J. A. MILLER.

DEVICE FOR ATTACHING SHACKLES TO SUBMERGED OBJECTS.

APPLICATION FILED MAY 17, 1920.

1,388,363. Patented Aug. 23, 1921.

3 SHEETS—SHEET 1.

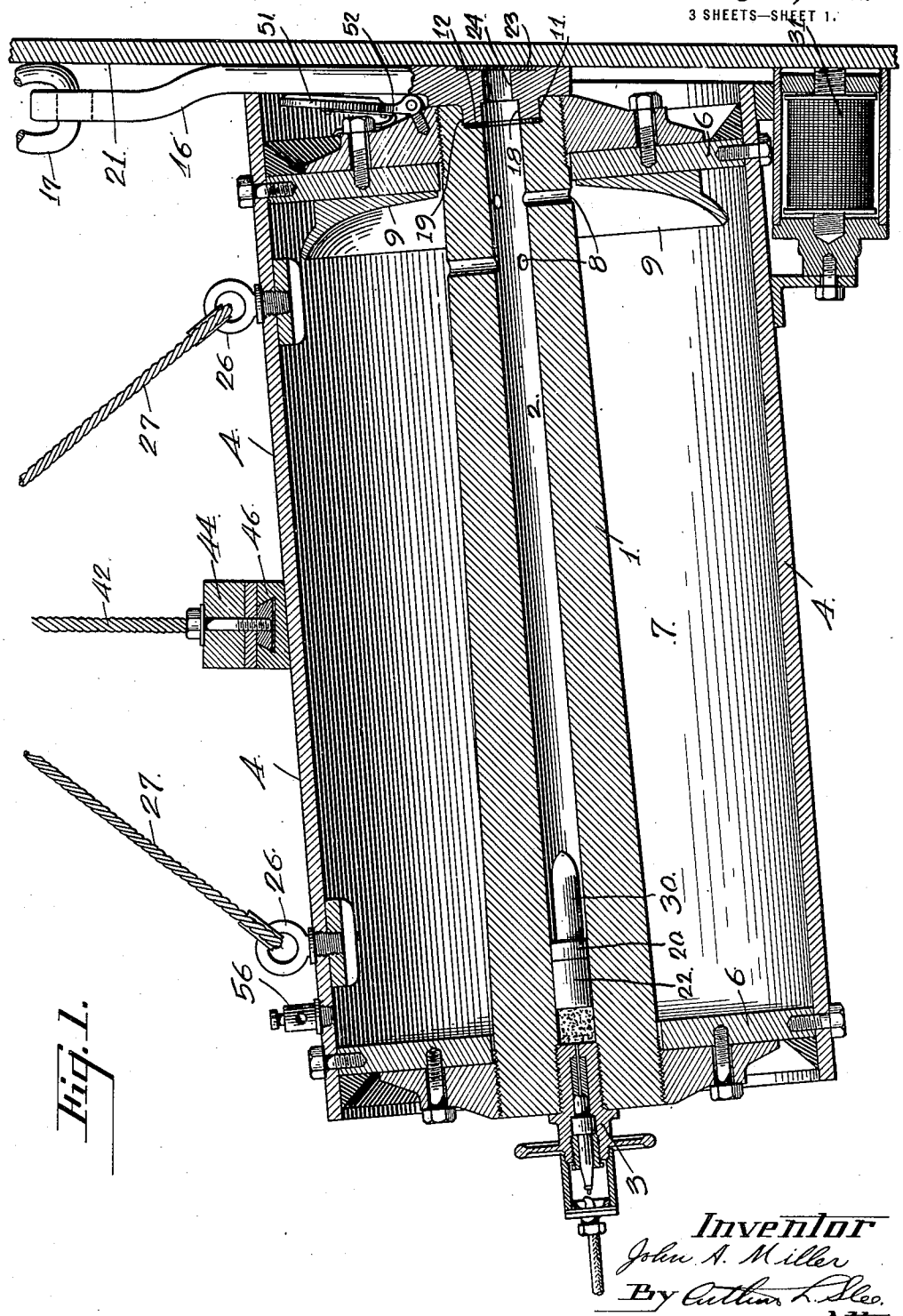


Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 2.

