Oct. 31, 1944. G. SNEDDON, JR 2,361,660

APPARATUS FOR BLOWING SCALE FROM PIPES

Filed Sept. 24, 1941 3 Sheets-Sheet 1

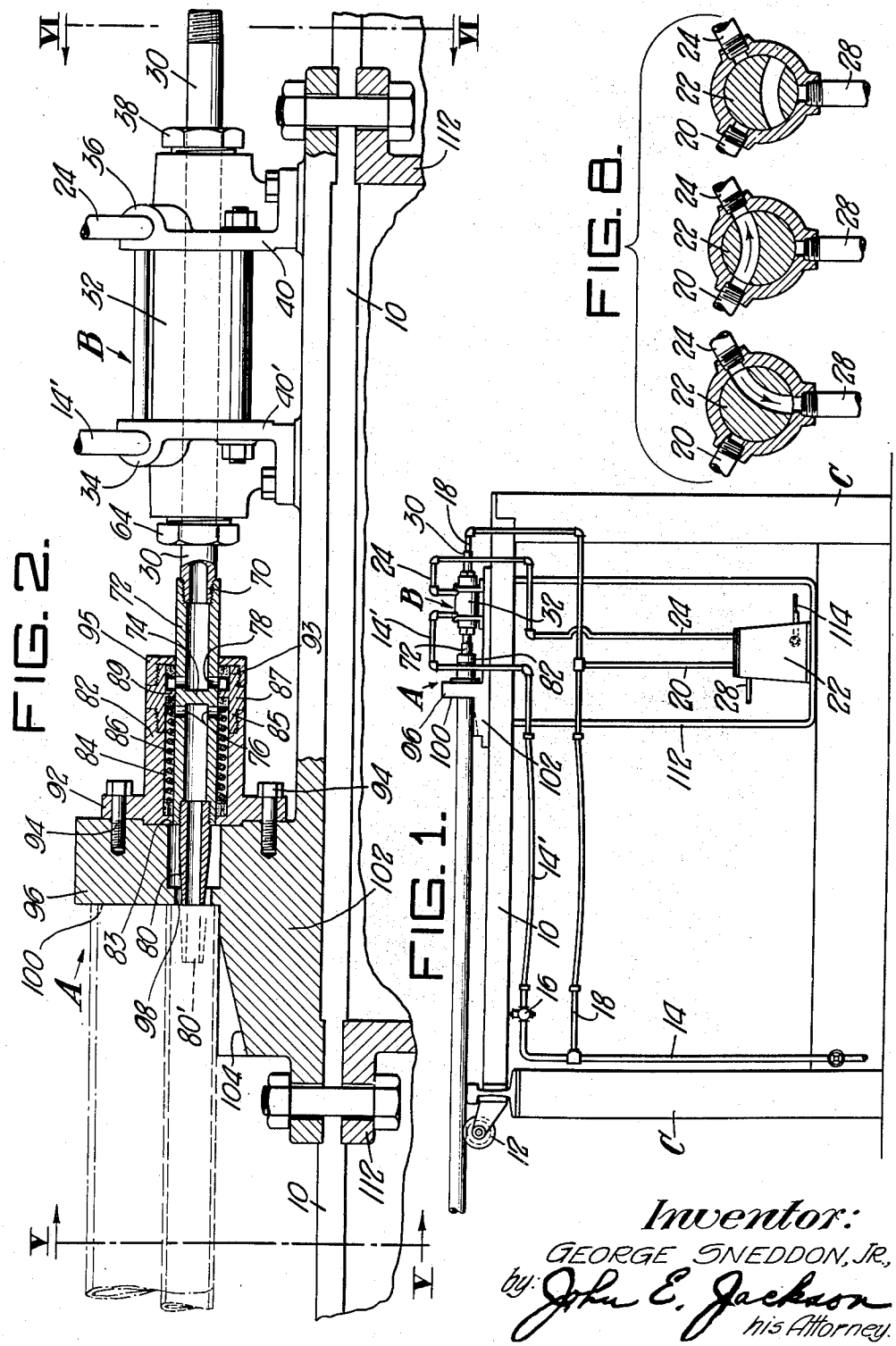


FIG. 2.

FIG. 1.

FIG. 8.

Inventor:
GEORGE SNEDDON, JR.,
by: John E. Jackson
his Attorney.

