C. R. GABRIEL.

MOORING FOR MINE ANCHORS, &c.

APPLICATION FILED JULY 23, 1909.

947,230.

Patented Jan. 25, 1910.

2 SHEETS—SHEET 1.

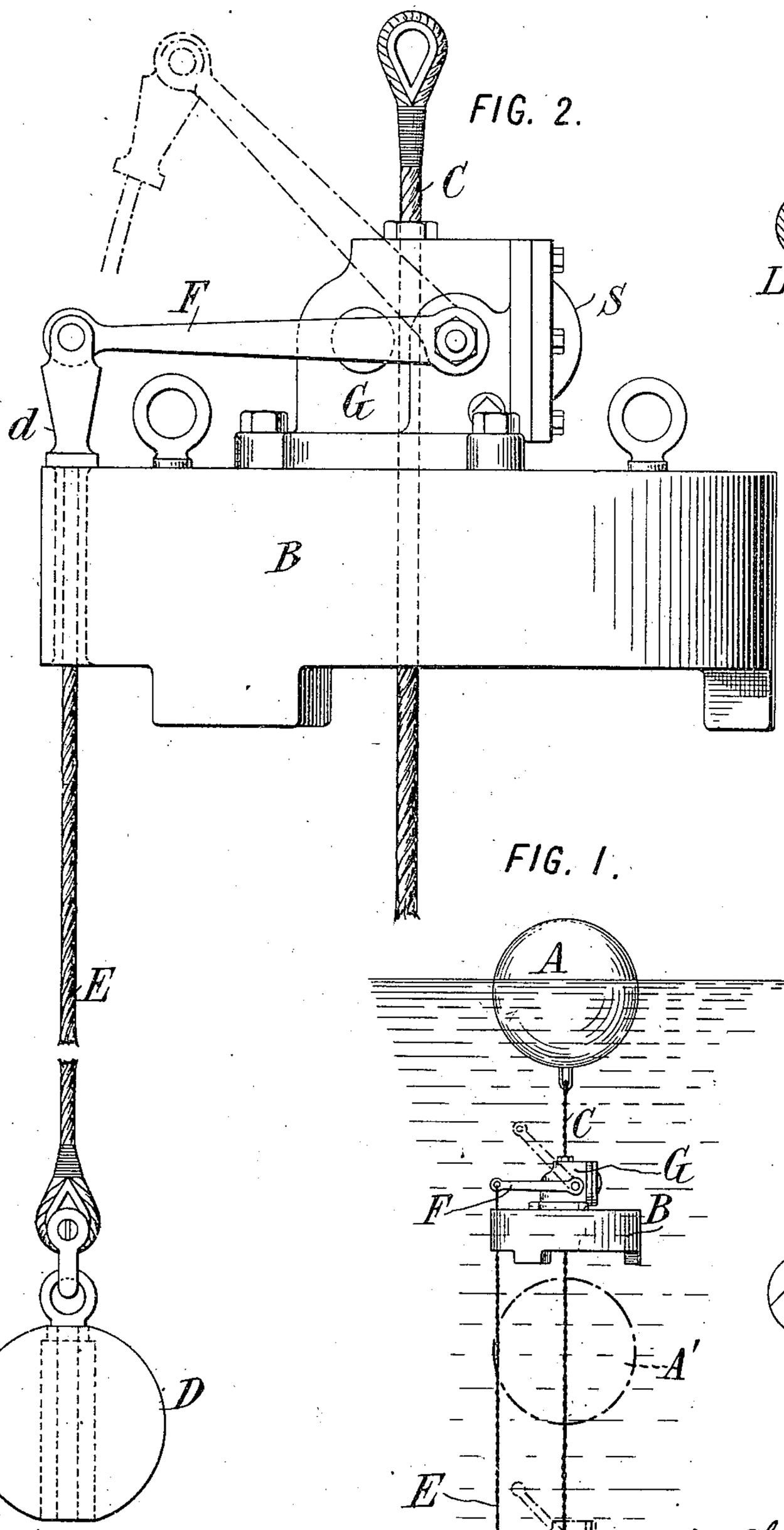


FIG. 1.

FIG. 2.

