Jan. 22, 1957 K. T. MILLER, JR 2,778,267

BORESCOPE

Filed March 16, 1955

T 2270
X 2187

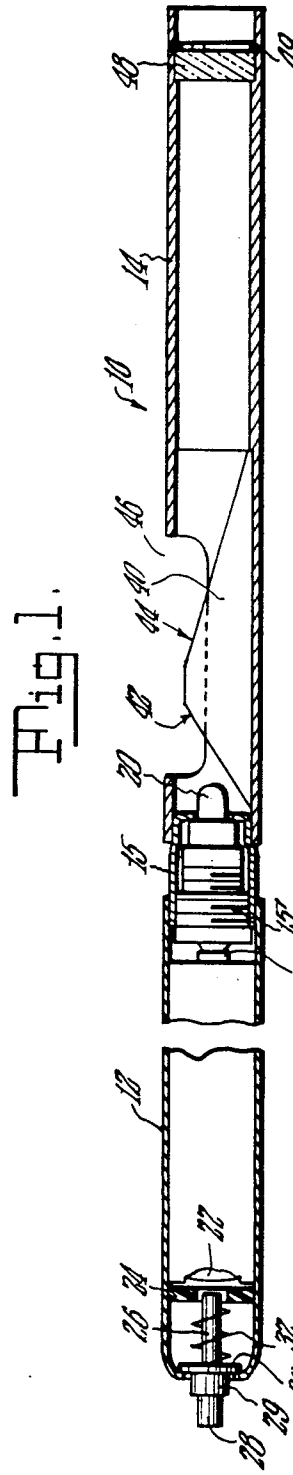


Fig. 1.

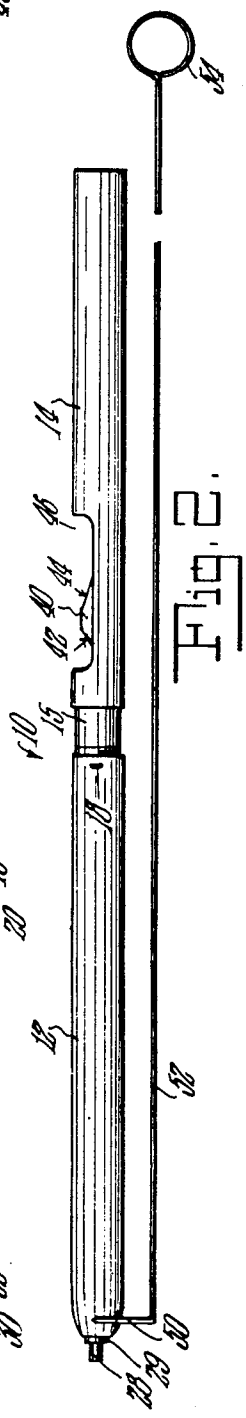


Fig. 2.

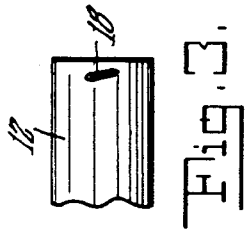


Fig. 3.

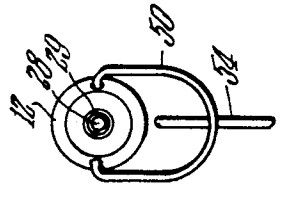


Fig. 4.

INVENTOR.
Kenneth T. Miller, Jr.
BY
Rowe & Rowe
Atty's & Agents

United States Patent Office 2,778,267 Patented Jan. 22, 1957

2,778,267

BORESCOPE

Kenneth T. Miller, Jr., Longmeadow, Mass.

Application March 16, 1955, Serial No. 494,767

4 Claims. (Cl. 88—14)

This invention relates to new and useful improvements in a borescope and is directed more particularly to the provision of a device by means of which the interior surfaces of pipe, tubing, gun barrels and the like may be inspected for the purpose of determining the existence or non existence of defects such as pitting, and like surface imperfections.

The invention is basically adapted for use in such instances where it is desired to inspect in minute detail the interior surfaces of articles of the above described character which are ordinarily not accessible to the observer.