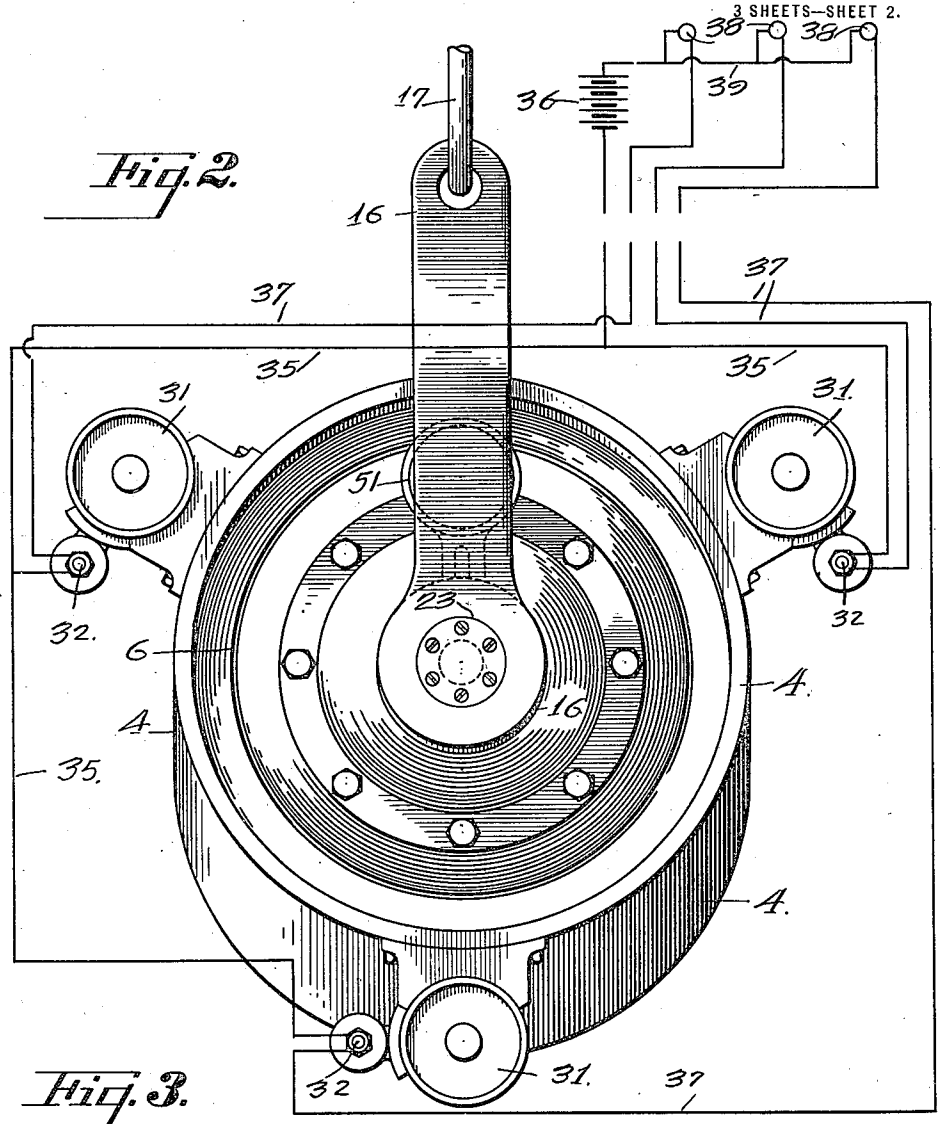
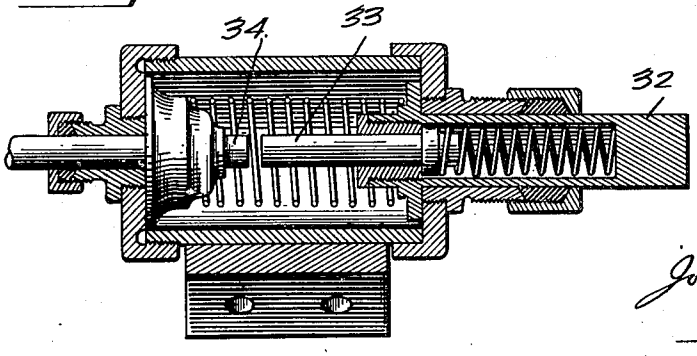


