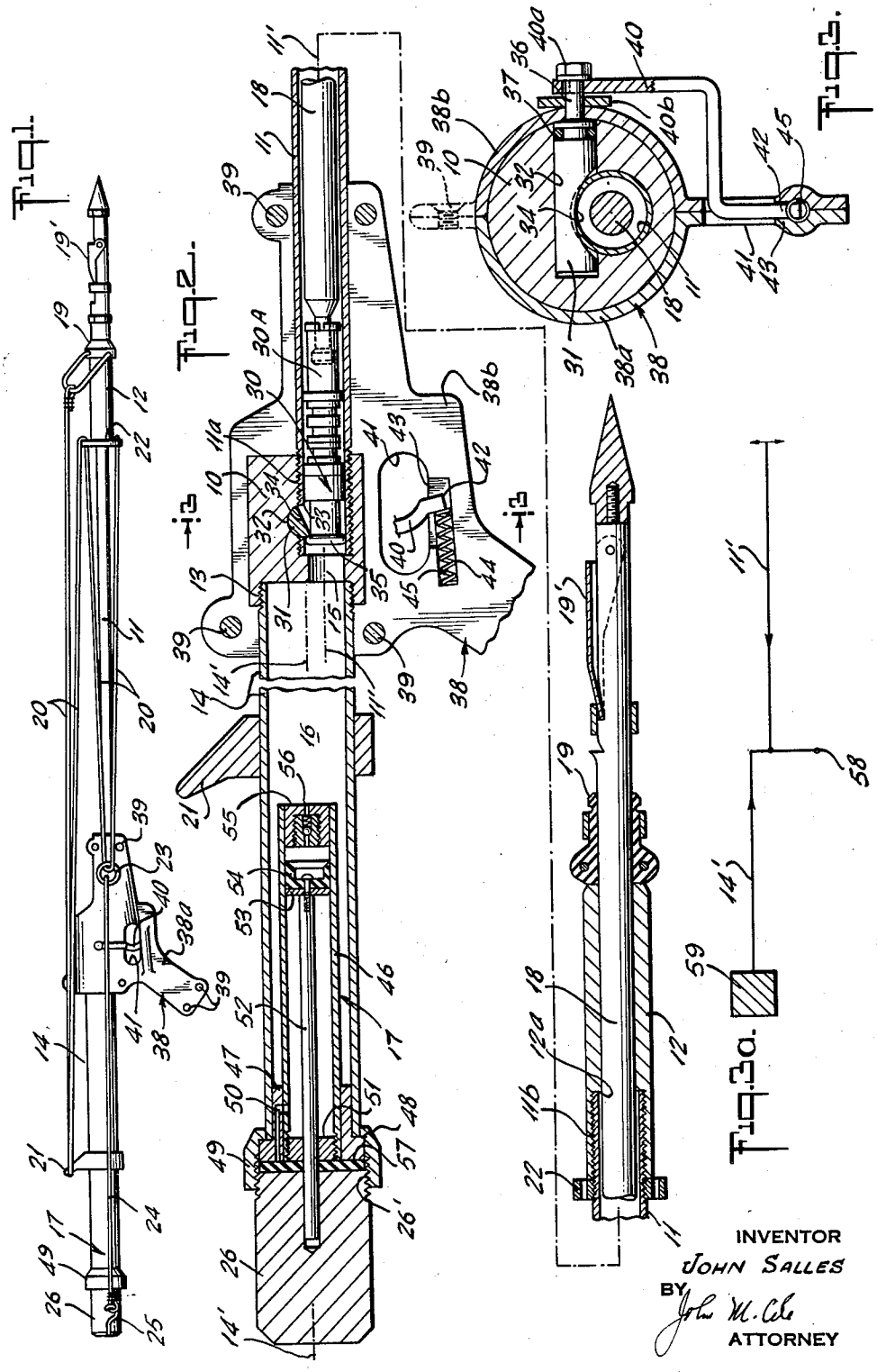
Feb. 2, 1960 J. SALLES 2,923,285

SPEAR GUNS

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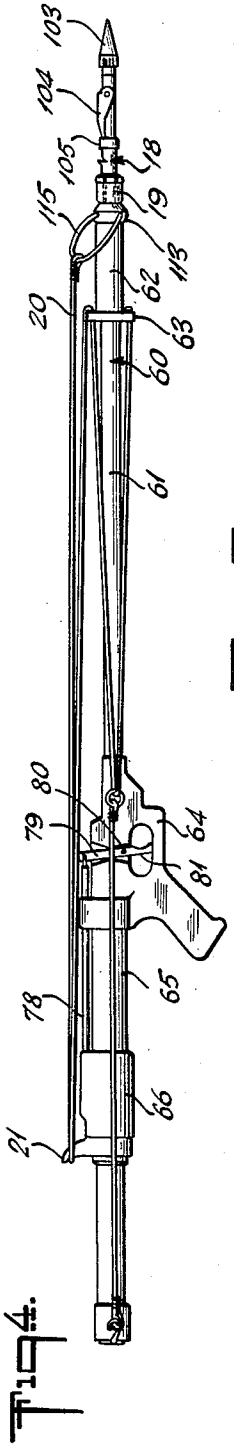


FIG. 4.

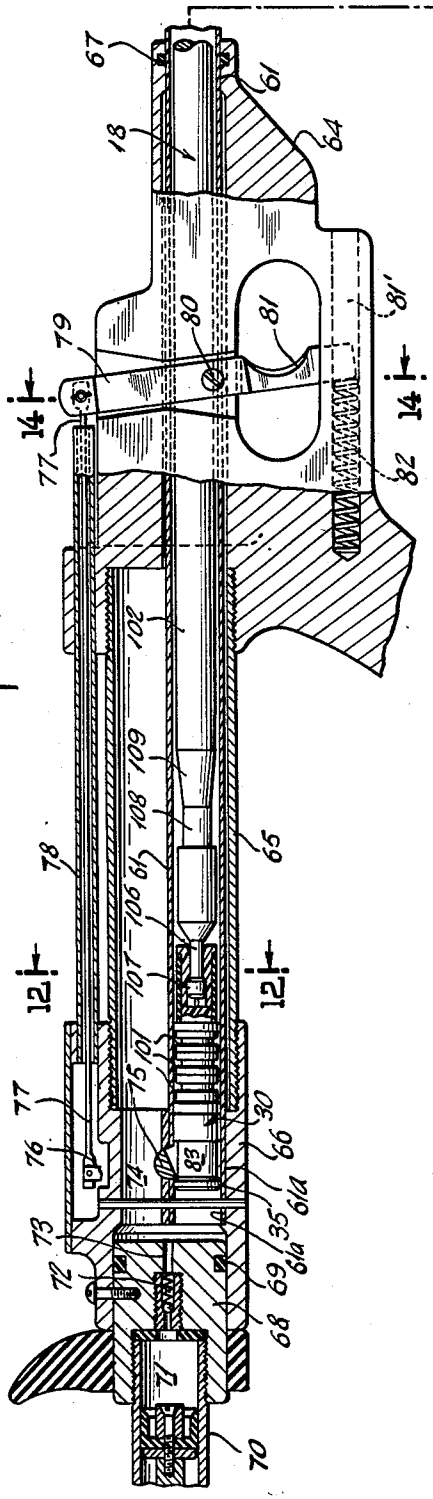
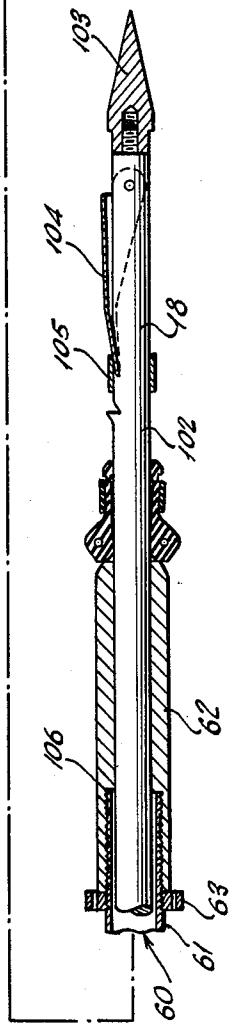


FIG. 5.

