

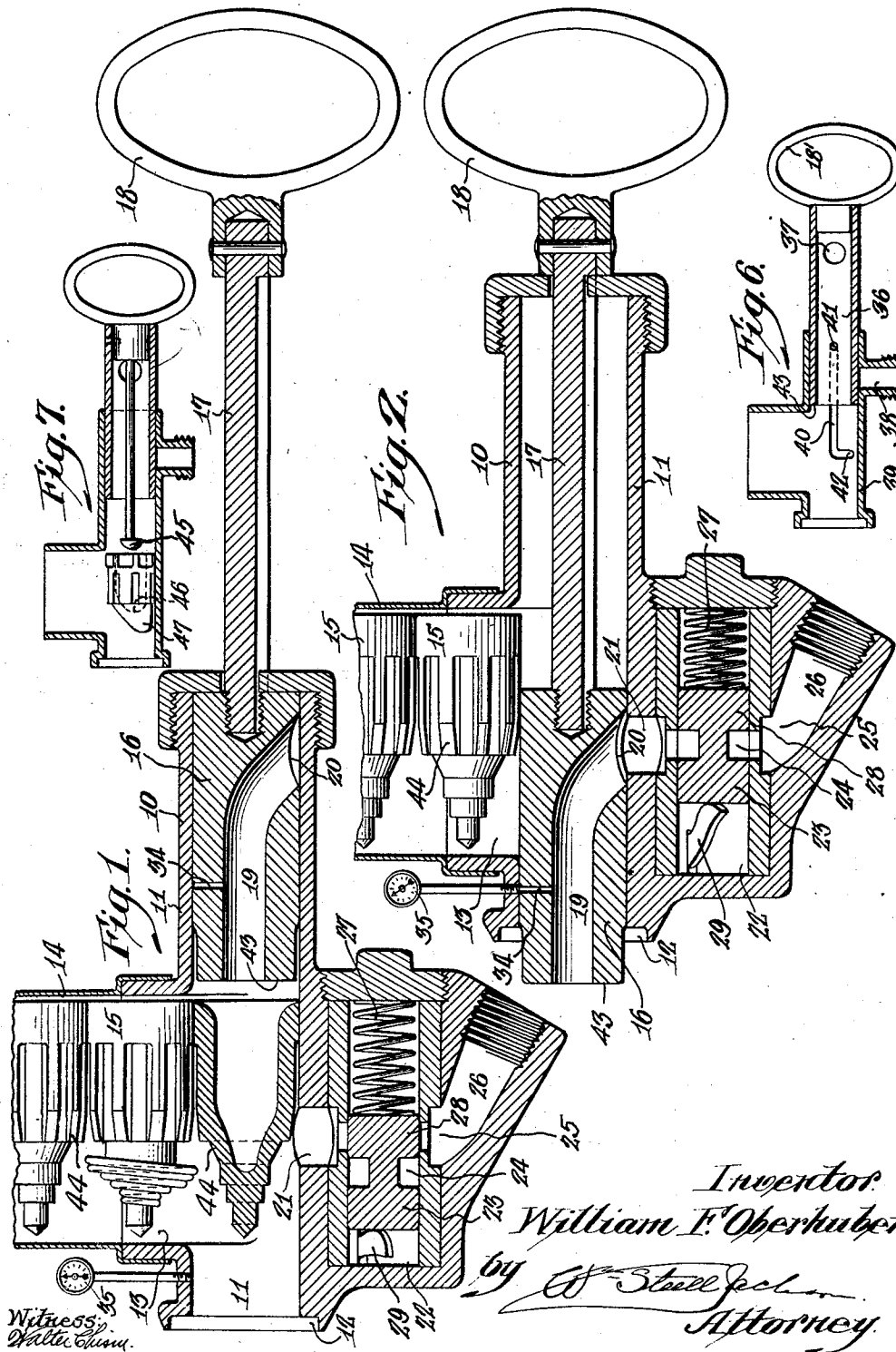
July 14, 1931.

