Sept. 27, 1938. C. S. LAWTON 2,131,445

RELEASING GEAR

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FIG. 1

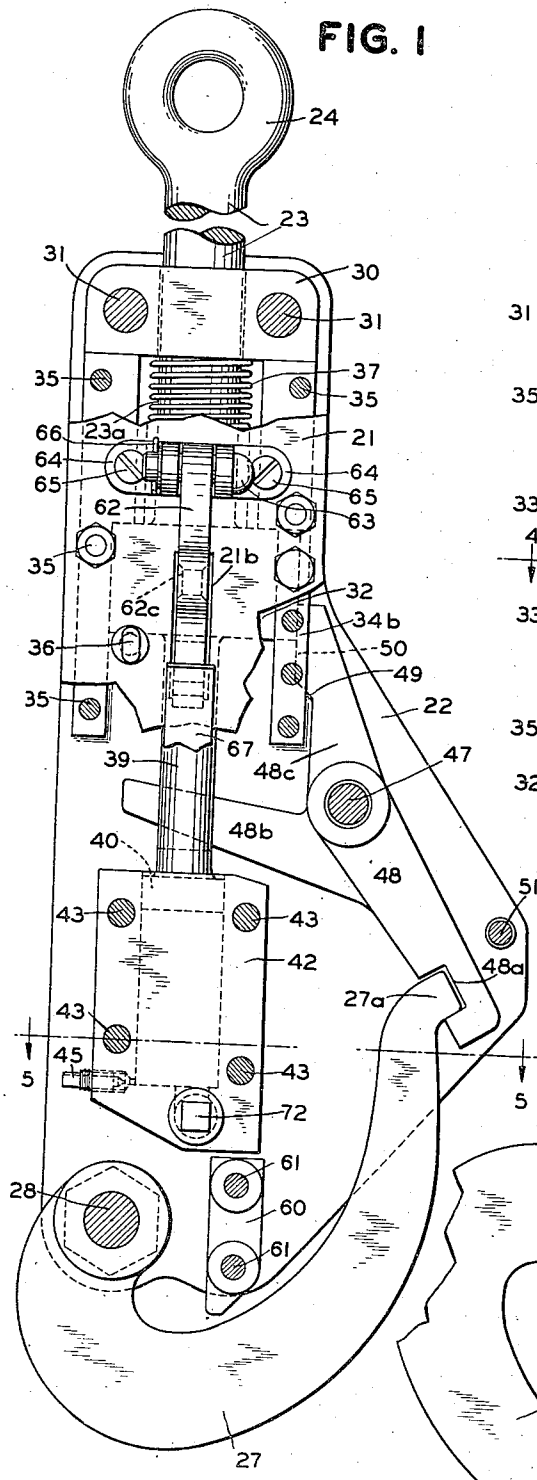
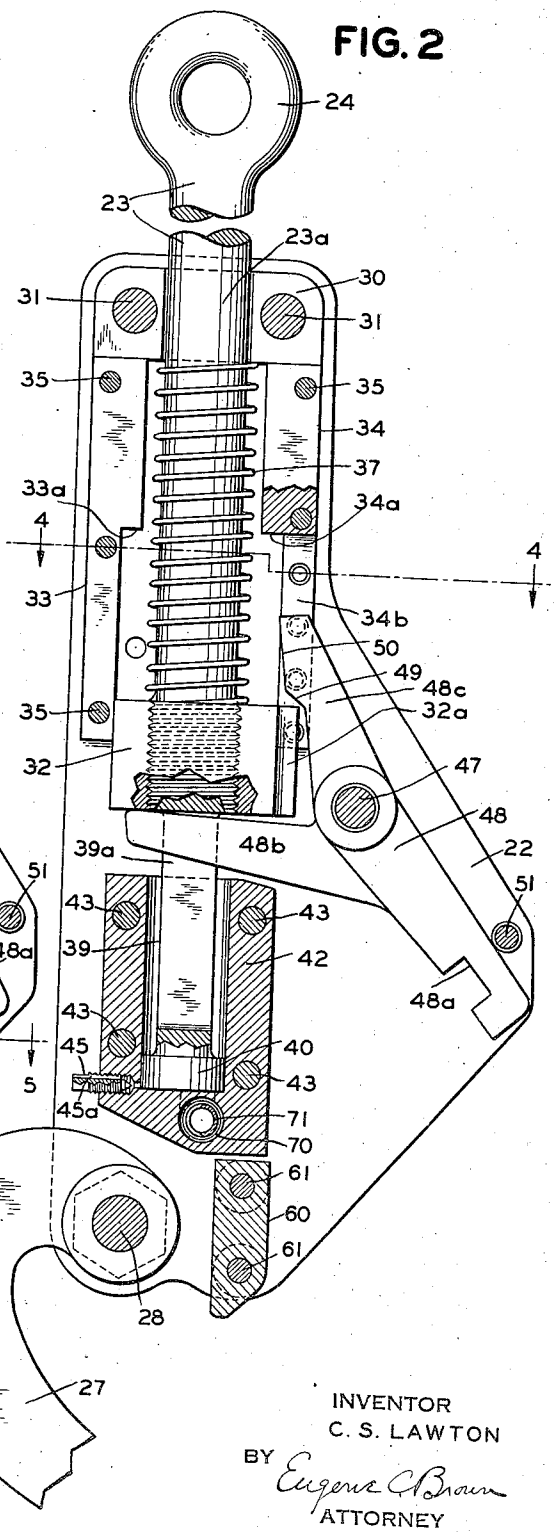


