

Jan. 4, 1955

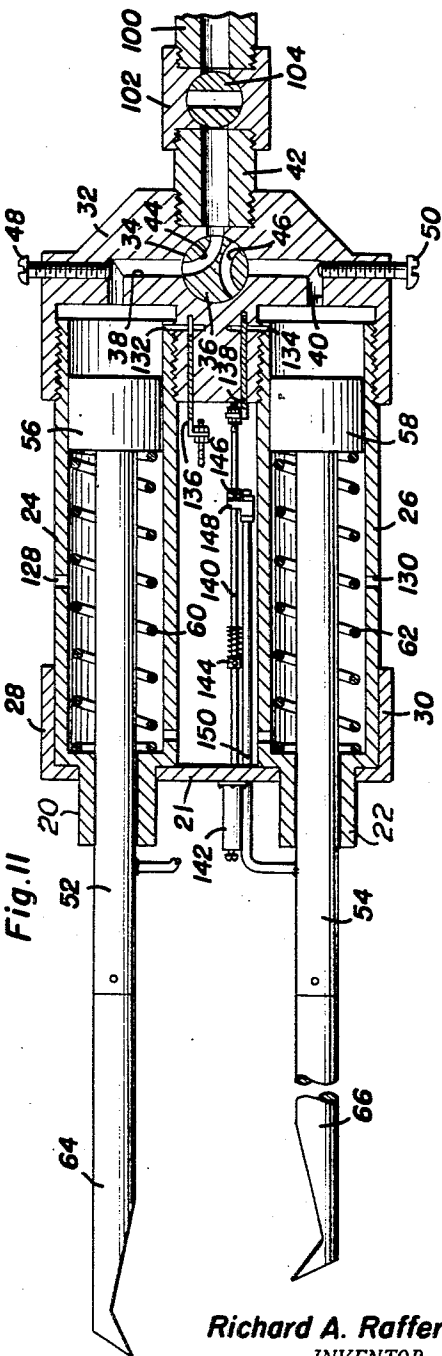
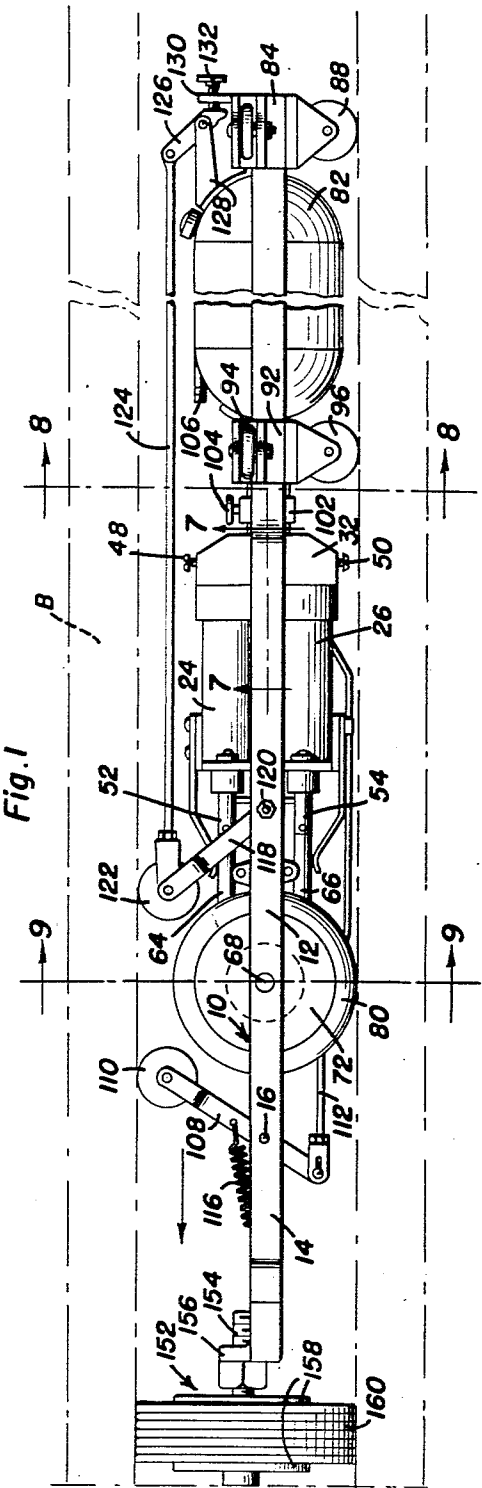
R. A. RAFFERTY

2,698,449

TUBE CLEANING APPARATUS

Filed March 20, 1952

5 Sheets-Sheet 1



Richard A. Rafferty
INVENTOR.