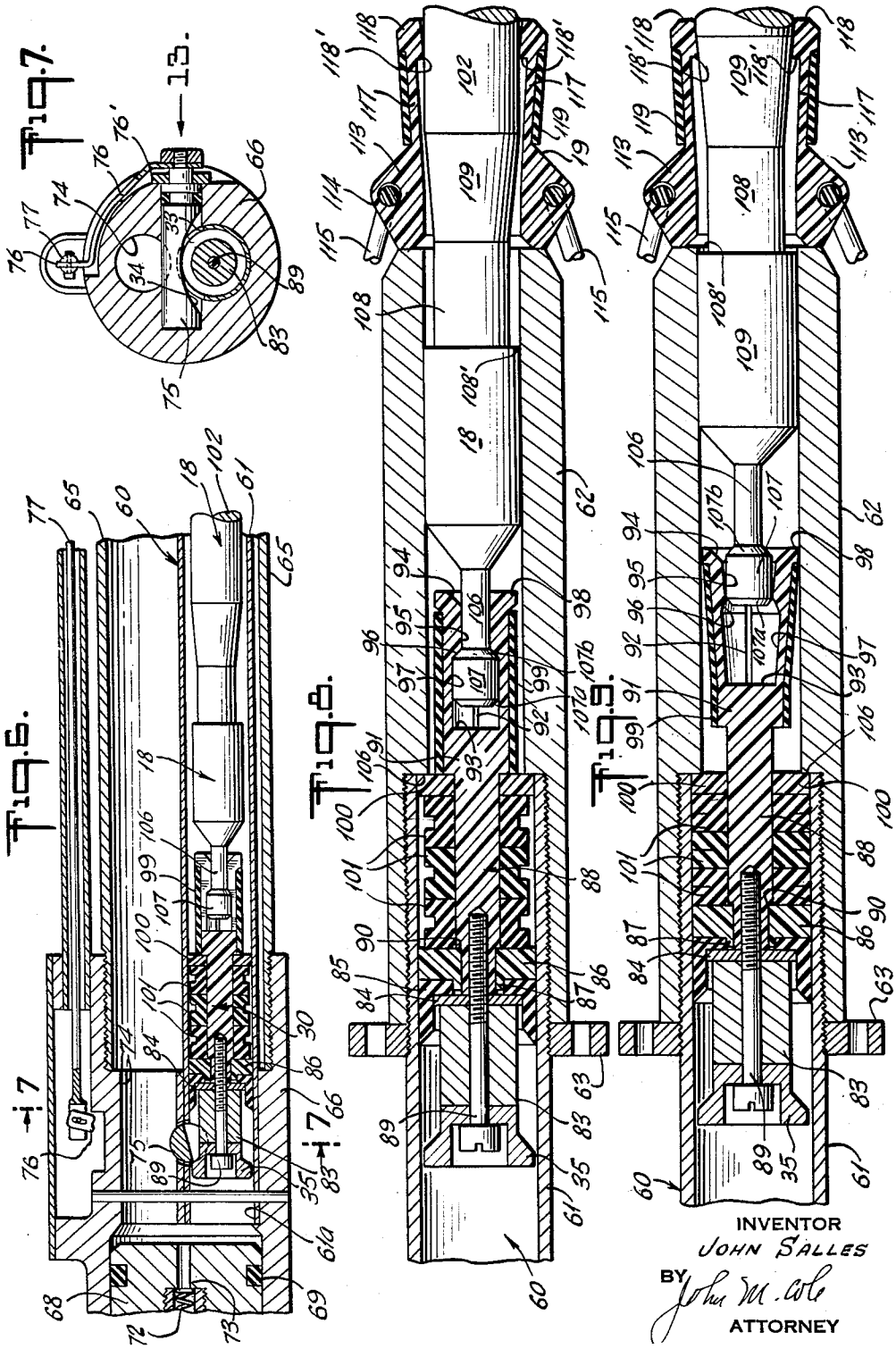


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SPEAR GUNS

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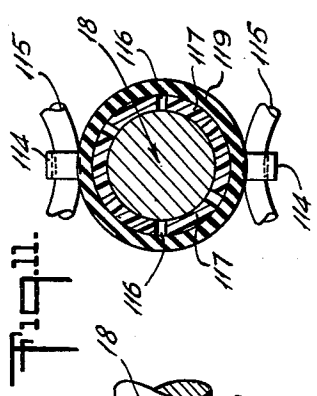


Fig. 11.

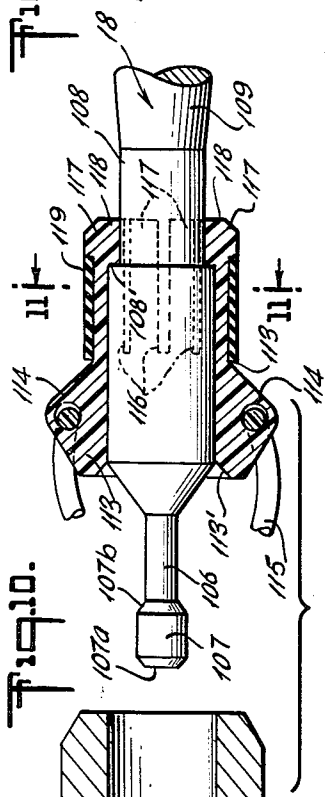


Fig. 10.

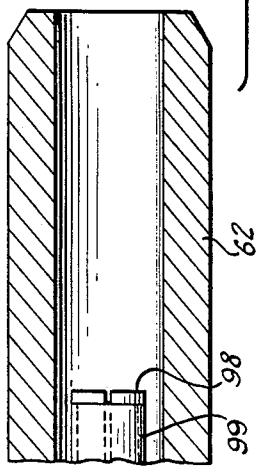


Fig. 12.

