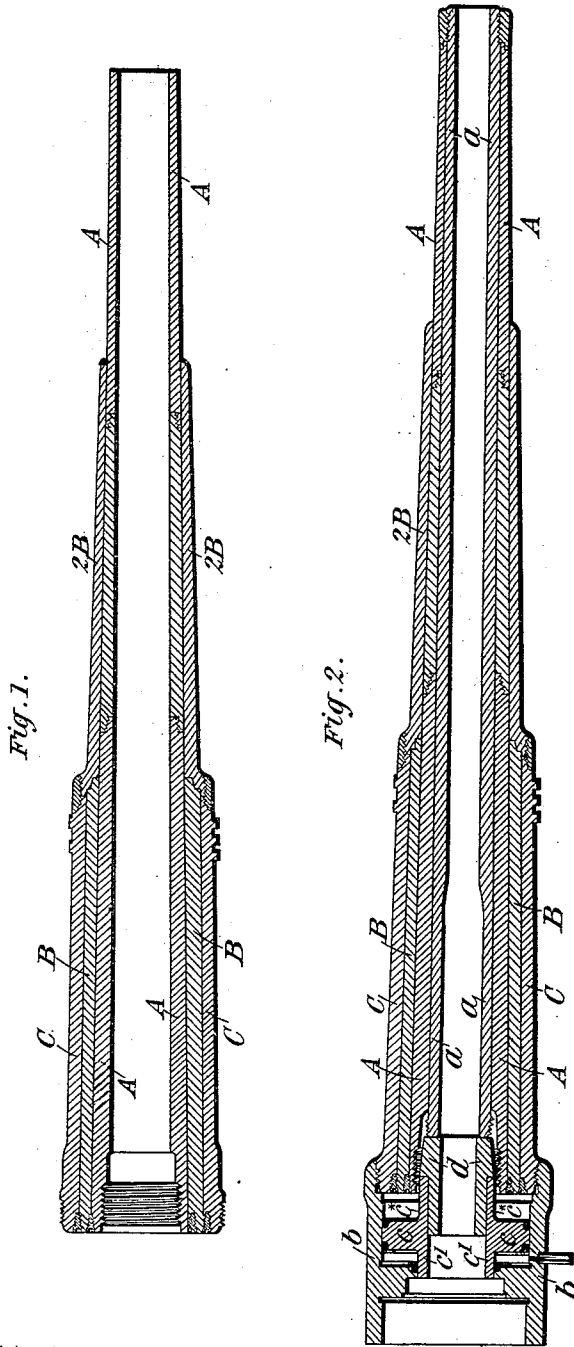


M. GLEDHILL.

DEVICE FOR INSERTING OR REMOVING TUBES IN ORDNANCE.

No. 523,633.

Patented July 24, 1894.



Witnesses:
J. A. Rutherford
Robert Corbett

Inventor:
Manassah Gledhill
 By *J. W. Norris*
Attorney

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Fig. 3.