BY *Charles A. O'Brien*
and *Harvey B. Jackson*
Attorneys

Jan. 4, 1955

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Fig. 2

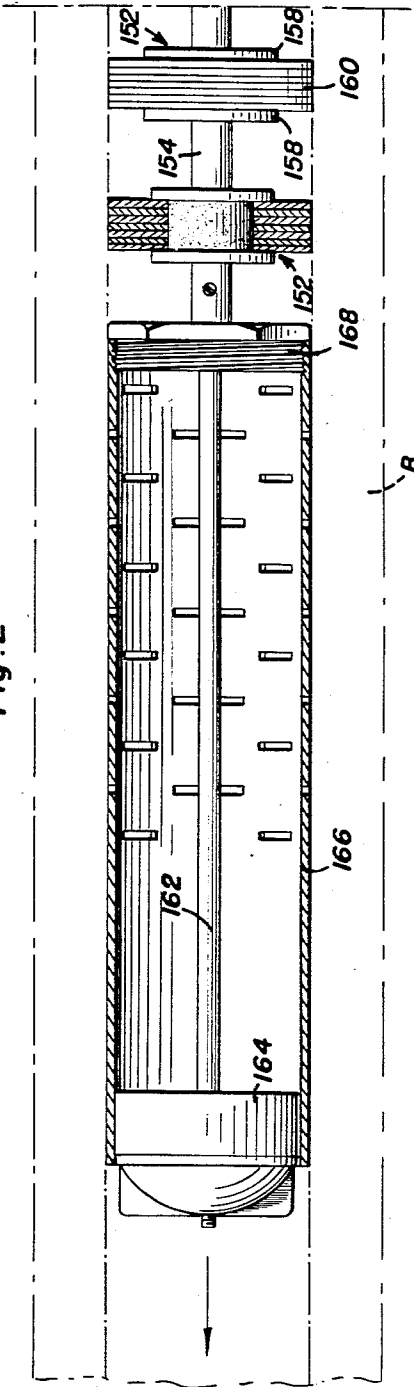
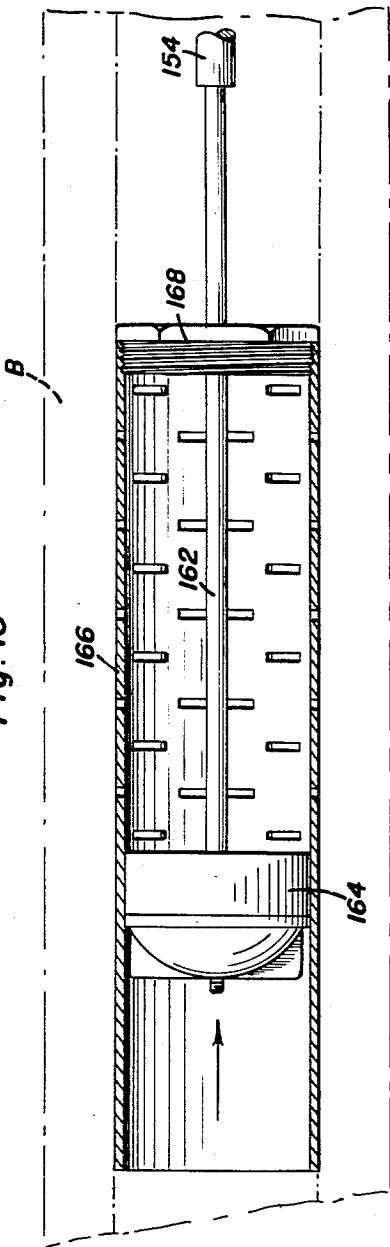


Fig. 10



Richard A. Rafferty
INVENTOR.