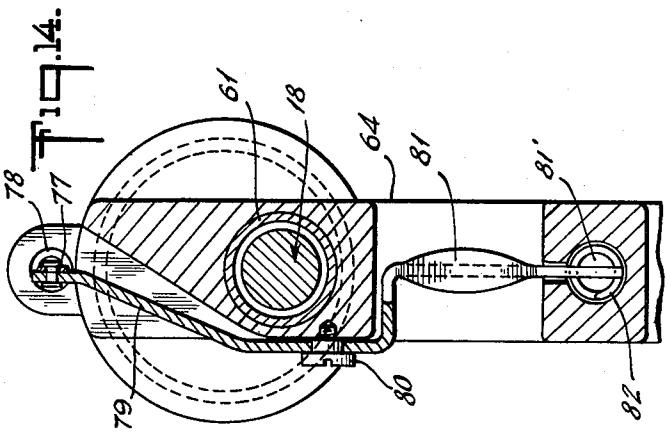


Fig. 14.

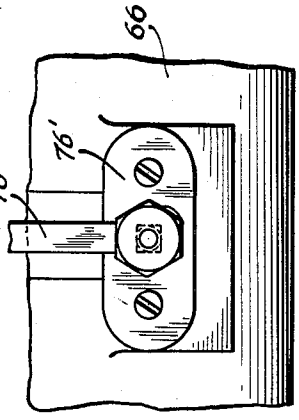
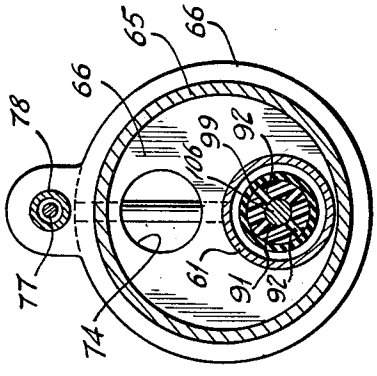


Fig. 13.



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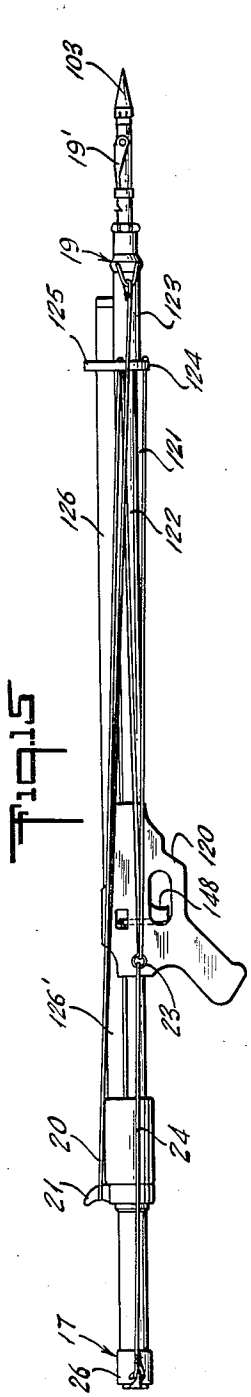


Fig. 15.

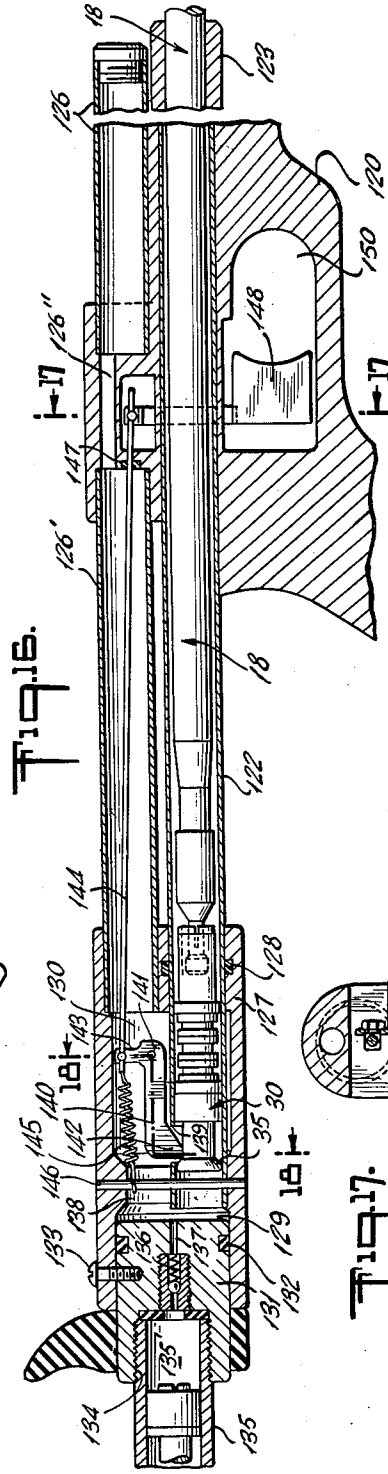


Fig. 16.

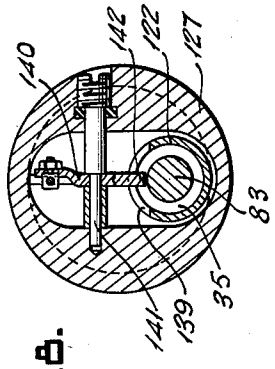


Fig. 18.

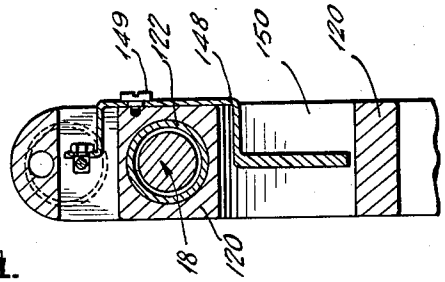


Fig. 17.

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2,923,285

SPEAR GUNS

John Salles, Orange, N.J.

Application July 5, 1955, Serial No. 520,046

17 Claims. (Cl. 124—13)

The present invention relates to spear guns and more specifically to manually operated guns for firing or shooting spears of the type generally used for underwater fish spearing sports and similar purposes and to an improved spear and retrieving ring for use in connection with the gun.

Manually operated spear guns heretofore used for underwater spear fishing and the like have generally used elastic bands or spring mechanisms as the propelling means for the spear though in some instances compressed air has been employed. In each case the firing force is obtained by manually inserting the spears in the guns to stress the elastic bands or springs or compress the air. Since the average man can exert a limited amount of power and since the size of the device must necessarily be limited in order to permit manual operation, elastic band and spring devices provide firing pressures that vary from a maximum with the spear firmly seated in the gun to substantially zero at the moment the spear clears the gun upon firing. Since the total power applied is a function of the average pressure over the time applied and since the maximum pressure is limited by man's ability to compress the spring or stretch the band, it has not been possible to increase the power of such guns. On the other hand compressed air guns can be arranged to provide more uniform drive for the spear during the propelling period and thus enable a greater total firing power to be obtained.

Another problem that has faced spear gun operators is that of securing the retrieving cord to the gun so that the spear can be retrieved and refired. In loading a spear, it is inserted into a tube or barrel with only the front part or nose extending therefrom. A ring is placed about the spear and is secured to the retrieving cord. When the spear is fired the ring slides over the body of the spear and is caught by a tail ridge of somewhat larger diameter than the body of the spear. This tail ridge has been found to create substantial difficulty since it is essential that the firing tube be large enough to accommodate the ridge with the result that the accuracy of the gun is seriously affected. Moreover this ridge has been known to cause deflections of the spear of 10° to 30° as it leaves the gun. This of course produces a highly dangerous condition as well as considerable annoyance to the user.

