Aug. 23, 1927. 1,639,810

H. B. PRATT

DEPTH SETTING GEAR FOR SUBMARINE MINES

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Fig. 2.

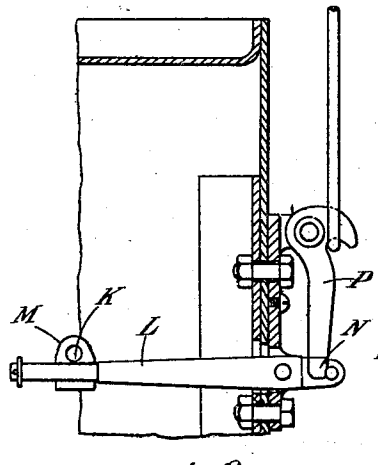


Fig. 3.

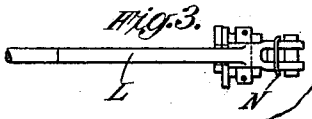


Fig. 1.

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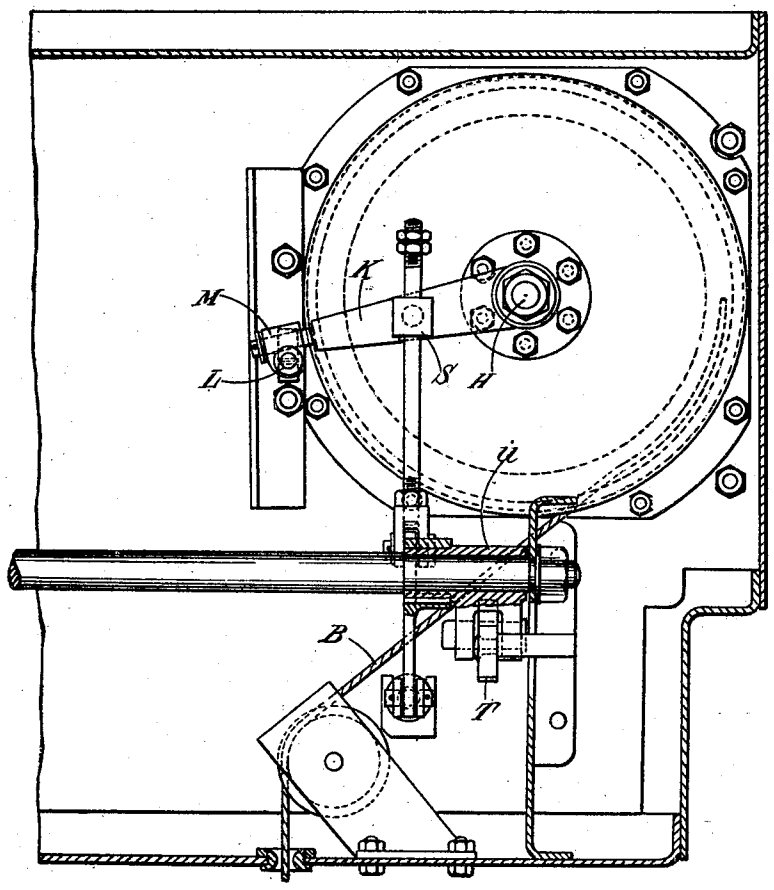
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Fig. 4.



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Fig. 6.