Oct. 31, 1944. G. SNEDDON, JR 2,361,660

APPARATUS FOR BLOWING SCALE FROM PIPES

Filed Sept. 24, 1941 3 Sheets-Sheet 2

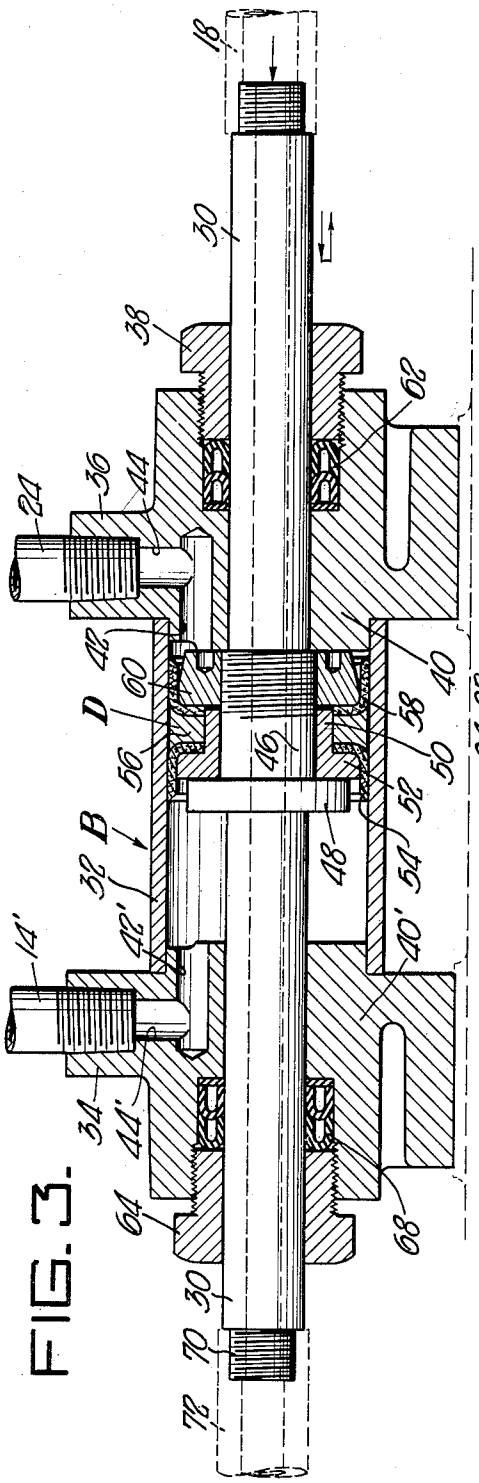


FIG. 3.

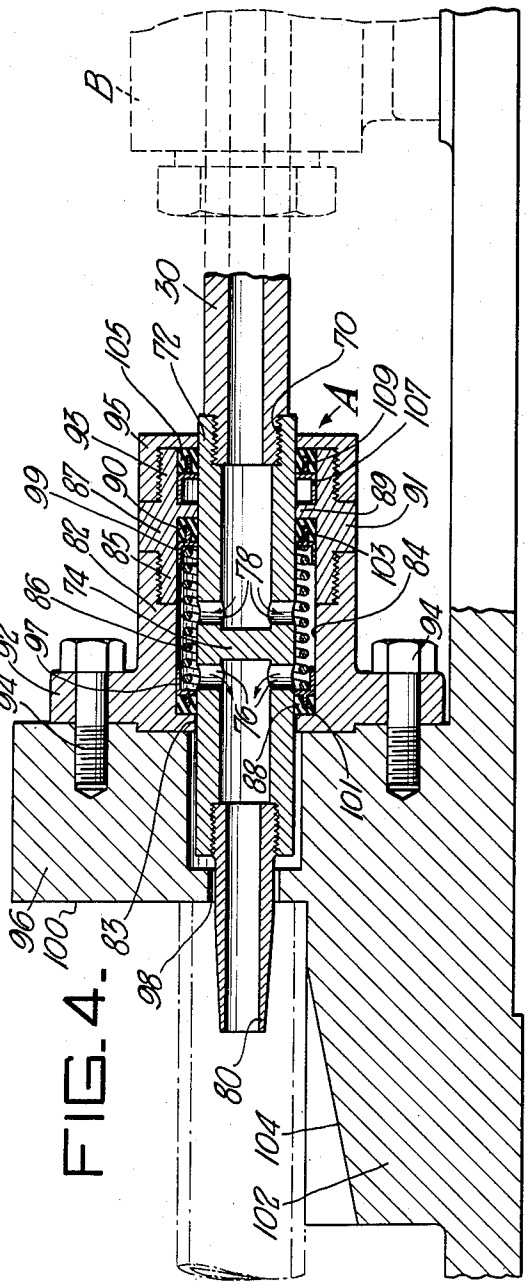


FIG. 4.

