2 Sheets—Sheet 1.

WOOD & LAY.

Operating Submarine-Shells.

No. 46,853

Patented Mar. 14, 1865

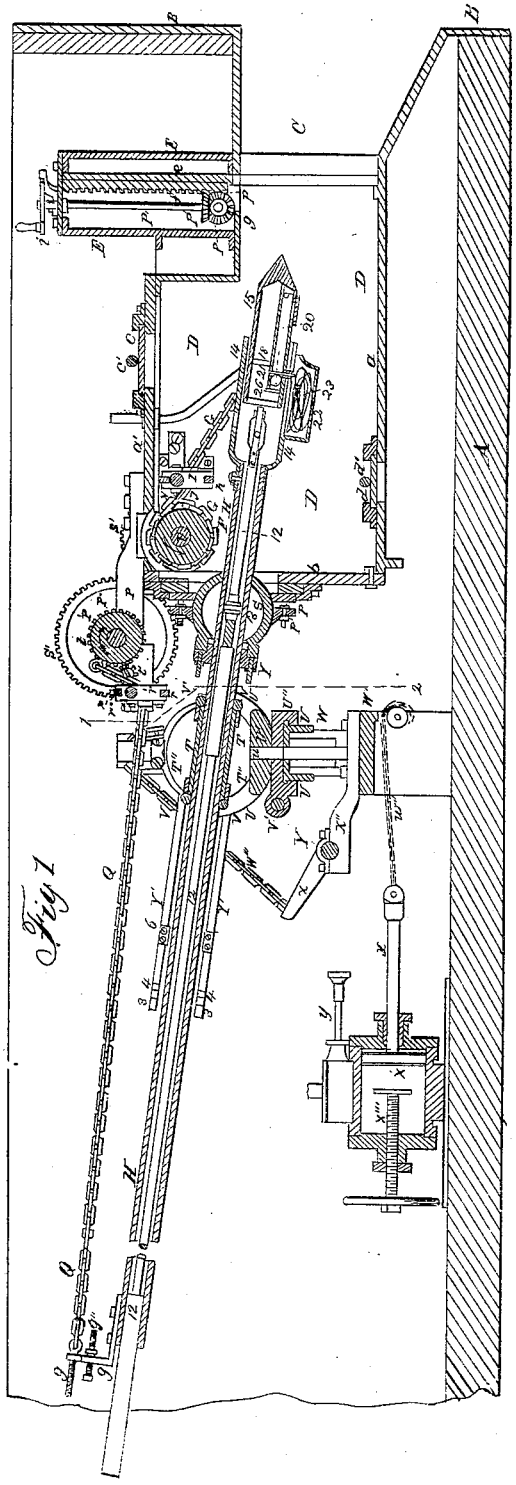

Fig 1

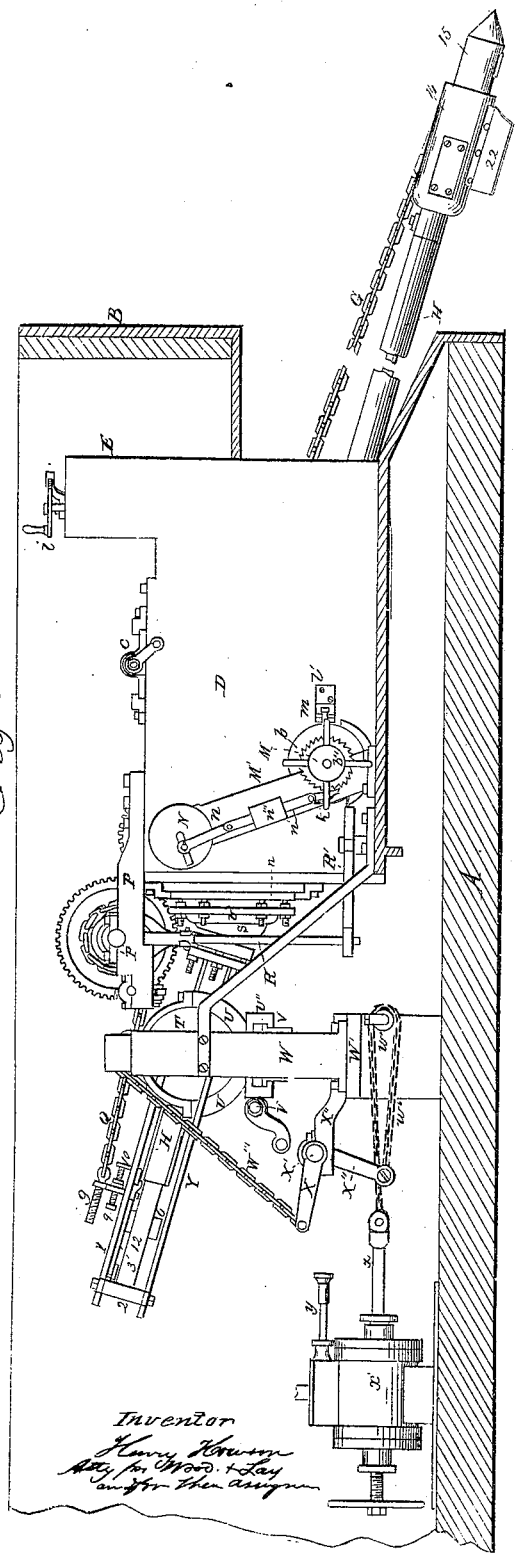