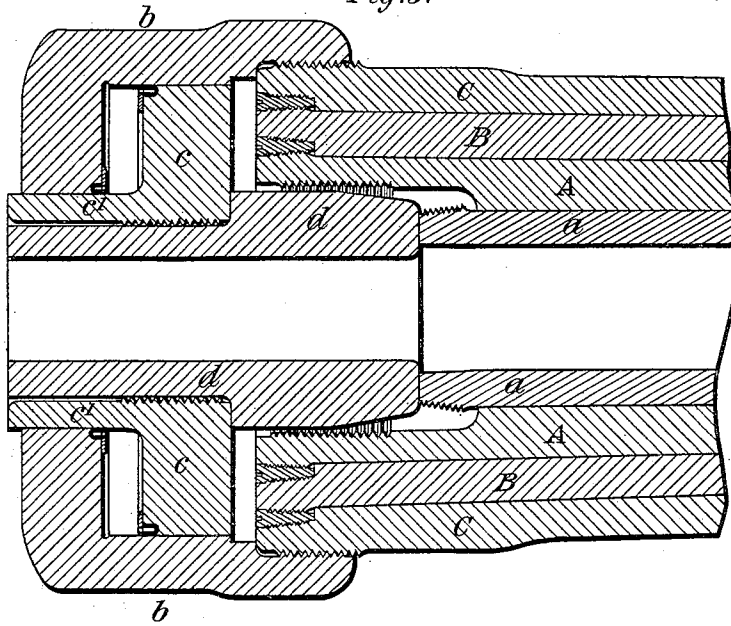
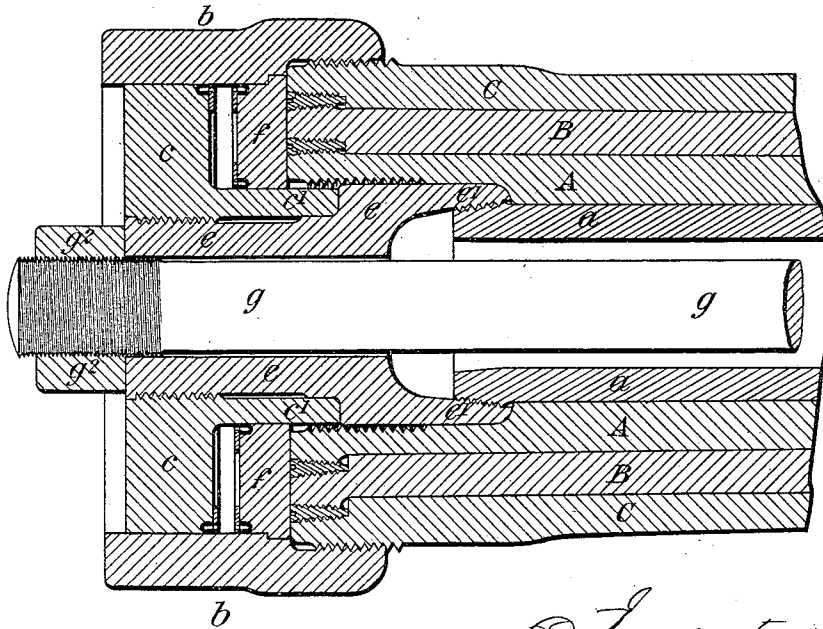


Fig. 4.



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(No Model.)

4 Sheets—Sheet 3.

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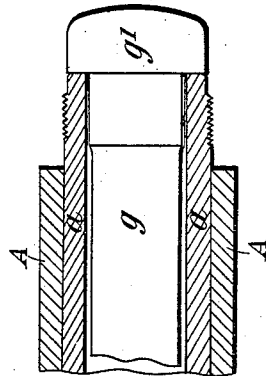
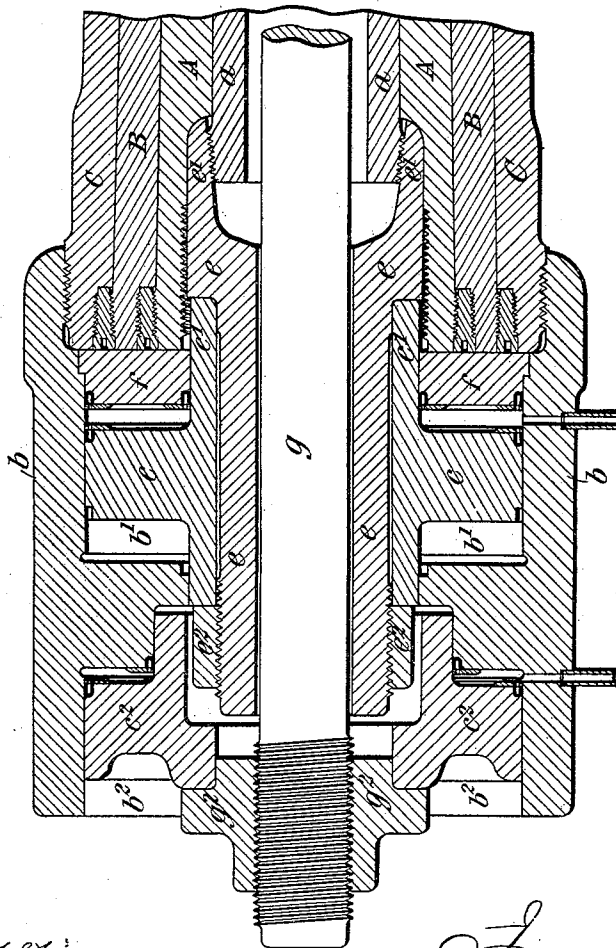


Fig. 5.



Witnesses:
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Inventor:
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James L. Norris
Attorney.

(No Model.)