In addition to the foregoing disadvantages and serious limitations of prior devices it is of course apparent the springs and elastic bands have limited life and may be adversely affected by constant contact with water. Moreover the structure of spears as discussed above not only adversely affects the accuracy of the device but also has been found to produce excessive wear on certain elements of the gun which must therefore be replaced often in an effort to maintain reasonably good gun operation.

Accordingly one object of the invention resides in an improved manually operable gun and spear which overcomes the disadvantages of prior devices and provides

high power, dependable and effective operation and exceedingly long life.

Another object of the invention resides in the provision of an improved spear gun utilizing a sealed compressed air supply and having self contained manually operated pumping means. With this arrangement, air pressure can be maintained in the gun for many months and the gun may be fired underwater as many times as desired. In addition, by utilizing an air chamber providing the best compromise of size and effective power produced, the average power imparted to the spear is materially increased over prior known devices. This advantage is attained by reason of the fact that the force exerted on the spear in firing does not reach zero with the result that much higher average pressures are attained. It has also been found that this increased firing power can be obtained with less effort required of the user in loading the gun.

Still another object of the invention resides in the provision of an improved spear structure and cooperating gun tube that will provide long life, highly accurate and dependable operation and far greater safety. This is attained in part by an improved spear retrieving collar and in part by an improved spear that avoids the need for a projecting shoulder on the spear.

A still further object of the invention is the provision of an air operated piston characterized by its simplicity and effectiveness and wherein improved means are provided for cooperation with the tail end of the spear so that the spear will not accidentally fall from the gun and that at the same time will be easily and quickly released when fired.

A still further object of the invention is the provision of an improved spear gun and spear that is relatively small, light in weight and affords long dependable life.

Other and further objects will appear as the description proceeds.

The accompanying drawings show, for purposes of illustrating the present invention, three embodiments in which the invention may take form, it being understood that the drawings are illustrative of the invention rather than limiting the same.

In the drawings:

Figure 1 is a side elevation of one form of a gun and spear in accordance with the invention;

Figure 2 is a longitudinal, sectional view of the gun of Figure 1;

Figure 3 is a cross sectional view of Figure 2 taken along the line 3—3 thereof;

Figure 3*a* is a diagram illustrating reactions which take place at the time of firing;

Figure 4 is a side elevational view of another embodiment of a gun and spear in accordance with the invention;

Figure 5 is a longitudinal sectional view of Figure 4;

Figure 6 is an enlarged fragmentary portion of Figure 5 illustrating the position of the plunger and its cooperation with the spear at the moment of firing;

Figure 7 is a cross sectional view of Figure 6 taken along the line 7—7 thereof;

Figure 8 is an enlarged cross sectional view of the piston and tube of the gun of Figure 5 and the spear retrieving ring at the moment the piston arrives at the end of its travel;

Figure 9 is a view similar to Figure 8 to illustrate the action of the piston as the spear is released from the gun for free flight;

Figure 10 is a cross sectional view of the muzzle of the gun of Figure 4 and the tail end of the spear to show the action of the retrieving ring;

Figure 11 is a cross sectional view of the retrieving ring taken along the line 11—11 of Figure 10;

Figure 12 is a cross sectional view of Figure 5 taken along the line 12—12 thereof;

Figure 13 is a side elevational view of a part of the trigger mechanism of the gun shown in Figure 5;

Figure 14 is a cross sectional view of Figure 5 taken along the line 14—14 thereof;

Figure 15 is a side elevational view of another embodiment of the invention;

Figure 16 is a fragmentary longitudinal sectional view of the embodiment of the invention shown in Figure 15; and

Figures 17 and 18 are cross sectional views taken along the lines 17—17 and 18—18 respectively of Figure 16.

Broadly, the spear, or underwater gun now to be described utilizes a self-contained sealed compressed air supply for firing the spear and forms an exceedingly compact weapon, and at the same time provides materially increased driving force for the spear. Through the employment of a wholly enclosed compressed air tank substantially uniform driving effort can be supplied to the spear and at the same time the maximum effort required to manually load the spear in the gun can be maintained well within that of a man. Since the compressed air is never allowed to emerge from the gun tube and is always under pressure the gun may be fired under water as often as desired without the necessity for resurfacing to obtain additional air. In actual practice it has been found that it is possible with the improved structure employed in this gun to retain air within the compressed chamber for periods of six months or longer. As an example of one of the advantages gained from this improved gun it has been found that with an air pressure of 500 pounds per square inch, which can be easily developed by a self-contained hand pump, that a total force of 60 to 70 pounds can be exerted on the spear when loaded within the barrel or firing tube with the driving piston in its latched position. With the piston in its forwardmost position after having been released to drive the spear from the firing tube the pressure reduces to some 40 to 50 pounds. In this way the maximum effort that is required for manual loading of the spear and forcing the driving piston back to its cocked or latched position need be no more than about 70 pounds while in conventional guns using either springs or elastic bands the maximum force that must be exerted in reloading may be as much as 90 pounds. This would be an average force of only 45 pounds on the spear since the terminal force applied to the spear is substantially zero. With this gun, however, the average force under the conditions enumerated above is 60 pounds which produces greater spear velocity with considerably reduced reloading effort.

In addition to the improved gun structure, the spear and retrieving ring are arranged so that there is no interference with the spear trajectory, the direction of which is entirely under control of the operator. Moreover, the gun embodies an improved piston for retaining the spear within the firing tube so that it will not fall from the tube under the influence of gravity and at the same time the piston is so arranged and designed as to become automatically released upon arriving at the muzzle of the firing tube. This prevents unnecessary wear and stress on the piston and provides exceedingly long life.

One embodiment of a gun and spear in accordance with the invention is illustrated in Figures 1 to 3*a* of the drawings. In this embodiment of the invention it will be seen that the length of the gun is roughly determined by the length of the spear to be fired together with the length of the compression chamber that may be required in order to hold the desired amount of compressed air.

In the construction of Figures 1–3*a*, all the parts are directly or indirectly secured to a coupling member or trigger housing **10**. The firing tube **11** is threaded at the end and coated with cement and then threaded into an opening **11***a* near the bottom of the coupling member **10**. The tube is so adjusted as to bring opening **33** opposite trigger latch **31**, to be described. The firing tube is a long, smooth bored tube threaded at the forward end **11***b* to receive a relatively short muzzle section **12** of smaller internal diameter so as to provide a stop shoulder **12***a* for a piston to be described.

The rear end of the coupling member is internally threaded at **13** to receive a relatively large diameter compression chamber forming tube **14**, threaded and coated at the end with cement. The axis **14'** of the tube **14** is above the axis **11'** of the firing tube. An air passage **15** connects tubes **14** and **11**. The tube **14** forms an air compression chamber **16** and carries a hand operated pump mechanism designated generally by the numeral **17**.

