OR 995,794

[redacted]

A. LERNET.

FLOATING MINE.

APPLICATION FILED MAR. 7, 1910.

995,794.

Patented June 20, 1911.

2 SHEETS—SHEET 1.

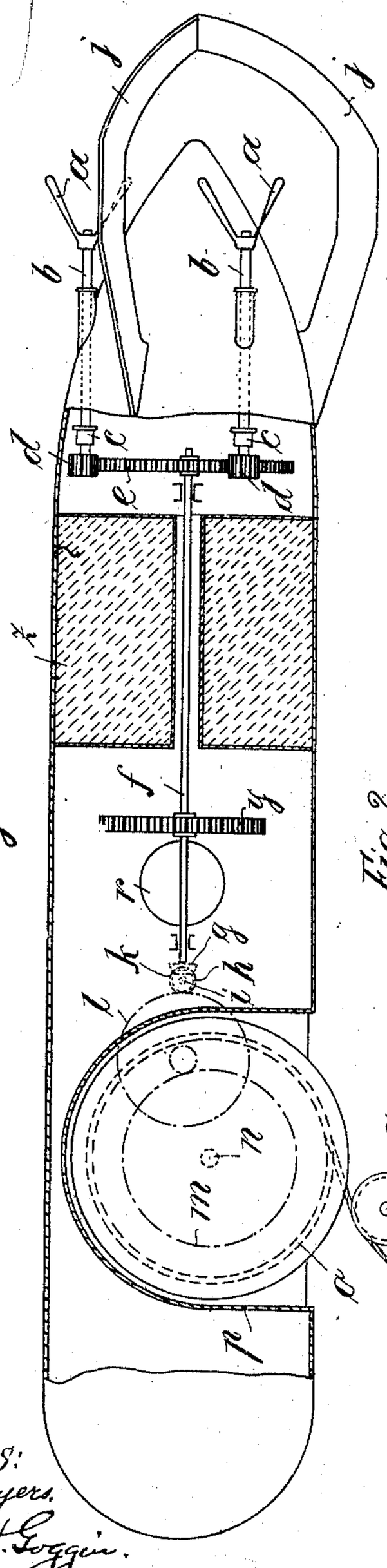


Fig. 1

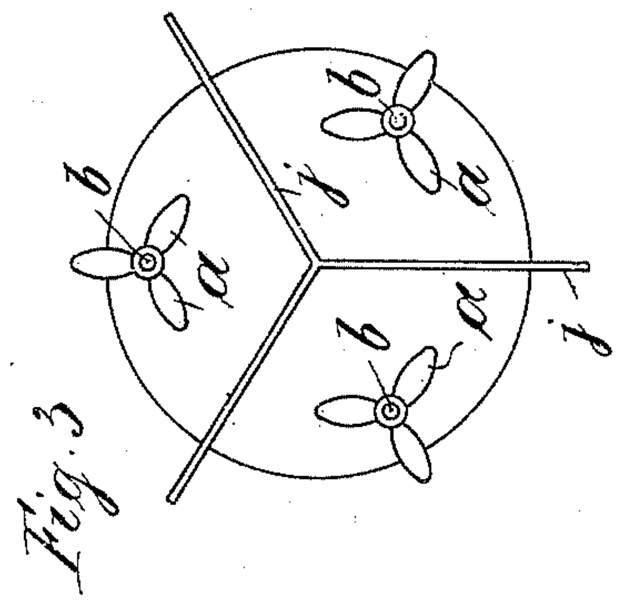


Fig. 3

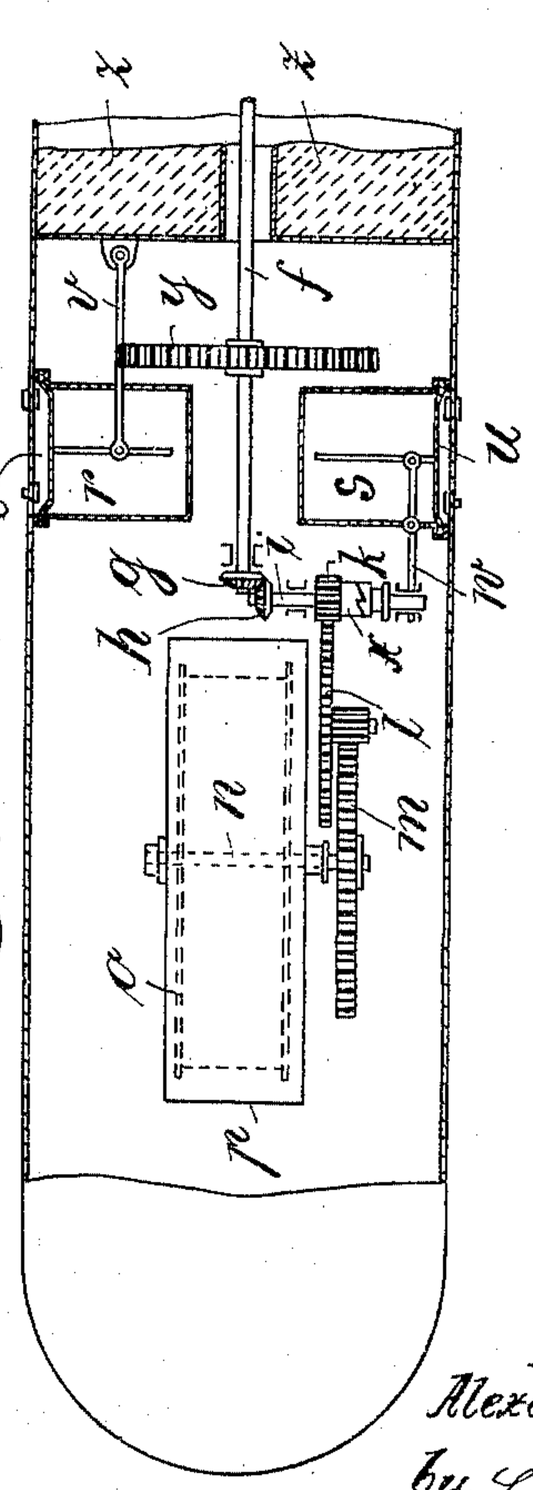


Fig. 2

Witnesses:
Corinne Myers.
James A. Goggin.

Inventor:
Alexander Lernet
by L. K. Böhm,
Attorney

A. LERNET.

FLOATING MINE.

APPLICATION FILED MAR. 7, 1910.

995,794.

Patented June 20, 1911.