4 Sheets—Sheet 4.

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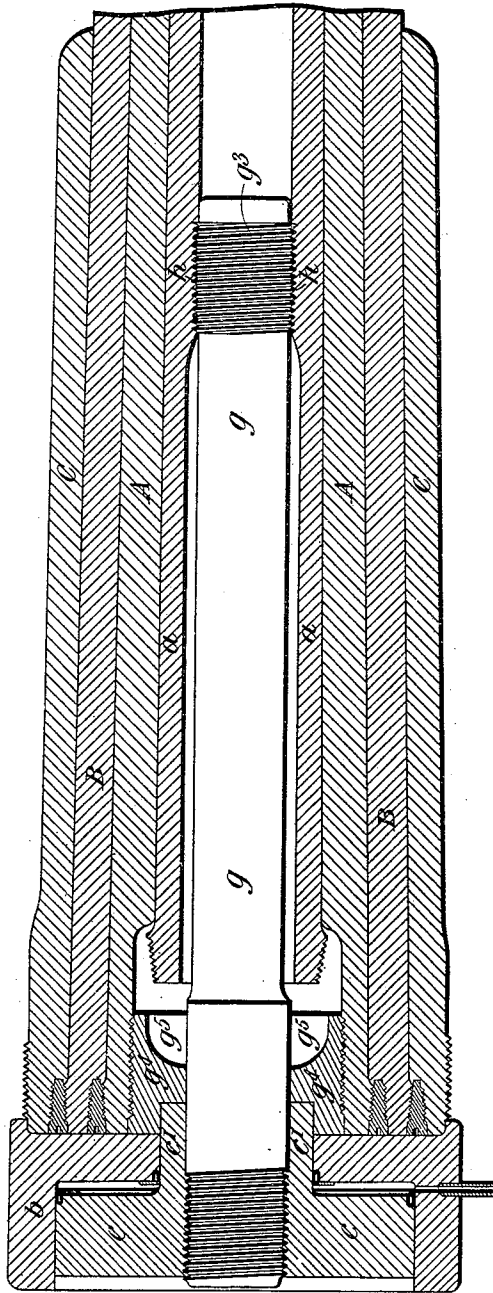


Fig. 6.

Witnesses: J. A. Rutherford. Robert Conwell. Inventor: Manassah Gledhill. James O. Norris. Attorney.

UNITED STATES PATENT OFFICE.

MANASSAH GLEDHILL, OF MANCHESTER, ENGLAND, ASSIGNOR TO THE MESSRS. SIR JOSEPH WHITWORTH & COMPANY, LIMITED, OF SAME PLACE.

DEVICE FOR INSERTING OR REMOVING TUBES IN ORDNANCE.

SPECIFICATION forming part of Letters Patent No. 523,633, dated July 24, 1894.

Application filed July 21, 1892. Serial No. 440,802. (No model.) Patented in England July 6, 1887, No. 9,564.

To all whom it may concern:

Be it known that I, MANASSAH GLEDHILL, engineer, director of Sir Joseph Whitworth & Company, Limited, of Openshaw, Manchester, England, a subject of the Queen of Great Britain, and a resident of Openshaw, Manchester, England, have invented certain new and useful Improvements in and Relating to Devices for Inserting or Removing Tubes in Ordnance, (for which I have obtained a patent in Great Britain, No. 9,564, dated July 6, 1887,) of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to novel apparatus for the insertion and removal of the liners or inner tubes of ordnance, which apparatus will be specially advantageous in cases where, in actual service or practice, the liner is worn out or otherwise injured, as it provides very simple means for withdrawing the said liner and replacing the same by a new liner.

The said apparatus is chiefly designed for use in connection with the guns described in my application for Letters Patent of the United States, filed July 21, 1892, Serial No. 440,801. It may, however, be used in connection with other guns in which an inner tube or liner is employed.

According to my said invention I construct a special form of hydraulic apparatus which I apply to the end of the gun and connect with a pump in such a manner that under the pressure obtained thereby, the said apparatus can be caused to act either to force in or draw out the liner, that is to say, I can use the said apparatus in the construction of a gun to force the liner into its place, or in repairing a gun to start the liner from the tube in which it is inserted, so that its removal from the gun can be easily effected, or to force into the said tube a new liner to replace the one removed.