BY *Chance A. Wilson*
and *Harvey R. Jacobson*
Attorneys

Jan. 4, 1955

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Fig. 3

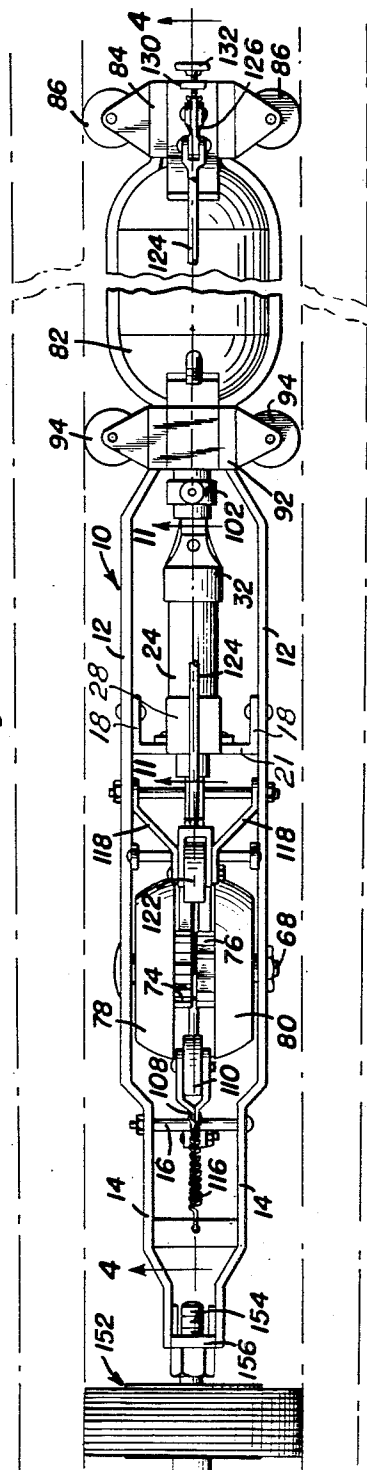


Fig. 8

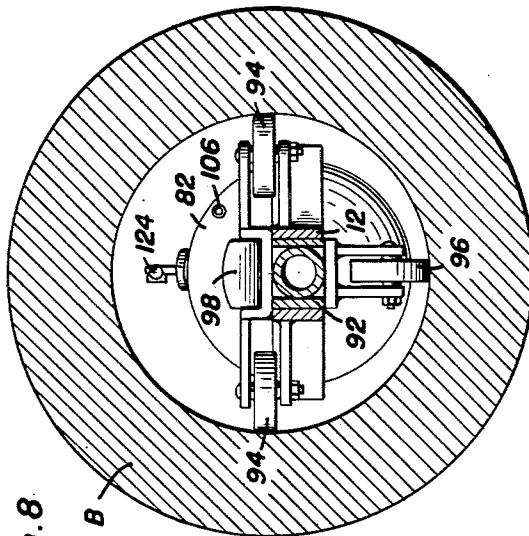
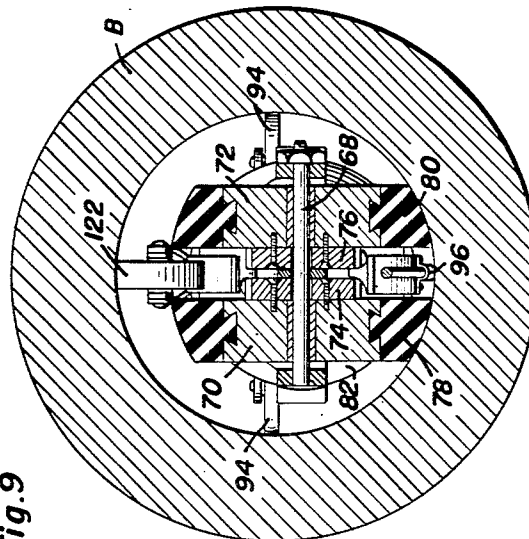


Fig. 9



Richard A. Rafferty
INVENTOR.

BY *Thomas A. O'Brien*
and Harvey B. Jackson
Attorneys

Jan. 4, 1955

R. A. RAFFERTY

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Fig. 4

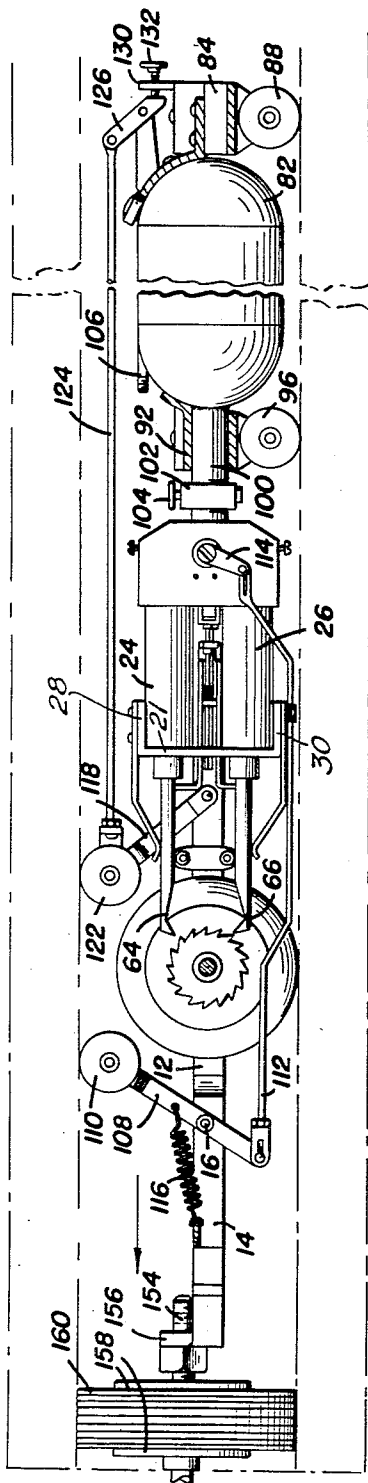
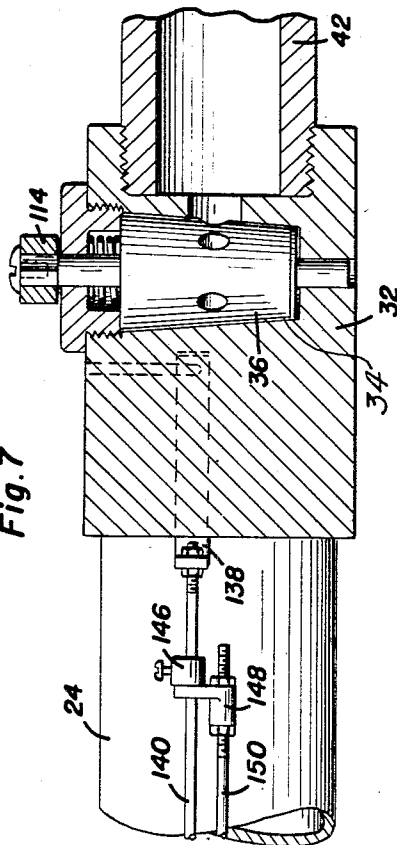


Fig. 7



Richard A. Rafferty
INVENTOR.