2 SHEETS—SHEET 2.

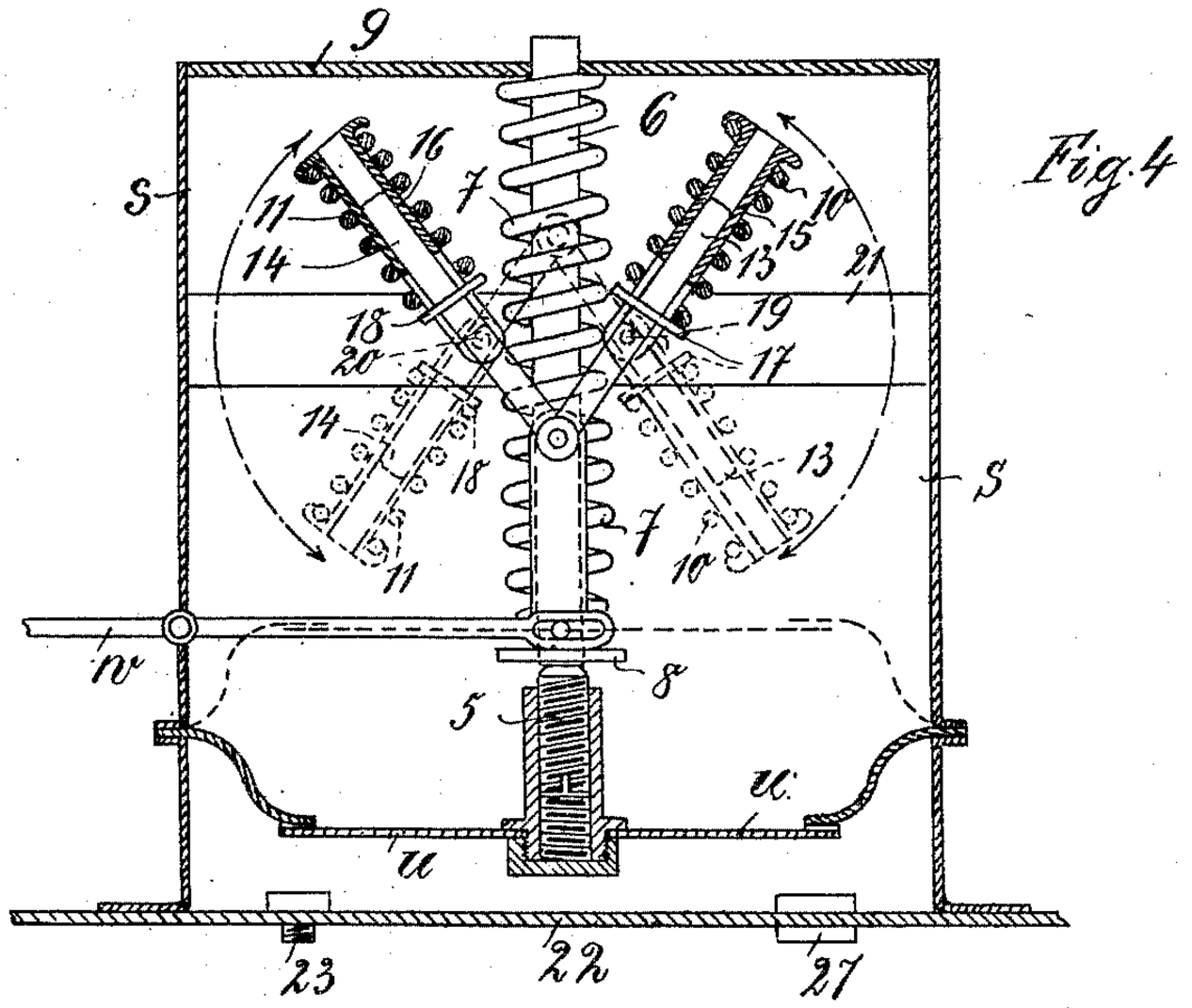


Fig. 4

Fig. 5