The spear **18** is shown in place within the gun tube **11**. Then the retrieving ring **19** is disposed just to the rear of the spear barb **19'**. The retrieving ring is shown and described in detail hereinafter; see Figures 8–11 and description thereof. The retrieving ring is held tightly against the end **12***b* of the muzzle section **12** by the retrieving cord **20** which extends over a yieldable hook-like member **21**, usually made of rubber, positioned about the compressed air tube **14**. The cord is threaded through an opening in the flange **22** or collar on the muzzle portion **12**, then about a ring **23** and back to the flange **22**. The retrieving cord is held taut by an elastic member **24** secured at one end to the ring **23** and at its other end to a hook or catch **25** fastened to the handle **26** of the pump **17**.

The firing tube **11** is completely closed by a slidable piston generally denoted by the numeral **30**. This piston includes means **30A** at its forward end for releasably engaging the spear **18** and also intermediate means for retarding its forward motion as it nears the terminal end of the firing tube **11**. The piston **30** is described more completely in connection with a modified embodiment of the invention shown in Figures 4 through 9.

The trigger mechanism for holding the piston **30** in its retracted position as illustrated includes cylindrical member or latch **31** rotatably disposed within a transverse opening **32** in the coupling or trigger housing **10** and intersecting the opening **11***a* which receives the firing tube **11**. The tube **11** is also provided with an opening **33** registering with the opening **32**. The cylindrical latch is cut away as indicated at **34** to a depth sufficient to clear the firing tube in one position so that the flange **35** on the rear end of the piston **30** can advance beyond the latch **31** and in another position can be rotated counterclockwise as viewed in Figure 2, so that the edge of the depressed part of the latch **31** will enter the tube **11** and engage the flange **35** to hold the piston and spear **30** in its cocked or loaded position.

The cylindrical member or latch **31** has a reduced end **36** adapted to carry a trigger, and is recessed to receive a rubber washer or O ring **37** which provides an air and water tight seal so that when the gun is fired, compressed air within the chamber **16** cannot escape through the latch mechanism.

A gun stock **38** formed of two halves **38***a*, **38***b* is fitted about the coupling **10** and the adjacent ends of tubes **11** and **14**. These halves are held together by screws **39**. The reduced end **36** of the latch **31** extends out through an opening in one of the stock halves, where it is non-rotatably secured to the upper end of trigger **40**. The trigger is between a nut **40***a* and washer **40***b*. The trigger extends through a finger opening **41** in the gun stock. The lower end **42** of the trigger **14** extends through a slot **43** and into a long chamber **44** housing a trigger spring **45**. This spring bears against the lower end **42** of the trigger **38** and constantly urges the cylindrical member **31** into the position illustrated in Figure 2.

When the spear **18** is loaded into the gun and forces the piston **30** rearwardly, the annular flange **35** on the rear end of the piston **30** engages the sloping face **34**

of the cylindrical member 31 and causes the member to rotate slightly against the action of the spring 45. The moment the flange 35 passes the cylindrical member 31, the member rotates in a counter-clockwise direction to secure the piston in its loaded or cocked position.

The manually actuated air pump 17 for compressing air within the chamber 16 defined by the tube 14 includes an inner tubular member, a pump cylinder 46 concentrically disposed within the tube 14 and secured to the outer end thereof by means of a bushing 47 fixedly disposed about one end of the tube 46 and secured in the end of the tube 14. This bushing is provided with a flange part 48 forming a shoulder for engagement with the ring nut 49. The bushing 47 also includes a passage 50 communicating with the chamber defined by the tube 46 and opening at its other end in the left hand or outer face of the flange 48 of the bushing 47. The left end of the tube 46 is closed by a threaded bushing 51 having a central opening therein for slidably receiving the piston rod 52 carrying on its inner end a relatively stiff washer 53 and a flexible member 54 of rubber, leather or other suitable material. The right hand or inner end of the tube 46 is closed by a bushing 55 having a check valve 56 therein such as a conventional valve of the type used in automobile tires and the like. The outer end of the piston rod 52 is fitted with the handle 26 having threads 26′ thereon for cooperation with the nut 49. A rubber washer 57 is disposed between the inner face of the handle 26 and the outer face of the flange 48 so that the piston rod opening in bushing 51 as well as the passage 50 are completely closed and sealed against the admission of water when the handle 26 firmly engages the ring 49.

To compress air within the chamber 16 the user of the gun merely unscrews the handle 26 and pumps air into the chamber defined by the tube 14 in the usual manner. When sufficient air is compressed within the chamber 16 the handle is screwed back in place and the chamber is completely sealed both by the action of the rubber washer 57 as well as the check valve 56.

In the normal position of the gun the piston 30 will be at the outer end of the firing tube 10 and both the chamber 16 as well as the firing tube 11 will contain compressed air by reason of the inter-communication through the opening 15. When the gun is loaded the tail end of the spear 18 is fed into the muzzle 12 of the firing tube, whereupon it engages the piston 30 and proceeds to move the piston 30 backwardly until it finally engages the trigger latch mechanism 31.

In Figure 3*a* the point of support of the gun, i.e., the gripping point of the gun stock 38, is indicated at 58, the firing tube axis at 11, the compression chamber axis at 14′ and the mass of the compression chamber, pump and pump handle is indicated at 59. When the gun is fired there is a backward reaction or kick which must be absorbed by the operator and the inertia of the structure. This tends to make the muzzle rise, moving the tail of the spear upwardly and impairing the accuracy of aim. As the line of the rearwardly acting forces on the axis 11′ of the firing tube is at a shorter distance from the gripping point than the line of reaction of the compression chamber and associated parts on axis 14′, there is a reduced tendency for the muzzle to rise. In practice, one can obtain an axial displacement of in the neighborhood of about ½ inches, and it has been found that this practically nullifies the tendency of the muzzle of the gun to rise.

In the embodiment of the invention shown in Figures 4 to 14, inclusive, it is possible to materially condense the size of the gun by arranging at least part of the compression chamber 16 to overlie the firing tube 11. These figures also illustrate more clearly the action of the piston assembly 30 as shown in Figure 2 and the retrieving ring 19, illustrated in Figure 1.

In this embodiment of the invention the firing tube is broadly denoted by the numeral 60. It is made up with a relatively thin walled tubular larger diameter, portion 61 and a smaller diameter terminal or muzzle portion 62 substantially similar to the corresponding elements shown in Figure 1. As will be observed in Figure 5 the muzzle element 62 threadably engages the end of the tubular section 61 of the firing tube and the muzzle is locked in place by an internally threaded collar 63 which corresponds to the collar 22 of Figure 1. This embodiment of the invention differs from the embodiment shown in Figures 1 to 3*a* in that it will be observed that the tubular section 61 of the firing tube extends completely through the stock 64 with the left hand portion of the firing tube being disposed within a surrounding compressed air chamber formed by the tubing 65. In this case one end of the tube 65 threadably engages the rear portion of the stock 64 while the other end threadably engages a surrounding fitting or housing 66 and receives the breech end 61*a* of the firing tube 61. Since the tubular portion 61 of the firing tube 60 extends clear through the stock 64 and into the tubing 65 it is sealed in the stock by means of an O ring or other suitable sealing device 67. The rear end 61*a* of the firing tube part 61 terminates within the housing 66 which in turn is closed by a bushing 68 sealed in place by an O ring 69. The bushing 68 threadably receives an air pump 70 like the one shown and described in connection with Figures 1 to 3*a*, inclusive.

