

Oct. 8, 1957

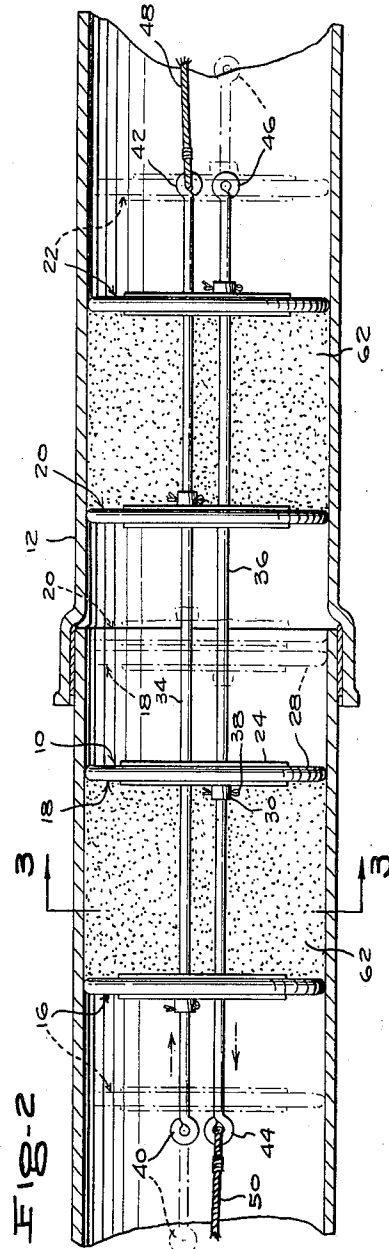
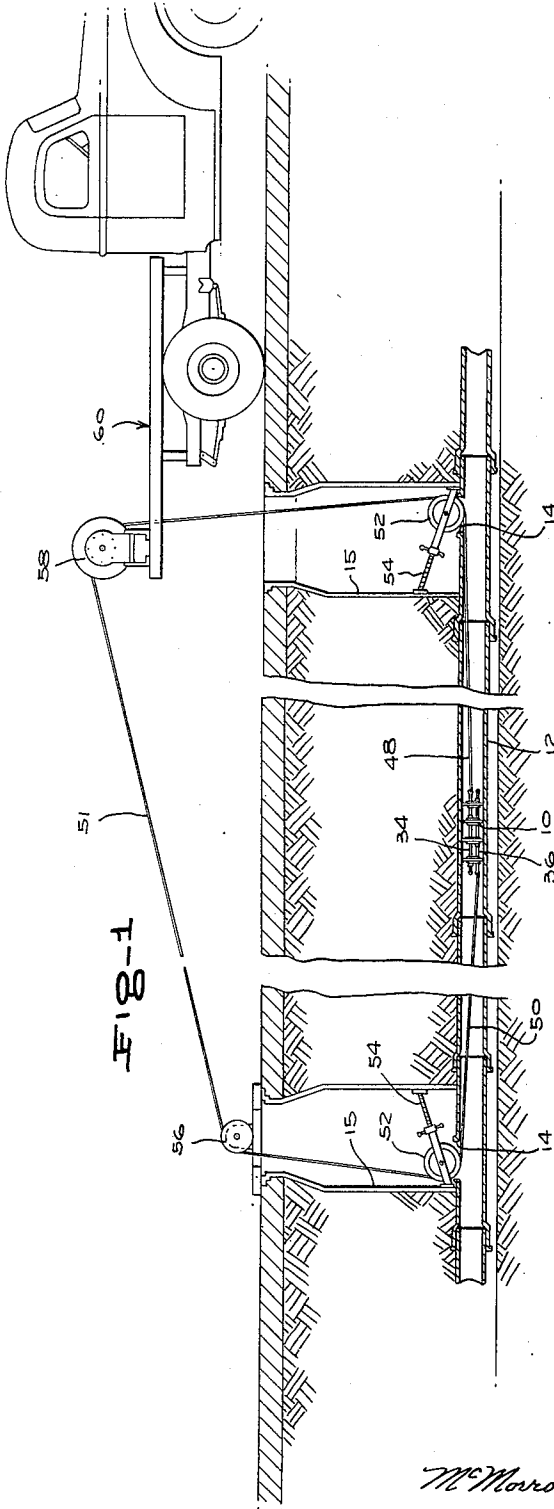
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APPARATUS FOR CLEANING AND REPAIRING PIPE LINES