FIG. 2



INVENTOR
C. S. LAWTON
BY Eugene A. Brown
ATTORNEY

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FIG. 3

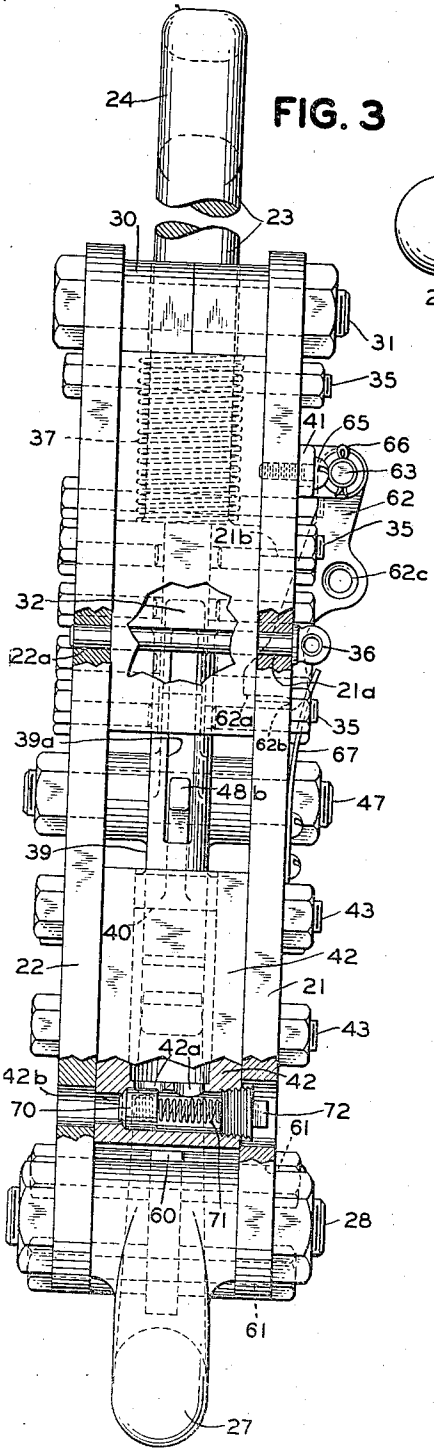


FIG. 4

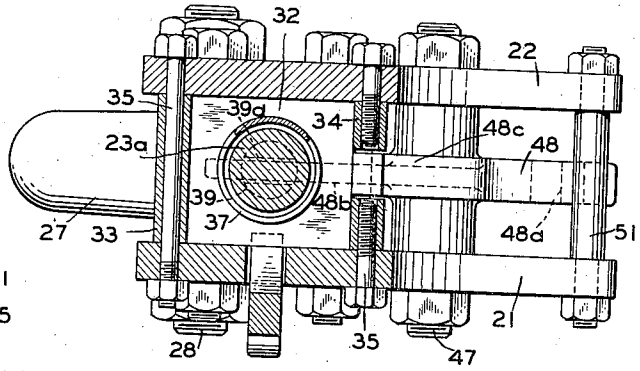


FIG. 5

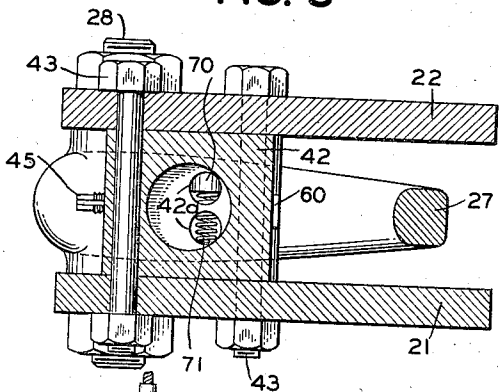
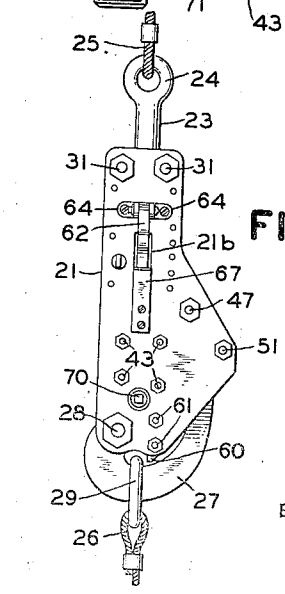


FIG. 6



INVENTOR
C. S. LAWTON
BY Eugene C Brown
ATTORNEY

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RELEASING GEAR

Chester S. Lawton, Ridgewood, N. J., assignor to The Western Union Telegraph Company, New York, N. Y., a corporation of New York

Application March 2, 1937, Serial No. 128,688

12 Claims. (Cl. 294—83)

This invention relates generally to releasing gear, and more particularly to automatic releasing gear adapted to hoist or lower a load through water or other fluid medium without premature release of the load.

It is frequently necessary or desirable to lower a device from a ship which is pitching in a seaway, to the bottom of the sea, and then automatically detach the lowering line from the device so that the line can be retrieved by the ship. For instance, when embedding submarine cable in the manner disclosed in the United States patent to Lawton and Bloomer No. 2,067,717, issued January 12, 1937, it is necessary to lower the cable embedding device by a line from the ship to place the device in working position on the bed of the ocean. If this manœuvre is attempted with an ordinary automatic releasing hook, such, for instance as is commonly used for the release of lifeboats from a vessel's side, there is danger that at some time during the lowering operation, the part of the ship from which the embedding device is suspended will roll or pitch downward faster than the mass can sink freely through the water, so that slack is momentarily put on the lowering line, and the embedding device will become released prematurely and possibly lost.