In prior art devices available for similar purposes, there has been the everpresent objection that a clear and unobstructed view of the entire inner circumferential expanse of the wall being examined has not been possible as the device has been moved longitudinally along the length of the tube. During the course of the visual inspection of the circumferential surfaces, it was possible and in fact probable that certain sections of the interior of the tube would be overlooked in view of the fact that the prior art device being employed usually necessitated being revolved while advancing it through the tube so as to permit a complete circumferential view. That is to say, prior art devices have had the objection that obstructed and incomplete views frequently occurred when and if the device was not rotated carefully in order to examine every bit of the area of the circumferential surface. Accordingly, as a result of this deficiency, the visual inspection frequently was not sufficiently thorough or complete and defects in the tubing were frequently overlooked.

To overcome these heretofore existing objections, I have directed my structure to one wherein a body may be inserted into and pulled through the bore wherein inspection by means thereof is facilitated by the mere placement of the naked eye of the operator at the end of the tube nearest to the lens in one end of the tube. In this manner, the elongated tube employed in prior art structures is eliminated and the operator no longer is called upon to place his naked eye at one end of the tube itself which, it will be appreciated, may conceivably be extended outwardly away from an end of the barrel or the like being examined.

It is the principal object of my invention to provide a novel and improved construction of the type in which the device may be easily and conveniently moved through a 360° circle and may be moved along the entire longitudinal axis of the work being inspected whereby the entire area or surface of the same may be examined and there is the further provision of features which will eliminate the now present and aforementioned objectionable inconveniences and which will operate with a maximum amount of ease and with a minimum degree of effort.

One of the primary purposes of my invention is to provide structural and operational improvements in devices of the class to which reference has been made, which improvements simplify the structure as such, and provide important distinct advantages in efficiency and the like.

Other prime objects of my invention include: first, the securement of a higher degree of accuracy and greater degree of variety in the manner of work performed therewith than has heretofore been possible with prior devices known in the art; second, the attainment of a higher speed of construction and assembly of the device due to its simplification of design and its unique composition of parts; third, the attainment of a flexibility or a capability of adjustment by which a large variety of work can be produced by means of the same device, fourth, the achievement of a greater ease in adjustment and repairs; fifth, the provision of an improved borescope which may be made more economically and with fewer operations in the manufacture of its parts, as well as in the assembly of the same, than prior devices known in the art; sixth, the provision of a construction which may be readily installed with respect to the various purposes for which it is intended, and seventh, the provision of such other improvements in and relating to borescopes of the type above referred to as are hereinafter described and claimed.

Further objects and advantages of my invention will become apparent as the following description proceeds, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming parts of this specification.

In the accompanying drawing, I have illustrated a complete example of a physical embodiment of the invention in which the parts are combined and arranged in accordance with one mode which I have devised for the practical application of the principles of the invention.

It will however be understood that changes and alterations are contemplated and may be made in these exemplifying drawings and mechanical structures, within the scope of the claims, without departing from the principles of the invention.

With the above primary objects in view, it is another object of my invention to provide a construction of the above described character in which the number of operating parts is greatly reduced and which is compact in accordance with the demands and desires of manufacturers and purchasers alike and which is not only distinctive in its appearance and practical in its value but also reliable in its operation and efficient in its use.

In the above mentioned drawing annexed hereto and forming a part of this specification, I have presented but one embodiment of my invention which is deemed preferable. It is for purposes of illustration only. It is to be understood that the invention is susceptible of incorporation in other modified forms coming equally within the scope of the claims hereof and that changes may be made in various respects and within the scope of the appended claims without departing from the broad aspects and spirit of the invention.

In the drawings:

Fig. 1, is a sectional elevational view of the device of the invention;

Fig. 2, is a small scale side elevational view of the device shown in Fig. 1;

Fig. 3 is a partial plan view of the inner end of the operating end of the device to show certain features thereof; and

Fig. 4, is an end elevational view of the operating end of the device of the invention shown in Fig. 2 showing certain features of the invention.

Referring now to the invention more in detail, the invention will now be more fully described.