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2 Sheets-Sheet 1



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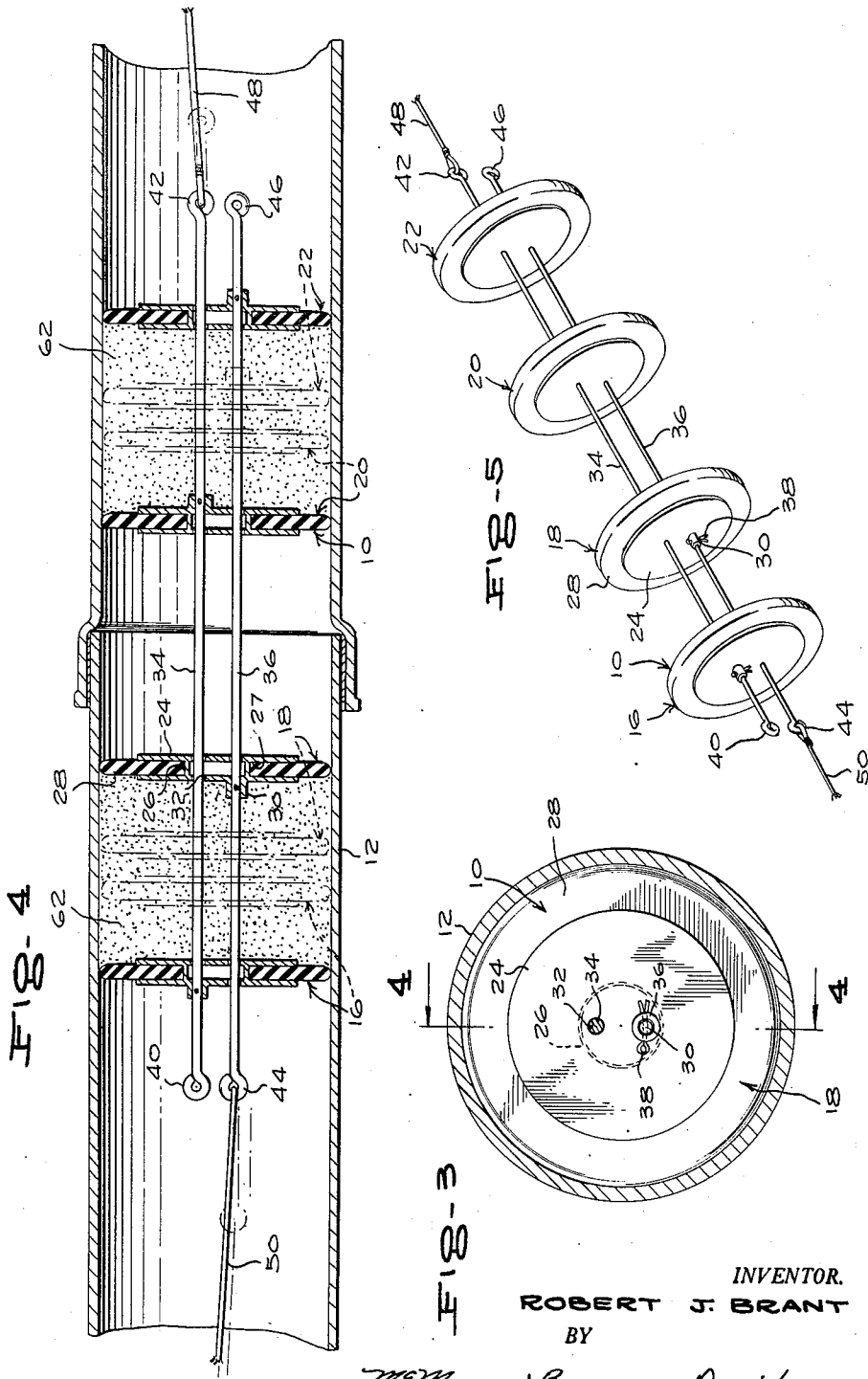
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APPARATUS FOR CLEANING AND REPAIRING PIPE LINES

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5 Claims. (Cl. 138—97)

This invention relates to pipe cleaning and repairing apparatus insertable in pipe lines to which access, at all locations along the length thereof, is not always readily had. Pipe lines falling within this category, for example, are subterranean lines having manholes spaced substantial distances, usually 300 feet more or less, along the length of the line.

The main object of the present invention is to provide a generally improved apparatus of this type, so designed as to be insertable through one manhole, and pulled through the pipe line by means of a cable extending through the line and out of spaced manholes to winch or similar device located on the surface.

Summarized briefly, the invention comprises a series of rubber rings or discs, having an outside diameter equal to the inner diameter of the pipe to be cleaned or repaired. Said discs are used in an even number, with half of them keyed or attached by equivalent means to a first rod connectable to a cable and the remaining half similarly connected to a second rod movable by a cable longitudinally of the first rod in an opposite direction. The discs are so arranged that adjacent discs define between them a chamber for a cementitious material such as grout. On pulling of the rods in opposite directions, the chambers are reduced in length, so as to exert a pressure on the grout tending to force the same radially outwardly against the wall of the pipe, to fill cracks or other defects.