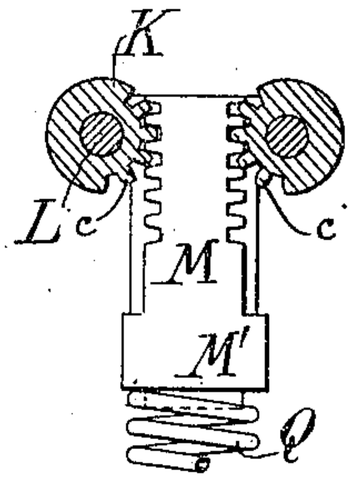


FIG. 5.

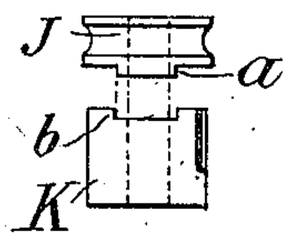
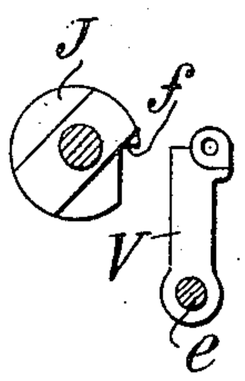


FIG. 6.

FIG. 7.



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2 SHEETS—SHEET 2.

FIG. 3.