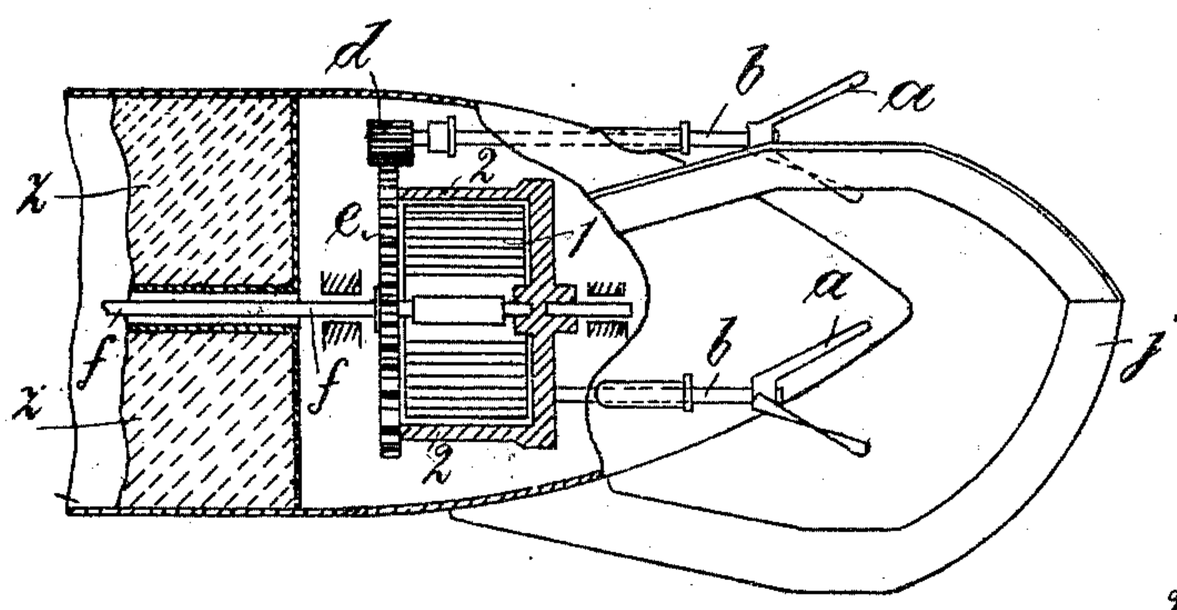
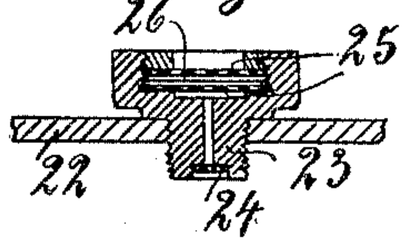


