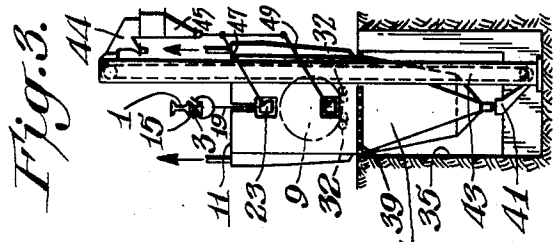
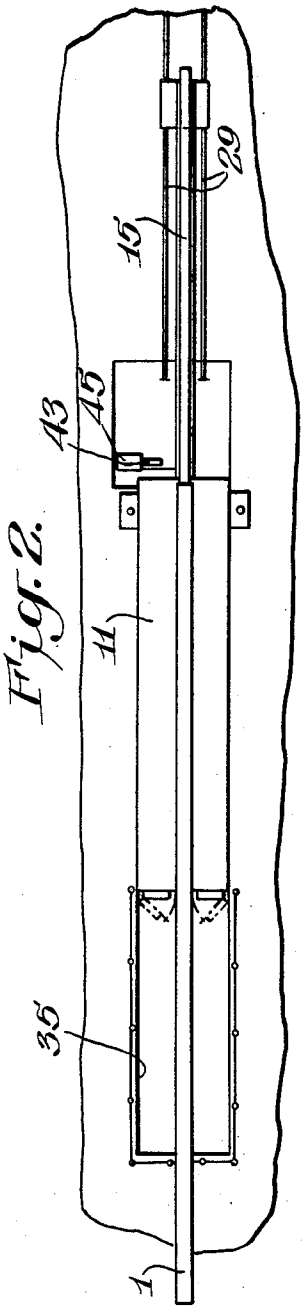
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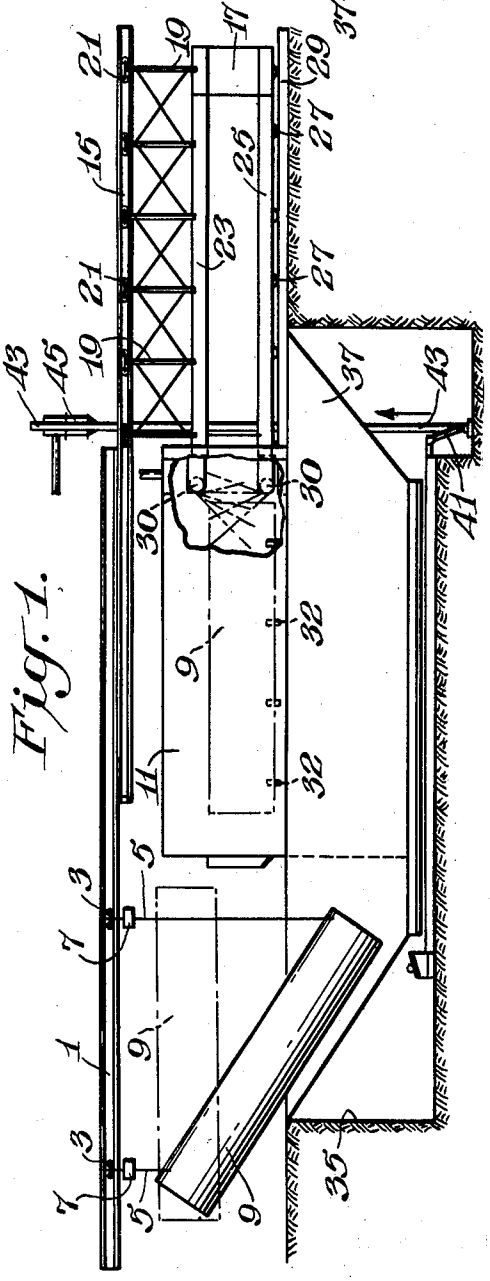
PIPE CLEANING APPARATUS

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Fig. 4.