It will be observed that the air chamber 71 within the pump 70 is connected by means of a check valve 72 and passage 73 to an opening 74 within the housing 66 that communicates with the chamber defined by the tubing 65. In addition, pressure within the chamber defined by the tubing 65 will pass via the opening 74 and into the left hand end of the firing tube part 61 in substanitally the same manner as described in connection with Figures 1 to 3. It will also be observed in this form of the invention that for the same length of spear as that used in connection with the embodiment shown in Figure 1 the distance between the muzzle 62 of the gun and the stock 64 is materially decreased and this provides a more compact device.

The latching device for the piston 30 in this embodiment of the invention is substantially identical to that shown and described in connection with Figures 1 to 3 and comprises a rotary member 75 mounted in a suitable opening within the housing part 66 so that it will engage the rear flange 35 of the piston. Rotation of the latch 75 is effected by a lever 76 (see Fig. 7) substantially the same as the lever 40 of Figure 3 except that it extends in an upwardly direction. The rotary member 75 is sealed in housing 66 (see Fig. 7) in the same manner as shown in Figures 1 to 3 and it is held in place by the plate 76′.

The top end of the lever 76 is pivotally connected to a forwardly extending rod 77 housed within an elongated tube 78. This tube is supported at one end by the stock 64 and at the other end by the housing 66. The right hand end of the rod 77 extends from the tube 78 and is pivotally coupled to the other end of a lever member 79 which is pivoted to the stock 64 at 80 and is provided with the trigger 81 at the lower end thereof. The bottom of the trigger extends into a longitudinal opening 81′ within the stock and engages a spring 82 which constantly urges the trigger 81 forwardly and at the same time actuates the latch 75 to maintain it in substantially the position shown in Figure 5.

The piston 30 used in the embodiments of the invention shown in Figures 1 and 4 is illustrated in Figures 6, 8 and 9. It has a cylindrical member 83 preferably of a light metallic material such as aluminum, magnesium or the like. The rear flange 35 is preferably made of a hard metal to remove the wear and the friction with part 75. Overlying the right hand end of the cylindrical member 83 is a metal washer 84 surrounded by a cup

shaped washer 85 of leather or other suitable material and held in place by a relatively rigid washer 86, preferably of nylon. This washer has a rearwardly extending flange 87 which engages the opening in the cup shaped washer and aids in centering it relative to the cylindrical member 83. The successive washers 84, 85 and 86 are held in firm engagement with one another, a central body member 88 extending through washer 86 shouldered at 90, and an elongated screw 89. The body member 88 is also preferably made of nylon or other suitable non-metallic or metallic material.

The right hand end of the part 88, as shown in Figures 6, 8, 9 and 12, has an enlarged end 91, provided with radial slits 92 and with counter bore 93. This counter bore has an outer beveled entrance portion 94, a small diameter portion 95, a reversely beveled shoulder 96 and a large diameter inner portion 97. This construction forms a plurality of resilient fingers 98 adapted to be spread radially. These fingers are surrounded by an elastic (rubber) band 99 which resists spreading of the fingers.

The piston 30 also includes a self contained shock absorber to halt its forward motion when it reaches the muzzle. This is attained through the use of a relatively rigid washer 100 of a plastic material such as nylon or the like slidably mounted on the body 88 and several relatively soft elastic washers 101. The normal diameter of the washers 101 is substantially smaller than the inside diameter of the tube part 61 of the gun.

The spear 18 is arranged to cooperate with the gun tube and piston to provide improved and more dependable accuracy and comprises essentially an elongated cylindrical shaft 102 having a pointed end part 103, a barb 104 and a barb latch 105. The body 102 of the spear has a diameter substantially equal to the inside diameter of the muzzle portion 62 of the firing tube which functions as the primary guiding means as the spear is driven from the firing tube. The inner or rear end of the spear 18 has a small diameter portion 106 and an intermediate diameter portion 107, chamfered as indicated at 107*a* and 107*b*.

When the spear is being inserted in place, the portion 107*a* spreads the fingers 98 on part 88 and then enters into the larger diameter portion 97 of the counter bore 93 so that the portion 107*b* is against beveled shoulder 96, (see Figures 9 and 8). The surrounding rubber collar 99 will now hold the spear and piston in coupled relation. The piston can be pushed back to the cocked position. The grip in the piston is sufficient to hold it in place when the gun is tilted downwardly. One can, however, manually withdraw the spear, if desired.

Near the rear end of the spear 18 is a cylindrical section 108 of substantially reduced diameter to the right of an outwardly facing stop shoulder 108', also a tapered section 109.

Referring more specifically to Figures 8 through 10 it will be seen that the retrieving ring 19 has a cylindrical body part or ring 113 made of nylon or similar material, and provided at its rear end with a pair of outwardly extending ears 114 for attachment of a bridle 115 which in turn is coupled to the retrieving cord 20. The rear part of this ring is of a size to readily pass the spear. In the normal position, the retrieving cord 20 continues to hold the retrieving ring 19 against the forward edge of the muzzle 62. The forward end of the cylindrical body part 113 is provided with a plurality of longitudinal slots 116 to form a plurality of independent wall segments or spring fingers 117, having claw-like ends 118, surrounded by an elastic band 119. When the gun is loaded, as in Figures 5 and 8, the fingers are spread, and when the gun is discharged (see Fig. 10), the claw-like fingers engage the shoulder 108'.

When the gun is assembled, as in Figure 1 or 4, the center of gravity, when submerged, is close to the stock so that the gun can be held in position by the hand and readily aimed without placing a continuous strain on the muscles of the user. The handle at the pump may well act as a counterweight.

When the operator wishes to fire the gun, it is merely necessary to aim and pull the trigger. This shifts the release member 31 of Figure 2 or 75 of Figure 6, so that it clears the tail flange 35 on member 83, and releases the assemblage 30 and spear to shift due to air pressure acting on the assemblage. The assembly so moves along the tube 61 at high velocity until the washer 100 strikes the shoulder formed by the inner or left end of muzzle tube 62 as shown in Figure 8.

The air pressure will cause the member 88 to shift from the position of Figure 8 to the position of Figure 9, causing the rubber washers 101 to flatten out and expand against the walls of cylinder or tube 61. This cushions the shock on these parts. An air seal is provided by the cup 85.

As motion of the assembly 30 is retarded, the inertia of the spear readily causes the conical portion 107*b* of the spear end to act against the shoulder 96 and spread the fingers 98 as shown in Figure 9, thereby freeing the spear from the fixed gun body. At about this time the yieldable fingers 117 begin to close in on the reduced diameter portion 108, 109 of the spear. Soon the spear has moved far enough for the elastitc band 119 to press the flanges 118 on the ends of fingers 117 of the retrieving ring 113 inwardly and, as the stop shoulders 118' of these fingers engage the stop shoulder 108' of the spear, the ring 113 is coupled to the spear.

