June 6, 1933. C. J. COBERLY ET AL 1,912,760

SAND BLAST MACHINE

Filed Feb. 4, 1930 5 Sheets-Sheet 1

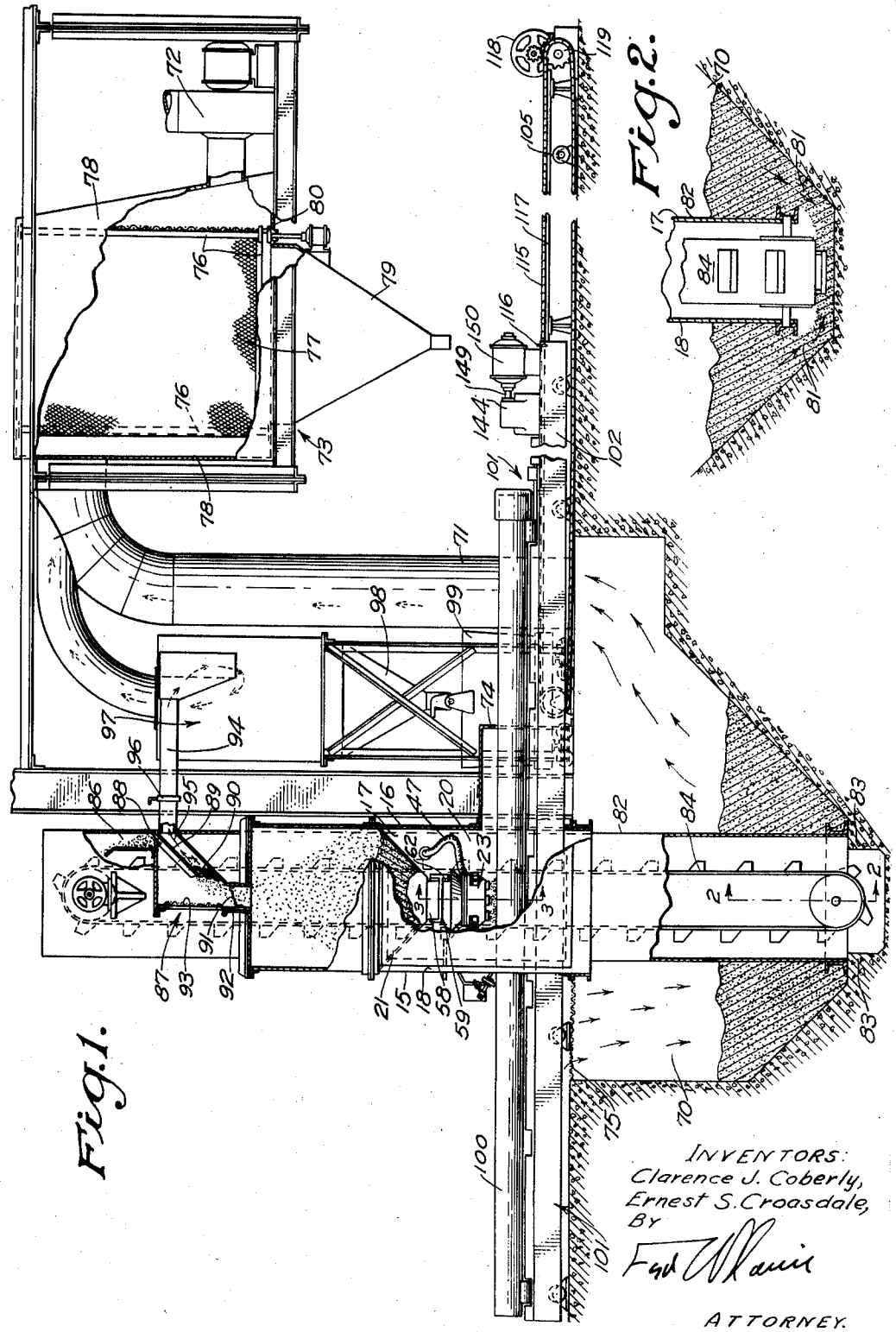


Fig. 1.

Fig. 2.

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SAND BLAST MACHINE

Filed Feb. 4, 1930 5 Sheets-Sheet 2

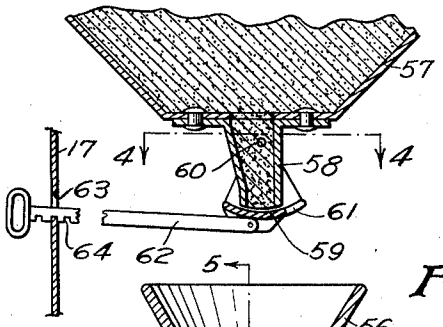


Fig.3.

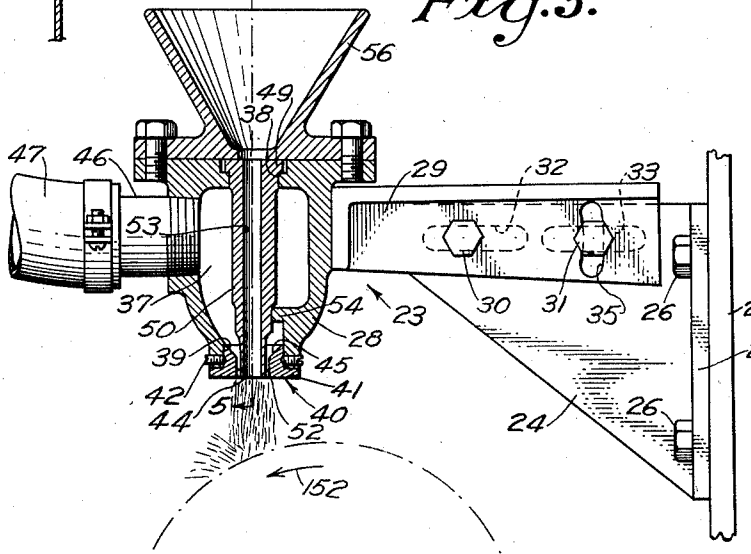


Fig.4.