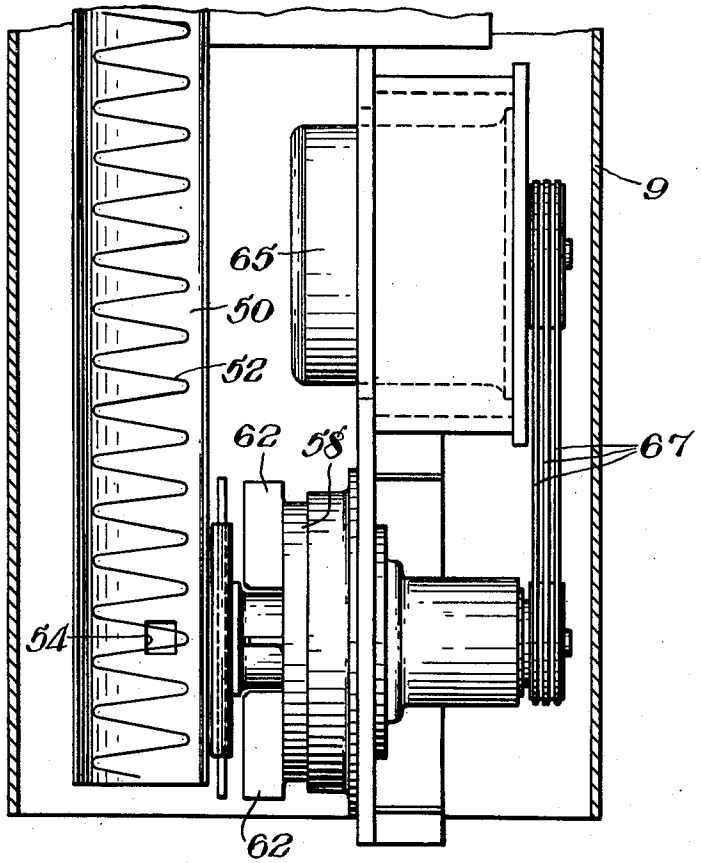
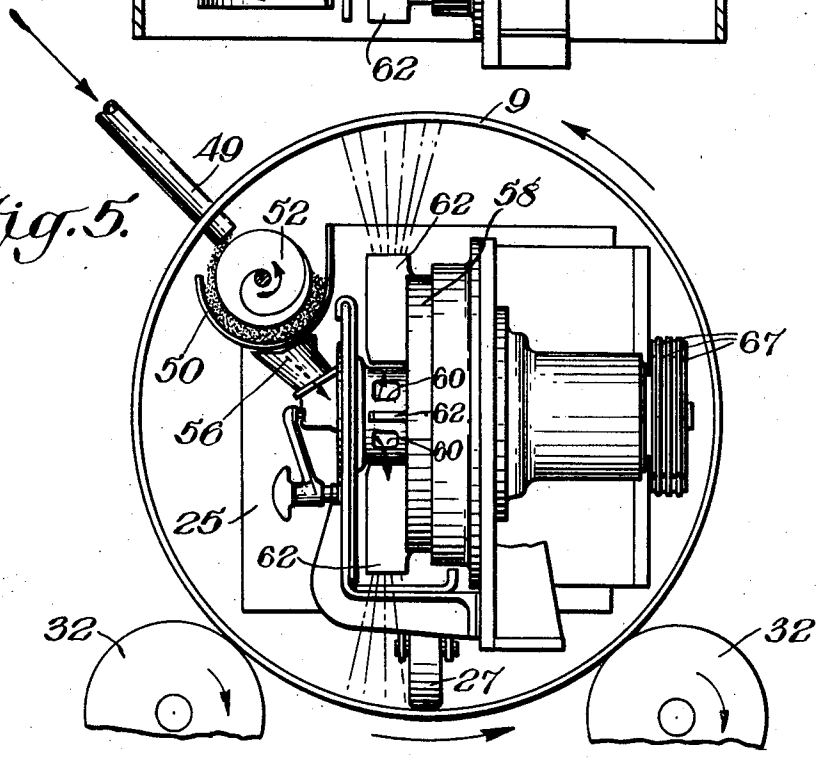
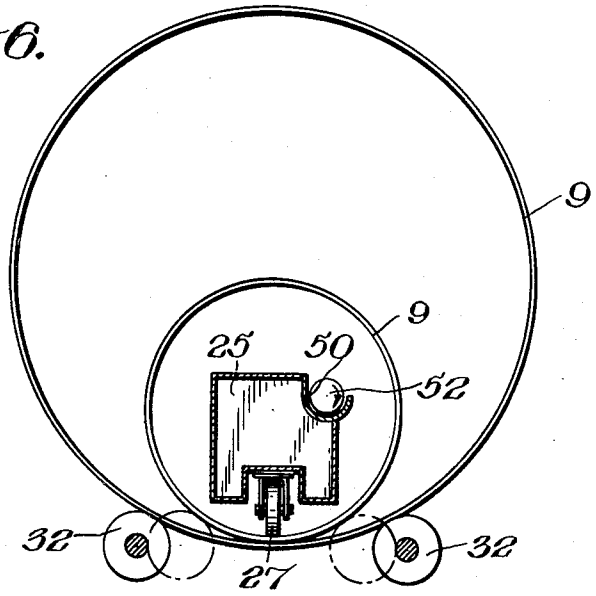


Fig. 5.