One of the objects of the invention is to obviate the foregoing disadvantages and to provide suitable automatic releasing gear adapted to hoist or lower a load through a fluid medium from a structure which is pitching or moving in the fluid medium without premature release of the load being hoisted or lowered. Specifically, and as shown, the gear includes a time-delay action which allows its full operating period to be adjusted so that it is in excess of the rolling or pitching period of the ship, and has means for returning the action to its initial position almost instantaneously if tension is reestablished on the lowering line, together with a latching device which prevents the actual release from taking place until the line has remained slack for a continuous full operating period; preferably, there is provided a catch which prevents the gear from being accidentally relocked when tension is put on the lowering line after the release has once operated.

The invention further resides in the novel construction, combination and arrangement of parts of the releasing gear hereinafter described and specifically pointed out in the claims.

For a better understanding of the invention, and for illustration of one of the various forms it may take, reference is had to the accompanying drawings, in which:

Fig. 1 is a side view of releasing gear in accordance with the invention, with one of the side plate members thereof broken away to disclose the interior construction of the gear, the latter being shown in locked position;

Fig. 2 is a side view of the gear similar to Fig. 1, with one of the side plates removed and certain parts shown in section, the gear being in unlocked or releasing position;

Fig. 3 is a front view of Fig. 1, with certain parts broken away to disclose other parts thereof;

Fig. 4 is a cross-sectional view, taken along the line 4—4 of Fig. 2, looking in the direction of the arrows;

Fig. 5 is a cross-sectional view, taken along the line 5—5 of Fig. 1, looking in the direction of the arrows;

Fig. 6 is a side view, on a smaller scale, of the gear in operating position.