Fig 2.

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Atty for Wood & Lay
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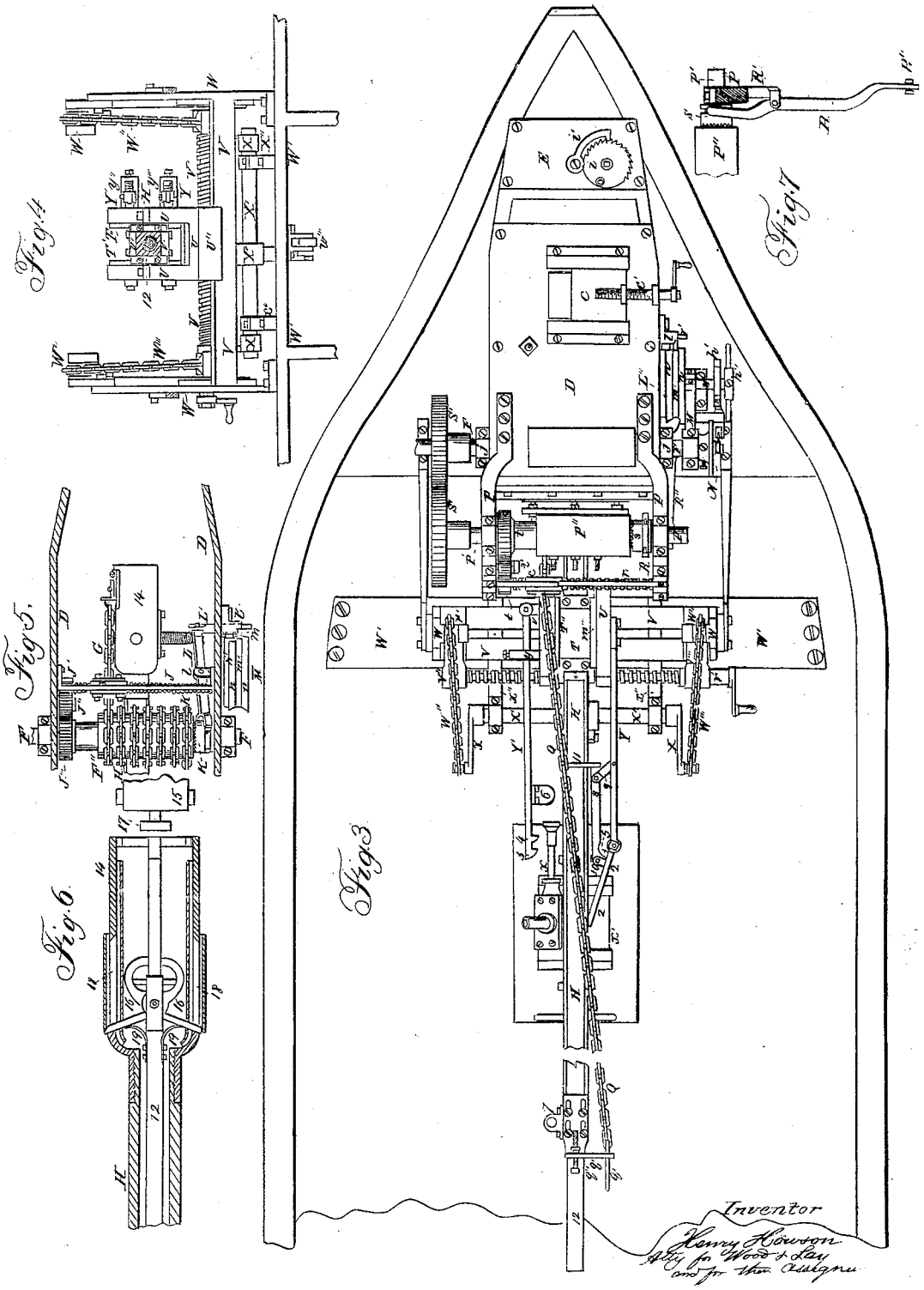