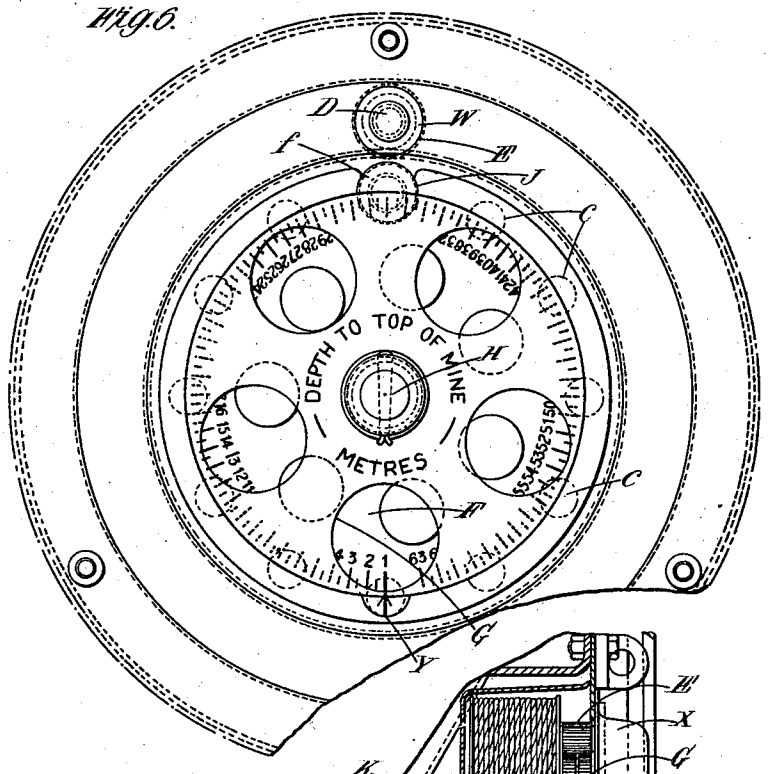
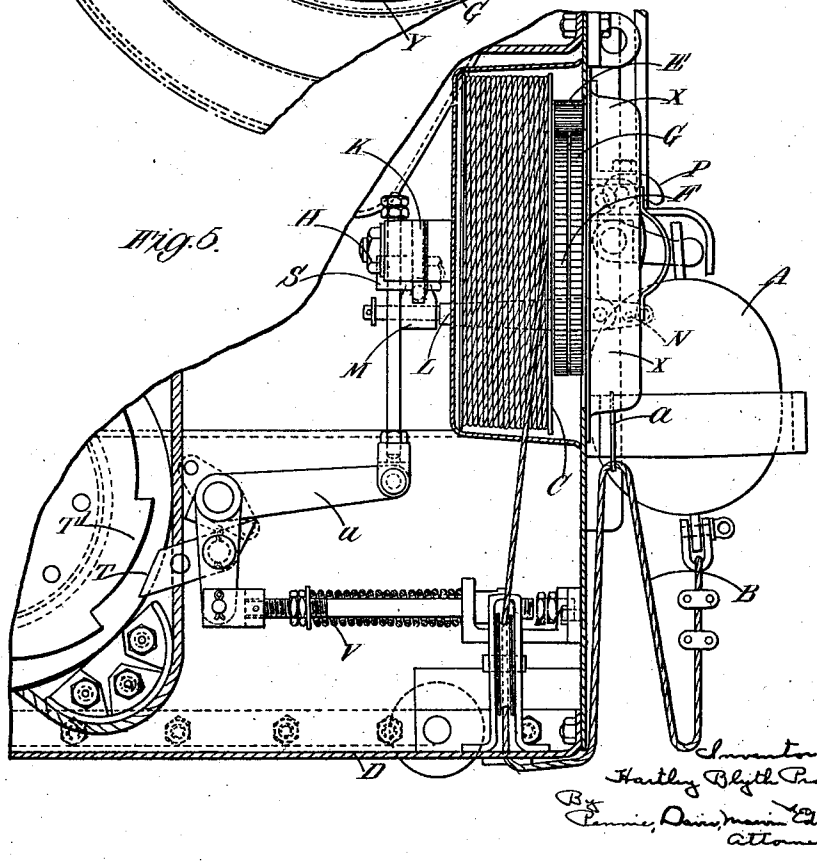


Fig. 5.



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UNITED STATES PATENT OFFICE.

HARTLEY BLYTH PRATT, OF BARROW-IN-FURNESS, ENGLAND, ASSIGNOR TO VICKERS LIMITED, OF LONDON, ENGLAND, A BRITISH COMPANY.

DEPTH-SETTING GEAR FOR SUBMARINE MINES.

Application filed January 5, 1926, Serial No. 79,340, and in Great Britain January 7, 1925.

This invention relates to depth setting gear for submarine mines, the object of the invention being to provide improved means whereby regulation of the plummet depth setting gear may be readily adjusted to any required depth within the maximum range without having to make use of any length adjustment by the usual method of coupling together measured lengths of chain or wire, or by measuring the length of a wire.

According to the present invention the unwinding of a predetermined length of plummet line is controlled by varying the starting position of contiguous members adapted to be angularly displaced relatively to one another by the unwinding of the plummet line. To this end the plummet line is wound upon a drum or reel adapted to rotate under the influence of the weight of the plummet acting through the plummet line and during its rotation it may be adapted to displace angularly, rotatable means carrying a locking device, said locking device after a predetermined degree of angular displacement of the rotatable means being adapted to lock the plummet reel so as to stop the unwinding of the plummet line. Means are provided for controlling the starting position of the angularly displaceable means relatively to the reel on which the plummet line is wound or to a member associated with the drum or reel, so as to vary as desired the length of plummet line which is unwound before the locking device becomes effective and, by locking the plummet reel stops any further unwinding of the plummet line.