Fig. 6



Witnesses:
Corinne Myers.
James N. Boggs.

Inventor:
Alexander Lernet
by L. K. Böhm,
Attorney

UNITED STATES PATENT OFFICE.

ALEXANDER LERNET, OF VIENNA, AUSTRIA-HUNGARY.

FLOATING MINE.

995,794. Specification of Letters Patent. Patented June 20, 1911.

Application filed March 7, 1910. Serial No. 547,750.

To all whom it may concern:

Be it known that I, ALEXANDER LERNET, a subject of the Emperor of Austria-Hungary, and resident of Vienna, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Floating Mines, of which the following is a specification.

This invention relates to improvements in floating mines for seas or rivers which are anchored so as to float at a predetermined level below the surface of the water.

The principal object of this invention is to insure that the mine shall be maintained within a certain allowable deviation from the normal level. For this purpose one hydrostatic device is employed for controlling the supply of energy for winding up the cable and a second independent hydrostatic device for coupling and uncoupling the cable-drum.

In carrying my invention into effect I employ for example a plurality of water motors with a coupling to each motor adapted to operate in one direction of rotation only, so that in case one or more motors are stopped by floating objects the remaining motors may be serviceable.

A further object is to accelerate the second half of the movement of the controlling element of the hydrostatic device in one direction by energy stored up by the first half of said movement.

Another object is to prevent the entrance of refuse into the water chamber of the hydrostatic device and to minimize the influence upon the controlling element of sudden changes of pressure due to wave movements or explosions in the neighborhood, while at the same time permitting a rapid exhaust of water from said chamber.

A still further object is to continually store up energy derived from movement of the water motors, so that this stored energy may be utilized during periods of slack tides or temporary diminution in the flow of water, to wind up the cable.

This invention is illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a partial vertical longitudinal section of a mine constructed in accordance with the present invention, Fig. 2 is a broken longitudinal section taken at right angles to Fig. 1, Fig. 3 is an end view, Fig. 4 a section to an enlarged scale of one of the hydrostatic devices, Fig. 5 a broken longitudinal section showing a modification of the driving gear, and Fig. 6 a section, to a still further enlarged scale, of the inlet plug in the outer wall of the hydrostatic chamber.

The mine constructed in accordance with the present invention is preferably given the form of a torpedo and provided at the stern with rigid rudders *j* and a plurality of propellers *a* symmetrically arranged with respect to their longitudinal axes around the axis of the mine and adapted to be impelled by the motion of the water. The movement of each of the propellers *a* is transmitted through a shaft *b* provided with a coupling *c* adapted to operate in one direction of rotation only and a pinion *d* gearing with a spur wheel *e* mounted on a main shaft *f* which passes through the chamber for the explosive charge *z*. The object of the coupling *c* on each shaft *b* is to insure the continuous movement of the remaining shafts *b* in case one of the propellers may be stopped by sea-weed or other floating objects.