Referring now to the drawings, the mechanism of the gear is substantially enclosed in a housing comprising two side plates **21** and **22** of the same configuration. Projecting from the upper end of the gear is a rod **23** having an eye **24** by means of which the gear is suspended from a lowering line **25**, and at the lower end of the gear is a tumbler **27** adapted to support a load, for example, a cable embedding plow as it is being lowered from the cable ship, the plow being held by a bridle or rope **26** shackled to a link **29** which loosely encircles the tumbler **27**. The tumbler is pivotally mounted on a bolt or stud **28** passing through and supported by the side plates **21** and **22** so that the tumbler may turn or rotate, in a manner hereinafter described, to release the plow from the gear after the plow is in position on the bed of the ocean or other body of water in which the cable is to be embedded.

The shank **23***a* of the rod **23**, which preferably is formed from forged steel, is longitudinally slidable in a split collar **30** rigidly secured by bolts **31** to the side plates, the shank having a portion thereof threaded into a steel block **32** slidably mounted between guide members **33** and **34** secured in any suitable manner, as by bolts or pins **35**, to the plates **21** and **22**. Encircling the shank is a spiral steel compression spring **37**, the shank **23***a* and block **32** moving to compress the spring when tension is put on the gear, as shown in Fig. 1, the upper limit of travel of the rod **23** being determined by shoulders **33***a* and **34***a* of the guide members **33** and **34** which engage the block **32** and sustain the weight of the plow or

other load on the gear. The lower portion of the shank forms a piston rod 39 and piston 40 reciprocable in a hydraulic chamber 42 rigidly secured, as by bolts 43, to the side plate structure. The rate at which the piston 40, under the urge of spring 37, can descend in the chamber 42, against the pressure of a fluid medium in the chamber, is controlled by a time-delay action, such as a needle valve 45 at the lower end of the cylinder which controls the rate of escape of the fluid medium from the chamber through the valve opening 45*a*, which valve may be adjusted to give within certain limits any desired time-delay characteristic to the releasing mechanism.

Pivotally mounted on a stud or bolt 47 secured to plate members 21 and 22 is a trigger 48 which has a notched portion 48*a* for engaging and latching, or locking, the end 27*a* of the tumbler 27 in position to support and lower the load, the locking position being shown in Fig. 1. The trigger has an arm 48*b* which works in a slotted portion 39*a* of the piston rod 39, shown more clearly in Fig. 2, and also has an arm 48*c* with a camming surface 49 and a plane surface 50 adapted to coact with a projecting portion 32*a* of the block 32 which travels in a slotted portion 34*b* of the guide member 34.

When the gear is set from unlocked position, Fig. 2, to locked position, Fig. 1, the block 32 is moved upwardly in the guide members 33 and 34, and the projection 32*a* engages the camming surface 49 and rotates the trigger in a clockwise direction so that the notch 48*a* engages and locks the end of the tumbler 27 which has previously been set to enable the end 27*a* to enter the notch. In order to maintain the gear in its locked position, prior to application of the load on the tumbler 27, a pin 36 is inserted, in openings 21*a* and 22*a* in the side plates, beneath the block 32 to hold the spring 37 under compression. When the load is applied to the tumbler 27, i. e., when the plow or other load is lowered over the side of the cable ship, the pin 36 is withdrawn to place the gear in operative condition to automatically release the load at the proper time. So long as the load is suspended from the tumbler the weight of the load keeps the block 32 seated against the shoulders 33*a* and 34*a*, but when the tumbler is relieved of the weight of the load, as when slack is put on the lowering line 25, the spring 37 expands and forces the block 32 and piston 40 downwardly towards the unlocking position of the gear. Assuming the weight of the load has been removed from the tumbler a sufficient length of time to enable the piston 40 to move to the bottom of the cylinder 42, the block 32 will be in the position shown in Fig. 2, at which time the upper end of the slot 39*a* of the piston rod has engaged the trigger arm 48*b* and caused rotation of the trigger, in a counterclockwise direction as viewed in Fig. 2, to its unlatching position, at which time the tumbler drops to its lowermost position to release the load from the gear. A bolt 51 which passes through the plates 21 and 22 forms a stop for limiting the travel of the trigger 48 as it moves to unlocking position.