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Fig. 6.



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PIPE CLEANING APPARATUS

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9 Claims. (Cl. 51—9)

The present invention relates to abrasive blast cleaning apparatus for cleaning both the inside and outside surfaces of pipes and large tubing.

Prior apparatus for abrasive blast cleaning of pipes has not been found to be satisfactory for one reason or another. One such apparatus requires that the pipe be positioned vertically for the blast cleaning operation. Accordingly, to clean a 40-foot section of piping, this would require an 80-foot elevation since the pipe must be vertically moved as it is cleaned. Also, an additional length is required for the support of the probing mechanism. The pipe is mounted first horizontally and then raised to the vertical position which requires multiple operations and additional apparatus. This above described apparatus also has its blast wheel located in the center of the unit and sprays abrasive on a 360° path. This severely limits the size of pipe or tubing that can be cleaned and further reduces the efficiency of the unit as the diameter increases.

Therefore, such an apparatus is more or less limited to the blast cleaning of short lengths of pipe and in addition is extremely cumbersome to operate.

It is, therefore, one object of the present invention to provide a new and novel pipe cleaning apparatus of the abrasive blasting type.

Another object of the invention is to provide a new and novel apparatus for simultaneously blast cleaning both the inside and outside surfaces of a pipe.

Still a further object of the invention is to provide a new and novel apparatus for cleaning both the inside and outside surfaces of a pipe simultaneously while the pipe is maintained in a stationary and horizontal position.

Other objects and advantages of the invention will become more apparent from a study of the following description and drawings wherein:

FIGURE 1 is a side view of the abrasive cleaning apparatus for pipes of the present invention;

FIGURE 2 is a top view of the apparatus of FIGURE 1;

FIGURE 3 is an end view of the apparatus of FIGURE 1;

FIGURE 4 is a detail as seen from the top and on an enlarged scale of a portion of the apparatus of FIGURE 1;

FIGURE 5 is an end view of the detail shown in FIGURE 4; and

FIGURE 6 is an end view showing that both small and large minimum diameter pipes can be cleaned by the blast apparatus of the present invention.

The overall apparatus is shown more particularly in FIGURES 1–3. Here, we see a horizontally extending monorail track 1 which supports driven roller assemblies 3 which in turn support pipe carrying lines 5. A lowering and raising pulley assembly 7 is supported on each pipe carrying line 5 whereby the ends of the pipe 9 may be lowered or raised for reasons which will be explained hereinafter.

With the above-described arrangement, the pipe 9, shown in the phantom line position, is conveyed toward and into an abrasive blasting chamber 11. Once the pipe is moved into the chamber 11, it remains therein for the duration of the blast cleaning operation. At the opposite end of the blast chamber, there is shown a second monorail support or assembly 15 which supports a frame carriage 17 by rods 19 depending from driven roller assemblies 21 mounted on the monorail 15. The frame carriage 17 has an upper arm 23 and a lower arm 25 which extend horizontally and inwardly toward the blasting chamber 11. The lower arm 25 of the carriage and the carriage itself moves upon swivel wheels 27 which rest upon a ground support 29.

As further shown in FIGURE 1, an abrasive blasting wheel 30 is positioned at each free or inner end of the upper and lower arms 23 and 25 of the carriage 17. The upper abrasive blasting wheel 30 will spray abrasive along the outside surface of the pipe while the lower blasting wheel 30 sprays abrasive along the inside surface of the pipe. In order to spray blast the entire circumference of both the inner and outer surfaces, the pipe is rotated on drive rollers 32 as shown in FIGURES 1 and 3.

The blasting operation is performed by moving the carriage 17 along the track 15 toward and into the blasting cabinet 11 after the pipe 9 has been moved into the blast chamber 11 by monorail assembly 1. With this movement, the upper blasting wheel 30 moves slowly axially of the pipe along the exterior surface thereof while the lower blasting wheel 30 does the same within the pipe interior. The wheels 27 which support the carriage ride into the pipe and travel along the pipe wall as the pipe is rotated. After traveling the full length of the pipe, the carriage 17 is then retracted along track 15 to the position shown in FIGURE 1.

Below the blasting cabinet and the tracks 1 and 15, there is provided a pit 35 which has a tapered wall bin 37 supported therein and which houses a screw conveyor (not shown). Abrasive and debris removed from the pipe pass downwardly through the lower screen 39 (see FIGURE 3) which forms a bottom wall of the blasting chamber 11. This is collected by the screw conveyor, passed into funnel 41 (FIGURE 3) which leads to elevator 43 which raises the abrasive up through an air separator 44 from which point it passes to a feed hopper 45. From the hopper 45 it is dropped into feed lines 47 and 49 which lead to abrasive conveying troughs in the upper and lower arms 23 and 25 of the carriage 17 as will be described hereinafter.