Inventor:
GEORGE SNEDDON, JR.,
by: John E. Jackson
his Attorney.

Oct. 31, 1944. G. SNEDDON, JR 2,361,660

APPARATUS FOR BLOWING SCALE FROM PIPES

Filed Sept. 24, 1941 3 Sheets-Sheet 3

FIG. 5.

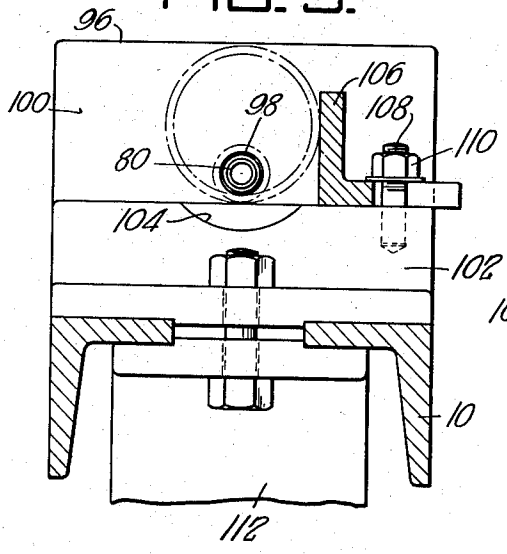


FIG. 6.

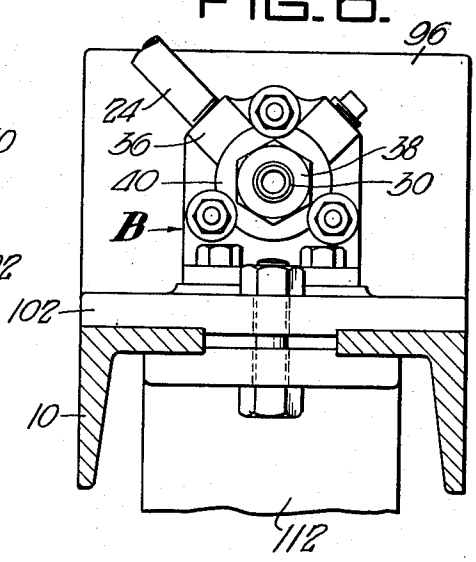
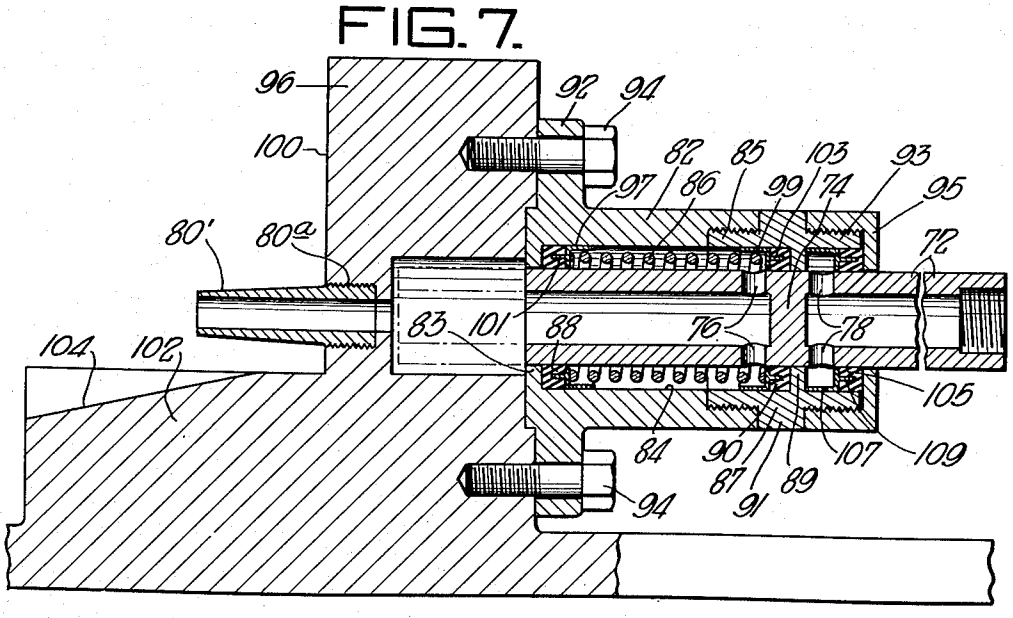


FIG. 7.