After the load has been released from the gear, the gear is prevented from jamming or relocking accidentally by means of a lever or catch 62 pivotally connected by a pin 63 passing through bracket members 64 secured, as by screws 65, to the side plate 21, Figs. 1 and 3. A cotter pin 66 passing through the pin 63 locks the pin in place. A leaf spring 67 has one end secured by screws to the plate 21, and the other end of the spring bears against the lever 62 and urges the lever inwardly, through an opening 21*b* in the plate 21, so that after the block 32 has moved downwardly to the unlocking position of the gear, the block is prevented from again coming up towards locking position by the end 62*a* of the lever 62, shown in dotted outline in Fig. 3, which is held in this position by the spring 67. The limit of travel inwardly of the lever 62 is determined by a shoulder portion 62*b* adapted to abut the plate 21. To facilitate resetting of the gear, an opening 62*c* is provided in the lever 62 whereby a hook or other device may be inserted for the purpose of pulling the lever back to clear the block 32.

To prevent the tumbler 27 from moving upwardly to a point beyond the notched portion 48*a* of the trigger, a preventer device 60 is mounted betwen the plates 21 and 22 by means of bolts 61.

In the event the force exerted on the gear by the load is temporarily removed, as when slack is momentarily introduced in the lowering line by rolling or pitching of the cable ship from which the cable plow is being lowered, means are provided whereby the gear will automatically reset itself to insure that a full operating period must elapse before release will be effected on each succeeding instance, this means comprising an intake check valve 70, Figs. 3 and 5, which controls two ports 42*a* in the hydraulic cylinder 42. A spring 71 normally keeps the check valve 70 in closed position with respect to the inlet 42*b*, and a screw plug 72 is provided to hold the valve parts in place and also permit removal of the parts for inspection, cleaning or repair purposes. When the cylinder 42 moves upwardly by reason of the momentary removal of the weight of the load from the tumbler 27, the piston forces some of the water or other fluid medium in the cylinder out through the needle valve 45. Upon reapplication of the weight on the tumbler the piston again returns to its initial position, shown in Fig. 1, because the cylinder 42 is again pulled downwardly by the weight, and the pressure within the cylinder is substantially reduced, with respect to the pressure exerted by the fluid medium on the outside of the cylinder. This causes a flow of the sea water on the outside through the check valve 70 to the interior of the hydraulic cylinder until a hydrostatic balance between the interior and exterior of the cylinder again obtains, and the cycle of operation of the automatic releasing mechanism will again start when the force exerted by the load is again removed. When the gear has again returned to its initial position, the pressure within and without the hydraulic cylinder is substantially the same, and thus the operation of the device is not affected by change in the density of the water or other fluid medium through which the plow is being lowered; therefore, the releasing gear will operate satisfactorily at any desired depth in the ocean or other body of water.

In practice the lowering line is shackled to the eye 24 in the upper end of the shank 23, and the egg-shaped chain link 29 is shackled to the mass to be lowered. The tumbler, now in the open position, is engaged with the link and then moved to the locking position. Releasing the catch 62, tension is now put on the device, which causes the shank to move outwardly against the compressive force of the spring 37, and the trigger 48 is caused to engage the tumbler 27, thus positively preventing the link 29 from becoming disengaged from the tumbler. The safety pin 36 is

now inserted under the sliding block 32 on the shank, which locks the mechanism.