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4.

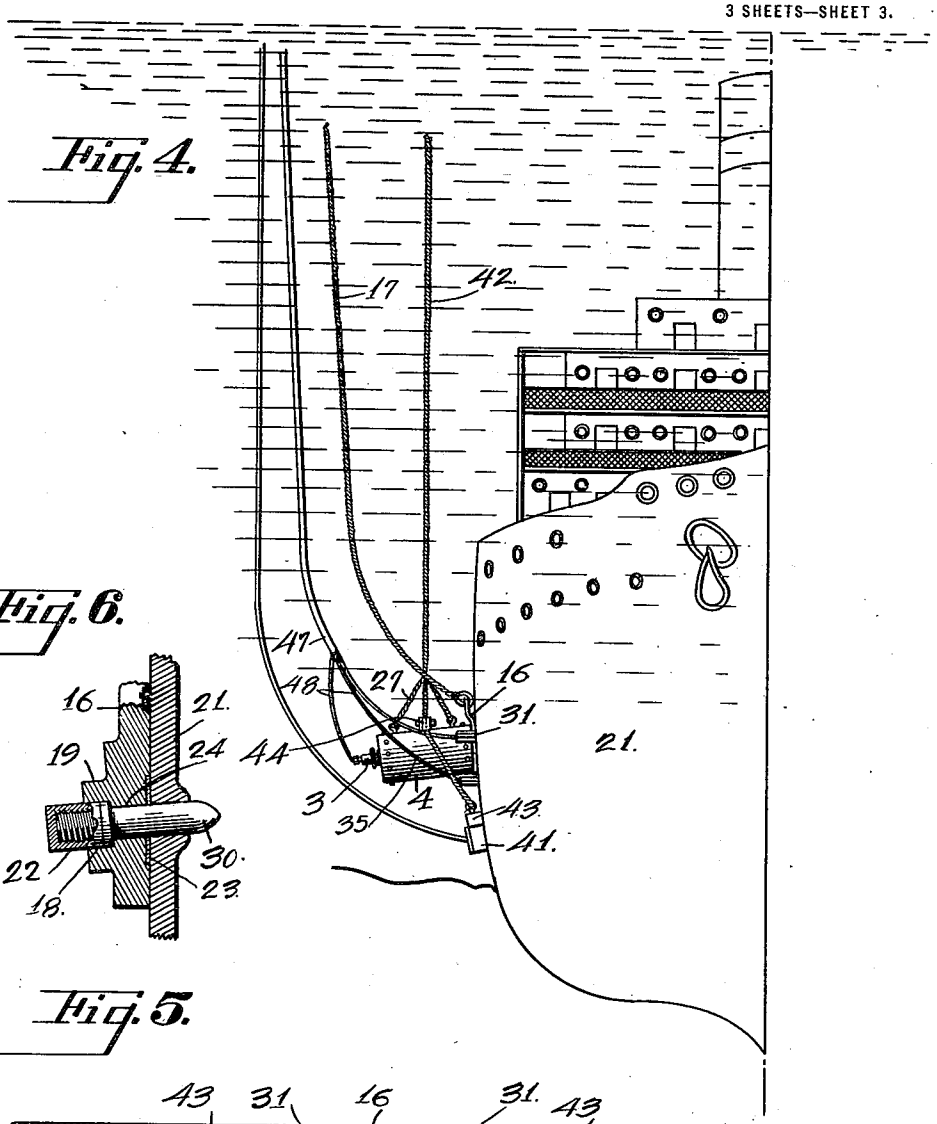
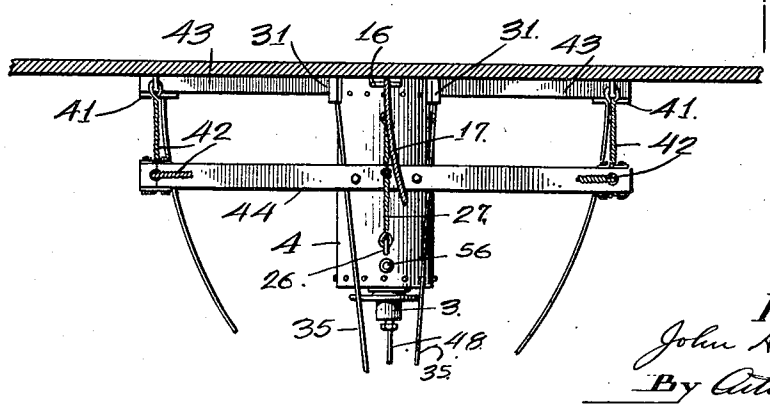