BY *Charles A. O'Brien*
and *Harvey R. Jackson*
Attorneys

Jan. 4, 1955

R. A. RAFFERTY

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Fig. 5

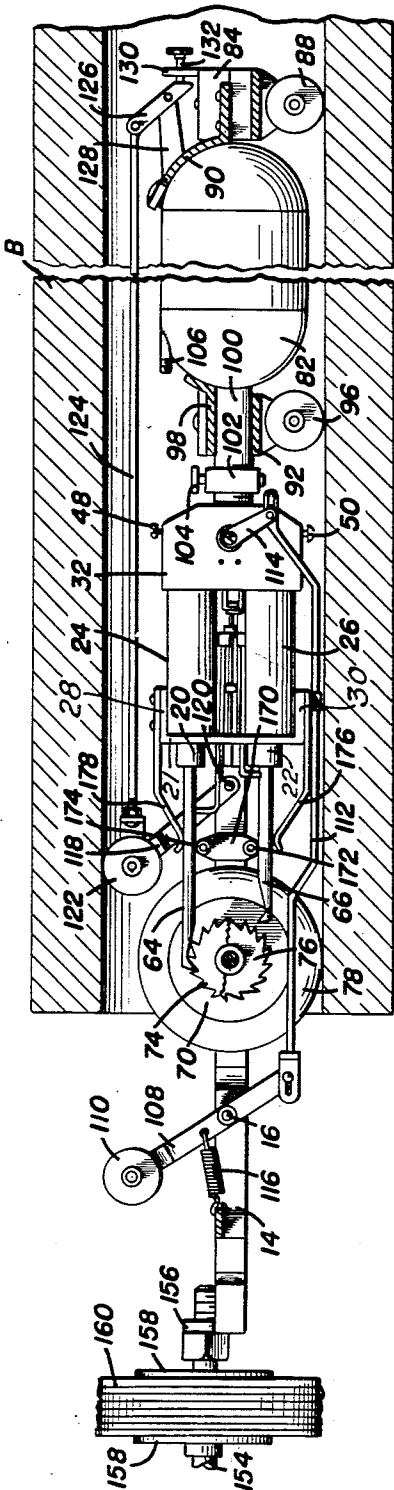
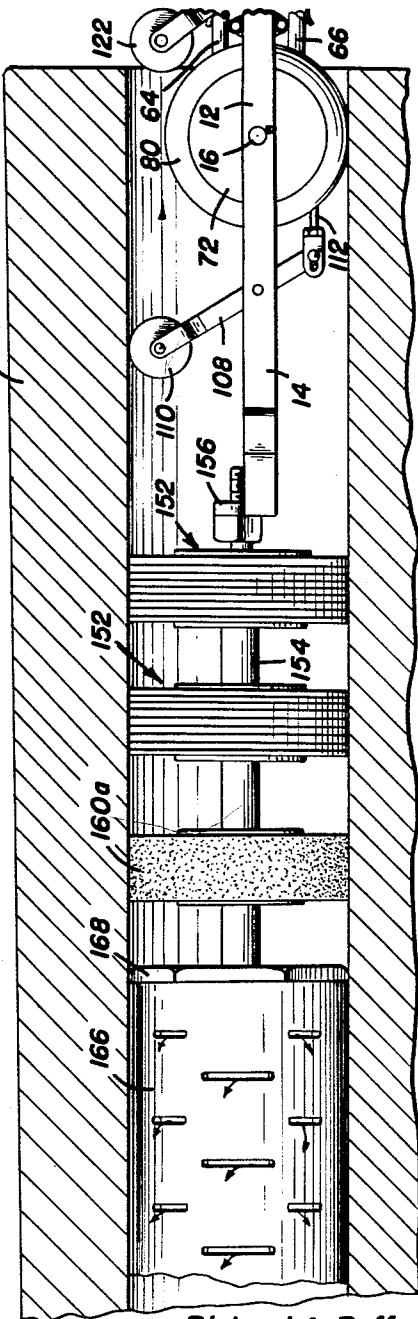


Fig. 6



Richard A. Rafferty
INVENTOR.

BY *Chance A. Olson*
and *Harvey B. Jacobson*
Attorneys

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TUBE CLEANING APPARATUS

Richard A. Rafferty, Mechanicsburg, Ohio

Application March 20, 1952, Serial No. 277,697

9 Claims. (Cl. 15—104.16)

This invention relates to new and useful improvements in rifle cleaning apparatus and the primary object of the present invention is to provide a powered unit reciprocable within a barrel and having a cleaning element attached thereto that will be propelled back and forth through the barrel in order to clean the rifling of the barrel.

Another important object of the present invention is to provide a pneumatically driven carriage carrying a cleaning element at its front end, and including means for reversing the direction of travel of the carriage as a portion of the carriage is extended from one end of a barrel, in order that the carriage may move back and forth within the barrel being cleaned.

Yet another object of the present invention is to provide a rifle cleaning apparatus including a reciprocating carriage selectively pushing and pulling a perforated cylinder at its forward end together with a plunger secured to the carriage and movable within the cylinder for forcing a lubricant in the cylinder outwardly from the cylinder and into contact with the rifling of a barrel.