The movement of the main shaft *f* is transmitted to a counter shaft *i* by bevel or miter-gear wheels *g*, *h*. On the shaft *i* is freely mounted a pinion *k* which can be connected to the shaft *i* by a sliding coupling *x*. The pinion *k* is adapted to gear with a wheel *l* and upon the spindle of this wheel is mounted a pinion adapted to gear with a wheel *m* mounted on a spindle *n* of a drum *o* upon which the anchor-cable is wound after passing over an idle pulley *q*. The spindle *n* is suitably mounted in watertight bearings in an appropriate water chamber formed by a shield *p*. The main shaft *f* is provided with a locking device, which, as shown, consists of a notched wheel *y* mounted on said shaft, and a pivoted locking lever *v* adapted to engage in the notches of the wheel *y*.

The setting at the normal depth of the mine, which is anchored in the usual way to the sea- or river-bed, is attained by means of two independent hydrostatic devices, *r*, *s*. The moving element or diaphragm *t* of the device *r* is adapted to operate the locking lever *v*, while the diaphragm *u* of the device *s* operates the coupling *x* by means of a double-armed lever *w*.

The function of the arrangement is as follows:—The diaphragms *t* and *u* are so arranged, that the locking lever *v* and the coupling *x* are thrown into gear when the

mine is at the normal depth and since all movement of the winding drum *f* is thereby stopped, the mine is maintained at this level within a certain allowable deviation. When however a fall in the level of water takes place, so that the mine is too high, then the locking lever *v* is withdrawn as a result of the diminished hydrostatic pressure upon the diaphragm *t*, thereby unlocking the winding and propeller gear. Under the influence of the movement of the water the propellers *a* rotate and the winding drum is caused to revolve, so that the anchor-cable is thus wound up and the mine drawn down in consequence. When the mine has arrived at the normal depth, the increased hydrostatic pressure upon the diaphragm *t* causes the locking arm *v* to be again thrown into gear, so that the winding drum is again stopped and the mine held at the correct depth below the level of the water. When the level of the water is raised, so that the mine remains at too great a depth, the diaphragm *u* will be influenced by the increased hydrostatic pressure in such a manner, that the coupling *x* will be moved out of gear with the pinion *k* thus breaking the connection between the main shaft *f* and the drum shaft *u* so that the winding drum is free to revolve, so as to slack out the cable and thus permit the mine to rise. When the mine has returned to normal level, the coupling *x* is again closed by the diaphragm *u* owing to the diminution in the pressure of the water so that, since the main shaft *f* is held locked by the diaphragm *t*, the mine is again secured at the normal depth.

In order to insure the completion of the reversing movement of the coupling *x* and of the locking lever *v* by the diaphragms *t*, *u* in an efficient and rapid manner, when the mine has passed the deviation allowed, the diaphragms each operate in conjunction with snap-springs. The snap-springs are arranged or operated in such a manner, that when one of the diaphragms under the influence of the increase or decrease in the pressure of the water has been moved through approximately half of its stroke and the full amount of energy has been stored up in the snap-springs, any slight further movement of the diaphragm in the same direction will permit the snap-springs to extend themselves rapidly and accelerate the movement of the diaphragm to complete the stroke.