Inventor:
GEORGE SNEDDON, JR.,
by: John E. Jackson
his Attorney.

Patented Oct. 31, 1944

2,361,660

UNITED STATES PATENT OFFICE

2,361,660

APPARATUS FOR BLOWING SCALE FROM PIPE

George Sneddon, Jr., McKeesport, Pa., assignor to National Tube Company, a corporation of New Jersey

Application September 24, 1941, Serial No. 412,167

3 Claims. (Cl. 15—104.055)

In accordance with the present invention, there is provided improved mechanism for removing scale or the like from steel surfaces. The formation of this scale is a well-known occurrence, it resulting principally from oxidation of the surfaces during the treating and shaping of the steel. This scale may be attached firmly to the steel surface, or it may become loosened or dislodged during handling. Its presence is undesirable both to manufacturer and to consumer.

Where the scale is in the interior of pipes or similar tubular objects, the detached portions of the scale, with at least a substantial amount of other loosened scale, may be blown out with a jet of air passing under pressure through the interior of the pipe, the air being introduced from a nozzle inserted into the pipe and attached to one end of a flexible hose. The air supply to the nozzle is controlled by a hand-operated valve with a pistol grip and trigger grip.

Specifically, the present invention relates to the above-indicated type of equipment, it providing certain improvements in the nozzle construction and control instrumentalities, as will be pointed out in greater detail hereinafter.

Further objects of the invention will be apparent as the description proceeds, and the features of novelty will be pointed out in particularity in the appended claims; and it will be understood that the specific embodiments of the invention as are described and illustrated herein are intended only by way of illustrating one form of the invention which is subject to various alterations, modifications, or rearrangement of parts as may become necessary to adapt the invention to varying conditions and uses, as defined by the appended claims.

The invention will be understood more clearly by reference to the accompanying drawings, in which:

Fig. 1 represents an assembly view of the improved apparatus, indicating diagrammatically fluid control circuits for the mechanism;

Fig. 2 represents a side elevation of the apparatus partially in section, showing details of the nozzle assembly;

Fig. 3 represents a longitudinal sectional elevation of the actuating cylinder showing details of construction;

Fig. 4 is a longitudinal sectional elevation of the nozzle assembly, the view being on a larger scale than in the showing of Fig. 2, and showing the nozzle in operative position;

Fig. 5 is a sectional elevation of the left-hand end of the machine as viewed in Figs. 2 and 4, the view being taken on the section line 5—5 of Fig. 2, looking in the direction of the arrow;

Fig. 6 is a similar view of the right hand end of the apparatus, the view being taken on the line 6—6 of Fig. 2 looking in the direction of the arrows;

Fig. 7 is a view similar to Fig. 4, but showing a modified nozzle assembly;

Fig. 8 is a diagrammatic view illustrating the action of a control valve forming a part of the improved apparatus of this invention.

Referring more particularly to the drawings, it will be observed that the machine of the present invention comprises a nozzle assembly which is indicated generally at A and an actuating assembly B. This actuating assembly B is adapted to receive compressed air from suitable air lines such as are shown in Fig. 1, to which detailed reference may now be made.

It will be seen that the mechanism of the present invention is mounted on an operating table which is indicated generally at C and which is composed of a suitable number of rails on the top of which, as indicated at 10, is inclined, so that the pipes or other articles to be treated may roll to the treating station. Suitable rollers, one of which is illustrated at 12, are provided, each of the rollers preferably being provided with anti-friction bearings. These rollers facilitate the handling of pipe and contribute to the speed of the operation.

The air supply line is indicated at 14, in which is posted a pressure regulator 16 which is adapted to maintain a constant pressure in the actuating assembly B, which will be described hereinafter. A flexible pipe 14' connects the pressure regulator 16 to the actuating assembly B.