UNITED STATES PATENT OFFICE.

WM. W. W. WOOD, OF PHILADELPHIA, PENNSYLVANIA, AND JOHN L. LAY, OF BUFFALO, NEW YORK, ASSIGNORS TO DONALD McKAY, OF EAST BOSTON, MASSACHUSETTS.

IMPROVED APPARATUS FOR OPERATING SUBMARINE SHELLS OR TORPEDOES.

Specification forming part of Letters Patent No. **46,853**, dated March 14, 1865.

To all whom it may concern:

Be it known that we, WILLIAM W. W. WOOD, chief engineer, United States Navy, and J. L. LAY, first assistant engineer, United States Navy, have invented certain Apparatus for Operating Submarine Shells or Torpedoes; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

Our invention consists of certain apparatus (fully described hereinafter) for so projecting from a vessel, submerging, and exploding submarine shells or torpedoes that their discharge may take place without danger to the apparatus itself, to the vessel from which the operations are conducted, or to those whose duty it is to manage the operations.

In order to enable others to make and use our invention, we will now proceed to describe its construction and operation.

On reference to the accompanying drawings, which form a part of this specification, Figure 1, Drawing No. 1, represents a longitudinal section of our apparatus for operating submarine shells or torpedoes; Fig. 2, a side view; Fig. 3, Drawing No. 2, a plan view; Fig. 4, Drawing No. 3, a transverse vertical section of part of the apparatus on the line 1 2, Fig. 1, Drawing No. 1; Fig. 5, a plan of part of the apparatus; Fig. 6, a sectional view of the front end of the operating-rod, and Fig. 7 a detached view of part of the machine.

Similar letters refer to similar parts throughout the several views.

A represents the bottom of the vessel in which the machinery is placed, B representing the iron-plated bows of the vessel, in which is an opening, C, communicating with the water and air tight box or chamber D, of which *a* is the bottom, *a'* the top, and *b* the rear. E is a water-tight casing communicating with the interior of the box D, and in this casing is a sluice-valve, *e*, having at the back a rack, *f*, into which gears a cog-wheel on a shaft, *g*, and on this shaft is a bevel-wheel, *p*, gearing into a similar wheel, *p'*, on the vertical shaft *p''*, the latter projecting through and turning in the top of the casing E, above which it is furnished with a ratchet-wheel, *i*, the teeth of which are adapted to the reception of a pawl, *i'*. On drawing back this pawl from the wheel the sluice-valve, which moves in suitable guides, will fall by its own gravity and present a perfectly water-tight construction in front of the box D. On the top *a'* of this box is an opening covered by a plain valve, *c*, which can be moved to and fro in suitable guides by means of a screw, *c'*, and on the bottom of the same box a similar valve, *d*, is caused to slide by a screw, *d'*, these screws being furnished with suitable handles situated at accessible points on the outside of the box D. Through this box D, and turning in suitable packed boxes, *j j*, Fig. 3, attached to the same, passes a shaft, F, on which is a barrel, F', for receiving the chain G, one end of which is attached to the operating-bar H at the front end of the same. The chain passes through an opening in a block, I, which is arranged to slide on horizontal guiding-bars *k k*, secured to the interior of the box. (See Figs. 1 and 5.) A horizontal screw-shaft, J, passes through the sliding box I and is arranged to turn in suitable bearings on the opposite sides of the box D, a rotary motion being communicated to this screw from the barrel F'' through the medium of the wheel J''', secured to a tubular projection on the drum and gearing into a pinion, J'', which gears into a similar pinion, J', on the said screw shaft, (see Fig. 5, Drawing No. 3,) so that when the drum F revolves the block I is caused to traverse along the bars *k k*, thereby guiding the chain G and preventing one coil of the chain from crowding onto the other, as it is wound round the barrel. A clutch, K, Fig. 5, is arranged to slide freely, but not to turn, on the shaft F, the teeth of the clutch being adapted to similar teeth on the end of the drum F'. A lever, L, is hung to a stud, *l*, secured to the inside of the box D, Fig. 5, one end of this lever being forked so as to embrace the clutch K, which has a groove for the reception of pins on the forked arm of the lever, the opposite end of which is connected to a bar, L', arranged to project through and slide in one side of the box D, as well as in a bracket, *l'*, secured to the same. From one side of this bar L' projects a pin, *m*, which, under the circumstances described hereinafter, occupies a position in a