W. F. OBERHUBER  
GUN FOR DRIVING SLUGS

1,814,766

Filed Feb. 6, 1929

2 Sheets-Sheet 1



Witness  
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Inventor  
William F. Oberhuber  
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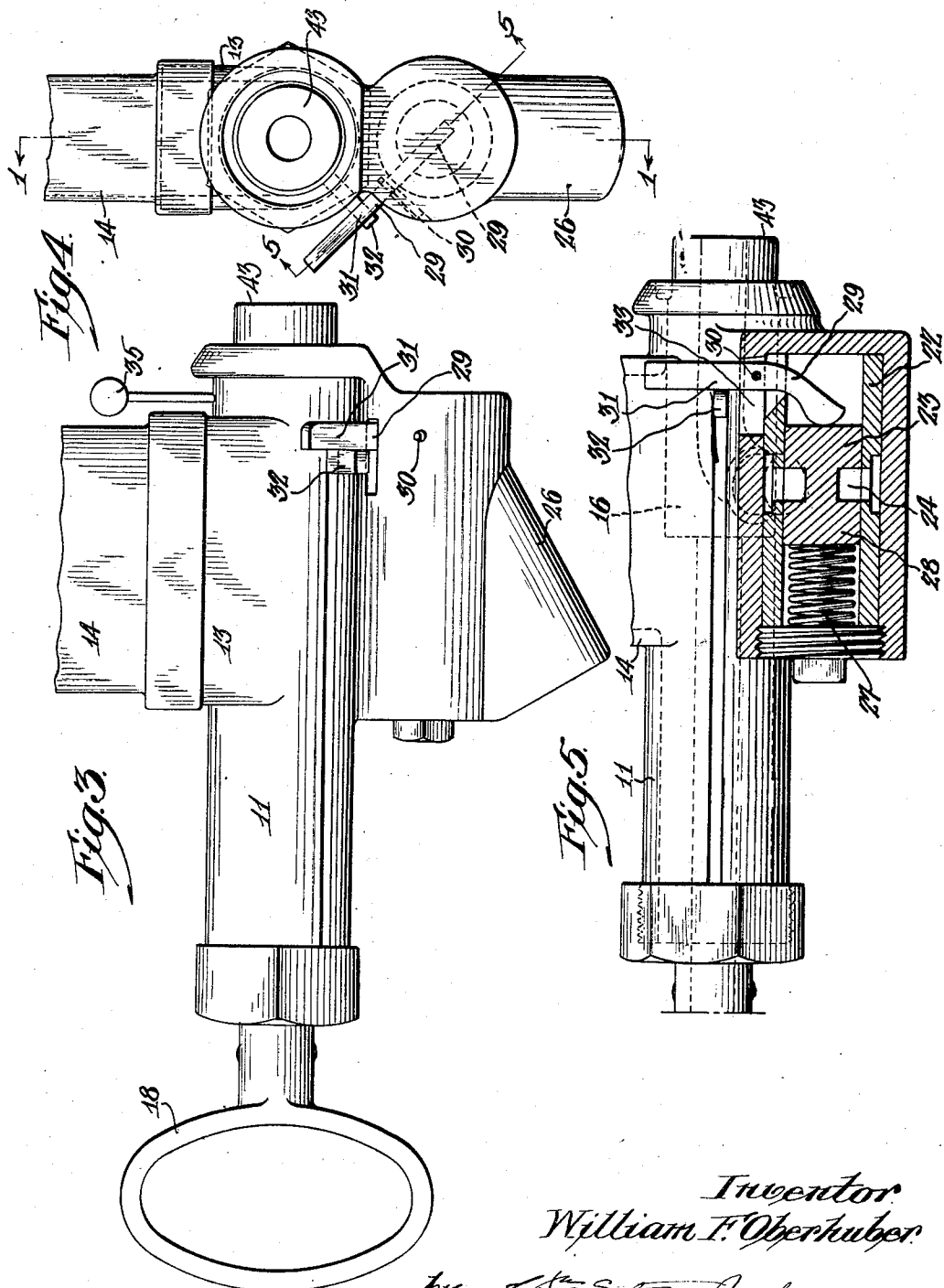
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# UNITED STATES PATENT OFFICE

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## GUN FOR DRIVING SLUGS

Application filed February 6, 1929. Serial No. 333,012.