Another feature of the present invention is to provide a pneumatically driven carriage including a power driven wheel and means for selectively driving the wheel clockwise and counterclockwise in order to reciprocate the carriage longitudinally within a rifle barrel.

Another feature of the present invention is to provide a carriage that is of such a size as to permit the same to be utilized in relatively small barrels and which is also adaptable for use in conjunction with pipes, conduits and other such tubular members that require cleaning.

Another important feature of the present invention is to provide a rifle cleaning unit, of the aforementioned character, including novel and improved means supported upon the carriage for engaging the inner periphery of a barrel to force the driven wheel into gripping engagement with the inner periphery of a barrel.

A further object of the present invention is to provide a rifle cleaning unit composed of parts that are quickly and readily assembled or disassembled in a convenient manner to permit inspection of the various parts, repair and cleaning thereof.

A still further aim of the present invention is to provide a bore cleaner that is simple and practical in construction, strong and reliable in use, neat and attractive in appearance, efficient and durable in operation, inexpensive to manufacture and operate, and otherwise well adapted for the purposes for which the same is intended.

Other objects and advantages reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming part hereof, wherein like numerals refer to like parts throughout, in which:

Figure 1 is a side elevational view of the present invention and showing the same positioned within a barrel and moving leftward in the barrel, the barrel being shown in dotted lines;

Figure 2 is a longitudinal vertical sectional view of one of the present invention to illustrate the cleaning element employed with the moving carriage;

Figure 3 is a fragmentary top plan view of Figure 1;

Figure 4 is a longitudinal view partly in section taken substantially on the plane of section line 4—4 of Figure 3;

Figure 5 is a longitudinal vertical sectional view of the present invention parts of which are shown in section and showing the same within a barrel and partially exposed

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from one end of the barrel in order to permit reversing movement of the carriage;

Figure 6 is a fragmentary longitudinal sectional view of a barrel and showing the forward portion of the carriage and the cleaning element being moved in a rightward direction;

Figure 7 is an enlarged detail sectional view taken substantially on the plane of section line 7—7 of Figure 1;

Figure 8 is an enlarged detail transverse vertical sectional view taken substantially on the plane of section line 8—8 of Figure 1;

Figure 9 is an enlarged detail transverse vertical sectional view taken substantially on the plane of section line 9—9 of Figure 1;

Figure 10 is a view similar to Figure 2 but showing the carriage being moved in a direction opposite from that shown in Figure 2 in order that the plunger may move longitudinally relative to its receiving cylinder; and

Figure 11 is an enlarged detail vertical sectional view taken substantially on the plane of section line 11—11 of Figure 3.

Referring now to the drawings in detail, wherein for the purpose of illustration, there is disclosed a preferred embodiment of the present invention, the numeral 10 represents a carriage generally including a pair of elongated side frame members 12 whose forward inwardly offset ends 14 are connected together by a combined pivot and fastener 16. The intermediate portions of the frame members 12 are secured to the aligned angulated arms 18 of a spider-like bracket 21 having a pair of apertures that receive the reduced forward ends 20 and 22 of a pair of spaced parallel cylinders 24 and 26.

Cylinders 24 and 26 are disposed one above the other and the angulated upper and lower arms 28 and 30 of bracket 20 engage the cylinders 24 and 26, respectively, to aid in retaining the cylinders parallel, as shown in Figure 11. The rear externally threaded ends of the cylinders 24 and 26 are receivably engaged in threaded recesses in a casing member 32 having a transverse frusto-conical bore 34 that rotatably receives a frusto-conical valve 36.

Bore 34 is in communication with the rear end cylinder 24 through the medium of a passage 38 in member 32, and bore 34 is in communication with the rear end cylinder 26 through the medium of a passage 40 in the member 32. An inlet nipple 42 extends rearwardly from casing member 32 and will selectively register with arcuate passages 44 and 46 in the valve 36 to permit fluid under pressure to be directed into a selected one of the cylinders.

A pair of valve forming screws 48 and 50 are threaded into the member 32 and enter the passages 38 and 40, respectively, to regulate the velocity of fluid admitted under pressure into the cylinders.

Piston rods 52 and 54 are slidably carried by the cylinders 24 and 26 and carry pistons 56 and 58 that are slidable in the cylinders 24 and 26. Coil springs 60 and 62 embrace the rods 52 and 54 and are biased between the pistons 56, 58 and the internal shoulders at the forward portions of the cylinders to urge the rods 52 and 54 rearwardly. The forward ends of the rods 52 and 54 are suitably coupled to pawls 64 and 66 which will reciprocate with their supporting rods 52 and 54.

A wheel supporting axle or shaft 68 is secured to and extends between the members 12 forwardly of bracket 20. The two wheel-forming sections 70 and 72 of a forward driving wheel are journaled for rotation on the shaft 68, as shown in Figure 9, and the flat inner faces of sections 70 and 72 support ratchets 74 and 76. The peripheral edges of the wheel sections 70 and 72 carry rubber tires or rings 78 and 80 that are shaped to engage the inner periphery of a barrel B, reference again being directed to Figure 9.