The adjustable needle valve opening 45a is covered with cup grease to seal it against leakage. Placing the gear on its side with the check valve opening 42b up and with the tumbler end slightly higher than the shank end, the check valve 70 is depressed with a small clean wooden pin or other implement, and water is poured through the valve into the valve chamber and hydraulic cylinder until all air has been excluded and they are completely filled. The device is then restored to a vertical position and is ready for lowering away as soon as the safety pin is removed. The grease put on the needle valve opening is pushed off by the pressure of the water the first time the mechanism operates, but has enough body to prevent gravity flow of the water from the cylinder. The means for adjusting the operating period is provided by the needle valve which controls the leakage rate from the cylinder and valve chamber. This supplements the leakage around the hydraulic piston which must be kept to a fairly good fit, of course, or be provided with a sealing ring or rings.

While the foregoing description relates to lowering a cable embedding device or other load in the ocean or other body of water, it is to be understood that the automatic releasing gear may be employed either for hoisting or lowering various kinds of devices in a fluid medium in such manner that pitching of the ship or other supporting structure from which the devices are hoisted or lowered will not cause premature release of the load from the gear.

Various other modifications and forms, and also various other uses for the invention, will readily suggest themselves to those skilled in the art without the exercise of inventive skill, and I therefore do not wish to be restricted except as indicated by the scope of the appended claims.

I claim:

1. Automatic releasing gear comprising means for releasably holding a load, means automatically operative upon removal of the force exerted on the gear by the load for releasing the load from the gear, and means for preventing release of the load, when the force exerted thereby is removed from the gear, until a predetermined time interval has elapsed after the removal of said force.

2. Automatic releasing gear comprising means for releasably holding a load, means automatically operative upon removal of the force exerted on the gear by the load for releasing the load from the gear, and fluid controlled means for preventing release of the load, when the force exerted thereby is removed from the gear, until a predetermined time interval has elapsed after the removal of said force.

3. Automatic releasing gear comprising means for releasably holding a load, means automatically operative upon removal of the force exerted on the gear by the load for releasing the load from the gear, and hydraulic means for preventing release of the load, when the force exerted thereby is removed from the gear, until a predetermined time interval has elapsed after the removal of said force.

4. Automatic releasing gear comprising means for releasably holding a load, said means being actuatable to latching and unlatching positions, means controlled by the force exerted on the gear by the load for latching the first named means in position to hold the load, releasing means automatically operative upon removal of the force exerted on the gear by the load for actuating said first named means to unlatching position to release the load, and means for preventing the releasing means for actuating said first named means to unlatching position, when the force exerted by the load is removed from the gear, until a predetermined time interval has elapsed after the removal of said force.

5. Automatic releasing gear comprising a tumbler member for releasably carrying a load, said tumbler member being actuatable to latched and unlatched positions, means including a trigger controlled by the force exerted on the tumbler member by the load for latching the tumbler member in position to hold the load, means automatically operative upon removal of the force exerted on the tumbler member by the load for actuating the trigger to unlatching position to cause the tumbler member to release the load, and time-delay means for preventing actuation of the trigger to said unlatched positions, when the force exerted by the load is removed from the tumbler member, until a predetermined time interval has elapsed after the removal of said force.

6. Automatic releasing gear comprising means for releasably holding a load, said means being actuatable to an initial latching position and an unlatching position, means controlled by the force exerted on the gear by the load for maintaining the gear in said latching position to hold the load, releasing means automatically operative upon the removal of the force exerted on the gear by the load for unlatching the gear to release the load, means for preventing the releasing means from unlatching the gear, when the force exerted by the load is removed from the gear, until a predetermined time interval has elapsed after the removal of the force, and means whereby reapplication of the force exerted on the gear by the load prior to the expiration of said time interval resets the gear to said initial latching position.

7. Automatic releasing gear comprising means for releasably holding a load, said means being being actuatable to an initial latching position and an unlatching position, means controlled by the force exerted on the gear by the load for maintaining the gear in said latching position to hold the load, releasing means automatically operative upon removal of the force exerted on the gear by the load for unlatching the gear to release the load, fluid controlled means for preventing the releasing means from unlatching the gear, when the force exerted by the load is removed from the gear, until a predetermined time interval has elapsed after the removal of the force, and means including said fluid controlled means whereby reapplication of the force exerted on the gear by the load prior to the expiration of said time interval resets the gear to said initial latching position.