groove, m', formed by two strips, $n\,n$, secured to the periphery of a disk-wheel, L″, these strips extending only partly round the said disk-wheel, which is secured to a shaft, M, the latter turning in one side of the box D and in the lower part of a frame, M′, which is secured to the bottom of the vessel, and the upper end of which serves as an additional bearing for the above-mentioned shaft F. To the end of the latter shaft is secured a crank-wheel, N, Fig. 2, having an adjustable pin, which is connected, by a rod, n', to a bar, n'', which is arranged to slide in a projection, n''', on the frame M′, the lower end of the bar being provided with a spring-pawl, h, adapted to the teeth of the ratchet-wheel h' on the shaft M, which is furnished with a suitable hand-wheel, h''. In brackets P P, Figs. 1 and 3, secured to and projecting from the top of the box D, turns a shaft, P′, on which is a drum, P″, for receiving the chain Q, the outer end of which is connected to an adjusting-screw, q, in a plate, q', attached to the rear of the operating rod H. Horizontal rods r are also secured to the brackets P, and serve as guides for the block r', through an opening in which passes the chain Q to the barrel P″, this block being operated by a screw-shaft, r'', to which motion is communicated from the barrel through the medium of the cog-wheels t, t', and t'', a clutch, s, on the shaft P′ having teeth adapted to similar teeth on the barrel, and this clutch being under the control of a lever, R, which is hung to a projection, R′, on one of the brackets P, as seen in Fig. 7, Drawing No. 3. The lower end of this lever passes through an eye or slot in one end of a horizontal lever, R″, which is hung to a pin at the bottom of the box D, the end of the short arm of this lever fitting, under the circumstances described hereinafter, in the groove m', formed by the strips $n\,n$ on the disk-wheel L″. It should be understood that these strips are beveled at the ends which strike the pin m and the end of the lever R″ during the operation of the machine.

The two barrel-shafts F and P″ are geared together by cog-wheels S′ S′, and are driven by a steam-engine placed in a suitable position in the hold of the vessel.

The operating-bar H is made of sheet iron, and is square, with the corners removed. This bar passes through a sphere, S, Fig. 1, which is so fitted to the plate w, attached to the rear b of the box D, as to turn freely therein, the sphere being confined to the said plate w by an annular plate, w', and suitable studs or bolts, and the sphere being provided with a suitable stuffing-box, v.

The operating-bar H also passes through a sleeve, T, Fig. 1, on each end of which are suitable friction rolls v' v', bearing against the operating-bar. Attached to or forming a part of this sleeve are two disks, T′ and T″, or, as they may be properly termed, "journals," which are arranged to turn in bearings U U projecting from and forming part of the plate U′, (see Figs. 1 and 4,) which rest on a plate, U″, and turn on a central pin, u, secured to the said plate. The plate U″ is so secured to a cross-head, V, that it can be moved freely on the same in a longitudinal direction only.

A screw-shaft, V′, is arranged to turn in brackets V″, Fig. 3, secured to the cross-head V, the threads of this shaft being adapted to similar threads in the plate U″, so that on turning the screw-shaft the position of the said plate U″ on the cross head V can be altered at pleasure.