My invention relates to a magazine gun for charging cleaning slugs into condenser tubes.

A purpose of my invention is to provide a gun of the character indicated that will be inexpensive to manufacture, easy to operate and that will well meet the needs of service.

A further purpose is to mount a magazine of slugs above the barrel of a charging gun member and to charge the slugs from the magazine successively into a condenser tube by reciprocating the nozzle of a plunger that is adapted to admit air pressure back of each slug in its forward position and to shut off the air during each return stroke.

A further purpose is to combine a charging plunger with an air inlet valve so that the valve is open when the plunger is in its forward position and closed when the plunger is retracted. I may operate the control of the driving air by either the forward movement of the charging plunger or by a rotary movement of the plunger after it has reached its forward position.

A further purpose is to provide for engagement between a charging plunger and a slug at near the front end of the slug in order to avoid bulging of the slug when it is being charged into a tube.

Further purposes will appear in the specification and in the claims.

I have elected to show a few only of the many forms of my invention, selecting forms that are convenient and efficient in operation and which well illustrate the principles involved.

Figure 1 is a longitudinal section through one form of gun embodying my invention, being a section taken from the line 1—1 of Figure 4.

Figure 2 is a fragmentary portion of Figure 1 but showing a plunger valve in advanced position, whereas in Figure 1 the same valve is shown in retracted position.

Figure 3 is a side elevation of the structure shown in Figure 2 but looking in the opposite direction from that of Figure 2.

Figure 4 is an end view of Figure 3.

Figure 5 is a section taken upon the line 5—5 of Figure 4.

Figures 6 and 7 are longitudinal sections to reduced scale of somewhat different forms.

Like numerals refer to like parts in all figures.

Describing in illustration and not in limitation and referring to the drawings:—

In the past the cleaning of surface condenser tubes by swabbing them out with rubber slugs driven through the tubes by means of compressed air has been an operation taking a very considerable amount of time, and labor that is intended to be greatly reduced by the present invention.

It will be understood that in operating surface condensers, cooling water flowing through the condenser tubes deposits sludge or soft scale upon the interiors of the tubes. These deposits lessen the efficiency of condensation by lessening the effectiveness of heat transmission from the steam upon the outside of the tubes to the cooling water flowing inside the tubes.

In some conditions the deposits upon the inside of the tubes are relatively hard and in this event, each slug desirably carries a spring at the front, one or more turns of the spring upon each travelling slug making a resilient engagement around the inside of the tube to scrape off the adhering deposit, preferably a stream of the driving fluid, usually water, if a spring is used, escaping from the rear end of the slug to carry away the loosened deposit from in front of the moving slug. One of the slugs contained in the magazine of Figure 1 is seen to be provided with a spring scraper, attached to the nose, as shown in my co-pending application for slugs for cleaning condenser tubes, Ser. No. 338,675, filed February 9, 1929. Any of the slugs used may be of this type or of the type not provided with a spring, or of any other suitable form.

The slugs that carry springs are usually driven through the tubes by means of water pressure and move relatively slowly while those that are driven through the tube without the spring are more usually driven by

air pressure, and move through the tubes usually at high velocities.

My invention is best adapted to the rapid insertion and transmission through the tubes of successive air driven slugs, by far the greater number of the slugs being of this character.

In the structure shown in Figures 1 to 5 a gun member 10 includes a barrel 11 having at its forward end a nozzle 12 formed to fit over a tube end.

The barrel has a charging opening 13 at its upper side and carries a magazine 14 that is adapted to carry any desired number of slugs 15, for example a dozen or more or conveniently as many slugs as there are to be sent through a single tube.

A plunger and valve member 16 is mounted inside the barrel to be reciprocated by a rearwardly extending stem 17 having an operating handle 18.