A pipe 18 connects into the pipe 14, a branch 20 leading from this pipe 18 into a three-way valve which is indicated generally by the reference number 22. The valve 22 is provided with a pipe 24 which connects with the actuating assembly B for the purpose hereinafter set forth. Also, the valve 22 is provided with an additional pipe indicated generally 28, the operation of which is indicated diagrammatically in Fig. 8, which view shows the pipes 20, 24 and 28 as joining in the valve. These pipes are all controlled by the three-way valve 22, which may be any suitable standard three-way valve, the operation thereof being shown only in a generally diagrammatic manner in Fig. 8.

The pipe 18 is connected to a supply pipe 30 which enters the actuating assembly B through the right end thereof, when viewed as in Fig. 2, for example. This pipe 30, therefore, is connected to the main supply line 14, and is adapted to deliver the full line pressure to a nozzle assembly A. The line 24 from the valve 22 enters the right hand portion of the actuating assembly B at the top thereof, as viewed in Fig. 2, while the line 14' enters the left hand portion of the actuating assembly B, and is adapted to deliver air under constant pressure to the left hand portion of the actuating assembly. Pipe lines 14', 18, 20, and 24 are all flexible, the reason for which will become apparent hereinafte

The actuating assembly now will be described in detail, and for this purpose reference may be made to Fig. 3.

It will be seen from this view that the actuating assembly includes a housing 32 provided with bushings 34 and 36 into which the pipes 14' and 24 conveniently are threaded.

It will be seen further that the pipe 30 passes through a screw-plug 38, and through a bearing portion 40 of the housing, this portion being a casting having a hole through which the pipe 30 passes. Also, the bearing portion 40 of the housing is provided with a hole 42 which is machined, as shown, part way through the casting and communicates with a hole 44 into which the pipe 24 opens, the resulting juncture making a duct which extends through the casting for supplying air from the valve 22 into the actuating assembly B and behind a plunger head assembly D, which operates in a piston chamber referred to in more detail hereinafter.

This assembly comprises a sleeve 46 provided with a flange or collar 48, the sleeve and collar being fitted over the pipe 30 and retained suitably thereon, as by shrinking the sleeve on the pipe. The sleeve 46 also is provided with an enclosing sleeve 50 having a flanged abutment collar 52 which is adapted to engage the collar 48 and defines a retaining flange or seal for a suitable yieldable packing 54. This packing 54 is held in place by a ring 56, against which is secured a second similar washer 58, by means of a collar 60, which is threaded on the pipe 30 and is positioned against the sleeves 46 and 50 and the ring 56 so as to secure the resulting assembly in tightly assembled relationship.

The plug 38 retains suitable packing 62 in position which may be impregnated with graphite or other lubricant, and forms an additional seal against air leakage; this packing thereby facilitating the movement of the pipe 30.

This construction is duplicated in the other end of the actuating assembly. Pipe 14' enters a hole 44' which communicates with a hole 42' in casting 40' thereby forming a duct for admitting air into the plunger chamber under substantially constant pressure, this chamber being the space between the bearing castings 40 and 40', this chamber being divided into forward and rear compartments by the plunger head assembly D.

A screw-plug 64, similar to plug 38 has likewise an annular hole through it through which hole the pipe 30 is passed. The plug 64 retains packing 68 in place, this packing being similar to the packing 62.

It will be seen that since pipe 14' receives air automatically maintained under substantially constant pressure, such air under constant pressure is transmitted into the forward compartment of the plunger chamber, so that the plunger head assembly D always works against this pressure as a cushion.

Likewise, air is admitted under pressure through the pipe 24 into the rear compartment of the plunger chamber. However, this air passes through the three-way valve 22, and consequently, under the manual control of the operator of the machine, who can build up and release at will the pressure in this rear compartment so as to maintain a positive or negative pressure differential with reference to the constant pressure in the opposing chamber. This causes the plunger head assembly to move towards the chamber containing the less pressure. This movement moves the pipe 30 accordingly, and the purpose of this forth and back or reciprocating movement will become apparent as the description proceeds.

Now if, for example, the valve 22 is open so as to supply a pressure of 100 lbs. through the pipe 24, and behind the collar 60, while the line 14 is supplying a constant pressure of, for example, 50 lbs. through line 14' because of the action of pressure regulator 16, it will be seen that the entire plunger assembly D and the pipe 30 will be moved to the left as viewed in Figure 3, the flexible hose 18 allowing this movement, which is cushioned because of the air being admitted through the pipe 14'.