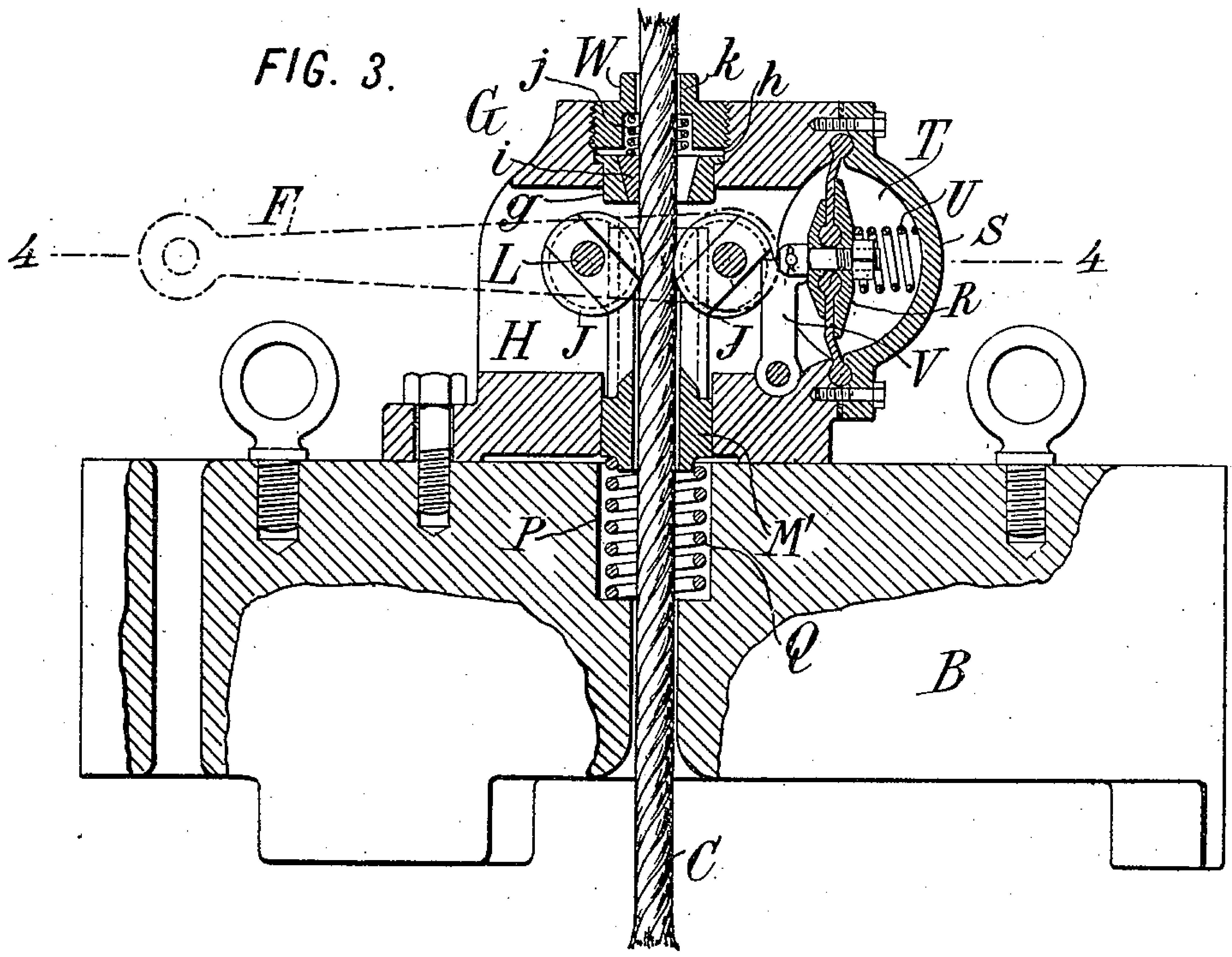
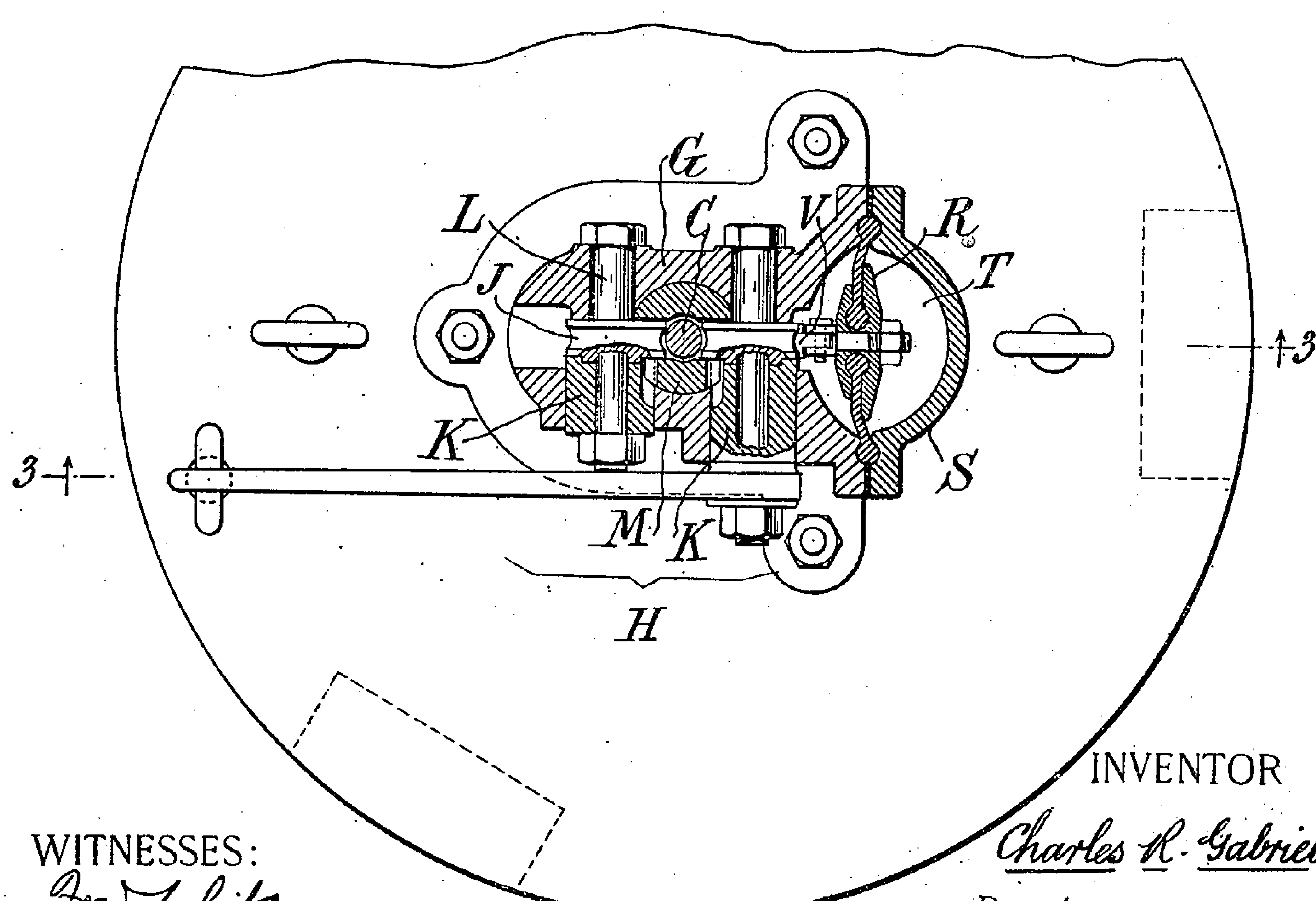


FIG. 4.