In the accompanying drawings:—Figure 1 is a longitudinal central section of a gun constructed according to the aforementioned specification ready for the insertion of the liner or inner lining. Fig. 2 is a longitudinal central section of the said gun with the liner therein, showing hydraulic apparatus,

constructed according to my present invention, for forcing in the said liner. Fig. 3 is a longitudinal central section, drawn to an enlarged scale, of part of the said gun showing a modified form of the said hydraulic apparatus. Fig. 4 is a similar view showing the said hydraulic apparatus adapted for withdrawing the liner from the gun. Fig. 5 is a longitudinal central section, also drawn to an enlarged scale, showing another form or modification of my hydraulic apparatus adapted for withdrawing the liner. Fig. 6 is a longitudinal central section of part of the said gun, showing a further modification of my hydraulic apparatus adapted for withdrawing the said liner.

Like letters indicate corresponding parts throughout the drawings.

The "A," "B," "2 B" and "C" tubes or hoops of the gun are indicated respectively by these letters.

a is the liner or inner lining of the gun.

The said hydraulic apparatus comprises a cylinder *b* in or upon one end of which is cut a screw-thread to fit a corresponding screw-thread in or on the breech end of the gun, upon which, when the apparatus is to be used, the said cylinder is fixed. This cylinder is fitted with a piston *c* which is made tight by cup-leathers or other suitable means. The said piston has fitted therein or attached thereto by screw-threads or by a screw-nut or otherwise the forcing-in ram or the withdrawing bar hereinafter referred to, either of which can be removed and replaced by the other as required.

When my improved apparatus is to be used for the insertion of the liner in the construction of a gun, or in the renewal or replacement of the liner of a gun, I use the ram or head *d*, which, in the apparatus shown in Fig. 2, fits into a tubular extension *c'* of the piston *c* and the forward end surface of which ram or head is designed to bear against the rear end of the liner, as shown, when the said liner has been inserted into its tube. The piston *c* is formed with another cylindrical or tubular extension *c'* which is fitted to slide through a hole in the cylinder end, and is kept tight therein by a cup-leather or

other suitable means. To force the liner into its place in the tube A, the hydraulic cylinder *b* is connected to the pump so that the water enters the cylinder between the piston *c* and the outer or rear end of the cylinder. The pump being then operated, the pressure acts to drive the liner home into the tube.

In Fig. 3, the piston is made, without the extension *c*³ above described and the ram or head *d* passes through the said piston and into the extension *c*¹ thereof.

When the apparatus is to be used for withdrawing the liner, I use the withdrawing bar or tube *e*, Fig. 4, which has a screw threaded socket *e*¹ designed to engage with the end of the liner *a* when the liner-nut is removed from the same. A disk or plate *f* furnished with cup-leathers is fitted within the cylinder *b* to close the forward end thereof. This disk or plate bears against the breech end of the gun when the cylinder is screwed thereon. The extension *c*¹ of the piston *c* is fitted to slide in a hole in the said disk or plate *f*, and the withdrawing bar or tube *e* is passed through the said extension and screwed into the piston *c*, so that it forms the rod thereof. Instead of screwing the cylinder on the gun and using the said plate *f* to form the end thereof, I can make the said cylinder with its end solid or in one piece with its body and screw or otherwise fix the said cylinder on the end of the gun, as shown in Fig. 6. The said bar or tube *e* is screwed on the end of the liner *a* in place of the nut. The hydraulic cylinder is tightly screwed or otherwise secured upon the end of the gun and is connected with the pump so that the water forced by the same will enter the cylinder *b* between the piston *c* and the aforesaid disk or cylinder end; the pump being then operated, the pressure exerted upon the piston *c* forces it rearwardly away from the breech of the gun and thereby starts the liner from the tube A.

It will be seen that the piston shown in Fig. 3 for inserting or forcing in the liner may be used in the cylinder shown in Fig. 4 for withdrawing the liner, the position of the said piston being reversed and the withdrawing bar *e* being substituted for the ram *d*.

I sometimes combine with the above described withdrawing apparatus, a rod *g* Figs. 4 and 5, which passes through the piston *c* and tube *e* and extends to the muzzle end of the gun, where it is provided with a head *g*¹ (Fig. 5) or with a collar or nut, which engages with the end of the liner *a* as shown. The said rod *g* is connected with the piston *c* by a screw-nut *g*² or otherwise, so that, as the said piston moves away from the breech under the hydraulic pressure as above specified, force tending to withdraw the liner *a* is simultaneously applied at both ends of the same, that is to say, to the breech end through the tube *e* and to the muzzle end through the rod *g*. By the use of this device I am enabled to apply at both ends of the gun force tending

to extract the liner, and I avoid or greatly diminish the danger of separating and pulling away the rear portion from the forward portion of the liner and leaving the latter fast in the tube which, although not probable, is possible when the withdrawing force or pull is applied only to the breech end of the said liner.