Other objects will appear from the following description, the claims appended thereto, and from the annexed drawing, in which like reference characters designate like parts throughout the several views, and wherein:

Figure 1 is a longitudinal sectional view through a pipe line, showing the device in use;

Figure 2 is an enlarged, fragmentary longitudinal section through the pipe line in which the cleaning device remains in side elevation, the dotted and full lines showing the discs in first and second stages, respectively, of the operation;

Figure 3 is a transverse sectional view, still further enlarged, on line 3—3 of Figure 2;

Figure 4 is a longitudinal sectional view, on the same scale as Figure 2, on line 4—4 of Figure 3, the full and dotted lines respectively showing the discs at the second and third or final stages of the operation; and

Figure 5 is a perspective view of the device per se.

The pipe repair and cleaning apparatus constituting the present invention has been generally designated at 10, and is used in a pipe line 12 such as a subterranean line having a plurality of sections abutting in end to end relation. At 14 in Figure 1 spaced openings of the line are illustrated. The openings are made when the line is to be cleaned, at the bases of manholes 15.

The cleaning apparatus comprises a series of spaced discs 16, 18, 20, 22 disposed in planes normal to the axis of the pipe. Four discs are shown, but this number

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can be increased or decreased, so long as there is an even number of discs.

The discs are all identically formed, though arranged in different positions in a manner to be described in detail hereinafter. Therefore, a description of the disc 18, it is believed, will suffice for all of them. Disc 18 includes a retaining plate 24 having a hollow cylindrical core 26 defining about the same a deep, continuous peripheral groove 27. The retaining plate can in actuality comprise a pair of plate members if desired.

A rubber ring 28 has a center opening receiving the core, with the ring seating snugly in the peripheral groove and bearing firmly at its opposite sides against the side wall of the groove. Ring 28 is in wiping contact, at its outer diameter, with the inner surface of the pipe line.

Formed upon one side of the retaining plate of the disc is a short sleeve 30, projecting outwardly from said side, in spaced relation to the center of the disc. At the other side of the disc center, and diametrically opposing the sleeve, is an opening 32, formed in the retaining plate. The bore of the sleeve and said opening communicate with the interior of core 26, the retaining plate having openings at its opposite side aligned with said sleeve 30 and opening 32. Extending through the opening 32 and sleeve 30 are straight, parallel rods 34, 36 respectively, rod 36 being pinned by a cotter key 38 to sleeve 30 and rod 34 being freely slidable in opening 32.

The same arrangement is carried out with respect to the remaining discs, with the discs 16 and 18 comprising one pair and the discs 20, 22 comprising another pair of discs. As previously noted, any number of pairs of discs can be employed in the apparatus. With respect to the discs of each pair, one disc is pinned to one rod and the other disc is pinned to the other rod, and thus, on axial movement of one of the rods in respect to the other, the discs of each pair will be moved toward or away from one another, as the case may be.

Formed on the opposite ends of rod 34 are eyes 40, 42, while rod 36 has similar eyes 44, 46 on opposite ends thereof. Connected to eye 42 is one end 48 of a cable, the other end of which is connected to eye 44 of the other rod, said cable being designated at 51 and being trained, adjacent openings 14 of the pipe line, about pulleys 52 of adjustable jacks 54 extending diametrically across each manhole in firm engagement with the side wall of the manhole. The cables are then extended upwardly out of the manholes, with end portion 50 trained about an idler pulley 56 at the upper end of one of the manholes. Then, cable 51 is coiled about the drum of a winch 58 mounted on the bed of a truck 60 on the surface.

In use of the apparatus, the same is lowered into the pipe line through one of the openings 14, and the space between the discs of each pair is filled with grout 62. Obviously, the particular composition of the grout may be varied as desired. It is important, in this regard, that the grout be of a quick drying type, so that it will harden before externally applied pressures force it back into the pipe interior.

Initially, the discs are in the dotted line positions of Figure 2, and it will be seen that the discs of each pair are spaced a maximum distance apart. Thus, considering one of the pairs of discs, disc 16 is initially abutted against eye 44, while disc 18 abuts against disc 20.

With the device ready for operation in this manner, the apparatus is shifted axially of the pipe line, from one to the other of the manholes. During movement of the device, pull is exerted on the end portions 48, 50 in opposite directions, so as to draw the discs of each pair toward one another. This causes the grout 62 to be forced radially, outwardly of the apparatus against the

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inner surface of the wall of the pipe line, with the radial pressure being adapted to force the grout into any cracks, crevices or other defects appearing in the pipe line.

The discs are shown at an intermediate stage of their movement toward one another, in full lines in Figure 2 and 4, it being apparent from a study of these disc positions that the quantity of grout between the discs of each pair has been partially exhausted.