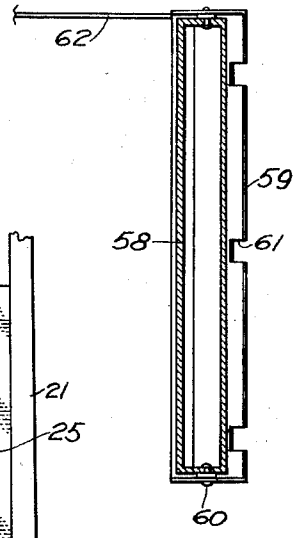
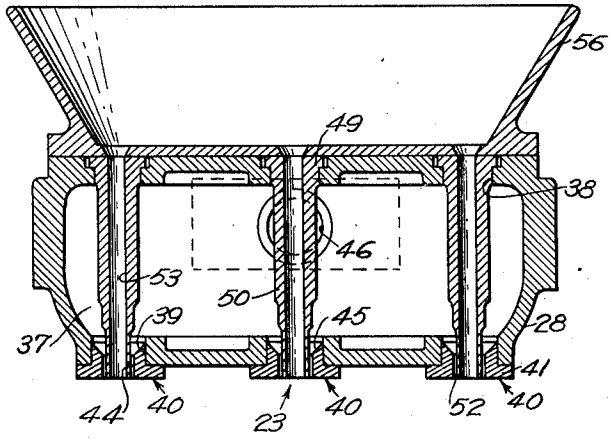


Fig.5.



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SAND BLAST MACHINE

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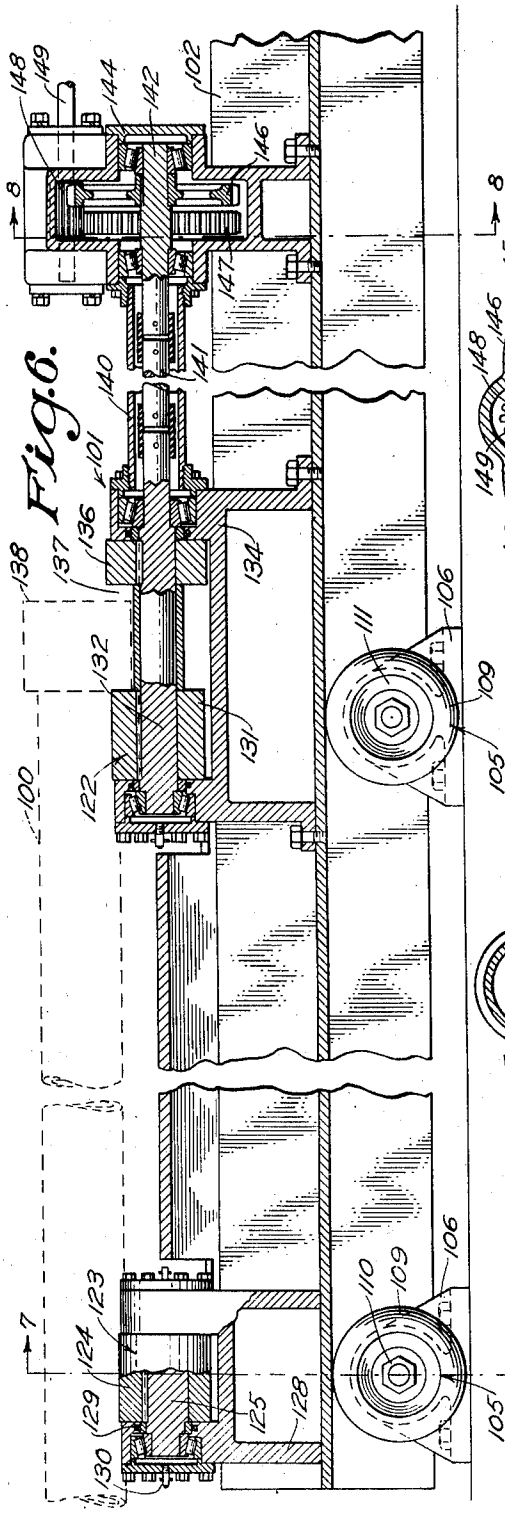


Fig. 6.

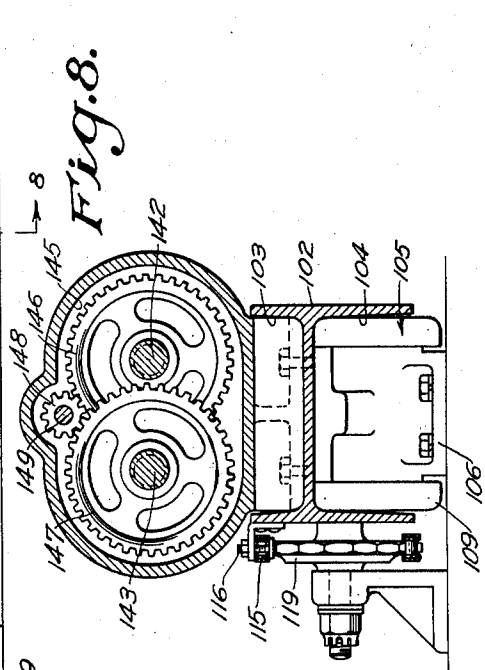


Fig. 8.