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UNITED STATES PATENT OFFICE.

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MOORING FOR MINE-ANCHORS, &c.

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To all whom it may concern:

Be it known that I, CHARLES R. GABRIEL, a citizen of the United States, residing in the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Moorings for Mine-Anchors, &c., of which the following is a specification.

This invention relates to means for mooring submarine mines or fixed torpedoes or like devices which require to be moored at a predetermined depth beneath the surface. For this purpose it is customary to make the mine buoyant and to attach it by a mooring cable to an anchor which rests on the bottom. To avoid the necessity of preparing each mine and anchor in advance with the necessary length of cable to accord with the sounding, and to automatically insure that each mine shall be dragged down by its anchor to the desired depth, it is customary to provide the anchor with means for engaging the cable so as to leave a required length of cable between the anchor and mine, and to provide means for operating such device when the descending anchor reaches the prescribed distance above the bottom, so that in the remaining portion of its descent it shall pull down the mine to a corresponding depth. My invention provides certain improvements in such automatic gripping means as will be hereinafter set forth.

Referring to the accompanying drawings, Figure 1 is an elevation upon a reduced scale showing the mine, anchor and appurtenances, and illustrating the operation of planting the mine; Fig. 2 is a side elevation on a larger scale of the anchor and appurtenances; Fig. 3 is a vertical section through the anchor and gripping mechanism on the line 3—3 in Fig. 4; Fig. 4 is a horizontal section of the latter on the line 4—4 in Fig. 3; Fig. 5 is a sectional elevation of certain of the working parts removed; Fig. 6 is a plan of one of the gripping jaws and its connected segment hub; Fig. 7 is an elevation of one of the gripping jaws and a locking dog.

Referring first to Fig. 1, let A designate the buoyant mine, B the anchor, C the mooring cable, D a plummet, E a sounding line, F the operating lever, and G the casing containing the gripping mechanism.

To make the operation clear, let it be assumed that the mine is to be submerged to the depth indicated in dotted lines at A′, the anchor resting upon the bottom at B′. A suitable length of mooring cable is provided according to the depth of the water at the prescribed location, this cable is passed through the grip mechanism and through the anchor, and a suitable length of sounding line E is provided corresponding to the depth to which the buoyant mine is to be sunk beneath the surface. To plant the mine, the anchor is thrown overboard at the proper location and permitted to sink while the mine A floats at the surface. In sinking, the anchor travels down freely along the cable until the plummet D strikes bottom and stops, so that the continued descent of the anchor is accompanied by a lifting movement of the lever F which applies the grip and thereby attaches the anchor to the cable C. Thereafter the continued descent of the anchor pulls down the mine to the corresponding depth. The construction is such that the gripping mechanism having once acted, continues its hold upon the cable, so that the mine is maintained permanently at the level to which it is first sunk.

In the operation of such automatic anchor grips, certain practical difficulties have been encountered which it is the object of the present invention to overcome. The principal defect has been a liability of the gripping mechanism to act prematurely, so that the mine is sunk deeper than was intended. To avoid this, my invention provides hydrostatic means which renders the gripping device inoperative until the anchor has descended to a given depth, or in other words until a prescribed hydrostatic pressure is attained. My invention also provides an improved construction of the gripping mechanism.

Referring to the drawings, the gripping mechanism, which as a whole is designated by the letter H, comprises two eccentric gripping jaws J J receiving between their grooved peripheries the mooring cable C, and means for connecting or gearing these jaws together so that they must oscillate in unison to grip or release the cable. Each jaw J is provided with a hub K, which might be formed integrally with it, but preferably is formed separately as shown in Fig. 6, but with interengaging shoulders *a b*

whereby the two parts are compelled to oscillate together. The eccentric jaw and its hub turn upon a stud L, the two studs L L being fixed in the casing G as shown in Fig. 4. The hubs K K are formed with gear teeth *c* so that they constitute sectors. These might mesh with each other, but it is preferable to make them of small diameter and interpose a sliding toothed rack M, as best shown in Fig. 5, which meshes with both the sectors and which as it rises or falls insures simultaneous oscillating movements of the gripping jaws sufficient to cause them to grip or release the cable. The rack M is formed as part of a plunger M′ which is movable vertically in an upright cylindrical bore or cavity P and pressed upwardly by a spring Q. The spring pressure is in such direction as to tend to oscillate the jaws in such direction as to make them grip the cable. On the hub K of one of the jaws is fixed the operating lever F, the free end of which is connected to the sounding line E so that the weight of the plummet D pulling down on this lever holds it initially to the horizontal position shown in Fig. 2, where it is stopped by the abutment of a spacing piece *d* connected to it against the top of the anchor.