The teeth of the ratchet 74 are adapted to be sequentially engaged by the pawl 64 and the teeth of the ratchet 76 are adapted to be sequentially engaged by the pawl 66, and furthermore, the teeth of the ratchet 74 are inclined opposite to the teeth of the ratchet 76, so that when the pawl 64 engages the teeth of ratchet 74, the wheel section 70 will rotate counterclockwise but when the pawl 66 engages the teeth of ratchet 76, wheel section 72 will be rotated clockwise, as illustrated in Figure 5, wherein pawl 64 is shown engaged with the ratchet 74.

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Means is provided for reciprocating the piston rods 52 and 54 and hence the pawls 64 and 66. This means comprises a tank 82 supported between the rear ends of members 12. A rear wheel holding bracket 84, attached to the rear ends of the members 12, supports horizontal rollers 86 and a vertical roller 88. Bracket 84 also carries a rigid arm element 90 that engages the rear end of tank 82.

A second rear bracket 92 is disposed in front of bracket 84 and tank 82 and is suitably secured to the members 12. Bracket 92 also supports horizontal rollers 94 and a vertical roller 96. An arm element 98 secured to bracket 92 engages the forward portion of tank 82 and coacts with the arm 90 in holding the tank between these arms.

The outlet 100 of the tank 82 is coupled to nipple 42 by a sleeve 102 having a cylindrical valve 104 rotatably supported therein. A suitable finger-grip may be applied to valve 104 to permit movement of the valve to its open or closed positions, as shown in Figure 4.

Tank 82 may be filled with air under pressure to approximately 500 pounds pressure, although a suitable air compressor may be connected by a flexible conduit to the valved inlet 106 of the tank, to supply air under pressure into the tank. The tank may be refilled when desired or necessary by application of a compressor or pump to the valved inlet 106 while valve 104 is in its closed position.

An operator for the valve 36 is provided and comprises a vertically swingable arm 108 positioned on the pivot 16. One end of arm 108 carries a roller 110 and the other end of arm 108 is slidably and pivotally secured to a pitman 112 whose rear offset end is slidably and pivotally connected to the operating arm 114 of valve 36. A coil spring 116 is connected to the forward end of the carriage and to the arm 108 above pivot 16 to urge the roller 110 forwardly and the arm 114 rearwardly.

Means is provided for forcing the tires of the wheel sections 70 and 72 into gripping engagement with the inner periphery of the barrel B. This means comprises a forwardly and rearwardly swinging roller holding arm 118 pivoted to a pin 120 between the members 12, in front of bracket 20 but behind wheel sections 70 and 72. The arm 118 supports a roller 122 and is connected to the forward end of a pitman 124. A vertically swingable lever 126 is pivoted to an ear 128 carried by a bracket 90 and the upper end of the lever 126 is pivoted to the rear end of pitman 124.

A rigid ear 130 extends from bracket 84 and is provided with an internally threaded aperture that receivably engages a set screw 132. The set screw 132 abuts the lower end of the lever 126 to shift pitman 124 longitudinally in order to move roller 122 into engagement with the inner periphery of barrel B and the tires of wheel sections 70 and 72 against substantially diametrically opposite sides of the inner periphery of the barrel B.

In order that the rods 52 and 54 may reciprocate, there is provided an exhaust for each of the cylinders 24 and 26 in addition to the relief ports 128 and 130 thereof. The exhaust ports 132 and 134 extend from the rear ends of the cylinders and outwardly through the member 32 into communication with the atmosphere. Slide valves 136 and 138 are slidably carried by the member 32 for selectively opening and closing the ports 132 and 134.

The operating rods 140 for the slide valves are slidably carried by guides 142 on bracket 20 and have forward and rear abutments 144 and 146 between which slide elements 148 are positioned. The slide elements 148 are secured to angulated arms 150 fixed to the rods 54 exteriorly of the cylinders, as shown in Figure 11.

The slide valve will remain closed until the rods 52, 54 are moved forwardly a predetermined distance, at which time the slides 148 will engage the forward abutments 144 to open the ports 132, 134 and permit the air under pressure behind the pistons 56, 58 to exit from the cylinders.

Various types of cleaning elements may be attached to the forward end of the carriage to be propelled with the carriage through the barrel B. One such type cleaning element 152 is shown in Figure 1 and comprises a supporting rod 154 threadingly engaged with an ear 156 at the forward end of the carriage. A pair of spaced disks 158 are received on rod 154 and are clamped against a plurality of juxtaposition flexible cleaning disks 160 or a wire brush 160a also received on rod 154. Spacer collars may be retained on the rod and provided with

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self-contained set screws in order to clamp the plates 158 against the flexible disks disposed therebetween.

A series of the elements 152 may be retained on rod 154, by suitable means as shown in Figure 2, and the rod 154 provided with a forward extension 162 carrying a piston 164 that is slidable in a perforated cylinder 166. The rear end of the cylinder 166 is closed by a guide plug 168 for the rod extension 162, and the cylinder 166 may be filled with a relative light lubricant that will be forced through the perforations in the cylinder 166 as the piston 164 moves longitudinally and rearwardly relative to the cylinder 166. As is clearly illustrated in the drawings the cylinder 166 is of a diameter so as to have only slight frictional contact with the barrel.