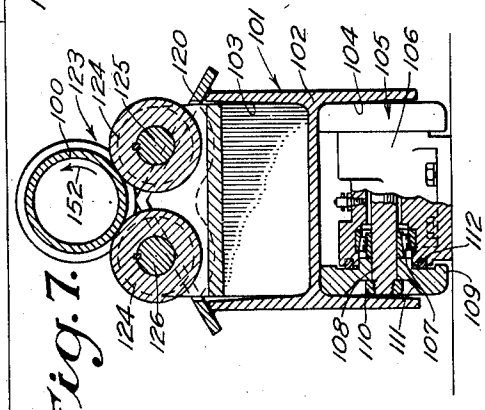


Fig. 7.

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SAND BLAST MACHINE

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Fig. 9.

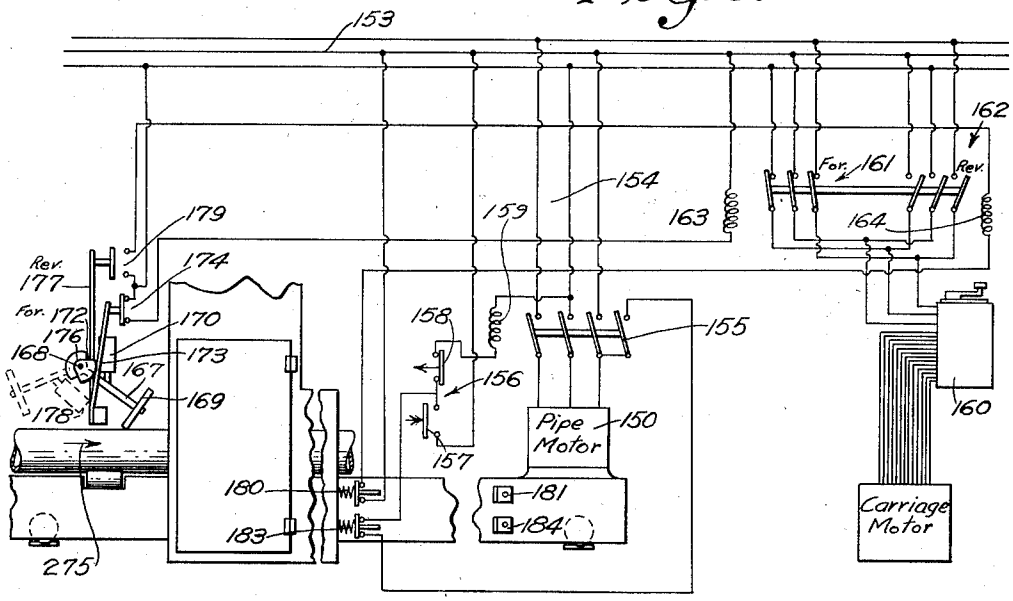
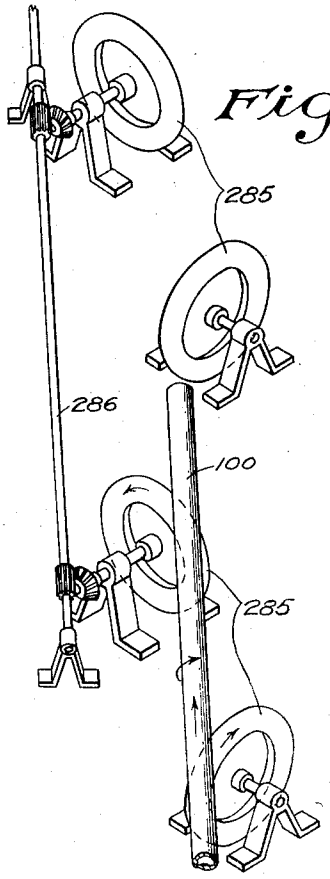


Fig. 13.



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SAND BLAST MACHINE

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Fig. 10.

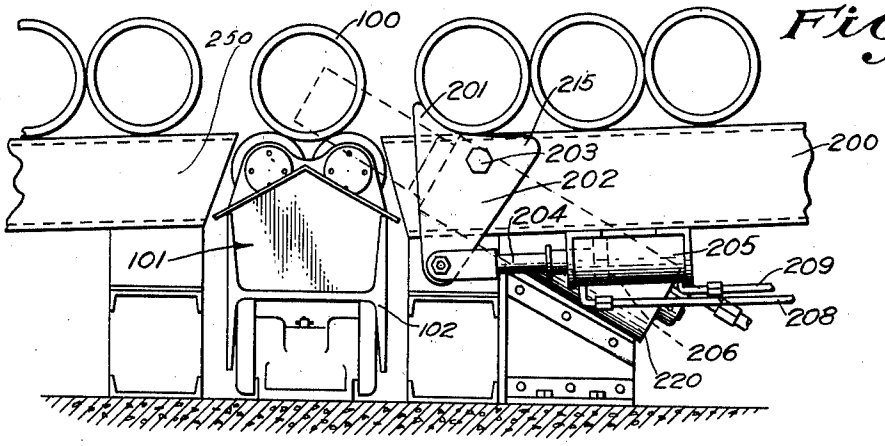


Fig. 11.