The cross-head is arranged to slide in vertical guides W W, Fig. 4, secured to the base-plate W′, which is attached to the bottom of the vessel, each guide having at the top a pin carrying a pulley, W″, over each of which passes a chain, W‴, one end of each chain being connected to the cross head V and the other to an arm, X, Fig. 3, one of these arms being secured to each end of the shaft X′, which turns in brackets X″, secured to the foundation-plate W. Another arm, X‴, is secured to the shaft X′, and to this arm is connected one end of a chain, w'', which passes around a pulley, w''', on a hanger secured to the under side of the base-plate W′, (see Figs. 1 and 2,) the other end of the chain being attached to the piston-rod x of the steam-cylinder x', the piston x'' in which is limited as regards its backward movement by the adjusting-screw x'''. This steam-cylinder is secured to the bottom of the vessel in the position illustrated in the drawings, and is furnished with a valve-chest, a slide-valve, and a valve-spindle, y, with which may be connected any suitable apparatus for operating the valve.

To one of the disks or journals T″, which, as before remarked, form a part of the sleeve T and turn in bearings U, are secured two rods, Y Y, Fig. 3, and to projections y' on the other disk or journal, T″, are hinged two rods, Y′ Y′, each of which passes through a staple-like projection, y'', containing a spiral spring, as seen in Fig. 4, which springs, acting on the rods Y′ Y′, tend to force the same toward the rods Y Y. To the outer ends of the latter rods is hinged a plate, 2, which can be moved outward to the position shown in Fig. 3, or inward so that its outer edge shall occupy a position between the lugs 3 4 on the rods Y′ Y′, a stop, 5, preventing the plate from being moved beyond this point, and the lugs 3 being rounded on one side for a purpose rendered apparent hereinafter.

A rounded projection, 6, Fig. 3, is secured to the inside of the bars Y′ Y′, and is so arranged as to be acted upon by a rounded projection, 7, on one side of and near the rear end of the operating-rod H, under the circumstances described hereinafter.

A rod, 8, Fig. 3, is connected by a link, 9, to the bars Y Y, one end of the rod being jointed to a projection, 10, on the plate 2, and the other end having a plate, 11, which is acted on by the set-screw q'' at the rear of

the operating-bar H, in the manner and at the time explained hereinafter.

Within the operating-bar H is an internal rod, 12, the rear of which projects a given distance beyond the rear of the said operating-bar, in which the internal rod can be moved longitudinally to a limited extent, a suitable packing, 13, being so secured to the rod 12 as to prevent the water from passing through the interior of the bar. To the front end of this bar H is secured a casing, 14, for containing the submarine shell or torpedo 15, the end of the internal rod, 12, projecting into this casing. The construction of the latter and of the rod will be best observed on reference to Fig. 6, Drawing No. 3.

To the end of the rod 12 are hinged two levers, 16 16, forming together jaws for grasping the head 17 of the shell or torpedo 15, the straight arm of one lever projecting through a slot, 18, in one side of the casing, and the straight arm of the other lever through a similar slot in the opposite side of the casing, both slots terminating at the front in beveled ends, and both levers being acted on by springs 19, the tendency of which is to close the jaws.

The torpedo, which consists of a cylindrical shell of plate iron charged with explosive material, is placed in the casing 14, lugs on the torpedo sliding along grooves formed in the said casing, so that the torpedo cannot turn therein.

The jaws, which are open, owing to the straight arms of their levers being in contact with the beveled ends of the slots 18, receive the head 17 of the torpedo, and this being pushed back into the casing 14, together with the rod and its jaws, the latter, owing to the springs 19, close on the projection 17 of the torpedo, which is thus held at the end of the operating-rod. The torpedo, as seen in Fig. 1, Drawing No. 1, has two chambers separated from each other by a yielding wad or diaphragm, 18, the larger chamber containing the powder or other explosive material, and the smaller chamber being a simple air-space, as described in the specification relating to our application for a patent for improvements in submarine shells or torpedoes.