Briefly and in its broadest aspects, the invention comprises an elongated tube for inserting into the bore of a tube such as the barrel of a fire arm or the like. Said

tube has a rear operating end and a forward sighting end. The forward sighting end has a portion of the wall thereof cut away so as to provide an opening. Additionally, there is a socket within the rear operating end having a light bulb therein and also a battery. There is also a switch disposed within the rear operating end of the tube for connecting/disconnecting the light bulb and the battery. There is a reflector within the forward sighting end of the tube which is disposed forwardly of the light. This reflector has primary and secondary reflecting surfaces which are disposed in the opening of the forward sighting end, which surfaces are disposed angularly relative to one another and to the longitudinal axis of the tube proper. The primary surface is so arranged that when the device is inserted into the bore of the tube or barrel being inspected, it reflects light from the bulb into the bore. The secondary surface is likewise so arranged as to direct reflections from the bore through the tube to the sighting end thereof. A lens is secured in the forward sighting end forwardly of the secondary surface of the reflector.

The elongated tube is generally designated by the numeral **10** and comprises a rearward operating end **12** and a forward sighting end **14**.

At the forward extermity of the rearward operating end **12**, a socket **15** is provided in which a bushing **15'** is seated. The rearward extremity of the forward sighting end **14** is slidable over the free outer end of the socket **15** so as to be in frictional engagement therewith, as best shown in Fig. 1.

The forward extremity of the rearward operating end **12** is provided with one or more indents **18** which are engageable with the external thread of the socket **15** whereby the socket **15** may be held secure to the rearward operating end **12**.

The socket **15** is also internally threaded so as to receive the bushing **15'**. The bushing **15'** is internally threaded so as to be engageable with the threaded end of a light bulb **20**.

One or more batteries **22**, of the dry cell type, are provided within the bore of the rearward operating end **12**, as shown, whereby the light bulb **20** may be energized when the switch means, about to be described, is moved into the "on" position.

Rearwardly of the battery **22**, an annular insulating disc **24** is provided having a central opening therethrough through which the inner end of a switch **26** extends so as to contact the battery **22** as desired. The outer end **28** of the switch extends outwardly through an enlarged opening in the rear extremity of the rearward operating end **12** so as to permit manual engagement of the switch, as desired.

The switch **26** is provided with an annular shoulder **29** and an annular flange **30**, as shown, whereby, upon depression of the switch, the same may be caused to be locked in the operating position in that the shoulder **28** may be brought to bear against the inner wall of the member **12** adjacent the rearmost enlarged opening.

A spring **32** urges the member **26** rearwardly when the switch is in the "off" position whereat the flange **30** abuts the inner wall of the member **12** around the enlarged opening, as shown in Fig. 1.

Within the rearward extremity of the forward sighting end **14**, a reflector **40** is disposed so that when assembled it is disposed forwardly of the light **20**.

The reflector has a primary reflecting surface **42** and a secondary reflecting surface **44**, which surfaces are disposed angularly relative to each other and to the longitudinal axis of the tube.

An opening **46** is provided in the member **14** and the reflector **40** is so disposed relative thereto that, when the device is inserted in the bore of a tube or a barrel or the like, the primary surface **42** reflects light from the bulb into the bore of the article being inspected through the opening **46**. The secondary surface **44** directs the reflections from the bore through the member **14** and forwardly thereof.

A lens **48** is secured within the member **48** by means of a ring **49** at the forward end thereof. The reflection from the secondary surface **44** is passed forwardly through member **14** and through lens **48** to the outside.

A U-shaped link **50** is pivotally fixed to the rear end of the member **12** and has engageable therewith an elongated member such as a wire **52**. This member **52** may be in the form of a chain or the like. Upon rotation thereof, the device may be rotated, as desired, within the tube.

At the free outer end of the member **52**, a ringlike finger engaging portion **54** may be provided. By rotating the member **52** through the portion **54**, the device **10** may be rotated and/or pulled through the article being inspected as may be desired.

While I have illustrated and described the invention as embodied in a specific arrangement, I do not intend to be limited to the details shown since various modifications and structural changes may be made without departing in any way from the spirit of the invention.