In Fig. 4 of the accompanying drawing such an arrangement appropriate for use with both the diaphragms is shown diagrammatically as applied to the hydrostatic device *s*. The pressure of a spiral spring 7 threaded over a spindle 6 connected by an adjusting screw 5 to the plate *u* is arranged to oppose the hydrostatic pressure the resistance of the spring to compression being equal, or almost equal, to the hydrostatic pressure when the mine is within the allowable deviation, and the lever *w* of the coupling *x* being connected to the spindle 6 so as to normally hold the coupling *x* in engagement. The spring 7 abuts at one end against the end wall 9 of the casing and at the other end against a plate 8 secured on the spindle 6. The plate 8 is provided with side ears 12 in which are pivoted rods 13, 14 provided with shoulders 17, 18 and sliding in cylinders 15, 16 provided at their outer ends with caps which are connected by side-straps to fixed pivots 19, 20 on a transverse bracket 21 secured to the casing. Springs 10, 11 are threaded over the cylinders 15, 16 so that they abut at one end against the caps and at the other end against the shoulders 17, 18. Upon the mine sinking to a greater depth, the increased pressure on the diaphragm *u* overcomes the resistance of the spring 7 and the spindle 6 is raised, thus operating the coupling lever *w* and raising the pivots of the rods 13, 14 and therefore compressing the springs 10, 11 until the centers of the three pivots are in line. After this central position has been reached, a slight increase in the hydrostatic pressure will raise the pivot of the rods 13, 14 above the level of the fixed pivots 19, 20. The two components of the pressures of the springs 10, 11 then lie in the axis of the diaphragm spindle, and in a direction to produce a sudden acceleration in the movement of the diaphragm into the extreme reversed position shown in dotted lines in which the lever *w* is moved sufficiently to completely open the coupling *x*. Upon a decrease in hydrostatic pressure the movements of the several parts are reversed. A similar device to that shown in Fig. 4 is also preferably provided in connection with the hydrostatic device *r*, the resistance of its spring 7 being of course somewhat less than the hydrostatic pressure when the mine is at normal depth, so that at this depth its resistance is overcome and the locking lever *v* thereby put in engagement with the wheel *y*, the spring relaxing and withdrawing the lever *v* when the mine lies above the normal depth and thereby putting the propellers into gear with the winding drum, so as to cause the cable to be taken up until the mine is again at the normal depth.

In order to minimize the effect upon the diaphragm of sudden changes in pressure due for example to an explosion in the neighborhood or to the movement of waves upon the surface of the water and to prevent entrance of refuse into the water chamber the inlet for the water to this chamber, as shown in detail in Fig. 6, is provided in a plug 23 screwed into the outer wall 22 of the mine. The outer end of the passage in the plug is protected by a finely perforated plate 24, while the inner end opens into an

enlarged chamber protected by two layers of filter cloth 25 with an intermediate plate 26 permitting the passage of water. On the other hand, to permit of the rapid exhaust of the water from the water chamber when the diphragms are rapidly reversed from the position corresponding for example to an increase in pressure to that corresponding to a diminution in pressure, the wall of the mine is provided with a return valve 27 opening outward.

In the case of both sea-mines and tidal river-mines, which are not constantly, but only periodically exposed to the influence of flowing water, provision must be made that the force to which the propellers are periodically subjected shall be correspondingly accumulated so that it can be utilized in case of need for the movement of the winding drum. In such cases, as shown diagrammatically in Fig. 5, the propeller shafts *b* are utilized to operate an accumulator here shown in the form of a spring drum. In such a case the spur wheel *e* is not keyed upon the main shaft *f* but is secured to the drum 2 so that as the propellers rotate the spring 1 is wound up and always maintained in a state of tension by the movement periodically imparted to the propellers. The shaft *f* in this arrangement is connected with the normally wound spring 1, so that the winding drum is rotated by the spring 1 when the locking lever *v* is thrown out of gear and the coupling *x* is thrown into gear as already described.

I claim:—

1. In a floating mine, the combination with an anchor, a cable for said anchor, a winding drum for said cable and driving gear operated by the flow of water for driving said drum so as to wind up the cable; of means for locking said gear and drum when the mine is at the normal depth and means for maintaining the mine within a certain allowable deviation from said normal depth, comprising a device for operating said locking means to unlock said drum and enable the cable to be wound up when the mine rises, said device being actuated by the decrease in hydrostatic pressure, means for uncoupling said drum from said driving gear, so as to enable the cable to be paid out, and a second device for operating said uncoupling means, said second device being actuated by the increase in hydrostatic pressure when the mine falls below the normal depth.

2. In a floating mine, the combination with an anchor, a cable for said anchor and a winding drum for said cable, of a plurality of motors operated by a flow of water, gearing connecting said motors with said winding drum, a loose coupling in said gearing, a locking device arranged between said motors and said coupling and adapted in "locking" position to lock said gearing and in "open" position to permit the rotation of said gearing, a hydrostatic device adapted to move said locking device into "locking" position when the mine is approximately at the desired normal level and to move said locking device into "open" position when the mine rises above said normal level, and a second hydrostatic device adapted to close said coupling when the mine is at said normal level and to open said coupling when the mine falls below said normal level.