Fig. 6.

Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN A. MILLER, OF SOUTH SAN FRANCISCO, CALIFORNIA.

DEVICE FOR ATTACHING SHACKLES TO SUBMERGED OBJECTS.

1,388,363. Specification of Letters Patent. Patented Aug. 23, 1921.

Application filed May 17, 1920. Serial No. 382,347.

To all whom it may concern:

Be it known that I, JOHN A. MILLER, a citizen of the United States, residing at South San Francisco, in the county of San Mateo and State of California, have invented a new and useful Improvement in a Device for Attaching Shackles to Submerged Objects, of which the following is a specification.

My invention relates to improvements in devices for attaching shackles to submerged objects wherein a gun barrel operates in conjunction with a projectile to attach a shackle to a submerged object whereby said object may be raised to the surface by means of said shackle after the same has become detached from the gun barrel.

The primary object of my invention is to provide improved means for attaching a shackle, secured to the end of a line, to a submerged object, such as ships and the like, whereby said object may be raised to the surface.

A further object of the present invention is to provide an improved submarine gun barrel adapted to fire a projectile when submerged, to attach a shackle, by means of said projectile, to a submerged object.

A still further object of the invention is to provide improved means for alining the barrel and shackle in operative alinement and substantially in contact with a surface of the submerged object in order to reduce to a minimum the amount of water between the shackle and the object to facilitate passage of the projectile when projected.

It is also an object of the present invention to provide improved means for indicating, at a point remote from the device, such operative alinement.

A still further object of the present invention is to provide means for permitting the expansion of combusted gases from the gun barrel and to prevent compression of air in front of the projectile when fired and for detaching the barrel from the shackle after the same has been attached to the submerged object.

A still further object of the invention is to provide an improved gun adapted to fire a projectile, when submerged, to attach a shackle to a submerged object and having improved means for normally retaining engaging relation with the shackle previously, and for automatically detaching itself from said shackle subsequently, to firing said projectile.

A still further object of the invention is to provide improved means for automatically preventing the entrance of water into the barrel after the shackle has been detached therefrom.

I accomplish these and other objects by means of the preferred form of the device disclosed in the drawings forming a part of the present specification wherein like characters of reference are used to designate similar parts throughout the said specification and drawings, and in which—

Figure 1 is a longitudinal sectional view of my improved device disclosing the same in position and in contact with a surface of a submerged object, ready for firing;

Fig. 2 is a front elevation of the device, including a diagrammatic circuit for the means for indicating operative alinement of the device; and

Fig. 3 is an enlarged longitudinal sectional view of one of the push button contacts for operating the alinement indicating means;

Fig. 4 is a front elevation of a portion of a submerged vessel disclosing the manner in which the device is positioned for operative alinement;

Fig. 5 is a plan view of the device and holding means therefor as applied to the side of a submerged vessel or object; and

Fig. 6 is a broken detailed view, partly in section, disclosing the submerged object by a projectile.