The pipe 30 is threaded as is shown at 70 for the attachment of a valve section 72, which in practice forms a continuation of the pipe 30. However, the section 72 is divided internally into two compartments by a partition 74 which extends across the inside of the section, and blocks the flow of fluid through this section. Ports, however, are provided, as are indicated at 76 and 78, on both sides of this partition. A nozzle 80 is threaded into the free end of the section 72.

Enclosing a portion of this section is a sleeve 82 which is provided at one end with an internal flange 83 which spaces the sleeve 82 away from the valve section 72, and forms a space 84 around the section 72. The section 72 therefore is a sliding valve plunger.

The other end of the sleeve 82 is recessed and threaded, and receives an annular shoulder 85 of a retaining ring 87. This ring 87 has an internal annular flange 89 which corresponds in depth to the flange 83, and an upstanding annular web 91 which abuts against the end of the sleeve 82. Shoulder 93 of the ring 87 is threaded and receives a retaining cap 95.

At each end of the space 84 there is provided a layer of suitable packing 88, 90, each layer being sufficiently thick to form an effective seal against air leakage from the said space. A coil spring 86 is compressed between these layers of packing sufficiently to retain the packing positively in position without displacement as the sliding part 72 reciprocates during operation of the apparatus. The spring 86 abuts against retaining members 97, 99, these retaining members being anchored by a thin flange 101, 103 retained in the packing. Packing 105 also is retained in place around the cap 95 by a suitable resilient washer 107 which has a flange 109 anchored in the packing.

The housing 82 is provided with a flange 92 which is secured by screws 94 to a second housing 96 which constitutes the nozzle housing. The nozzle 80 extends into this housing 96, and when in inoperative position, it is substantially flush with the outer face of the housing.

The face 100 of the housing 96 comprises a target against which the pipe is placed for blow-

ing. It will be observed from Fig. 5 that the nozzle 80 extends into a hole 98 which is positioned towards the bottom of the target faces 100 of the housing. This enables the accommodation of pipes of widely different diameters at the nozzle 80 for the blowing operation.

It will be seen that the housing 96 is provided with a heavy base 102, the front of which has a conical concave depression 104 cut into it. This forms a guide for the pipe to be blown and enables the pipe to be placed easily and directly at the proper position at the target face 100 to admit the blowing nozzle into pipe. Suitable pipe guides such as indicated at 106 and Figure 5 may be provided on the mounting frame, adjustment, therefore, being provided by a bolt 108 and nut 110, which allow the guide 106 to be positioned at the proper adjustment for a given size of pipe being treated.

It will be seen also that top frame members 10 define ways upon which the entire assembly may travel. The valve 22 is shown as being mounted in a bracket 112 and is actuated by a treadle 114, which treadle is operated by the operator placing his foot upon it. The bracket 112 is movable along with the machine and pipes, and to allow the air lines to accommodate themselves unrestrictedly to this movement, flexible air hose is used between the main air supply line 14 and all working air connections.

Fig. 8 shows diagrammatically how the valve operates, and from this view it will be seen that when in closed position the valve 22 maintains the supply line 20 closed, and also the outlet line 24. When the treadle 114 is depressed, lines 20 and 24 are brought into communication so that air from the flexible hose 18 will pass through hose 20 into hose 24 and thence into the rearward compartment of the actuating assembly B. With an air pressure of 100 lbs. per sq. inch, for example, being maintained in the line 14, the opening of the valve 22 will deliver substantially 100 lbs. per sq. inch of pressure into this rearward compartment of the actuating assembly. At the same time, hose 14' is delivering air at 50 lbs. pressure into the forward compartment of the air cylinder, this air being maintained automatically under substantially constant pressure.

The pipe 30, therefore, acts as a plunger which is controlled by the actuation of the three-way valve 22 which in turn is under manual (i. e., pedal) control of the operator. When, in accordance with the example, the operator manipulates the valve 22 to feed into the rear cylinder compartment air under 100 lbs. pressure, this air acts in opposition to the air under 50 lbs. pressure in the forward cylinder compartment. This pressure differential moves the plunger head assembly D towards the left as viewed in Fig. 3.

This action moves pipe 30 to the left, and also the slide-valve plunger 72, displacing the latter towards the left until ports 78 pass under flange 89, and, therefore, are brought into communication with each other through the space 84, thus allowing air under the line pressure to be blown through nozzle 80, which in the construction of Fig. 2 has been moved out from the housing into projecting position 116 in the pipe to be treated.