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 drawing, in which:—

Figure 1 is a part longitudinal section of an anchor or sinker fitted with one constructional form of the improved adjustable depth setting gear.

Figure 2 is a part sectional elevation showing the releasing gear for the flotation chamber or mine proper.

Figure 3 is a plan of the release lever for the flotation chamber, and

Figure 4 is a cross sectional view of part of the sinker.

Figure 5 is a longitudinal section through the sinker corresponding to Figure 1, but showing the gear wheels and the plummet line in outside elevation.

Figure 6 is a detail view showing the indicator and regulating device for varying the depth adjustment, the indicator in the example shown and the adjusting mechanism associated therewith being such that an adjustment to any required depth between 1 and 60 metres can be obtained.

A is the plummet, B is the plummet line, C is the drum on which the plummet line is mounted and D is the casing of the anchor or sinker within one side of which the depth setting gear is mounted. G and F are a pair of gear wheels, one of which (hereinafter termed the fixed wheel F) is keyed to a shaft H, said fixed wheel F being provided with a flanged part F^1 upon which the plummet reel C is rotatably mounted. The other toothed wheel (hereinafter termed the free wheel G) is free to rotate upon the said shaft H and both wheels are engaged by a pinion E which is carried by the plummet reel C and which is free to rotate on a shaft E projecting laterally therefrom. The fixed wheel F has fewer or more teeth than the free wheel G. For example, the fixed wheel may have 102 teeth and the free wheel may have 104 teeth, the pitch circle diameters being the same in both gear wheels and the tooth gaps being the same, and the pitch of the teeth on the fixed wheel F may be approximately .2618 of an inch, and the pitch of the free wheel may be approximately .2567 of an inch. The tooth gaps on both the fixed and the free wheel may be cut with the same cutter so that the gaps are the same in both cases but the tooth thickness will be slightly different. The pinion E which is carried on the laterally projecting shaft E carried by the plummet reel C may have fourteen teeth with a pitch of .2618 of an inch. Alternatively, and in the mechanism shown, the wheel F has 126 teeth and the wheel G 128 teeth, the pitch circle diameter and the tooth gap being the same in both wheels. It will be seen, therefore, that in the example illustrated with reference to the drawing that during each complete revolution of the drum C the free wheel G will rotate 1/64 of a revolution relatively to the fixed wheel F. The free wheel G carries a laterally projecting casing J^1 within which a spring controlled plunger

or stop J is mounted, the fixed wheel F being provided with an opening *f* and the plummet reel C being provided with a series of openings *c*, *c*, through which the said stop or plunger J is adapted to pass after a predetermined amount of lateral displacement of the free wheel G relatively to the fixed wheel F, so as to lock the two gear wheels to the plummet reel C and thereby stop the unwinding of the plummet line B.

In operation, and when the plummet A is released in any known manner, and after breaking a twine lashing *a* normally holding a free length of the plummet line in place it first falls freely and unwinds the said free length of plummet line. The weight of the plummet A then causes the drum C on which the plummet line B is wound to revolve and pay out the plummet line B, the drum C revolving freely upon the flange F^1 of the fixed gear wheel F. The pinion E which is rotatably mounted on the laterally projecting spindle E^1 carried by the plummet drum C gears as aforesaid with both gear wheels F and G, and, owing to the fact that one is keyed to the shaft H and the other is free to rotate thereon, it follows that during each complete revolution of the plummet drum, the free wheel G will rotate about 1/64th of a revolution relatively to the fixed wheel F. During such relative angular displacement the spring loaded stop or plunger E presses against the fixed wheel F, the latter being provided as aforesaid with an opening *f* through which the plunger E is adapted to pass. The free wheel G continues to rotate relatively to the fixed wheel F until the stop or plunger E comes opposite the opening *f* in the fixed wheel, whereupon it is pushed therethrough by the plunger spring and then enters one or other of the holes *c* in the flange of the plummet reel or drum C thereby locking the latter.

The pull of the plummet A through the wire B, then acts as a torque on the shaft H, this torque being transmitted by levers K and L and a coupling block M, to the shearing pin N. The arrest of the plummet causes the pin N to be sheared and the shaft H rotates and depresses the short end of the lever L until the slip hook P is free to fly out and to release the mine from the sinker.