Referring to the drawings the numeral 1 is used to designate a gun barrel having the usual bore 2 therein and likewise having a suitable firing pin 3 closing the breech of said barrel 1.

A cylindrical shell 4, having suitable end plates 6, is mounted around the barrel 1 to provide a vacuum chamber 7 connected with the bore of the barrel 1 by means of a plurality of passages 8 arranged transversely to and adjacent the muzzle end of the barrel 1. A circular dished baffle plate 9 is internally mounted upon one of the end plates 6 of the shell 4 and adjacent the apertures 8 to deflect combusted and expanding gases from the bore 2 toward the body of the vacuum chamber 7.

The muzzle end of the bore 2 is provided with a counterbore 11 having a gasket 12 therein.

A shackle 16 is apertured at its upper end to receive a cable 17 or other suitable lifting element and is likewise provided at its lower end, on one side, with a cylindrical boss or lug 19 adapted to enter the counterbore 11, of the barrel 1 and against the gasket 12, and having a centrally disposed aperture 18 therein alined with and of the same diameter as the bore 2 of the barrel 1.

The end of the shell 4 adjacent the submerged object 21 is slightly beveled or inclined relatively to the axis of said shell 4 and the bore 2 of the barrel 1. The outer surface of the lower end of the shackle 16, surrounding the aperture 18, is inclined parallel to said inclined end of the shell 4, whereby a projectile 22, adapted to enter the aperture 18 and having a reduced portion 30 adapted to enter a corresponding reduced portion 24 of the aperture 18, fired through the bore 2 may enter the object 21 at a slightly upwardly inclined angle to secure the lower end of the shackle 16 to said object 21 in a manner hereinafter more fully set forth.

The outer end of the reduced portion 24 of the aperture 18 is covered with a substantially soft metal plate 23 to normally prevent the entrance of water, when the device is submerged, into the bore 2 of the barrel 1.

The shell 4 is provided with a pair of eyebolts 26 to which are secured suitable supporting cables 27 for raising or lowering the device into and out of the water.

The projectile 22 is provided with a sleeve 20 preferably of a compressible material so that when the said projectile 22 is fired into the aperture 18 of the shackle 16 said sleeve will be compressed between the shoulders formed by the reduced portion 30 of the projectile 22 and the reduced portion 24 of the aperture 18 thereby partially absorbing the shock of impact and tending to more tightly wedge said projectile into the aperture of the shackle.

Located at regular intervals around the periphery of the front or inclined end of the shell 4 are preferably three electro-magnets 31 suitably insulated from the surrounding water and having their outer faces flush with said inclined end of the shell 4. Mounted adjacent each magnet 31 is a spring controlled plunger 32 bored to receive a spring controlled extension rod 33 arranged to engage and actuate a contact button or switch indicated in general by the numeral 34, said switch being electrically connected to the signal lights 38 by connections 37 and 35 inclosed within the broken conduit disclosed in Fig. 3 of the drawings.

A common return wire 35 is connected to all of the magnets 31 and to one side of a source of electrical energy 36 while separate wires 37 connect each magnet 31 with a separate indicator 38, such as a lamp or other suitable signal, while a second common return connects said signals or indicators 38 with the other side of the electrical source 36, which connections and indicators operating in conjunction with the electromagnets 31 provides a means for indicating operative alinement of the barrel 1 with the submerged object at a point remote therefrom, in a manner hereinafter more fully set forth.

The initial position of the device adjacent the submerged object 21 is obtained by lowering a pair of electromagnets 41 by means of a pair of cables 42, said magnets 41 being retained in spaced relation by a spacing bar 43. A second spacing bar 44 is slidably connected at its approximate longitudinal center to a grooved block 46 on the upper portion of the shell 4, and has the ends slidably engaging the cables 42 so that the said cables 42 may be used as guideways for lowering the shackle attaching device or shell 4 adjacent the submerged object 21 and midway between the electromagnets 41 on the cables 42.