Without further analysis, the foregoing will so fully reveal the gist of my invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the claims below.

What it is desired to claim and secure by Letters Patent of the United States is:

1. A device for examining the bore of the barrel of a firearm comprising in combination, an elongated tube construction insertable in the bore of a fire arm having forward and rear end portions and provided intermediate said forward and rear end portions with an elongated opening through the side wall at one side thereof, a lens in said tube adjacent the extremity of the forward portion thereof, a reflector in said tube intermediate the forward and rear portions thereof having upper forward and rear reflecting surfaces in said opening, said reflecting surfaces being angularly disposed relative to the longitudinal axis of said tube and relatively diverging forwardly and rearwardly relative to a central portion of said reflector, a lamp socket in said tube rearwardly of the rear reflecting surface having a light bulb rearwardly thereof, a battery in said tube rearwardly of and in contact with said socket, and an on-off switch in said tube at the extremity of the rear portion thereof for connecting said battery in a circuit including said socket and lamp.

2. A device for examining the bore of the barrel of a firearm comprising in combination, an elongated tube construction insertable in the bore of a firearm having forward and rear end portions and provided intermediate said forward and rear end portions with an elongated opening through the side wall at one side thereof, a lens in said tube adjacent the extremity of the forward portion thereof, a reflector in said tube intermediate the forward and rear portions thereof having upper forward and rear reflecting surfaces in said opening, said reflecting surfaces being angularly disposed relative to the longitudinal axis of said tube and relatively diverging forwardly and rearwardly relative to a central portion of said reflector, a lamp socket in said tube rearwardly of the rear reflecting surface having a light bulb rearwardly thereof, a battery in said tube rearwardly of and in contact with said socket, an on-off switch in said tube at the extremity of the rear portion thereof for connecting said battery in a circuit including said socket and lamp, and operating means including an elongated member and connections between the rear end thereof and the rear end of said tube spacing said elongated member outwardly from said tube, said elongated member having a manually engageable portion at the forward end thereof.

3. A device for examining the bore of the barrel of a firearm comprising in combination, an elongated tube construction insertable in the bore of a firearm formed by elongated forward and rear tubes connected together at inner adjacent ends by a socket construction for a lamp, a rear portion of said forward tube provided with an elongated opening in a side wall thereof disposed forwardly of said socket construction, a lens in said forward tube adjacent the forward extremity thereof, a reflector in the rear portion of said forward tube having forward and rear reflecting faces disposed in the opening thereof and being disposed relatively angularly and inclining forwardly and downwardly and rearwardly and downwardly respectively towards forward and rear of said tube construction, a lamp in said socket construction rearwardly of said rear reflecting surface, a battery in said rear tube rearwardly of said socket, and an on-off switch in said rear tube at the rear extremity therof for making and breaking a circuit including said battery and lamp.

4. A device for examining the bore of the barrel of a firearm comprising in combination, an elongated tube construction insertable in the bore of a firearm formed by elongated forward and rear tubes connected together at inner adjacent ends by a socket construction for a lamp, a rear portion of said forward tube provided with

an elongated opening in a side wall thereof disposed forwardly of said socket construction, a lens in said forward tube adjacent the forward extremity thereof, a reflector in the rear portion of said forward tube having forward and rear reflecting faces disposed relatively angularly and inclining forwardly and downwardly and rearwardly and downwardly respectively towards the forward and rear ends of said tube construction, a lamp in said socket construction rearwardly of said rear reflecting surface, a battery in said rear tube rearwardly of said socket, an on-off switch in said rear tube at the rear extremity thereof for making and breaking a circuit including said battery and lamp, and means for moving said tube construction in the bore of a barrel including an elongated member and connections between the forward end of said member and said tube construction adjacent the rear extremity thereof spacing said elongated member from said tube construction and arranged for relative movements thereof.

References Cited in the file of this patent

FOREIGN PATENTS

647,185	France	July 24, 1928
486,138	Germany	Nov. 9, 1929
53,491	Netherlands	Nov. 16, 1942