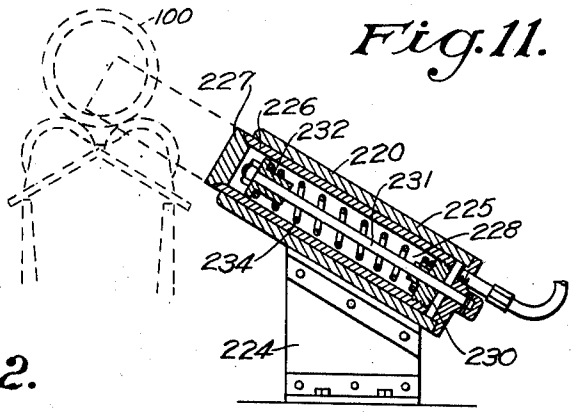
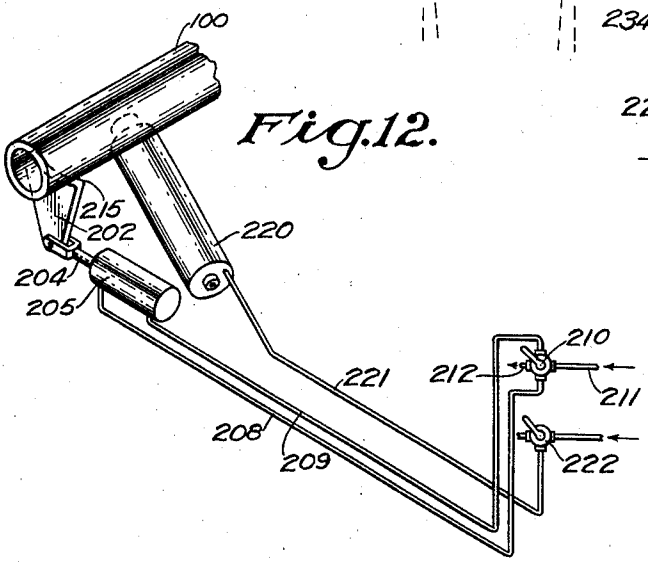


Fig. 12.



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Patented June 6, 1933 1,912,760

UNITED STATES PATENT OFFICE

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SAND BLAST MACHINE

Application filed February 4, 1930. Serial No. 425,841.

Our invention relates to cleaning devices, and more particularly to a novel sand blast machine.

Our machine is particularly adapted for sand blasting relatively long objects, and we shall describe the particular form of our invention which we find it desirable to use in sand blasting lengths of pipe, although it should be understood that we are not limited thereto.

The mill scale found on ordinary iron pipe or steel tubing is often objectionable. Not only does destructive corrosion often start beneath this scale, but the hardness thereof causes undue wear on tools during subsequent machining operations. Furthermore, the inspection of the pipe for defects is greatly facilitated if this scale is removed.

It is an object of our invention to provide a novel sand blast machine for cleaning the surface of lengths of pipe or other articles, and to further provide such a machine which will take various sizes and lengths of pipe or other articles without adjustment thereof.

A further object of the invention is to provide a novel apparatus for advancing the pipe through a sand blast machine, and at the same time rotating this pipe relative to one or more stationary nozzles in the machine so as to quickly clean the entire surface of this pipe.

In accomplishing these objects we have found it desirable to utilize a carriage for supporting the pipe and moving it through the sand blast chamber.

A further object of our invention lies in the provision of means outside of the sand blast chamber for supporting and advancing such a carriage, thus preventing undue wear upon this means.

A further object of the invention is to provide a rotating device, preferably on the carriage itself, although not necessarily so, for rotating the pipe.

A further object of the invention is to provide a sand blast machine in which the sand or other abrasive particles are re-used after any undesirable particles have been removed therefrom, and to provide a novel means for separating those particles which are not effective in further blasting operations.

Another object of the invention is to provide a machine which may be controlled by a single operator, this operator controlling both the loading and unloading of the length of pipe, as well as the axial advancing in rotation thereof. The loading and unloading means of this invention is novel both in itself and in combination with the remainder of the sand blast machine.

Another object of the invention is to provide a novel supporting means for the sand blast nozzle structure which permits easy removal for replacement or cleaning.

The nozzle structure itself also incorporates novel elements, and it is an object of this invention to provide a simple nozzle structure for single or multiple jets which effects a superior cleaning action, and the life of which is greater than other nozzle structures operating under analogous conditions.

Still another object of the invention is to provide a sand blast machine which is unobjectionable as far as throwing sand is concerned, the machine of our invention being capable of use in the same room with other equipment, thus eliminating a large waste of space previously necessary in shielding and protecting sand blast machines.

Further objects and advantages of our invention will be evident to those skilled in the art from the following description:

The form of our invention illustrated in the drawings is adapted particularly for cleaning pipe or other cylindrical objects. Referring to these drawings,—

Figure 1 is a side view, partially in section, of our invention.

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3.

Fig. 5 is a view taken on the line 5—5 of Fig. 3.

Fig. 6 is a sectional view of the carriage of our invention.

Figs. 7 and 8 are sectional views taken along corresponding lines of Fig. 6.

Fig. 9 is a wiring diagram of our invention.

Figs. 10 to 12 are views of the remotely controlled loading and unloading apparatus of our invention.

Fig. 13 is a diagrammatic view of an alternative form of advancing and rotating means.

Referring particularly to Fig. 1 our invention provides front and rear walls 15 and 16 joined by side walls 17 and 18 which cooperate therewith in defining a cleaning chamber 20. The side wall 18 provides a door 21 suitably hinged thereto, this door supporting a nozzle structure 23 in the cleaning chamber 20.

This nozzle structure 23 is best shown in Fig. 3. A supporting member 24 providing a flange 25 is secured to the door 21 by bolts 26. The openings in the supporting member 24 through which these bolts pass are vertically elongated, thus permitting vertical adjustment of the nozzle structure. The main portion of the nozzle structure provides an enclosing structure 28 formed integrally with, or suitably secured to, an arm 29 attached to the supporting member 24 by bolts 30 and 31 passing through elongated openings 32 and 33 of the supporting member to permit horizontal adjustment of the nozzle structure. Further adjustment of this structure is permitted by an arcuate slot 35 formed in the arm 29 and through which the bolt 31 passes, thus allowing a rotation of the entire nozzle structure about the bolt 30.