The plunger is a combination ram for pushing in the successive slugs and valve member for passing in the driving air and is provided with an interior conduit 19 having an outlet at the forward end of the plunger and a bottom inlet near the rearward end at 20.

When the plunger is in its forward position, that shown in Figure 2, the inlet end 20 of the interior conduit through the plunger registers with an outlet 21 from a valve member 22 which is normally spring pressed toward closure.

The valve member 22 is shown as of the piston type, a piston member 23 having a circumferential groove 24 that is adapted to provide conduit connection between the outlet 25 of a connection 26 to high pressure air and the outlet 21 from the valve member.

Normally the piston 23 is spring pressed forwardly by a spring 27 into a position at which the valve is closed by a rearward portion 28 of the piston.

The piston is adapted to be pushed rearwardly into open position by a rocker member 29 which is pivoted at 30 and presents an operating arm 31 in the path of a projecting member 32 from the plunger 16.

The rocker member 29 controlling the position of the piston valve is mounted in a slot 33 through the wall of the cylinder encasing the valve member, one arm of the rocker member being presented against the forward face of the piston while the other arm extends out of the slot across the path of the projection 32 from the plunger 16.

When the plunger is pushed forward the projection 32 engages the arm 31 at near the end of the forward stroke and moves the piston rearwardly against the spring 27 and opens the air supply to the conduit through the plunger.

Preferably the upper side of the plunger is perforated at 34 and a gauge 35 is connected

upon the outside of the barrel to register the pressure back of the slug when the plunger is in its forward position.

This gauge shows the operator the pressure of air that is driving the slug through the tube. Sudden drop in the indicated pressure will show an operator that the slug has passed through the tube while maintenance of the operating pressure will indicate that the slug has not yet completed its travel through the tube.

It will be understood that in operation an operator reciprocates the operating handle while maintaining contact between the discharge end of the gun and the open end of the tube by pressing the gun against the tube end, with the barrel of the gun alined with the tube.

In the form of gun shown in Figures 1 to 5 the end portion of each forward stroke of the operating handle is made against the air pressure that drives the slug through the tube. While this is no particular hardship for an able-bodied operator, it produces a rearward kick against the forwardly moving arm of the operator that has been eliminated in the form shown in Figures 6 and 7.

In the form of Figure 6 the plunger is a piston valve 36 having an inlet 37 that is adapted to register with an air supply pipe 38 after the plunger has reached the forward end of its stroke provided the plunger is given rotary movement upon its own axis to bring the inlet in registry with the air supply pipe.

The barrel 39 is longitudinally slotted at 40 and a pin carried by the plunger extends through and slides along this slot, the stroke of the plunger being limited rearwardly by the engagement of the pin with the rearward end of the slot and limited on its forward stroke by the pin reaching the circumferential portion 42 of the slot.

Until the handle 18' of the plunger is given a rotary movement to turn the plunger in the barrel, a movement that is permitted by the registry between the pin and the circumferential portion of the slot, air cannot enter the barrel.

As a result, the forward movement of the plunger is completed before the air is admitted to the barrel and during the admission of air to the barrel the plunger is locked from rearward movement by the pin and slot connection at the circumferential portion of the slot.

The magazine may be substantially the same as in the form shown in Figures 1 to 5. The slugs are not shown in Figure 6 but are inserted in the magazine after which each forward stroke of the handle 18' delivers the slug that is already in the barrel below the magazine into the end of the open tube against which the gun is being held, and the

return stroke permits another slug to enter the barrel from the magazine.

It will be seen that in Figure 6 and in Figures 1 and 2 the engagement between the plunger and the slug is around the forwardly presented annular surface 43 presented by the forward end of the plunger to the corresponding annular surface presented by the rear end of the slug. In Figures 1 and 2 I show slugs that forwardly taper at 44 near the forward end of the body portion of the slug.

This taper insures an easy admission into the tube and avoids any danger of difficulty in pushing the slugs straight into the tube even when the body portion of a slug is pushed into a tube by engagement at its rearward end with the plunger surface 43.