The hydrostatic safety device for rendering the gripping mechanism initially inoperative, comprises essentially a diaphragm or equivalent movable part, exposed on one side to hydrostatic pressure, and on the other to the pressure of a yielding or compressible medium. This diaphragm is connected to a suitable catch, latch or lock which initially locks the jaws preferably by engaging a tooth or notch formed on one of them. In the preferred construction shown the hydrostatic member is a diaphragm R partitioning a cavity formed between one end of the casing G and a cap piece S applied thereto. Within the cap piece is an air chamber T which initially is charged with air at atmospheric pressure or under compression. If desired, a spring U (Fig. 3) may be introduced also to exert a pressure upon the diaphragm. The opposite side of the diaphragm is open to the interior of the casing G which is in communication with the water, so that the hydrostatic pressure is brought to bear upon the diaphragm on the opposite side to the air pressure or spring pressure in the chamber T. A latch or locking lever V, best shown in Fig. 7, is provided, being pivoted to the casing at *e* and being jointed or otherwise connected to the diaphragm so as to move therewith, and having a shoulder or projection which engages a tooth or shoulder *f* formed in one of the jaws J (Figs. 3 and 7). It is shown as formed by cutting a notch into the jaw.

To prevent too rapid descent of the heavy anchor, a friction brake W is provided to exert a slight gripping action upon the cable as the latter runs through it. This brake is arranged preferably in the upper part of the casing G. In the preferred construction it comprises a centering ring *g* which rests on a shoulder in the bottom of a socket *h* and is internally coned, forming a seat which receives a split cone *i* which constitutes a brake shoe. This cone is pressed down by a spring *j* which is housed in a recess formed in a screw cap *k* which serves the triple function of closing the recess *h* so as to prevent upward displacement of the ring *g*, of housing and receiving the upward reaction of the spring, and of affording a neck for guiding the cable. The pressure of the spring may be adjusted by screwing the plug *k* up or down. The spring presses the coned brake shoe downwardly into its coned socket and thereby contracts it, so that it hugs the cable and thereby generates sufficient friction to retard the descent of the anchor and prevent undue shock at the instant when the gripping jaws engage the cable.

In operation, (the anchor cable and mine having been suitably connected and the sounding line E having been applied of the desired length) the parts are put overboard and the anchor permitted to descend while the mine floats by reason of its buoyancy, being drawn down only to the extent of the retardation afforded by the friction brake W. Until the anchor descends to the prescribed depth at which the hydrostat will operate, the gripping device is held locked by the latch V; but as soon as this depth is reached the hydrostatic pressure forces back the diaphragm, which withdraws the latch V and unlocks the gripping jaws. This occurs before the anchor descends to the level at which the plummet D should strike bottom. When the plummet strikes, its weight no longer resists the upward stress of the spring Q, and this spring becomes effective to force up the plunger M′ and rack M, thereby oscillating the jaws J J, accompanied by an upward swing of the lever F (see dotted lines in Fig. 2), whereby the eccentric jaws close upon and tightly grip the cable so as to lock the anchor fast thereto. From this instant the descent of the anchor drags down the mine until the anchor rests upon the bottom with the mine held above it at the prescribed depth, as is shown in dotted lines in Fig. 1.

It is during the launching of the mine (on anchors not provided with a lock for the gripping device) that the possibility of the grip acting prematurely occurs, as the weight of the plummet must maintain a constant strain on its cable sufficient to keep the gripping mechanism inoperative during the descent of the anchor to the depth where the plummet strikes the sea bottom. In launching a mine of this type, it often occurs that the plummet does not sink rapidly enough at the moment of launching to main-

tain the necessary strain on its cable. This allows the grip to act at once, with the result that the mine is submerged to a greater depth than was intended. By the application of my hydrostatic locking device, the grip is held inoperative for a sufficient time to allow the plummet to sink to a depth where its weight will hold the lever F in the position shown in Figs. 2 and 3. This condition will occur after the anchor has descended a few feet, as the friction on the mooring cable will prevent its sinking as rapidly as the plummet. At the desired depth the hydrostatic pressure releases the latch V, so that the grip will be free to act when the plummet strikes bottom.