8. Automatic releasing gear comprising means for releasably holding a load, said means being actuatable to an initial latching position and an unlatching position, means controlled by the force exerted on the gear by the load for maintaining the gear in said latching position to hold the load, releasing means automatically operative upon removal of the force exerted on the gear by the load for unlatching the gear to release the load, hydraulic means for preventing the releasing means from unlatching the gear, when the force exerted by the load is removed

from the gear, until a predetermined time interval has elapsed after the removal of the force, and means including said hydraulic means whereby reapplication of the force exerted on the gear by the load prior to the expiration of said time interval resets the gear to said initial latching position.

9. Automatic releasing gear comprising a housing, a first member carried by the housing for releasably holding a load, said first member being actuatable to one position to hold the load and to another position to release the load, a member for locking said first member in position to hold the load, structure reciprocable within the housing having means for suspending the gear from supporting means, said reciprocable structure controlling the operation of the locking member, a hydraulic cylinder adapted to hold a fluid medium, a piston movable within said cylinder and actuated by movement of said reciprocable means, valve means for controlling the rate of flow of said fluid medium from said cylinder, said piston and valve means preventing the reciprocable means from moving to a position for unlocking said first member, when the force exerted by the load is removed from said first member, until a predetermined time interval has elapsed after the removal of the force, and means including valve means for controlling the admission of fluid to said cylinder whereby reapplication of the force exerted on said first member by the load prior to the expiration of said time interval causes a fluid medium to enter the cylinder and reset the gear to said locking position.

10. Automatic releasing gear comprising means for releasably holding a load, said means being actuatable to latching and unlatching positions, means controlled by the force exerted on the gear by the load for latching the first named means in position to hold the load, releasing means automatically operative upon removal of the force exerted on the gear by the load for actuating said first named means to unlatching position to release the load, and means for preventing the releasing means from actuating said first named means to unlatching position, when the force exerted by the load is removed from the gear, until a predetermined time interval has elapsed after the removal of said force, said preventing means comprising a hydraulic cylinder, a liquid medium within said cylinder, a piston operating in said cylinder, means whereby said piston moves against the pressure of the liquid in the cylinder for delaying operation of said releasing means, an adjustable valve in said cylinder to determine the rate of escape of the liquid from the cylinder, and check valve means automatically operative to admit liquid into the cylinder when the force exerted by the load is reapplied to the gear.

11. Automatic releasing gear comprising a tumbler member for releasably carrying a load, said tumbler member being actuatable to latched and unlatched positions, means including a trigger controlled by the force exerted on the tumbler member by the load for latching the tumbler member in position to hold the load, a reciprocable member and spring means associated therewith for urging the reciprocable member to a position for unlocking the gear to release the load, said reciprocable member carrying a member for engaging the trigger to prevent unlatching of the gear when the force of the load is applied to the tumbler member and for releasing the trigger to cause the gear to release the load when the force of the load is removed from the tumbler member, and means for preventing release of the trigger until a predetermined time interval has elapsed after the force of the load has been removed from the tumbler member.

12. Automatic releasing gear for lowering or hoisting a load in a liquid medium, said gear comprising a tumbler member for releasably holding said load to be lowered or hoisted, said tumbler member being actuatable to locked and unlocked positions, means including a trigger for locking the tumbler member in position to hold said load, a rod reciprocable between locking and unlocking positions, said rod having means for connecting the gear to a lowering or hoisting line, a stop member on said gear, a member on said reciprocable rod for engaging said stop member to limit the travel of the rod when the force exerted by the load is applied to the tumbler, a compression spring urging said member away from said stop member, a hydraulic cylinder, a piston within said cylinder connected to said rod and reciprocable therewith, a liquid within said cylinder and a valve in said cylinder to determine the rate of escape of the liquid from the cylinder when the piston moves in a direction to compress the liquid within the cylinder, another valve structure for freely admitting the liquid medium in which the gear is immersed to the cylinder when the piston is moving in a direction to admit said liquid, said rod having means for engaging said trigger so that when the reciprocable rod and piston move a predetermined distance in a direction to expel the liquid from the cylinder, it will actuate the trigger to unlock the tumbler member and release the load, and means whereby the trigger is prevented from again locking the tumbler member after the latter has released the load.

CHESTER S. LAWTON.