A tubular chamber, 20, is contained within the shell, and at one end of this chamber a spherical weight is confined by two pins, 26 and 21, the latter of which can be withdrawn, thereby permitting the weight to fall on a cap charged with detonate, and placed on a nipple at the end of the tubular chamber, this release of the weight taking place after the torpedo has been submerged and discharged clear of the operating-rod, and when it occupies a vertical or nearly vertical position in the water. One end of a cord, 23, is attached to the releasing-pin 21 and is coiled in a chamber, 22, formed in the under side of the casing 14, the opposite end of the cord being attached to any part of the said chamber.

Operation: In Fig. 1 the several parts are arranged as they appear prior to the projection of the torpedo from the vessel and its escape from the operating-rod, the sluice valve *e* having been elevated so as to leave the opening C in the bow of the vessel unobstructed.

The first thing to determine is the angle at which it is desirable to submerge the torpedo.

If it be necessary to move the operating-bar H so as to be at a greater inclination than that shown in Fig. 1, the attendant so manipulates the valve-rod *y* of the steam-cylinder *x'* that the steam will act on the front face of the piston *x'''* and cause the piston-rod to pull the chain *w''*, which, through the arm X''', shaft X', arms X X, and chains W''', elevates the cross-head V, and with it the plates U'' U', the sleeve T, and operating-bar H, and other parts connected therewith, the bar turning on a center coinciding with the center of the sphere S, which, together with the plates *w* and *w'* and stuffing-box N, form a perfectly water-tight ball-and-socket joint. The vertical position of the operating-bar having been thus decided, its proper lateral position should be the next care of the attendant, for it may be advisable in many cases to project the torpedo from the vessel at an angle laterally. By turning the screw-shaft V' the plate U'' and the whole superstructure, including the sleeve T, is caused to traverse along the cross-head V to any desired position, carrying with it the operating-bar H, which again turns in the ball-and-socket joint, the sleeve T, and its journals T' T', and the plate U', and all the appliances connected therewith, accommodating themselves to the altered position of the operating-bar by turning on the vertical pin *u*. The driving-engine is now started and causes the main shafts F and P'' to turn in the directions pointed out by the arrows, Fig. 1.

It should be understood that when the parts are in the positions illustrated in Fig. 1, the clutch *s* is in gear with the barrel P'', which consequently turns with the shaft P', and that the clutch K is out of gear with the barrel F', which is therefore loose on the shaft F, these positions of the clutches being determined by that of the wheel L'', the strips *n n* on which control both clutches, through the mechanism above described.

As the shafts F and P' revolve in the direction of their arrows the chain Q must be wound round the barrel P'', and consequently the operating-bar H, and with it the shell or torpedo 15, must be pushed forward, its front end being rapidly projected from the interior of the box D through the opening C in the bows of the vessel, thus submerging the torpedo.

As the operating-bar approaches the limit of its forward movement the end of the screw *q''* strikes the projection 11 on one end of the rod 8, causing the latter to pull the plate 2 forward, the edge of the plate striking against the rounded portions of the lug 3 so that the bars Y' Y' shall yield and permit the said edge of the plate to take a position between the lugs 3 and 4. The operating-bar has now been projected to the limit of its forward