In Figure 7 I provide the plunger with a forwardly extending push member 45 which enters the interior of the slug and engages the slug at 46 near the forward end of the slug, and preferably beyond the forward end of the body portion of the slug. The hollow interior of the slug is shown dotted in Figure 7, and is also seen in the broken rearward portion of one of the slugs contained in the magazine of Figure 1.

This engagement near the forward end of the slug results in the body of the slug being pulled rather than pushed into the tube, the pulling being effected by the forward portion 47 of the slug which is in turn pushed by the head of the push member.

The slug shown in Figure 7 is not provided with taper approach at the forward end of the body but enters the tube easily by reason of being engaged near the forward end of the slug instead of near its rearward end, that is by reason of being pulled as distinguished from being pushed into the tube.

The form of gun shown in Figure 6 relieves the plunger and therefore the arm operating the plunger from any kick with respect to the body of the gun during the forward movement of the plunger but obviously does not relieve the gun barrel itself from a rearward kick when the air is turned on after the plunger has been locked in forward position, but it will be seen the kick is against the barrel of the gun and need not be supported by the forwardly moving arm of the operator, being much more easily withstood by the operator merely throwing his weight against the gun to maintain it in position during the period that the slug is passing through the tube, or obviously if desired this kick may be supported by providing any suitable means for holding the gun in place until a sufficient number of slugs has been passed through a single tube.

In operation, the magazine is filled with the desired number of slugs, the forward end of the gun is applied to the inlet end of the condenser tube with the barrel of the gun

aligned with the tube, and the operating handle is worked up and down, each forward movement of the handle pressing a slug into the open end of a tube and admitting air pressure back of the slug to drive the slug through the tube and each rearward movement of the handle permitting another slug to move down into the barrel in front of the plunger.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such in so far as they fall within the reasonable spirit and scope of my invention.

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

1. A gun for use in passing slugs through condenser tubes or the like, comprising a barrel having a discharge end adapted to seal against and register with the open end of a tube, and having a lateral opening near its discharge end adapted to pass a slug into the barrel, a plunger adapted to be reciprocated in the barrel so that its forward end moves forwardly and rearwardly past the opening, and means for using the forward and rearward movement of the plunger to admit fluid pressure to the front face of the plunger when the plunger has reached an advanced position and to close it from said fluid pressure when the plunger is in rearward positions.

2. A gun for use in passing slugs through condenser tubes or the like, comprising a barrel having a discharge end adapted to seal against and register with the open end of a tube and having a lateral opening near its discharge end, a plunger adapted to be reciprocated in the barrel past the opening and having an interior passage with lateral inlet and front outlet and a valved fluid pressure connection into the barrel located to register with the lateral inlet of the passage in the plunger when the plunger is advanced to a position in which its forward end is beyond the said lateral opening.

3. A gun for use in passing slugs through condenser tubes or the like, comprising a barrel having a discharge end adapted to seal against and register with the open end of a tube and having a lateral opening near its discharge end, a plunger adapted to be reciprocated in the barrel so that its forward end moves forwardly and rearwardly past the opening and having an interior passage with lateral inlet and front outlet, a fluid pressure connection into the barrel located to register with the lateral inlet of the passage in the plunger when the plunger is advanced to a position in which its forward end

is beyond the said lateral opening, and a valve in said connection normally closing the fluid pressure from the barrel in combination with means for opening the valve by the forward movement of the plunger.

6 4. A gun for use in passing slugs through condenser tubes or the like, comprising a barrel having a discharge end adapted to seal against and register with the open end of a  
10 tube and having a lateral opening near its discharge end, a plunger adapted to be reciprocated in the barrel so that its forward end moves forwardly and rearwardly past the opening and having an interior passage with  
13 lateral inlet and front outlet, a fluid pressure connection into the barrel located to register with the lateral inlet to the passage in the plunger when the plunger is advanced to a  
20 position in which its forward end is beyond the said lateral opening, in combination with a valve in said connection spring-pressed toward closure, and a lever adapted to retract the valve and to be operated by the forward  
23 movement of the plunger to open the valve when the plunger is reaching its said position of registry.

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