The enclosing structure 28 provides an air chamber 37 and has upper and lower openings 38 and 39 which are vertically aligned, the lower opening receiving a hardened tip 40 forming a part of the enclosing structure and having a protecting flange 41 defining a hardened surface on the lower end of the enclosing structure. While we prefer to utilize a separate hardened tip held in place by set screws 42, it should be understood that we are not limited thereto, it being entirely possible to form these parts integrally, the only requirement being an orifice 44 formed through the lower walls of the enclosing structure and in axial alignment with the upper opening 38. We have found that best results are obtained if this orifice is cylindrical in shape rather than conical, it being preferable to bevel the upper end of the tip 40, as indicated by the numeral 45, so as to guide air supplied to the chamber 37 into the orifice 44 without undue turbulence.

This air is supplied from a suitable source through a nipple 46 to which is connected a flexible hose 47. This hose extends through the side wall 17, as best shown in Fig. 1, and a sufficient length thereof is placed in the cleaning chamber to permit easy opening of the door 21 for inspection or cleaning of the nozzles without disconnecting the air supply.

The opening 38 is counterbored to receive a flange 49 of a nozzle 50 of such size as to snugly fit this opening. The main body of this nozzle extends downward through the chamber 37 and the diameter thereof decreases before passing through the orifice 44 so as to provide an annular air outlet 52 between the periphery of the lower end of this nozzle and the walls forming the orifice 44. It will be noted that the lower end of the nozzle 50 terminates in a plane flush with the lower end of the tip 40, so that a stream of sand or other abrasive particles may pass downward through an opening 53 of the nozzle 50 and be discharged into the air stream at a point adjacent the lower end of the tip 40.

The nozzle 50 is accurately machined so that the flange 49 fitting in the counterbore of the opening 38 accurately positions the lower end of this nozzle relative to the tip 40. If desired, arms 54 extending into the chamber 37 may also be used to assist the centralizing of the nozzle, although the use of these arms is not essential.

The upper end of the nozzle 50 is flush with the upper end of the enclosing structure 28 so that a funnel member 56 bolted to the latter serves not only to hold the nozzle 50 in place, but also to guide into the nozzle opening 53 particles of sand or other abrasive material discharged thereinto from a storage hopper 57 secured above the walls 15 to 18 and providing a spout 58 which is positioned a distance above the funnel and directs the sand thereinto.

The amount of sand in the funnel member 56 is determined by the position of a valve plate 59 pivoted to the spout 58 on a rod 60. This valve plate may be of conventional design, but we have found it preferable to cut a slot 61 therein, this slot lying in the path of the sand discharged through the spout 58 when the valve plate is moved leftward from its position shown in Fig. 3. Such a slot prevents any clogging of the spout and allows a very uniform control to be effected. The position of the valve plate 59 may be controlled by an arm 62 extending through an opening 63 of the side wall 17, and providing notches 64 which may engage the walls of the opening 63 to determine various positions of the valve plate.

We prefer to utilize multiple jets in our cleaning chamber, and for this reason utilize the chamber 37 as a manifold chamber for all of the jets. Fig. 5 illustrates three of the nozzles 50 extending therethrough. Similarly, we prefer to utilize but one spout 58, and to use a single valve plate providing three slots 61 formed therein corresponding in vertical position to the openings 53 of the three nozzles 50.

After passing through the nozzle structure

23 and serving its intended cleaning function the sand drops into a pit which we have termed a discharge chamber 70. We have found it desirable to re-use this sand after a suitable cleaning thereof and removal of those particles which are unsuited for further use in effecting an efficient cleaning action. The minute particles of scale which are chipped from the pipe during the cleaning and the minute particles of sand which are chipped from other larger particles by the impact are removed from the discharge chamber by creating an upward draft through a pipe 71 communicating with a side of the discharge chamber.

This upward draft of air is effected by a blower 72, the intake of which communicates with the discharge chamber through a filter 73. This draft of air serves a dual purpose, first, in removing from the discharge chamber the finer sand particles suspended in the air, and, second, in creating an in-draft through all the openings of the cleaning chamber 20. These openings include an opening in the front wall 15 and an opening in a hood 74 the interior of which communicates with the cleaning chamber 20, through which openings the pipe or other article to be cleaned passes. Thus, this in-draft prevents any escape of sand from the cleaning chamber through these openings and around the article to be cleaned, thus making the use of the machine in a separate building unnecessary.

A screen or perforated plate 75 also permits the entrance of air into the discharge chamber, this screen being positioned on the opposite end of this chamber from the pipe 71 thus insuring a good air circulation through the discharge chamber in a manner to remove the finer sand particles.

The filter 73 is of the conventional cloth type and is diagrammatically shown as comprising a plurality of frames 76 on which a cloth filter medium 77 is secured, these frames and their associated cloth filter mediums dividing the interior of a tank 78 into inlet and exhaust chambers communicating respectively with the pipe 71 and the blower 72. The dust-laden air thus enters the inlet chamber and the dust particles are deposited on the cloth filters while the clean air is drawn into the blower. These dust particles may drop into a hopper 79, the removal of these particles from the cloth filters being facilitated by a vibrator such, for instance, as a motor-driven eccentric 80 connected to the frames 76.

The walls of the discharge chamber 70 converge downward in a manner to guide the heavier sand particles downward through side passages 81 formed between the side walls and a housing 82, as best shown in Fig. 2. This housing rests on abutments 83 so that the only communication between the discharge chamber and the interior of the housing 82 is through the passages 81. The sand thus entering the lower end of the housing 82 is carried upward to a point above the hopper 57 by means of a bucket elevator 84 and is discharged into a passageway 86 of a separating means or classifier 87.

Extending partially across the passageway 86 is a distributing baffle 88 which spreads the sand equally over the surface of a downward sloping deck 89. The sand drops from the lower edge of this deck onto the upper of a series of baffles 90 arranged in succession therebelow, each baffle extending a distance beyond the edge of the one immediately thereabove. A large mesh screen 91 is arranged below the lowermost baffle and is adapted to retain any large pieces of foreign matter which might accidently drop into the discharge chamber and be raised on the elevator 84. Any of this foreign matter thus collected may be removed through a door 92.