movement, and the rear end of the internal rod, 12, is in front of the plate 2. In the meantime an intermittent rotary motion has been imparted to the disk-wheel L″ from the shaft F through the medium of the crank-wheel *n*, sliding rod *n*″, pawl *h*, and ratchet-wheel *h*′, and the position of this wheel, when the operating-bar has been moved out to the full extent, is such that the lever R″ is beyond the control of the strips *n n* of the disk-wheel, and, through the action of a suitable spring, the clutch *s* is thrown out of gear with the barrel P″. At the same time the rod L′ and lever L are so acted upon by the strips *n n* on the periphery of the disk-wheel as to move the clutch K into gear with the barrel F′. As the shafts F and P′ continue to revolve the chain G must be wound round the barrel F′, and must consequently pull the operating-bar back, the chain Q at the same time running freely from the loose barrel P‴. Immediately after the operating-bar begins to move back the rear end of the internal rod, 12, comes in contact with the plate 2, and its further progress is thus arrested, while the operating-bar continues to move rearward. The consequence of this arrest of the rod 12 is the pushing of the torpedo 15 from the casing 14, by which movements the ends of the slots 18, Fig. 6, come in contact with the straight arms of the levers 16 and cause the jaws to open and to release the submerged torpedo. As the operating-rod continues to move back its projection 7 comes in contact with the projection 6 on the bars Y′ Y′, causing the latter to move back and to release the plate 2, which is opened by the operating-bar as the latter continues its backward movement. In the mean time the submerged torpedo, owing to its buoyancy, rises and comes in contact with the vessel against which it is destined to be exploded. Owing to the backward movement of the operating-rod the cord 23, attached to the pin 21 of the torpedo, is gradually withdrawn from the chamber 22, and this cord is of such a length that when the operating-bar is in the act of completing its backward movement the cord is pulled, the pin 21 withdrawn, and the spherical weight 19 is permitted to fall on the charged cap placed on the nipple at the bottom of the chamber 20. The discharge of the torpedo consequently takes place, and this at a time when the operating-rod has been moved to a safe position away from the torpedo and within the box or chamber D. The operating-rod having reached the limit of its backward movement the motion of the driving engine is arrested preparatory to readjusting another torpedo in the place previously occupied by that discharged. In order to do this it becomes necessary, in the first place, to permit the sluice-valve *e* to fall by its own weight so as to form a perfectly water-tight end for the box D. After this the valve *d* is opened, and the water in the box D is permitted to escape into the hold of the vessel, from which it is subsequently discharged by any adjacent pumping apparatus. The valve *c* is then opened so that access may be had to the interior of the box D, into which another torpedo is introduced, there adjusted to the casing 14 at the end of the operating-bar, and to the jaws within the same, the internal rod, 12, being pushed back to its former position. After this the valves *c* and *d* are closed, the sluice-valve *e* elevated, and the several parts are then in their proper position for a repetition of the above-described movements and for the submersion, escape, and discharge of another torpedo.

We claim as our invention and desire to secure by Letters Patent—

1. The combination of the operating-bar H, the internal sliding rod, 12, and the jaws herein described, or other equivalent retaining or releasing devices, the whole being arranged and operating substantially as described, for the purpose specified.

2. The packing 13, secured to the internal rod, 12, and fitting to the interior of the operating rod 13, as and for the purpose set forth.

3. The casing 14, arranged on the end of the operating-bar H, for the reception of the shell 15, as and for the purpose herein set forth.

4. The combination, substantially as described, of the operating-bar H with a cord, 23, so arranged and so connected with the shell and with appliances for igniting the charge in the same that the bar as it approaches the limit of its inward movement shall be the cause of exploding the shell.

5. The chamber 22, combined with the casing 14, and arranged for the reception of the discharging cord 23, as set forth.

6. The two driving-shafts F and P′, with their chain-barrels, the chains Q and G, and the operating-bar H, the whole being constructed, arranged, and operating substantially as set forth.

7. The disk-wheel L″, operated from one of the driving-shafts and arranged to control the clutches on the said shafts, as set forth.

8. The sliding blocks I and V′, caused to traverse in guides by the aid of screws, substantially in the manner and for the purpose described.

9. The sleeve T, adapted to the operating-bar H, and combined with the mechanism herein described, or the equivalent to the same, whereby the said sleeve can be turned in a vertical or horizontal plane, as herein set forth.

10. The said sleeve T, in combination with the slides and guides and operating-screws herein described, or the equivalent to the same, whereby the said sleeve can be moved to and fro horizontally.

11. The adjustable stop of the steam cylinder, in combination with the sleeve T, and the system of levers, chains, and pulleys herein described, or the equivalent to the same, whereby the said sleeve can be raised and lowered, and its downward motion limited, as set forth.

12. The combination of the said movable

sleeve T, the operating-bar H, and ball-and-socket joint, the whole being constructed and arranged for joint action, substantially as set forth.

13. The combination of the said sleeve T, its friction-rollers V V, and the operating-bar, the whole being arranged and operating substantially as and for the purpose described.

14. The arresting-plate 2, in combination with the operating-bar H and its internal rod, 12, the said plate being arranged to operate in conjunction with the appliances herein described, or the equivalents, to the same, substantially as and for the purpose herein set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

WM. W. W. WOOD.
JOHN L. LAY.

Witnesses:
WM. W. BRACKETT,
THOS. S. CUNNINGHAM.