The air separator 44 and the screen 39 at the bottom of the blast chamber 11 serve to remove debris from the shot blast.

When the pipe 9 has been cleaned, it is retracted to the position shown in phantom in FIGURE 1 after which the innermost end of the pipe 9 is lowered by the raising and lowering mechanism 7 until it assumes the full line position as shown in FIGURE 1. When in this position, the debris and shot will slide out of the pipe into the bin 37 to be picked up by the screw conveyor and recycled as explained above.

FIGURES 4 and 5 are details on an enlarged scale of a portion of the apparatus shown in FIGURES 1–3. In particular, the details are of the lower arm 25 connected with the carriage 17. As explained above, this arm extends into the pipe interior to clean the inner surface thereof.

An abrasive carrying trough 50 is supported at the upper left-hand corner of the arm 25 when looking at FIGURE 5. Abrasive is fed into the trough 50 by the feed line 49 which is also shown in FIGURE 3. The abrasive is moved forward in the trough by a screw conveyor 52 mounted for rotation in the trough 50. The abrasive is moved forward until it reaches a rectangular slot 54 in the floor of trough 50 from which point it passes downwardly into a funnel 56 which feeds the abrasive to the blasting wheel 58. As shown better in FIGURE 5, the impeller (not shown) feeds abrasive through slots 60 of the feed cage to the rotating blades 62 of the blast wheel 58. The slots are so arranged that the blast is sprayed upwardly and downwardly in a fixed

path, and as the pipe is rotated on roller **32** the entire inner surface of the pipe is thus spray blasted and cleaned. The same arrangement exists for upper arm **23**.

The blast wheel **58** is rotated by a motor **65** also supported by the arm **25** and driven through belt **76** as shown better in FIGURE 4.

FIGURE 6 is an end view of the lower arm of the carriage **17** and shows the minimum and maximum diameter pipes which can be treated by the apparatus. As seen therein, this diameter can vary to a great degree. For instance, 48 and 96 inch diameter pipes can be cleaned by the present apparatus.

As mentioned above, the advantages of the present invention are that the pipes **9** can be treated in a horizontal position which means that any length or size pipe can be easily handled. In addition, the spray blast pattern is fixed whereby fixed relation for the entire length of the pipe is maintained and thus more uniform cleaning is provided as the pipe is rotated by the roller **32**.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A pipe cleaning apparatus comprising a blast chamber, means for feeding and withdrawing a pipe into said chamber, means in said chamber for rotating said pipe, a carriage, means for moving said carriage into and out of said chamber, an upper arm supported on said carriage, a lower arm supported on said carriage, an abrasive blasting wheel supported at the free end of each arm, and means connected with said arms for feeding abrasive to said wheels supported by each arm, said lower arm being so positioned as to extend into and travel along the pipe interior and said upper arm being so positioned that it travels along the pipe exterior.

2. The pipe cleaning apparatus of claim 1 wherein the abrasive feeding means supported by each arm is an elongated trough extending axially of each arm, and a screw conveyor is supported in each trough.

3. The apparatus according to claim 2 wherein a pit is provided beneath the blasting chamber for collecting used abrasive, an elevator is mounted in said pit for raising the abrasive therefrom, an air separator is connected with the top portion of the elevator for receiving the abrasive therefrom, and an abrasive supply hopper is connected with said separator and said abrasive feeding means.

4. The apparatus of claim 1 wherein the lower arm of the carriage is supported on swivel wheels which run along the pipe wall when the carriage is moved into and withdrawn from the blast chamber.

5. The apparatus of claim 1 wherein the means for moving the pipe into and withdrawing the pipe from the blast chamber is a monorail assembly.

6. The apparatus of claim 5 wherein the monorail assembly has pipe suspending lines connected thereto, and raising and lowering assemblies connected with such lines for raising and lowering at least one end of said pipe.

7. The apparatus of claim 3 wherein the pit extends beyond the blast cabinet for collecting abrasive and debris expelled from the pipe after the pipe is withdrawn from the blast chamber.

8. The apparatus of claim 7 wherein the blast chamber has a perforated bottom wall, and a bin unit is supported in the pit below said chamber for collecting falling abrasive and debris.

9. The apparatus of claim 1 wherein the means for moving the carriage into and out of the blasting chamber is a monorail assembly.

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