A suitable insulated conduit 47 carries various cables 48 for the operation of the electromagnets 31, firing pin 3, and for the wires 35 and 37 from the push buttons 34.

In operation the electromagnets 41 are first lowered by the cables 42 and maneuvered to contact with the submerged vessel or object 21, said magnets 41 being first preferably lowered to the bottom and then raised a slight distance so as to leave sufficient space above said magnets 41 when attached, to provide for operation of the barrel 1 against the side of the object 21.

The shell 4 is then lowered with its spacing bar 44 slidably engaging the cables 42 of the magnets 41 until said shell is slightly above the spacing bar 43 of said magnets 41.

The cables 42 are then tightened to bring the inclined or beveled end of the shell 4 in contact with the side or surface of the submerged object 21.

When the shell 4 is in an operative position or alinement with the surface of the object 21, as indicated in Figs. 4 and 5 of the drawings, all of the plungers 32 will actuate the push buttons or switches 34 and thereby actuate the indicators 38 thereby indicating such operative alinement. The electromagnets 31, by engaging the side or surface of the submerged object 21 also assist in retaining such operative alinement.

When in operative alinement the lower end of the shackle 16 is held tightly against the surface of the submerged object 21 by the combined action of the tension of the cables 42 and the electromagnets 31 to re-

duce to a minimum the amount of water between said shackle 16 and the surface of the object.

When operative alinement of the device with the surface of the submerged object 21 has been attained the barrel 1 or gun is fired by means of an electric spark within the firing pin 3 and the projectile 22 is projected through the bore 2 and the aperture 18 of the shackle 16, the reduced portion 30 of said projectile 22 penetrating the plate 23 and the object 21 as disclosed in Fig. 6 of the drawings.

The sleeve 24 on the projectile 22 is compressed, as hereinbefore described, between the shoulders formed on the projectile 22 and shackle 16 by the reduced portions 30 and 24 respectively, to partially absorb the shock of impact and to facilitate a tighter fit of the projectile to the shackle 16.

As the projectile 22 is projected through the bore 2 of the barrel 1 it is obvious that no air will be compressed within said bore 2 in front of said projectile for the reason that said bore is in direct connection with the vacuum chamber 7 formed by the shell 4.

After the passage of the projectile 22 beyond the apertures 8 connecting the bore 2 with the vacuum chamber 7 the combusted and expanding gases back of said projectile 22 will pass through said apertures 8 and be deflected by the dished baffle plate 9 toward the body of the vacuum chamber 7, said chamber 7 thereby absorbing said expanding gases and the resulting heat which is later radiated through the shell 4 and surrounding water.

After the projectile 22 has been projected through the aperture 18 and has thereby attached the shackle 16 to the object 21, the recoil and further expansion of the combusted gases will tend to detach the barrel 1 from the projectile 22 so that it may be moved to another location or raised to the surface to be prepared for the next shot.

To prevent the entrance of sea water into the bore 2 of the barrel 1 after detachment from the projectile 22 I have provided a hinged valve 51 to close the muzzle end of the bore 2 as soon as said barrel 1 is detached from the projectile 22.

This valve 51 is normally retained, before firing of the barrel 1, in an open position by the shackle 16 as disclosed in Fig. 1 of the drawings, said shackle 16 being in turn held in position by the suction of the vacuum chamber 7.

The intense heat occasioned by the passage of the projectile 22 through the plate of the submerged vessel or object 21 will tend to soften and partially expand the material immediately adjacent the aperture produced by said passage, but the surrounding water will immediately act to contact such material and shrink the same upon said projectile and thereby tend to further secure said projectile to the object.

After the shackle 16 has been attached to the object 21 the electromagnets 31 and 41 are deënergized and the device raised for preparation of the next operation.