A bracket 170 is suitably secured between the members 12 in front of the pivot 120 and carries rollers 172 and 174 against which the pawls 66 and 64 ride. Spring arms 176 and 178 secured to the bracket 20 engage the pawl 64 and 66 and urge the same against the rollers 172 and 174, in order to guide the reciprocating movement of the pawls and retain the same coaxial with the sections to which they are flexibly attached.

In practical use of the present invention, the carriage is slipped into one end of a barrel or conduit B and the roller 110 is pulled rearwardly so that the valve 106 will be positioned as shown in Figure 11. The set screw 132 is tightened in order to force the roller 122 against the inner periphery of the barrel and the tires 78 and 80 against the inner periphery of the barrel. The valve 104 is in its open position so that air under pressure will pass into the cylinder 24 to move the rod 52 and pawl 64 forwardly in order to rotate wheel section 70 counterclockwise. As the rod 52 moves forwardly, the slide valve 136 will be moved to its open position so that air under pressure behind the piston 56 may exhaust, whereupon the spring 60 will return the rod 52 and pawl 64 to their rearward positions.

As the carriage approaches one end of the barrel B, the roller 110 is moved outwardly from the barrel, the arms 108 will swing forward, as shown in Figure 5, pushing the arm 114 rearwardly and moving valve 36 so that air under pressure from the tank 82 will pass into the cylinder 26 in order to move the rod 54 forwardly and pawl 66 also forwardly.

As pawl 66 is moved forwardly it will engage the teeth or ratchet 76 to impart clockwise rotation to wheel section 72 and cause rearward movement of the carriage within the barrel. During forward movement of the rod 54, the slide valve 138 will be moved to its open position to permit the exhaust of air under pressure behind the piston 58, whereupon spring 62 will return rod 54 to its normal position.

It is sufficient for the cleaning operation that the carriage move back and forth one complete cycle. If additional movement of the carriage is necessary in order to effectively clean the interior of the barrel or conduit, then the initial procedure is followed with the member 108 pulled rearwardly against action of the spring 116 before it is inserted into the barrel.

Having described the invention, what is claimed as new is:

1. A rifle cleaning apparatus comprising a relatively small wheeled carriage adapted to be propelled through the bore of a rifle barrel, a cleaning element attached to and supported in front of the carriage, said carriage including a front driving wheel, first and second reciprocable pawls supported on the carriage, a pair of side by side ratchet secured to and concentric with the wheel, the teeth of one ratchet being oppositely inclined relative to the teeth of the other ratchet, one of said pawls adapted to engage one of said ratchets to move the carriage in one direction and the other of said pawls adapted to engage the other of said ratchets to move the carriage in an opposite direction, fluid pressure means connected to said pawls for selectively reciprocating the pawls and including a valve having a first position whereby one of the pawls will be reciprocated and a second position whereby the other pawl will be reciprocated, an operator for the valve adapted to engage the inner periphery of a barrel to hold the valve in its first position, and means connected to the operator for moving the operator to a position for changing the valve to its second position when the operator is moved out of a barrel in which the carriage is moving.

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2. A rifle cleaning apparatus comprising a relatively small wheeled carriage adapted to be propelled through the bore of a rifle barrel, a cleaning element attached to and supported in front of the carriage, said carriage including a front driving wheel, first and second reciprocable pawls supported on the carriage, a pair of side by side ratchet secured to and concentric with the wheel, the teeth of one ratchet being oppositely inclined relative to the teeth of the other ratchet, one of said pawls adapted to engage one of said ratchets to move the carriage in one direction and the other of said pawls adapted to engage the other of said ratchets to move the carriage in an opposite direction, fluid pressure means connected to said pawls for selectively reciprocating the pawls and including a valve having a first position whereby one of the pawls will be reciprocated and a second position whereby the other pawl will be reciprocated, a vertically swingable arm carried by the carriage behind the cleaning element and in front of the wheel, a pitman connecting the arm to the valve, a roller supported by the arm for engaging the inner periphery of a barrel to retain the arm inclined relative to the carriage and the valve in its first position, and a spring connecting the arm to the carriage for urging the arm to a position where the valve will be moved to a second position when the roller is urged out of one end of a barrel.

3. A rifle cleaning apparatus comprising a wheeled carriage including a forward driving wheel, means carried by the carriage for forcing the driving wheel into tight gripping engagement with the periphery of a gun barrel, fluid pressure actuated means operatively connected to the driving wheel for selectively moving the carriage forwardly and rearwardly within a barrel, a cleaning element supported by the carriage in front of the driving wheel, and means operatively connected to the carriage moving means for controlling the direction of travel of the carriage and including a valve and a valve operator, said valve operator being initially disposed within a barrel when the carriage is moving in one direction and said valve operator reversing the valve and hence the direction of the carriage when the valve operator is moved outwardly from one end of a barrel.