As the sand drops from baffle to baffle a stream of air is drawn therethrough for the purpose of removing the smaller particles which are no longer desirable for blasting purposes. This stream of air enters the classifier through a screen 93 positioned just above the door 92 and may be maintained by the blower 72, if desired. We have shown a pipe 94 communicating with a passageway 95 formed below the deck 89, this pipe having a gate 96 therein which determines the velocity of the air in the classifier and thus the maximum size of particle removed, the pipe 94 connecting to a cyclone separater 97 which in turn communicates with the pipe 71. The larger particles which are removed in the classifier settle into a hopper 98 of the cyclone separator 97 and the smaller particles are removed by the cloth filter 73. A track extends below the hoppers 79 and 98 and a car 99 is adapted to move therealong and receive the collected sand particles which form useful by-products.

The article to be cleaned, in this example a pipe indicated by the numeral 100, is preferably conveyed through the cleaning chamber 20 and in the path of the sand blast from the nozzle structure 23 by means of a carriage 101. This carriage is best illustrated in Figs. 1, 6, 7, and 8 and provides a body 102 which is preferably formed of H-section, thus providing upper and lower chambers 103 and 104.

A plurality of roller structures 105 are positioned along the floor for movably supporting the carriage 101. These roller structures are preferably positioned outside of the cleaning chamber, and the details thereof are best shown in Figs. 6 to 8. Referring to these figures each roller structure provides a base 106 retaining bearings 107 which journal a shaft 108 on which wheels 109 are secured as by nuts 110 fitting in depressions 111 of the

wheels. These wheels are so shaped and so relatively spaced as to conform to the contour of the walls of the lower chamber 104, thereby guiding the carriage 101 through the cleaning chamber along a definite path. An annular packing ring 112 is provided in each end of the body 102 and bears against the wheels 109 thereadjacent to prevent entrance of abrasive particles into the bearings.

The carriage is moved forward and backward in the cleaning chamber by an endless chain 115 which is secured to the forward end of the carriage by a suitable shear key 116, shown in Figs. 1 and 8, this endless chain being supported by a plurality of sprockets or by a track 117 and being driven by a carriage motor 118 connected to a drive sprocket 119 through a suitable gear reduction. The extreme forward end of the carriage never passes through the cleaning chamber, thus permitting the drive means for the carriage including the endless chain to be positioned entirely outside of the cleaning chamber.

The upper end of the body 102 of the carriage 101 is covered by a shield 120 suitably welded thereto to prevent the upper chamber 103 from becoming filled with abrasive particles and thus adding excessive weight. This shield is cut away at a plurality of places to provide space for one or more pipe-supporting means. We have shown one pipe-supporting means indicated by the numeral 122 as being a drive means, and another means indicated by the numeral 123 as being an idler means, the position of which relative to the carriage is variable. The latter means includes a pair of rolls 124 horizontally spaced from each other and secured respectively to shafts 125 and 126 which are suitably journalled, preferably by roller bearings, in a support 128. This support may be positioned in any one of the cut away portions of the shield 120 to compensate for pipes of different length.

As best shown in Fig. 7, the pipe is adapted to engage the rolls 124 and be supported and centralized thereby. It is usually necessary to provide an annular packing 129 around the shafts 125 and 126 to prevent the entrance of abrasive particles into the bearings. Such entrance is further impeded by grease which completely fills the chambers in which the bearings are placed and which may be supplied through a conventional nipple 130.

The drive means 122 is positioned near the forward end of the carriage 101 and provides two drive rolls 131 of a diameter similar to the rolls 124 and secured on shafts 132 which are axially aligned with the shafts 125 and 126. The shafts 132 are, however, longer than the shafts 125 or 126 but are journalled in a structure 134 in a manner similar thereto. A guide roll 136 is also mounted on each of the shafts 132 in spaced relationship relative to the rolls 131, so as to provide a space 137 in which a cap or collar 138 threaded to the end of the pipe for protective purposes may turn. This cap, being of larger diameter than the pipe, serves to prevent the pipe from moving longitudinally on the carriage, although in many instances this cap may be dispensed with, especially if no threads are formed on the end of the pipe which might be injured by sand blasting, in this instance the end of the pipe butting against the guide rolls 136 which are slightly larger in diameter than the drive rolls 131.

The shafts 132 extend forward through a protective casing 140 and are respectively connected to idler shafts 141 which are in turn connected to drive shafts 142 and 143. The idler shafts 141 are connected to the shafts 132, 142, and 143 by flexible couplings, the latter two shafts being journalled in a drive structure 144 which provides a gear chamber 145 in which overlapping gears 146 and 147 respectively secured to the shafts 142 and 143 rotate. Each of these gears is meshed with a relatively long pinion 148 on a shaft 149 driven by a suitable drive means such as a pipe motor 150.

This pipe motor 150 is adapted to rotate the pipe in either direction but the preferable direction of rotation is indicated by the arrows 152 of Figs. 3 and 7, and the nozzle structure is so adjusted that the axes of the nozzles 50 do not intersect the axis of the pipe, so that the abrasive particles are not impinged upon the pipe in a direction substantially perpendicular to the surface thereof. The preferable positioning of the enclosing structure is shown in Fig. 3 wherein the axes of the nozzles are moved a distance away from the axis of the pipe in the direction of movement of the upper portion thereof so that the abrasive particles striking a pipe will be deflected to one side of the main blast. This not only gives a superior cleaning action, but also tends to prevent the particles from rebounding into contact with the tip 40, thus greatly increasing the life thereof.