The ring 113 with bridle 115 and cord 20 move with the spear as it emerges from the muzzle tube 62. The bridle swings so that the junction with the cable 20 is in line with the spear axis. The tightening of the cable, pulls it away from the finger 21 and the spear is free to travel until it hits its mark or the cable is pulled to the limit. This occurs when the ring 23 engages the collar 22 or 63.

It will be noted that while the spear is traveling in the barrel of the gun that it is accurately guided by the piston engaging the barrel 61 and its own engagement with muzzle tube 62. At no time is there any possibility of any part of the spear to impinge on anything to impair the aim, or cause wear or shock to any part.

The reloading of the gun, under water, is readily effected. One can readily pass the rear end of the spear through the muzzle tube 62 and couple it to the assemblage. He can then press the stock 13 against the instep and with the upwardly stretched arms push the assemblage 30 back to the position where the trigger mechanism locks it in place.

In the invention illustrated in Figures 15 to 18 inclusive, provision is made for a compressed air chamber of somewhat larger volume than that shown for instance in Figure 4. This enables the attainment of more uniform air pressure on the piston throughout its travel during the firing of a spear. Moreover with this enlarged air chamber which is arranged in parallel relationship with the firing tube the position of the stock or handle can more advantageously be placed at various points along the firing tube. In this way substantially longer guns and spears can be used without in any way affecting the ease with which the average person may load and aim the gun.

Referring more specifically to Figures 15 through 18 the gun includes a stock 120, a firing tube generally denoted by the numeral 121 and consisting of an elongated tube 122, similar to tube 61, for slidably receiving the piston 30 and a muzzle portion 123, similar to muzzle portion 62. The tube 122 and the muzzle 123 are threadably connected as in the same manner illustrated with the embodiment shown in Figure 5 of the drawings and is provided with a flange or collar 124 disposed therebetween. It will be observed that the flange 124 has an upwardly extending part 125 adapted to receive and hold the upper elongated tube 126 forming part of the pres-

sure chamber. As will be observed in Figure 16 the tube 126 terminates within the upper portion of the stock 120 and is suitabiy sealed in position therein. A second tube 126' also forming part of the air pressure chamber is secured within the stock in alignment with the tube 126 and extends rearwardly thereof. The tubes 126 and 126' are connected by a passage 126''. The rear or left hand ends of the firing tube part 122 and the pressure chamber tube 126' are received by a housing member 127. The firing tube is sealed within this housing by means of an O ring or sealing ring 128 and terminates in spaced relationship to a rear housing cavity 129. The tube 126' is also sealed within the housing 127 and is in communication with the chambers 130 and 138 within that housing. The chamber 129 opening into the rear face of the housing 127 is closed by an insert or plug 131, sealed by an O ring 132 and held in position therein by a screw 133 or other suitable fastening means. The cylindrical plug 131 has a threaded opening 134 therein for receiving a hand operated pump generally denoted by the numeral 135 which functions in substantially the same manner as the pumps shown in Figures 1 and 4. The chamber 135' within the pump is coupled to the chamber 130 by means of a check valve 136, a longitudinal passage 137, the chamber 129 and a second chamber or passage 138. With this arrangement pumping of air into the gun by mean sof the pump 135 will create air pressure within the housing 127, the tubes 126 and 126' and in that portion of the firing tube 122 to the rear of the piston 30.

As in the case of the previous embodiments of the invention that portion of the tube 122 disposed within the housing 127 has an opening 139 therein through which a suitable latch 140 may enter and engage the rear flange 35 of the piston 30. The latch 140 is in the form of a bell crank pivoted at 141 within the housing 127 and having a nose 142 extending through the opening 139 to engage the piston. The other arm 143 of the latch 140 extends upwardly and is pivotally connected to a forwardly extending rod 144. A spring 145 is interposed between the arm 143 of the latch and a vertically disposed pin 146 so that it constantly urges the L-shaped leg 142 downwardly to engage the piston. The forward end of the rod 144 extends through a bearing 147 in the stock 120 and is coupled to the trigger 148 pivoted to the stock at 149. With this arrangement rearward motion of the trigger 148 within the opening 150 in the stock will function to release the piston 30 in the same manner as described in connection with previous embodiments of the invention.

Since it is obvious that the invention may be embodied in other forms and constructions within the scope of the claims, I wish it to be understood that the particular forms shown is but several of these forms, and various modifications and changes being possible, I do not otherwise limit myself in any way with respect thereto.

What is claimed is:

1. A spear gun comprising a firing tube, a piston slidably retained within said tube, a compressed air chamber in communication with said tube, manually operated air pumping means including a piston and cylinder disposed within said chamber and spaced from the walls thereof, air inlet means communicating with said cylinder, and a triggering assembly including piston latching means for engaging and holding said first mentioned piston when a spear is inserted in said firing tube and for releasing said piston for forward motion under the action of the compressed air to drive the spear from the firing tube, said compressed air chamber and manually operated air pumping means being offset above the axis of the firing tube and said pump having a pump handle and cooperating gasket means releasably secured to the gun to seal the cylinder and air inlet means.

2. A spear gun comprising a relatively short gun stock having gripping means and a trigger, a firing tube extending forwardly of said stock, a compressed air tube extending rearwardly of said stock and offset above said firing tube, said tubes being in communication one with the other, a piston slidably retained within and sealing said compressed air tube, a piston latch coupled with said trigger for controlling the operation of said piston and a manually operated pump including a control valve at least partially within and sealing at least one end of said compressed air tube, said pump further including a pump operating handle and means on said handle sealably securing it to the gun to seal said pump and said compression chamber independently of the valve.

3. A spear gun comprising a gun stock, a firing tube extending forwardly of said stock, a muzzle on said firing tube, a compressed air tube extending rearwardly of the stock and offset above the firing tube, said tubes being in communication one with the other, a piston slidably retained within said firing tube, trigger means alongside the stock, a piston latch coupled with said trigger, an air pumping cylinder including air inlet means disposed within and closing the outer end of said compressed air tube, a check valve closing the inner end of said cylinder, a piston and piston rod slidably mounted in said cylinder, a pump handle on said piston rod, the axis of said piston rod and handle being offset above the axis of said firing tube, a sealing washer between said handle and the ends of the compressed air tube and cylinder and cooperating means on the last said tube and handle for releasably securing said handle to said compressed air tube and completely sealing the end thereof, including said air inlet means against the admission of fluids into and out of the pump and compressed air tube.

4. A spear gun according to claim 3 wherein said pump handle is threadably carried by said bushing and end of said compressed air tube by means of a surrounding bushing, and said air inlet means comprising a passage in said bushing for air communication between the outer face of said bushing and said pump cylinder and said pump handle is threadably carried by said bushing and operable to seal the pump and the last said opening.

5. A spear gun according to claim 3 wherein the piston within said firing tube includes braking means for controlling its rate of deceleration upon reaching the muzzle when the gun is fired.

6. A spear gun comprising a stock including a trigger mounted thereon, a compressed air tube secured to and extending rearwardly thereof, a firing tube extending through said stock and through at least a part of said compressed air tube, means including a manually operated air pump closing the rear ends of said firing and compressed air tubes, a piston slidably retained within said firing tube, a piston latch disposed within the last said means and coupled with said trigger, the center of mass of said compressed air tube being disposed rearwardly of the stock and offset above the axis of the firing tube.