It will be understood that when the radial pressure is being applied against the grout by movement of the discs of each pair toward each other the entire apparatus is being bodily shifted longitudinally of the pipe line, until ultimately, it reaches the other manhole, with the entire length of the line between the members being thus cleaned and repaired in the manner described.

By reason of the construction illustrated and described, it is apparent that tension can be maintained upon the end portions of the cable in such a manner as to draw the discs of each pair toward each other with minimum difficulty, while at the same time, the winch is operated to wind one end portion of the cable while unwinding the other end to effect the desired bodily movement of the apparatus axially of the pipe line.

It is believed apparent that the invention is not necessarily confined to the specific use or uses thereof described above, since it may be utilized for any purpose to which it may be suited. Nor is the invention to be necessarily limited to the specific construction illustrated and described, since such construction is only intended to be illustrative of the principles of operation and the means presently devised to carry out said principles, it being considered that the invention comprehends any minor change in construction that may be permitted within the scope of the appended claims.

What is claimed is:

1. Apparatus for cleaning and repairing a pipe line comprising at least one pair of discs adapted for disposition, at their peripheries, in wiping contact with the wall of a pipe line, said discs defining between them a chamber for receiving a quantity of a fluid surface-filling material; a first rod pinned to one of the discs and slidable in the other disc; and a second rod pinned to said other disc and slidable in the first disc, said rods being adapted at their opposite ends for connection to pulling cables, whereby to effect axial movement of the rods in opposite directions concurrently with bodily movement of both rods in the same direction within a pipe line, for drawing the discs of said pair toward one another to effect a radial outward pressure on said material tending to force the same against the wall of the pipe line, during travel of the discs and rods along said pipe line.

2. Apparatus for cleaning and repairing a pipe line comprising at least one pair of discs adapted for disposition, at their peripheries, in wiping contact with the wall of a pipe line, said discs defining between them a chamber for receiving a quantity of a fluid surface-filling material; a first rod pinned to one of the discs and slidable in the other disc; and a second rod pinned to said other disc and slidable in the first disc, said rods being adapted at their opposite ends for connection to pulling cables, whereby to effect axial movement of the rods in opposite directions concurrently with bodily movement of both rods in the same direction within a pipe line, for drawing the discs of said pair toward one another to effect a radial outward pressure on said material tending to force the same against the wall of the pipe line, during travel of the discs and rods along said pipe line, each

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of said discs including a peripherally grooved retaining plate through which the rods extend and a resiliently compressible ring confined in the groove with its outer diameter bearing against the wall of the pipe line.

3. Apparatus for cleaning and repairing pipe lines comprising a series of discs arranged in pairs, said discs being adapted for disposition in wiping contact with the wall of a pipe line to be cleaned; and support means for the discs, the discs of each pair being mounted on said support means for movement toward and away from one another, whereby to define between the discs of each pair a chamber for a fluid material to be forced against the wall of the pipe line responsive to movement of the discs toward each other, said support means being adapted to be drawn through a pipe line for shifting said series of discs bodily axially of the pipe line during movement of the discs of each pair toward each other, and comprising elongated, closely spaced parallel rods one of which is pinned to one disc of each pair and the other of which is pinned to the other disc of each pair.

4. Apparatus for cleaning and repairing pipe lines comprising a series of discs arranged in pairs, said discs being adapted for disposition in wiping contact with the wall of a pipe line to be cleaned; and support means for the discs, the discs of each pair being mounted on said support means for movement toward and away from one another, whereby to define between the discs of each pair a chamber for a fluid material to be forced against the wall of the pipe line responsive to movement of the discs toward each other, said support means being adapted to be drawn through a pipe line for shifting said series of discs bodily axially of the pipe line during movement of the discs of each pair toward each other, and comprising elongated, closely spaced parallel rods one of which is pinned to one disc of each pair and the other of which is pinned to the other disc of each pair, each of said rods including means at least at one end thereof adapted for attachment of pull cables thereto.

5. Apparatus for cleaning and interiorly coating a pipe line comprising: at least one pair of axially spaced discs adapted for peripheral wiping contact with a wall of a pipe line, said discs defining between them a chamber for a fluid coating substance; a first rod pinned to one and slidable in the other disc and projecting at one end beyond the space between the discs in one direction; a second rod pinned to the other disc and slidable in said one disc, the second rod projecting at one end beyond said space in the opposite direction; pulling cables respectively connected to said one end of the respective rods; and winch means remote from the discs, said cables being wound on the winch means so that the cables are pulled in opposite directions outwardly from the discs to shift the discs in opposite directions toward each other, the winch means being adapted for exerting a pulling force on one of the cables at a value exceeding that of the pulling force exerted on the other cable to bodily shift the discs in one direction axially of and within the pipe while maintaining pressure on the discs tending to move them relative to each other in directions to close the space therebetween.

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