In some instances, the hydraulic cylinder has two compartments *b*¹ *b*² and is provided with two pistons *c*¹ *c*² as shown in Fig. 5, that is to say, it has in the compartment *b*¹ a piston *c* provided with a withdrawing tube *e* to be connected with the breech end of the liner as above described, and in the compartment *b*² a piston *c*² to be connected with the rod *g* extending through the withdrawing tube *e* to the muzzle of the gun. The connection of the piston *c* with the tube *e* is effected by means of a screw nut *e*² and that of the piston *c*² with the rod *g* by means of screw-nut *g*².

The apparatus shown in Fig. 5 can, if desired, be used for inserting or forcing in the liner as shown in Fig. 2.

To prevent "upsetting" or enlargement of the diameter of the muzzle end of the liner, I sometimes provide a nut to replace the muzzle locking-nut when the rod *g* is used for withdrawing the liner.

Instead of attaching the withdrawing bar or tube *e* to the liner by screwing it upon the threads from which the liner-nut has been unscrewed as aforesaid, I sometimes cut a thread in the liner at or beyond the inner end of the chamber of the gun as shown at *h* in Fig. 6, for receiving the screw-threaded end *g*³ of a withdrawing bar or rod *g* and thus securing the said rod to the liner. This device will be advantageous if the liner should be found to be injured and weakened in the part forming the chamber.

In the apparatus shown in Fig. 6, the rod *g* is screwed into the piston *c*, and a plug *g*⁴ is screwed into the breech end of the gun in place of the breech-plug ring, for the purpose of guiding the piston *c* and rod *g*. This plug *g*⁴ is formed with a recess *g*⁵ into which the liner can be drawn, so as to increase the space through which the said liner may be moved backward by the said piston and rod.

I have hereinbefore described the construction and operation of my improved apparatus more particularly with reference to the insertion and removal of the liners; it will be understood, however, that the said apparatus is equally applicable for the insertion and removal of the tubes of built up guns.

It is obvious that the hydraulic apparatus might be applied to the muzzle of the gun if desired.

What I claim is—

1. The combination, with a built up gun, of a hydraulic apparatus comprising a cylinder *b* screwed on the breech end of the outer tube or hoop of the gun, a piston *c* working in said cylinder, a socket *e* secured to the said piston and to the breech end of the liner, and a

withdrawing rod *g* engaging the piston *c* at its rear end and the liner at its forward end, substantially as described.

5 2. The combination with a built-up gun, of a hydraulic apparatus comprising a cylinder *b* screwed on the breech end of the outer tube or hoop of the gun, a piston *c* working in said cylinder, a socket *e* secured to the said piston and to the breech end of the liner *a*, a
10 withdrawing rod *g* engaging the piston *c* at its rear end and extending through the bore of the gun, and a head *g'* formed on said rod to engage with the muzzle end of the liner, substantially as described for the purpose
15 specified.

3. The combination with a built-up gun, of a hydraulic apparatus comprising a cylinder *b* screwed on the breech end of the outer tube or hoop of the gun, a piston *c* working in said
20 cylinder and adapted to be engaged with the liner *a* and a plate *f* provided with cup leathers and adapted to bear against the end of the gun and tightly close the end of the cylinder, substantially as described for the purpose
25 specified.

4. The combination with a built-up gun, of a hydraulic apparatus comprising a two-chambered cylinder *b* screwed on the breech end of the outer tube or hoop of the gun, a piston *c* working in one of said chambers, a socket *e* 30 for coupling said piston *c* with the rear end of the liner *a*, a piston *c*² working in the other of said chambers, and a rod *g* extending through the bore of the gun, said rod having a head *g'* at its forward end engaging the 35 muzzle end of the liner and a nut *g*² at its rear end for connecting the rod with the piston *c*², substantially as described for the purpose specified.

In witness whereof I have hereunto signed 40 my name in the presence of two subscribing witnesses.

MANASSAH GLEDHILL.

Witnesses:

H. S. CARINGTON,
Secretary to Sir Joseph Whitworth & Co.,
Lmd.

J. M. GLEDHILL,
Director of Sir Joseph Whitworth & Co.,
Lmd.