A further slight rotation of the shaft H acts through the lever K, the swivel block S and the pull rod R, to hold back the pawl T out of engagement with the usual ratchet plate T^1 of the mooring rope drum, said pawl T being mounted on a composite lever U to one arm of which the pull rod R is connected.

When the sinker has descended to the depth at which the plummet reaches the sea bottom, and there is no longer tension in the wire B, the spring V is free to push the pawl T into engagement with the ratchet T^1 so as to lock the mooring rope drum in the known manner.

It will be evident that the initial angular displacement of the plunger J on the wheel G from the hole *f* in the wheel F will determine the amount of angular displacement of the wheel G relatively to the wheel F (and consequently the number of revolutions of the drum C and the length of wire which will be paid out) between the release of the plummet and the stoppage of the rotation of the drum C by the action of the plunger J.

The amount of rotation and wire paid out is adjusted by withdrawing the pinion E from engagement with the wheel F, the wheel G being then free to be set so that the plunger J is at the requisite angular distance from the hole *f*. This is effected by screwing back a knurled nut W until it abuts on a stop at the end of the spindle H^1. The wheel G is then turned by hand until the arrow Y on its web coincides with the desired indication on the scale on the wheel F. The pinion E is then pushed back and held in gear by the nut W, and the depth setting is effected.

An easily removable cover X protects the gear and preserves the watertightness of the sinker.

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

1. A submarine mine comprising a plummet, a drum, a plummet line wound on said drum and connected to said plummet, a pair of contiguous members adapted to be angularly displaced relatively to one another during the unwinding of the plummet line and means brought into operation after a predetermined degree of relative angular displacement of the said members for stopping the paying out of the plummet line.

2. A submarine mine comprising a plummet, a drum, a plummet line wound on said drum and connected to said plummet, contiguous members adapted to be angularly displaced relatively to one another to an extent less than a complete rotation by the unwinding of the plummet line and means for varying the initial starting position of one of said members relatively to the other said member.

3. A submarine mine comprising a plummet, a drum, a plummet line wound on said drum, the weight of said plummet, acting through the plummet line, being adapted to rotate said drum, an angularly displaceable member, a locking device carried on said angularly displaceable member, said locking device after a predetermined degree of angular displacement less than a complete revolution being adapted to lock the plummet reel so as to stop the unwinding of the plummet line.

4. A submarine mine provided with depth

setting gear comprising a pair of gear wheels, a shaft upon which one of said gear wheels is non-rotatably mounted, the other of said gear wheels being free to rotate upon said shaft, a plummet reel, and a freely rotatable pinion carried by said plummet reel and engaging both said gear wheels so that said free gear wheel will be angularly displaced with relation to fixed gear wheel by the unwinding of plummet line from plummet reel.

5. A submarine mine provided with depth setting gear comprising a pair of gear wheels, a shaft upon which one of said gear wheels is non-rotatably mounted, the other of said gear wheels being free to rotate upon said shaft, a plummet reel, and a freely rotatable pinion carried by said plummet reel and engaging both said wheels, said fixed wheel having a different number of teeth to said freely rotatable wheel, so that said free gear wheel will be angularly displaced with relation to fixed gear wheel to an extent less than a complete rotation by the unwinding of plummet line from plummet reel.

6. A submarine mine provided with depth setting gear comprising a non-rotatable gear wheel, a rotatable gear wheel, said non-rotatable gear wheel having a different number of teeth to said rotatable gear wheel, a plummet reel, a rotatable pinion carried by said plummet reel and adapted to engage both said gear wheels, and a locking device carried on said rotatable gear wheel, so that said locking device after a predetermined degree of angular displacement less than a complete revolution between fixed and free gear wheel, is adapted to lock plummet reel so as to stop the unwinding of the plummet line therefrom.

7. A submarine mine provided with depth setting gear comprising a fixed gear wheel and a rotatable gear wheel, said fixed wheel being formed with an opening and having a different number of teeth than the rotatable gear wheel, a plummet reel provided with a series of openings, a spring controlled plunger mounted on said rotatable gear wheel, said stop or plunger being adapted after a predetermined amount of angular displacement of the free wheel relatively to the fixed gear wheel to pass through the opening in said fixed gear wheel and to engage one of the openings in said plummet reel.

8. A submarine mine comprising a plummet line, a drum upon which said plummet line is wound and depth setting gear comprising contiguous members adapted to be angularly displaced by the unwinding of the plummet line, one of said members carrying a locking device which, after a predetermined degree of angular displacement less than a complete rotation locks said drum and stops the unwinding of the plummet line.

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