It will be seen that the control valve for the nozzle is free from manually operated parts, but on the contrary, its only moving part is the plunger 72 which is actuated by actuation of the remote valve 22.

When the operator removes his foot from the treadle 114, valve 22 operates to bring lines 24 and 28 into communication, closing line 20. This releases the air in the rearward compartment of the assembly B and causes the pressure entering through the line 14', which in the illustration is maintained constant at 50 lbs., to force the assembly D and pipe 30 backwards and places the nozzle in retracted or idle position. The air used in blowing the scale is direct line, or mill, pressure, usually about 100 lbs. per sq. inch.

It will be understood that in the course of production the mill is called upon to cut random and fixed lengths of pipe. Thus, in the present installation, the next operation following the scale blowing may be a sawing operation for the purpose of simply removing crop ends of random length pipe, or for the sawing of pipe to accurate fixed lengths.

Thus, under certain circumstances, it is essential that the pipe leave the position of the scale blowing and approach the saws in a very uniform and definite formation or alignment. This result is accomplished in the present case, by so mounting the machine that the scale blowing apparatus is moved bodily along suitable ways as will be understood from the accompanying drawings. As will appear from the foregoing, this movable feature includes the housing, the main air valve, the air cylinder, and the foot valve.

The operating table shown in the drawings consists of several parallel steel rails over which the pipe supply rolls. As the pipes approach the scale blowing machine, the operator grasps each piece by hand and places it against the target face of the housing for application of the air jet to the pipe. The rollers with anti-friction bearings are installed on the said rails in line with the scale blowing machine, the rollers facilitating the handling of the pipe and contributing to the speed of the operation.

Thus the foregoing construction enables the pipe to be suitably aligned against the face of the housing, and subsequent performance of the next operation on the pipe. The construction described above allows the pipe to leave the position of scale blowing and approach the saws in a very uniform and definite formation or alignment, as has been pointed out above.

This alignment is an important consideration, particularly where the pipes are to be finished by butt-welding them together. In this procedure, crop ends of the pipe are removed by high speed circular saws. It is customary to cut off more of the tong end of the pipe than of the back end, since the tong end is rough and irregular, while the back is square and can be welded better. The practice varies, but the average length of crop is about 2½ inches for the back end and 15 inches for the tong end. Pipe is carried by crane from a cooling table to a straightening machine, thence to saw table, and laid thereupon with the back end towards the operator. Here it is rolled out piece by piece by the operator, placed against the target of the scale blower, and the scale removed. The pipe is then advanced to the saws by means of an endless chain conveyor without longitudinal displacement. Thus, by predetermining the position of the target at the scale blower in reference to the leading saw the operator is able to advance the pipe forward to the saws and cut any length of crop end desired. The second saw is placed rearwardly of the first saw and removes the crop from the tong end, thereby cutting the pipe to any required length.

Random lengths of pipe are made by spacing

the saws at a greater distance than the maximum length of finished pipe, cutting off one end of the pipe, and then manually shifting the pipe by quick visual inspection and cutting off the second or tong end.

For such purposes, it may be unnecessary to align the ends evenly and consequently a protruding, nonreceding nozzle may be employed for performing the scale blowing operations.

This form of the device is illustrated in Fig. 7, wherein the nozzle **80'** is threaded as is indicated at **80a** into the housing **96** instead of into the sliding valve section **72**, the nozzle **80'** therefore being nonretractable. The valve section **72** is otherwise the same in construction and operation as has been described above and the same reference characters are used to represent corresponding parts.

I claim:

1. Apparatus for blowing scale or the like from metal pipes, which comprises the combination with a mounting platform, of an elongated integral base plate secured to the platform, a rigid upstanding abutment member integral with the base plate and having an opening therethrough, the said abutment member having an outer side and an inner side, the outer side of the said abutment defining an upwardly sloping guide surface terminating adjacent to the said opening and adapted to guide different sizes of pipes to the said opening, a nozzle in the said opening, a valve housing removably secured to the inner side of the said abutment member, a slide valve member in the said housing for controlling a supply of compressed air for the nozzle, the said slide valve member comprising a movable part of the control valve for the compressed air and the housing a complementary fixed part, means for supplying compressed air to the nozzle under line pressure, actuating instrumentalities for the valve operable by fluid pressure including a plunger and a housing therefor, mechanism for automatically maintaining compressed air under a substantially constant pressure in the housing on one side of the plunger, means for maintaining air under varying pressure on the opposite side of the plunger, pedal operated mechanism for applying air under line pressure to the said means and for maintaining a continuous pressure differential on the plunger so that when the said pedal operated mechanism is actuated to build up an air-pressure differential higher than the said constant pressure, the plunger is moved to open the said slide valve to supply a flow of compressed air under line pressure to the nozzle and when the said mechanism is operated to reduce the air-pressure differential below the said constant pressure, the plunger is moved to close the said slide valve to shut off the flow of compressed air to the nozzle, and a readily demountable connection between the movable part of the slide valve and the said plunger.

2. Apparatus for blowing scale and the like from metal pipes, which comprises the combination with a supply of compressed air, of plunger mechanism including a pipe for transmitting air under pressure from the supply thereof to the pipe being blown, a plunger housing enclosing a portion of the pipe, means on the pipe within the housing defining a plunger head positioned in the plunger housing and having opposite sides, the said plunger head dividing the said housing into forward and rear compartments, instrumentalities for maintaining a supply of air under constant pressure in the forward compartment of the plunger housing in advance of the plunger head, the said constant pressure being less than line pressure, a sliding valve part directly connected to the air-supply pipe, a complementary fixedly mounted valve housing enclosing the sliding valve part, whereby upon introduction of air under line pressure in the said rear compartment of the plunger housing, the plunger head and pipe are moved against the said constant pressure to bring the pipe into extended position relative to the plunger housing, thereby responsively moving the sliding valve part relative to its housing to open an air passage from the air-transmitting pipe into the pipe being blown, retraction of the air-transmitting pipe relative to the plunger housing responsively to release of pressure in the rear compartment and consequent retracting movement of the plunger head under action of the constant pressure in the forward compartment causing retractive movement of the sliding valve part in its housing into closing position for the said air passage, means for constantly supplying air under line pressure into the said air-transmitting pipe, valve means selectively operable for introducing air under line pressure into the rear compartment of the plunger housing and also for venting the said rear compartment to surrounding atmosphere for relieving the pressure in the said rear compartment, and pedal means for operating the said valve under foot-pressure of an operator.

3. Apparatus for blowing scale or the like from metal pipes, which comprises the combination with a mounting platform, of a supply line for compressed air for supplying compressed air under line pressure, a mounting platform, an integral base plate secured to the platform, a portion of the base plate defining a rigid upstanding abutment member integral with the base plate and having an opening therethrough, the said abutment member having an outer side and an inner side, the outer side of the said abutment member including an upwardly extending guide surface terminating adjacent to the said opening and adapted to guide different sizes of pipes to the said opening, a nozzle in the opening, a valve housing removably but fixedly mounted on the inner side of the abutment member, a movable slide valve member in the said valve housing for controlling a supply of compressed air for the nozzle, a plunger pipe directly connected to the slide member, a plunger housing, means on the pipe within the plunger housing defining a plunger head dividing the housing into a forward compartment and a rear compartment, a connecting pipe between the compressed air supply line and the said forward compartment, a reducing valve in the said supply line whereby air is maintained in the said forward compartment under substantially constant pressure which is less than line pressure, a second compressed air line directly connecting the compressed air supply line to the interior of the plunger pipe, whereby the plunger pipe is maintained continuously with air under line pressure, a third compressed air line for supplying air under line pressure from the compressed air supply line to the said rear compartment in the plunger housing, a multiple way control valve in the said third compressed air line, and pedal-actuated valve mechanism in the control valve for selectively introducing air under line pressure

into the rear plunger housing compartment for moving the plunger pipe into advanced position against the constant pressure in the forward plunger housing compartment, thereby automatically moving the said slide valve member in the housing relative to the housing to open an air passage from the plunger pipe through the said nozzle, thereby blowing air under line pressure through the pipe to be blown, further actuation of the pedal-actuated valve mechanism moving the multiple-way valve into a position closing the said third air supply line and venting the rear plunger compartment, thereby enabling the constant pressure in the forward plunger compartment to retract the plunger pipe to move the slide valve member into closing position, thereby shutting off flow of air through the plunger pipe to the said nozzle.

GEORGE SNEDDON, JR.