A check valve 56 is provided in the upper portion of the shell 4 to facilitate the extraction of water and air from the vacuum chamber, said valve being adapted for connection with any suitable water and air pumping device, not shown.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is—

1. A device for attaching shackles to submerged objects comprising a barrel for projecting a projectile; a shackle connected to the barrel to receive a projectile therefrom and to temporarily close the muzzle of said barrel; means for holding said barrel and shackle adjacent the side of a submerged object whereby projection of a projectile from the barrel will secure said shackle to said object; and means for preventing an air pressure within the barrel and in front of the projectile when the same is projected.

2. The combination with an apertured shackle having a flat surface surrounding said aperture and approximately transversely thereto, said surface being arranged for contact with a submerged object, of means for projecting a projectile through said shackle and into said aperture whereby said shackle may be secured to said object; and means for preventing an air pressure in front of the projectile when being projected.

3. A device for attaching shackles to submerged objects comprising a gun barrel; a shackle detachably mounted upon the muzzle of the barrel and having an aperture alined with the bore of said barrel; means for temporarily closing said aperture and gun barrel; and a vacuum chamber connected to the bore of the gun barrel adjacent the muzzle thereof to prevent an air pressure within said bore and to assist in retaining the shackle on the muzzle of said barrel.

4. A device for attaching shackles to submerged objects comprising a gun barrel; a shackle detachably mounted upon the muzzle of the barrel and having an aperture alined with the bore of said barrel; means for temporarily closing said aperture and gun barrel; and a vacuum chamber connected to the bore of the gun barrel adjacent the muzzle thereof to prevent an air pressure within said bore and to assist in retaining the shackle on the muzzle of said barrel; and means for holding the shackle and barrel in operative alinement with a submerged object.

5. A device for attaching shackles to submerged objects comprising a gun barrel; a shackle detachably mounted upon the muzzle of the barrel and having an aperture alined with the bore of said barrel; means for temporarily closing said aperture and gun barrel; and a vacuum chamber connected to the bore of the gun barrel adjacent the muzzle thereof to prevent an air pressure within said bore and to assist in retaining the shackle on the muzzle of said barrel; means for holding the shackle and barrel in operative alinement with a submerged object; and means for indicating the operative alinement of said barrel and shackle when submerged.

6. A device for attaching shackles to submerged objects comprising a barrel arranged to project a projectile; a shackle detachably mounted upon the muzzle of the barrel and having an aperture therein alined with the bore of said barrel; a vacuum chamber connected with the bore of the barrel adjacent the muzzle thereof to prevent an air pressure in front of said projectile and to assist in retaining said shackle on said muzzle; means for temporarily closing the aperture in the shackle to prevent the entrance of water into the bore of the barrel when submerged; means for holding the barrel and shackle in operative alinement with a submerged object and at a slight angle to the surface whereby a projectile may be projected from the barrel, while submerged, and through the aperture in the shackle to attach said shackle to said submerged object.

7. A device for attaching shackles to submerged objects comprising a barrel arranged to project a projectile; a shackle detachably mounted upon the muzzle of the barrel and having an aperture therein alined with the bore of said barrel; a vacuum chamber connected with the bore of the barrel adjacent the muzzle thereof to prevent an air pressure in front of said projectile and to assist in retaining said shackle on said muzzle; means for temporarily closing the aperture in the shackle to prevent the entrance of water into the bore of the barrel when submerged; means for holding the barrel and shackle in operative alinement with a submerged object and at a slight angle to the surface thereof whereby a projectile may be projected from the barrel, while submerged, and through the aperture in the shackle to attach said shackle to said submerged object; and means for indicating the operative alinement of said barrel and shackle with a submerged object.