3. In a floating mine, the combination with an anchor, a cable for said anchor, and a winding drum for said cable, of a plurality of motors operated by a flow of water, gearing connecting said motors with said winding drum, a loose coupling in said gearing adapted to operate in one direction of rotation only, a locking device arranged between said motors and said coupling and adapted in "locking" position to lock said gearing and in "open" position to permit the rotation of said gearing, a one-way coupling between each of said motors and said locking device adapted to operate in one direction of rotation only, a hydrostatic device adapted to move said locking device into "locking" position when the mine is approximately at the desired normal level, and to move said locking device into "open" position when the mine rises above said normal level, and a second hydrostatic device adapted to close said loose coupling when the mine is at said normal level and to open said loose coupling when the mine falls below said normal level.

4. In a floating mine, the combination with an anchor, a cable for said anchor and a winding drum for said cable, of a plurality of motors operated by a flow of water, gearing connecting said motors with said winding drum, a loose coupling in said gearing adapted to operate in one direction of rotation only, a locking device arranged between said motors and said coupling, and adapted in "locking" position to lock said gearing and in "open" position to permit the rotation of said gearing, a hydrostatic device adapted to move said locking device into "locking" position when the mine is approximately at the desired normal level and to move said locking device into "open" position when the mine rises above said normal level, a second hydrostatic device adapted to close said coupling when the mine is at said normal level and to open said coupling when the line falls below said normal level, an accumulator for storing up the energy developed by said motors and means for connecting said accumulator to said gearing on the motor side of said locking device.

5. In a floating mine, the combination with an anchor, a cable for said anchor and

a winding drum for said cable, of a plurality of motors operated by a flow of water, a driving shaft for each of said motors, a main shaft, gearing connecting each of said driving shafts to said main shaft, a coupling adapted to operate in one direction of rotation only in each of said driving shafts, a locking device for said main shaft, gearing between said drum and said main shaft, a loose coupling between said main shaft and said drum, two independent hydrostatic devices each comprising a moving element exposed on one side to the pressure of the water, a spring opposing said water pressure, means for storing up energy developed by the first half of the movement of said element in one direction, and means for utilizing said energy to accelerate the second half of said movement of said element, means connecting the element of one of said hydrostatic devices to said locking device so that when the pressure of the corresponding spring predominates said main shaft is unlocked and is locked when the pressure of the water predominates, and means for connecting the element of the other of said hydrostatic devices with said coupling, so that when the pressure of the spring predominates the main shaft is coupled to the drum, and when the pressure of the water predominates the connection between said main shaft and said drum is severed.

6. In a floating mine, the combination with an anchor, a cable for said anchor and a winding drum for said cable, of a plurality of motors operated by a flow of water, a driving shaft for each of said motors, a main shaft, gearing connecting each of said driving shafts to said main shaft a coupling between said gearing and each of said driving shafts adapted to operate in one direction of rotation only, a water-chamber, a moving element forming the inner wall of said chamber so as to be exposed on one side to the pressure of the water in said chamber, a spring opposing said water pressure, means for storing up energy developed by the first half of the movement of said element in one direction, means for utilizing said energy to accelerate the second half of said movement of said element, means connecting the element of one of said hydrostatic devices to said locking device so that when the pressure of the corresponding spring predominates said main shaft is unlocked and is locked when the pressure of the water predominates, means for connecting the element of the other of said hydrostatic devices with said coupling so that when the pressure of the spring predominates the main shaft is coupled to the drum, and when the pressure of the water predominates the connection between said main shaft and said drum is severed, a water inlet to said chamber, a filter in said water inlet, and a valve in said chamber adapted to permit of the exhaust only of water from said chamber.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ALEXANDER LERNET.

Witnesses:
AUGUST FUGGER,
FRANZ VOGLER.