Ordinarily we rotate the pipe in a single direction, although in some instances it is desirable to reverse this direction of rotation, especially when no cap 138 is applied to the pipe, in which case we have found that rotating the pipe in one direction will sometimes move the end thereof away from the guide rolls 136 while rotation in the opposite direction will not. In some instances it is desirable to reset the nozzles if the pipe is thus reversed. However, in Fig. 9 we have shown the pipe motor 150 as a conventional single or polyphase motor connected to a supply line 153 through a circuit 154 including a solenoid-operated switch 155 of conventional design, but it should be understood that we are not limited thereto. Con-

trol of this switch is effected through a manually operated control switch 156 including a starting contact 157, normally opened, and a stop contact 158, normally closed, these contacts being wired in series with a solenoid 159 operating the switch 155 and across one phase of the supply line.

We prefer to always use a reversible motor in the capacity of the carriage motor 118, though a reversing gear mechanism might, of course, be used, and further to use a drum controller 160 in the circuit thereof for speed control, this drum controller being preferably positioned adjacent the walls of the cleaning chamber so as to be readily accessible to the operator. In Fig. 9, we have shown interlocked forward and reversing switches 161 and 162, the former being closed by the energization of a solenoid 163 and the latter being closed by the energization of a solenoid 164.

The switch for controlling the closing of the forward and reversing switches 161 and 162 is preferably a semi-automatic one, and in the preferred form of our invention comprises an arm 167 mounted on a suitable journalled shaft 168 and rotatably mounting a roller 169 which is adapted to contact the surface of the pipe and to rotate therewith when the pipe is turned. A counterbalance weight 170 is suitably secured to the arm 167 or directly to the shaft 168 and serves to hold the roller 169 in contact with the pipe during the forward movement thereof. When in this position, a cam 172 engages a spring switch arm 173 in a manner to close forward control contacts 174 which are connected across the supply line in series with the solenoid 163. Also mounted on the shaft 168 is a cam 176 which engages a contact spring 177 when the arm 167 and roller 169 are manually or automatically moved into their dotted line positions indicated by the numeral 178. At this time the cam 172 opens the forward contacts 174 and closes a set of reverse contacts 179 which are wired across the supply line and in series with the solenoid 164 and an automatic stop switch 180 mounted on the machine and engageable by a stop 181, as will be more clearly explained hereinafter. An automatic stop switch 183 is also provided for the pipe motor and is connected in the holding circuit of the switch 155. A stop 184 is positioned on the carriage to engage the automatic stop switch when the carriage reaches a desired retracted position.

It is desirable that the operator be able to place a length of pipe on the carriage and remove it therefrom without leaving the sand blast machine. This we accomplish by the apparatus illustrated in Figs. 10 and 11 wherein we show an end view of the carriage 101 when in retracted position. An inclined track 200 is provided for retaining a number of lengths of pipe, these pipes resting one against the other, the lowermost being retained by a toe 201 of a control plate 202 which is pivoted to the track 200 by a bolt 203. The control plate is operated by a suitable linkage including a plunger 204 of a ram 205 of conventional design having a piston 206 which is movable from one extreme position into another by pressure supplied alternately through pipes 208 and 209 which are connected to a four-way valve 210 which receives a supply of air or liquid through a pipe 211 and supplies this pressure through one of the pipes 208 and 209 and exhausts the other pipe through an exhaust means 212 in a well-known manner.

The plate 202 provides a heel 215 which moves upward into the path of the remaining lengths of pipe when the piston 206 is moved rearward, this rearward movement allowing the length of pipe previously contacting the control plate to drop onto the supporting rolls of the carriage.

When this length of pipe is to be removed from the carriage, the operator supplies pressure to one or more rams 220 through a pipe 221 connected to a three-way valve 222, the position of this valve determining the supply of pressure to, and the exhaust from the ram 220.

Fig. 11 illustrates these rams in sections each ram having a base 224 supporting a cylinder 225 in which a hollow piston 226 operates, this piston being closed by a head 227 which is adapted to move into contact with a pipe when fluid is supplied to a pressure chamber 228. The end of the piston 226 opposite the head 227 retains a perforated plate 230 through which a rod 231 passes, this rod providing a collar 232, there being a spring 234 compressed between the collar 232 and the perforated plate 230. When pressure is supplied to the chamber 228 from the pipe 221, the piston 226 moves quickly outward into engagement with the length of pipe then on the carriage, and moves this pipe off the carriage and onto the track 250. By turning the control valve 222 the pressure which previously entered the chamber 228 is relieved therethrough due to the action of the spring 234, this fluid exhausting through the valve 222. The control valves 210 and 222 are preferably positioned on the walls of the sand blast machine so that the operator may control the movement of the length of pipe onto and from the carriage without leaving the machine.

Once the pipe is on the carriage, the operator manually moves the arm 167 from its dotted line position into its full line position, thus closing the forward control switch 174 and completing a circuit from the supply line through the solenoid 163, thus closing the forward switch 161. The desired speed of advancement may be secured by manually turning the drum controller 160. The oper-

ator then closes the starting contacts 157 which completes a circuit from the supply line through the solenoid 159 and the stop control switch 158, thus closing the switch 155. When the switch is thus closed the starting contacts 157 may be opened, the circuit through the solenoid 159 being completed through the stop switch 158, and the automatic stop switch 183, together with the auxiliary contact of the switch 155, so that the carriage is moving forward in the direction of the arrow 275 of Fig. 9. This movement continues until the end of the pipe comes adjacent the roller 169 at which time the counterbalance 170 swings the switch into its dotted line position, thus opening the forward contacts 174 and closing the reverse contacts 179.

At this time the solenoid 164 is energized, thus closing the reverse switch and moving the carriage in a direction opposite the arrow 275. This movement continues until the stops 181 and 184 open the automatic stop switches 180 and 183 which, when opened, respectively de-energize the reverse switch 162 and the switch 155 for the pipe motor. At this time the pipe is removed from the carriage by means of the ram 220 and the new length of pipe is placed thereon after which the operation is repeated.