8. A device for attaching shackles to submerged objects comprising a barrel arranged to project a projectile; a shackle attached to the muzzle of the barrel and having an aperture therein alined with the bore of said barrel whereby said aperture may receive a projectile from the barrel to attach the shackle to a submerged object; a vacuum chamber arranged around the barrel and in communication with the bore thereof to prevent compression of air in front of the projectile when fired and to receive expanded gases from said bore and also to assist in retaining, by suction, the shackle to the muzzle of the barrel; electromagnets arranged at regular intervals around the muzzle end of the barrel to hold said barrel and shackle against the surface of a submerged object; push buttons arranged adjacent each electromagnet to engage the surface of the submerged object; and means connected with said push buttons and arranged remote from the device for indicating operative alinement of the barrel and shackle with the submerged object.

9. A device for attaching shackles to submerged objects comprising a barrel arranged to project a projectile; a shackle attached to the muzzle of the barrel and having an aperture therein alined with the bore of said barrel whereby said aperture may receive a projectile from the barrel to attach the shackle to a submerged object; a vacuum chamber arranged around the barrel and in communication with the bore thereof to prevent compression of air in front of the projectile when fired and to receive expanded gases from said bore and also to assist in retaining, by suction, the shackle to the muzzle of the barrel; electromagnets arranged at regular intervals around the muzzle end of the barrel to hold said barrel and shackle against the surface of a submerged object; push buttons arranged adjacent each electromagnet to engage the surface of the submerged object; and means connected with said push buttons and arranged remote from the device for indicating operative alinement of the barrel and shackle with the submerged object; and means for firing a projectile through said barrel.

10. A device for attaching shackles to submerged objects comprising a barrel arranged to project a projectile; a shackle attached to the muzzle of the barrel and having an aperture therein alined with the bore of said barrel whereby said aperture may receive a projectile from the barrel to attach the shackle to a submerged object; a vacuum chamber arranged around the barrel and in communication with the bore thereof to prevent compression of air in front of the projectile when fired and to receive expanded gases from said bore and also to assist in retaining, by suction, the shackle to the muzzle of the barrel; electromagnets arranged at regular intervals around the muzzle end of the barrel to hold said barrel and shackle against the surface of a submerged object; push buttons arranged ad-

jacent each electromagnet to engage the surface of the submerged object; and means connected with said push buttons and arranged remote from the device for indicating operative alinement of the barrel and shackle with the submerged object; and means for deflecting combusted gases from the bore of the barrel into the vacuum chamber.

11. A device for attaching shackles to submerged objects comprising a barrel arranged to project a projectile; a shackle attached to the muzzle of the barrel and having an aperture therein alined with the bore of said barrel whereby said aperture may receive a projectile from the barrel to attach the shackle to a submerged object; a vacuum chamber arranged around the barrel and in communication with the bore thereof to prevent compression of air in front of the projectile when fired and to receive expanded gases from said bore and also to assist in retaining, by suction, the shackle to the muzzle of the barrel; electromagnets arranged at regular intervals around the muzzle end of the barrel to hold said barrel and shackle against the surface of a submerged object; push buttons arranged adjacent each electromagnet to engage the surface of the submerged object; means connected with said push buttons and arranged remote from the device for indicating operative alinement of the barrel and shackle with the submerged object; and means for automatically closing the bore of the barrel to prevent the entrance of water thereinto after the device has become detached from the shackle.

12. A device for attaching shackles to submerged objects comprising a barrel for projecting a projectile; a shackle connected to the muzzle of the barrel and having an aperture therein alined with the bore of said barrel to receive said projectile whereby said shackle may be attached to a submerged object; a vacuum chamber surrounding the barrel and in connection with the muzzle end of the bore of said barrel, said vacuum chamber operating to prevent an air pressure in front of the projectile passing through said bore, to assist in retaining the shackle on the muzzle of the barrel and to receive expanding gases from said bore when said barrel is fired; means for firing said barrel to project a projectile through the aperture in the shackle to attach said shackle to a submerged object; and a valve adapted to automatically close the bore of the barrel after the shackle shall have been detached therefrom to prevent the entrance of water into said bore.

In witness whereof I have hereunto set my signature.

JOHN A. MILLER.