to the hydrostatic depth setting device E. After the pressure in the said device has been adjusted to a degree corresponding to the desired mine depth setting as indicated by a pressure gauge F^5 (Figure 4) a stop valve F^6 (Figures 1 to 3) inside the pressure hull is closed so as to cut off the supply of compressed air. The hydrostatic depth setting device is thus set and the mine is ready to be released. After release takes place and the mine commences to drop the lever F^1 strikes against the stop member B^1 and the said lever is thereby moved from the position shown in Figure 1 to the position shown in Figure 2, thereby causing the isolating valve in the casing F to be closed in the manner hereinafter described so as to cut off communication between the tubing F^2 and the pipe E^1 leading to the casing of the hydrostatic device E so that a predetermined pressure is maintained within the latter; the said valve also prevents sea water from entering the casing of the hydrostatic device. After the mine has dropped a further suitable distance the tubing F^2 is pulled away from the valve casing F in the manner hereinafter described and the mine then drops freely. It will be understood that although only one mine has been referred to there will be several, each provided with the devices herein described.

Referring to Figure 4 the hydrostatic depth setting device E is similar in its broad aspect to that forming the subject of English Patent No. 264.973, that is to say it comprises a drum E^2 rotatably mounted within the casing E and carrying an auxiliary wire E^3 connected to the contrivance situated in the anchor for stopping the paying out of the mooring cable by the pull which is exerted on the said auxiliary wire when the rotation of the drum is stopped by a locking pawl E^4 which is moved into engagement with a lug E^5 on the side of the drum E^2 when the set depth is reached, this depth being determined by a diaphragm E^6 one side of which is open to the sea and the other is acted upon by the air pressure supplied by the pipe E^1. The said pawl E^4 forms part of a lever $E^{4\times}$ which is pivotally carried by a rod E^7 connected to the diaphragm E^6 and is acted upon by a spring E^8. In addition to the compressed air setting of the hydrostatic device a mechanical setting is provided so that regulation may be made before placing the mine in the laying tube as hereinbefore mentioned. For this purpose a movable fulcrum E^9 is provided between the pivot of the lever $E^{4\times}$ and the pawl E^4 and the contiguous portion of this lever is graduated as shown to correspond with different depth settings. By moving the fulcrum E^9 towards or away from the pivot the time at which the pawl E^4 is moved into engagement with the lug E^5 under the conjoint action of the spring E^8, the external sea pressure and the internal air pressure can be varied. This, as hereinbefore referred to, enables a preliminary depth setting to be effected by moving the fulcrum E^9 in accordance with the low tide water level at the locality where it is desired to lay the mines and the compressed air regulation is then only required to be used to give an equal increased depth setting to all the mines corresponding to the height of the actual water level above low tide water level at the time of laying.

The isolating valve casing F contains a spring controlled valve F^7 of disc shape adapted to bear against a valve seat situated between the compressed air inlet opening communicating with the tubing F^2 and the outlet opening communicating with the pipe E^1. The spindle of this valve is provided with a diaphragm F^8 to prevent leakage of the compressed air, and co-operating with a projecting portion of this spindle is the aforesaid lever F^1 which thereby retains the valve off its seat against the pressure of its spring F^9. When the lever F^1 is angularly displaced about its pivot as described above the valve is released and is moved on to its seat by the spring thus isolating the pipe E^1 from the tubing F^2. The said tubing is connected to a gland f^2 which fits in a socket f^3 on the valve casing F in such a manner that this gland will become pulled from the socket when the mine falls beyond the point at which the lever F^1 is operated to allow the valve F^7 to move on to its seat.

The above described method of regulating the depth setting of mines in open tubes or chambers by means of compressed air avoids the difficulties which would result from the use of mechanical connections for the depth setting devices of the mines, since such me-

chanical connections must pass through the pressure hull of the submarine and require a number of water-tight glands; moreover such an arrangement of mechanical connections would occupy more space than is desirable inside the submarine.

It is to be understood that the present invention relates only to cases where the submarine mines are carried in laying tubes or chambers which are open to the sea, as in an alternative system of mine laying from submarines in which the mines are carried inside the pressure hull and are launched in a similar manner to that employed for launching submerged torpedoes, the depth setting of the mines can be regulated directly by the personnel of the submarine up to the actual moment of laying the mines.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In a submarine, the combination of mine laying tubes or chambers which are open to the sea and from which mines provided with hydrostatic depth setting devices are dropped, mechanism operated from the interior of the submarine for releasing said mines and means for regulating the depth setting devices of the mines from the interior of the submarine when the mines are in position in the said open laying tubes or chambers.

2. In a submarine, the combination of mine laying tubes or chambers which are open to the sea and from which mines provided with hydrostatic depth setting devices are dropped, mechanism operated from the interior of the submarine for releasing said mines and compressed air means for regulating the depth setting devices of the mines from the interior of the submarine when the mines are in position in the said open laying tubes or chambers.

3. In a submarine, the combination of mine laying tubes or chambers which are open to the sea and from which mines provided with hydrosatic depth setting devices are dropped, mechanism operated from the interior of the submarine for releasing said mines, compressed air means for regulating the depth setting devices of the mines when the latter are in position in the said open laying tubes or chambers, and means for regulating the pressure of the compressed air from the interior of the submarine.

4. In a submarine, the combination of mine laying tubes or chambers which are open to the sea and from which mines provided with hydrostatic depth setting devices are dropped, mechanism operated from the interrior of the submarine for releasing said mines, lengths of external tubing connected to the chambers of the hydrostatic depth setting devices of the mines, a connection which passes through the pressure hull of the submarine and to which the external tubing is connected and tubing within the submarine connected to said connection and led to a control position within the submarine, the last mentioned tubing containing air under pressure.

5. A submarine mine for use in a submarine as claimed in claim 4 comprising an isolating valve associated with the hydrostatic depth setting device and means for detachably connecting the external tubing to the casing of said isolating valve, this isolating valve being operated to cut off communication to the hydrostatic depth setting device as the mine commences to descend in the laying tube or chamber.

6. In a submarine mine the combination with the elements claimed in claim 5, of mechanical means for setting the hydrostatic depth setting device in addition to the setting provided by the compressed air.

7. A submarine mine provided with a hydrostatic depth setting device which is adjusted by means of compressed air, a conduit leading to the interior of the chamber of said depth setting device, an isolating valve the casing of which communicates with said conduit, a second conduit leading compressed air into said isolating valve and means for moving said valve, when released, to its closed position so as to shut off communication to the interior of the hydrostatic depth setting device chamber.

8. A submarine mine provided with a hydrostatic depth setting device which is adjusted by means of compressed air, additional mechanical means for adjusting said device, a conduit leading to the interior of the chamber of said depth setting device, an isolating valve the casing of which communicates with said conduit, a second conduit leading compressed air into said isolating valve and means for moving said valve, when released, to its closed position so as to shut off communication to the interior of the hydrostatic depth setting device chamber.

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