7. A spear gun according to claim 6 wherein said piston includes shock absorbing means for controlling its deceleration upon reaching the outer end of said firing tube and resilient cylindrical means for releasably holding a spear prior to and during the firing thereof.

8. A spear gun comprising a stock, a firing tube extending through and supported by said stock, a compressed air tube overlying at least part of said firing tube, a housing closing the rear ends of said firing and compressed air tubes and coupling said tubes one to the other, a manually operated air pump carried by said housing, said pump including a cylinder having an air inlet, a piston slidably disposed within the cylinder and a pump handle connected with the piston removably secured to the cylinder to seal the cylinder and air inlet, a firing piston slidably retained within said firing tube, and a firing piston latch disposed within the last said means and coupled with said trigger for controlling the operation of said firing piston, the center of mass of said compressed air tube and pump being disposed rear-

wardly of the stock and offset above the axis of the firing tube.

9. A spear gun according to claim 8 wherein said piston includes self contained braking means and a resilient tubular member for releasably holding a spear within the firing tube and during the firing thereof.

10. An underwater gun adapted to be aimed and fired under water by a swimmer and having a gunstock provided with a pistol grip by which it can be aimed and fired by one hand, trigger mechanism including a finger-piece adjacent the grip, a barrel extending forwardly of the grip, an air tight piston reciprocable in the barrel, stop means near the muzzle end of the barrel to limit the outward movement of the piston, a piston latch for holding the piston in its rear position, trigger operated means for releasing the latch, means forming a compressed air chamber in communication with the barrel rearwardly of the piston and offset above the axis of the barrel, pump means for compressing air in said chamber and having a handle threadably coupled to said chamber for sealing the chamber and pump means against the discharge of air and the inlet of water, a spear adapted to be inserted into the barrel from the muzzle and engageable with the piston to shift the latter to latched position and apply further compression in the air in the chamber, the rear end of the spear and the front end of the piston having releasable coupling means which prevent unintentional separation thereof but permit the spear to release itself when the piston engages the stop means, and spear retrieving means including a retrieving ring through which the spear freely passes when inserted into the barrel but from which it cannot escape when discharged from the barrel and a cord connecting the retrieving ring and barrel.

11. The underwater gun claimed in claim 10 wherein the pump means is at the rear of the gun and includes a manually operable air pump operable in air to force air into the chamber and provided with a handle of a weight offset above the axis of the barrel which when the gun is submerged places the center of gravity in water closely adjacent the grip.

12. The underwater gun claimed in claim 10 wherein the stop means includes a rearwardly facing reducing shoulder in the barrel and the piston has a rigid washer engageable with the shoulder, a piston body slidable with respect to the washer, a piston cup bearing against the barrel wall and shock absorber means intermediate the piston body and washer to absorb the shock when the washer engages the shoulder.

13. An underwater gun adapted to be aimed and fired under water by a swimmer and having a gunstock provided with a pistol grip by which it can be aimed and fired by one hand, trigger mechanism including a finger-piece adjacent the trip, a barrel extending forwardly of the grip, an air tight piston reciprocable in the barrel, stop means near the muzzle end of the barrel to limit the outward movement of the piston, a piston latch for holding the piston in its rear position, trigger operated means for releasing the latch, means forming a compressed air chamber in communication with the barrel rearwardly of the piston, pump means for compressing air in said chamber and having a handle threadably coupled to said chamber for sealing the chamber and pump means against the discharge of air and the inlet of water, a spear adapted to be inserted into the barrel from the muzzle and engageable with the piston to shift the latter to latched position and apply further compression in the air in the chamber, the rear end of the spear and the front end of the piston having releasable coupling means which prevent unintentional separation thereof but permit the spear to release itself when the piston engages the stop means, spear retrieving means including a retrieving ring through which the spear freely passes when inserted into the barrel but from which it cannot escape when discharged from the barrel, a cord connecting the retrieving ring and barrel, the shock absorber means including a plurality of rubber like overlying washers normally of smaller outside diameter than the inside diameter of the barrel and expansible to engage the barrel wall, said washers being axially aligned with and carried by said piston.

14. An underwater gun adapted to be aimed and fired underwater by a swimmer and having a gunstock provided with a pistol grip by which it can be aimed and fired by one hand, trigger mechanism including a finger-piece adjacent the trip, a barrel extending forwardly of the grip, an air tight piston reciprocable in the barrel, stop means near the muzzle end of the barrel to limit the outward movement of the piston, a piston latch for holding the piston in its rear position, trigger operated means for releasing the latch, means forming a compressed air chamber in communication with the barrel rearwardly of the piston, pump means for compressing air in said chamber and having a handle threadably coupled to said chamber for sealing the chamber and pump means against the discharge of air and the inlet of water, a spear adapted to be inserted into the barrel from the muzzle and engageable with the piston to shift the latter to latched position and apply further compression in the air in the chamber, the rear end of the spear and the front end of the piston having releasable coupling means which prevent unintentional separation thereof but permit the spear to release itself when the piston engages the stop means, spear retrieving means including a retrieving ring through which the spear freely passes when inserted into the barrel but from which it cannot escape when discharged from the barrel, a cord connecting the retrieving ring and barrel, the releasable coupling means between the piston and spear including a socket with inwardly biased and undercut fingers and a bulbous portion at the end of the spear to spread the socket fingers when inserted between the same and to spread them when releasing the spear.

15. The underwater gun claimed in claim 10 wherein the rear end of the barrel is to the rear of the stock and the compressed air chamber is formed by tubing parallel and at least partially coextensive with the barrel.

16. An underwater gun comprising a firing tube, an air compression chamber, means fixedly securing the air compression chamber to the firing tube, an air passage between the compression chamber and firing tube, a manually operable pump carried by the compression chamber and having an air inlet orifice, said pump including a handle and gasket for sealing the compression chamber and air inlet orifice, a piston in the firing tube, the firing tube having a stop shoulder to limit forward movement of the piston, trigger mechanism at the rear of the firing tube and cooperable with the piston to latch it in cocked position, a spear insertable into the firing tube to push the piston to latched position, a gun stock having a grip extending laterally from the firing tube for gripping by one hand and carrying a trigger connected to the trigger mechanism for releasing the piston to move against the stop shoulder and expel the spear.

17. An underwater gun comprising a firing tube, an air compression chamber, means fixedly securing the air compression chamber to the firing tube, an air passage between the compression chamber and firing tube, a manually operable pump carried by the compression chamber, a piston in the firing tube, the firing tube having a stop shoulder to limit forward movement of the piston, trigger mechanism at the rear of the firing tube and cooperable with the piston to latch it in cocked position, a spear insertable into the firing tube to push the piston to latched position, a gun stock having a grip extending laterally from the firing tube for gripping by one hand and carrying a trigger connected to the trigger mechanism for releasing the piston to move against the stop shoulder and expel the spear, the firing tube axis being closer to the grip than the axis of the compressed

air chamber and pump whereby the reaction at the time of firing is opposed by the inertia of the air chamber and pump.

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