My invention is not limited to the precise details of construction herein set forth, being susceptible of such variation as may be within the skill of the mechanic or engineer.

A known equivalent for the grip sliding upon the mooring cable is a drum upon which the cable is wound, and a pawl or other means for stopping the drum or otherwise checking the paying out of the cable, in order to connect the anchor with the mine through the required length of cable.

What I claim is:—

1. The combination with a buoyant mine, an anchor therefor, and a mooring cable, of means applied to the anchor for engaging the cable to connect the anchor and mine through a required length of cable, means for operating said engaging means before the descending anchor strikes bottom, and means for rendering said operating means inoperative until the anchor is submerged to a prescribed depth.

2. The combination with a buoyant mine, an anchor therefor, and a mooring cable, of means applied to the anchor for engaging the cable, and hydrostatic means for rendering said means inoperative until the prescribed hydrostatic pressure is attained.

3. The combination with a buoyant mine, an anchor therefor, and a mooring cable, of means applied to the anchor for engaging the cable to connect the anchor and mine through a required length of cable, means for operating said engaging means before the descending anchor strikes bottom, and locking means for rendering such operating means inoperative until the anchor is submerged to a prescribed depth.

4. The combination with a buoyant mine, an anchor therefor, and a mooring cable, of an automatic grip applied to the anchor tending to grasp the cable, a lock for restraining said grip and rendering it primarily inoperative, and a hydrostat operatively connected to said lock to withdraw it when the prescribed hydrostatic pressure is attained.

5. The combination with a buoyant mine, an anchor therefor, and a mooring cable, of an automatic grip applied to the anchor and comprising opposite gripping jaws, a lock primarily engaging one of said jaws, and hydrostatic means for withdrawing said lock.

6. The combination with a buoyant mine, an anchor therefor, and a mooring cable, of an automatic grip applied to the anchor for grasping the cable, a plummet and sounding line connected to operate said grip when the plummet strikes bottom, and hydrostatic means for rendering said grip inoperative until a prescribed depth is reached.

7. The combination with a buoyant mine, its mooring cable, an anchor, and gripping mechanism applied to the anchor for grasping the cable, comprising oscillating eccentric jaws connected to turn together, and operating means connected to one of said jaws.

8. The combination with a buoyant mine, its mooring cable, an anchor, and gripping mechanism applied to the anchor for grasping the cable, comprising oscillating eccentric jaws having sector teeth, and a sliding part formed with rack teeth engaging said sector teeth to connect the jaws to oscillate in unison.

9. The combination with a buoyant mine, its mooring cable, an anchor, and gripping mechanism applied to the anchor for grasping the cable, comprising oscillating eccentric jaws having sector teeth, and a sliding part formed with rack teeth engaging said sector teeth to connect the jaws to oscillate in unison, and a spring pressing against said sliding part to impart to the jaws a tendency to grasp the cable.

10. The combination with a buoyant mine, its mooring cable, an anchor, and gripping mechanism applied to the anchor for grasping the cable, comprising oscillating eccentric jaws having sector teeth, said jaws formed with detachable hubs engaging them, and the sector teeth formed on said hubs.

11. The combination with a buoyant mine, its mooring cable, anchor and automatic grip, of a friction brake for moderating the descent of the anchor comprising a yielding brake shoe and a spring for pressing it against the cable.

12. The combination with a buoyant mine, its mooring cable, anchor and automatic grip, of a friction brake for moderating the descent of the anchor comprising a brake shoe, formed as a split cone seated in a conical socket, and a spring for pressing said cone into said socket to cause it to contract upon the cable.

13. The combination with a buoyant mine, its mooring cable, anchor and automatic grip, of a friction brake for moderating the descent of the anchor comprising a supporting ring held in a socket and having a conical recess, a split cone seated in said recess, a spring pressing said cone downwardly there-

into, and a cap serving to guide the cable and receiving the upward reaction of said spring.

14. The combination with a buoyant mine, its mooring cable and anchor, of a casing fastened on said anchor, automatic gripping mechanism and a hydrostatic lock therefor mounted in said casing.

15. The combination with a buoyant mine, its mooring cable and anchor, of a casing fastened on said anchor, automatic gripping mechanism mounted in said casing, and a brake for moderating the descent of the anchor, arranged in the upper part of said casing.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

CHARLES R. GABRIEL.

Witnesses:

WILLIAM RILEY,

CHAS. J. ELLSWORTH.