4. A rifle cleaning apparatus comprising a wheeled carriage including a forward driving wheel, a cleaning element supported by and in front of the carriage, a pair of side by side ratchets secured to the driving wheel, the teeth of one ratchet being inclined opposite to the teeth of the other ratchet, a pair of spaced parallel cylinders supported longitudinally on the carriage, piston rods slidably carried by the cylinders, pistons secured to the rods and positioned in the cylinders, pawls fixed to the rods, one of said pawls adapted to engage one of the ratchets to rotate the wheel in one direction and the other of said pawls adapted to engage the other ratchet to rotate the wheel in an opposite direction, spring means acting on the pistons and urging the pawls away from the ratchets, means on the carriage for directing fluid under pressure into a selected one of the cylinders to reciprocate one of the rods and including a valve having a first position whereby fluid under pressure will be admitted into one cylinder and a second position whereby fluid under pressure will be admitted into the other cylinder, each of said cylinders having an exhaust port to relieve the fluid behind the pistons, a valve for each port, an operator for each port valve and actuated by the rods during reciprocation of the latter, and means connected to the first named valve for selectively moving the same to its first and second positions.

5. A rifle cleaning apparatus comprising a wheeled carriage including a forward driving wheel, a cleaning element supported by and in front of the carriage, a pair of side by side ratchets secured to the driving wheel, the teeth of one ratchet being inclined opposite to the teeth of the other ratchet, a pair of spaced parallel cylinders supported longitudinally on the carriage, piston rods slidably carried by the cylinders, pistons secured to the rods and positioned in the cylinders, pawls fixed to the rods, one of said pawls adapted to engage one of the ratchets to rotate the wheel in one direction and the other of said pawls adapted to engage the other ratchet to rotate the wheel in an opposite direction, spring means acting on the pistons and urging the pawls away from the ratchets, means on the carriage for directing fluid under pressure into a selected one of the cylinders to

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reciprocate one of the rods and including a valve having a first position whereby fluid under pressure will be admitted into one cylinder and a second position whereby fluid under pressure will be admitted into the other cylinder, each of said cylinders having an exhaust port to relieve the fluid behind the pistons, a valve for each port, an operator for each port valve and actuated by the rods during reciprocation of the latter, a forwardly and rearwardly swingable arm pivoted to the carriage in front of the wheel and behind the cleaning element, a roller carried by the arm for engaging the inner periphery of a barrel, a pitman connecting the arm to the first-named valve to hold the first-named valve in its first position when the arm is inclined in one position, and a spring connecting the arm to the carriage for urging the arm to a second inclined position and the first-named valve to its second position when the roller is moved from one end of a barrel in which the carriage is moving.

6. A rifle cleaning apparatus comprising a wheeled carriage including a forward driving wheel, a cleaning element supported by and in front of the carriage, a pair of side by side ratchets secured to the driving wheel, the teeth of one ratchet being inclined opposite to the teeth of the other ratchet, a pair of spaced parallel cylinders supported longitudinally on the carriage, piston rods slidably carried by the cylinders, pistons secured to the rods and positioned in the cylinders, pawls fixed to the rods, one of said pawls adapted to engage one of the ratchets to rotate the wheel in one direction and the other of said pawls adapted to engage the other ratchet to rotate the wheel in an opposite direction, spring means acting on the pistons and urging the pawls away from the ratchets, means on the carriage for directing fluid under pressure into a selected one of the cylinders to reciprocate one of the rods and including a valve having a first position whereby fluid under pressure will be admitted into one cylinder and a second position whereby fluid under pressure will be admitted into the other cylinder, each of said cylinders having an exhaust port to relieve the fluid behind the pistons, a valve for each port, an operator for each port valve and actuated by the rods during reciprocation of the latter, means carried by the carriage for engaging the inner periphery of a barrel to force the wheel into gripping engagement with the inner periphery of a barrel, and means connected to the first-named valve for selectively moving the same to its first and second positions.

7. The combination of claim 6, wherein said means for forcing the wheel into gripping engagement with the inner periphery of a barrel includes a swingable holding element, a roller carried by said holding element, a lever pivoted to the carriage for forward and rear swinging movement, a link connecting the holding element to the lever, and means on the carriage engaging and pivotally adjusting the lever to force the roller carried by the holding element against the inner periphery of a barrel.

8. The combination of claim 6, and a bracket secured to the carriage between the pawls, rollers on the bracket against which the pawls ride, and spring arms attached to the carriage engaging and urging the pawls against the rollers on the bracket to guide the pawls during their sliding movement.

9. A rifle cleaning apparatus comprising a relatively small wheeled carriage adapted to be propelled through the bore of a rifle barrel, a cleaning element attached to and supported in front of the carriage, said carriage including a front driving wheel, means supported on the carriage and operatively connected to the front wheel for selectively driving the wheel in one direction or the other, and an operator for said driving means for retaining the driving means active for driving the wheel in one direction while the operator is within a barrel and for retaining the driving means active for driving the wheel in an opposite direction once the operator has been exposed from one end of a barrel in order to move the carriage back into the barrel, said cleaning element including a forwardly extending rod disposed longitudinally of the carriage, a piston secured to the forwardly extending rod, a perforated cylinder slidably receiving the piston and rod therein and adapted to contain a lubricant that will be forced through the perforations as the piston is moved within the cylinder.

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