In Fig. 13 we have illustrated an alternative advancing and rotating means for the pipe 100, this means comprising a plurality of pairs of skewed wheels or rolls 285, at least one roll of each pair being driven by a suitable drive means indicated by the numeral 286. The rolls at only one end of the sand blast machine are shown, those on the opposite end being identical and driven by the same drive means 286 if desired. The pipe 100 may thus rest upon these skewed rolls which are preferably formed of conventional automobile tires and wheels, and be advanced thereon through the sand blast machine, after which it may be either returned through the machine or be removed from the rolls at the opposite end of the sand blast machine. We have found, however, that the use of a single loading and unloading means, and the carriage illustrated in the preferred form of our invention, gives very desirable results.

We prefer to direct the sand blast against the pipe both on its forward and rearward movement. In this manner it is not necessary that the pipe be completely cleaned on its forward movement, thus permitting greater speed therethrough. So also if one of the nozzles should become momentarily clogged, an uncleaned space on the pipe might result if it were not for the fact that the pipe is again returned through the blast thereby insuring that no such uncleaned spots appear on the pipe when it is unloaded.

We have found our method of separating the undesirable particles from the sand or other abrasive to be very effective, and in addition the lowering of the pressure in the discharge chamber to a point below that of the surrounding atmosphere draws a draft of air into the cleaning chamber through all openings in the walls thereof, thus preventing the sand from leaving the cleaning chamber unless it drops into the discharge chamber.

We claim as our invention:

1. In combination in a device for cleaning pipe or the like: walls forming a cleaning chamber; a carriage adapted to move forward and backward through said cleaning chamber; means for so releasably supporting an article to be cleaned such as a pipe that upon its release it is moved by gravity onto said carriage when in a given position; means for moving said carriage and said pipe forward through said chamber and back again; means in said chamber for directing a blast of abrasive material against said pipe during its forward and reverse movement through said chamber; and means for unloading said article from said carriage when said carriage again reaches said given position.

2. In a sand blast machine, the combination of: walls forming a cleaning chamber, said walls including a door; a supply hopper above said cleaning chamber and having a spout extending thereinto; a nozzle structure so mounted on said door as to be adjustable to vary the direction of discharge of said nozzle structure and adapted to receive abrasive particles from said spout; and means for supplying air under pressure to said nozzle.

3. In a sand blast machine, the combination of: walls forming a cleaning chamber, said walls including a door; a supply hopper above said cleaning chamber and having a spout extending thereinto; a nozzle structure adjustably mounted on said door a distance below said spout so that it may be moved relative to said door to vary the direction of discharge from said nozzle structure; a funnel member extending upward from said nozzle structure and adapted to guide abrasive particles from said spout into said nozzle structure when said door is in closed position; and means for supplying air under pressure to said nozzle.

4. In combination in a device for cleaning pipe or the like: walls forming a cleaning chamber; a carriage adapted to receive a pipe when on one side of said walls; means for moving said carriage and said pipe forward through said chamber; means for automatically stopping said carriage and said pipe and moving said carriage and said pipe back through said chamber; and means in said chamber for directing a blast of abrasive material against said pipe during its forward and reverse movement through said chamber.

5. In combination in device for cleaning pipe or the like: walls forming a cleaning

chamber; a carriage adapted to receive a pipe when on one side of said walls; means for moving said carriage and said pipe forward through said chamber in the direction of the longitudinal axis of said pipe; means operative by engagement with the end of said pipe for automatically stopping said carriage and said pipe and moving said carriage and said pipe back through said chamber; and means in said chamber for directing a blast of abrasive material against said pipe during its forward and reverse movement through said chamber.

6. In combination in a device for cleaning pipe or the like: walls forming a cleaning chamber; a carriage adapted to move through said cleaning chamber; supporting means for supporting a plurality of articles to be cleaned; such as pipes; a releasing member so associated with said supporting means as to release one of said pipes, said supporting means being so related with said carriage that said pipes when released are moved onto said carriage by gravity; means for moving said carriage and said pipe through said cleaning chamber; a receiving member adapted to receive said pipes when cleaned; and means for lifting said pipes from said carriage onto said receiving member, said pipes being moved on said receiving member away from said carriage by gravity.

7. In combination in a device for cleaning pipe or the like: walls forming a cleaning chamber; a carriage adapted to move forward and backward through said cleaning chamber; supporting means for supporting a plurality of articles to be cleaned, such as pipes; a remotely controlled releasing member so associated with said supporting means as to release one of said pipes, said supporting means being so related with said carriage that said pipes when released are moved onto said carriage by gravity; means for moving said carriage and said pipe through said cleaning chamber; means operated by contact with said pipe for stopping said carriage and said pipe and reversing their motion through said cleaning chamber; a receiving member adapted to receive said pipes when cleaned; and remotely controlled means for lifting said pipes from said carriage onto said receiving member, said pipes being moved on said receiving member away from said carriage by gravity.

8. In combination in a machine for cleaning pipe or the like: walls forming a cleaning chamber; a carriage adapted to support said pipe; rollers disposed outside of said cleaning chamber for supporting said carriage; a connecting member attached to one end of said carriage; means for moving said connecting member to move said carriage and said pipe longitudinally through said cleaning chamber; a pair of supporting rollers on said carriage for supporting said pipe; a pair of driving rollers on said carriage adapted for supporting and rotating said pipe; means for rotating said driving rollers; and means for directing a blast of abrasive material against said pipe.

In testimony whereof, we have hereunto set our hands at Los Angeles, California, this 31st day of January, 1930.

CLARENCE J. COBERLY.
ERNEST S. CROASDALE.