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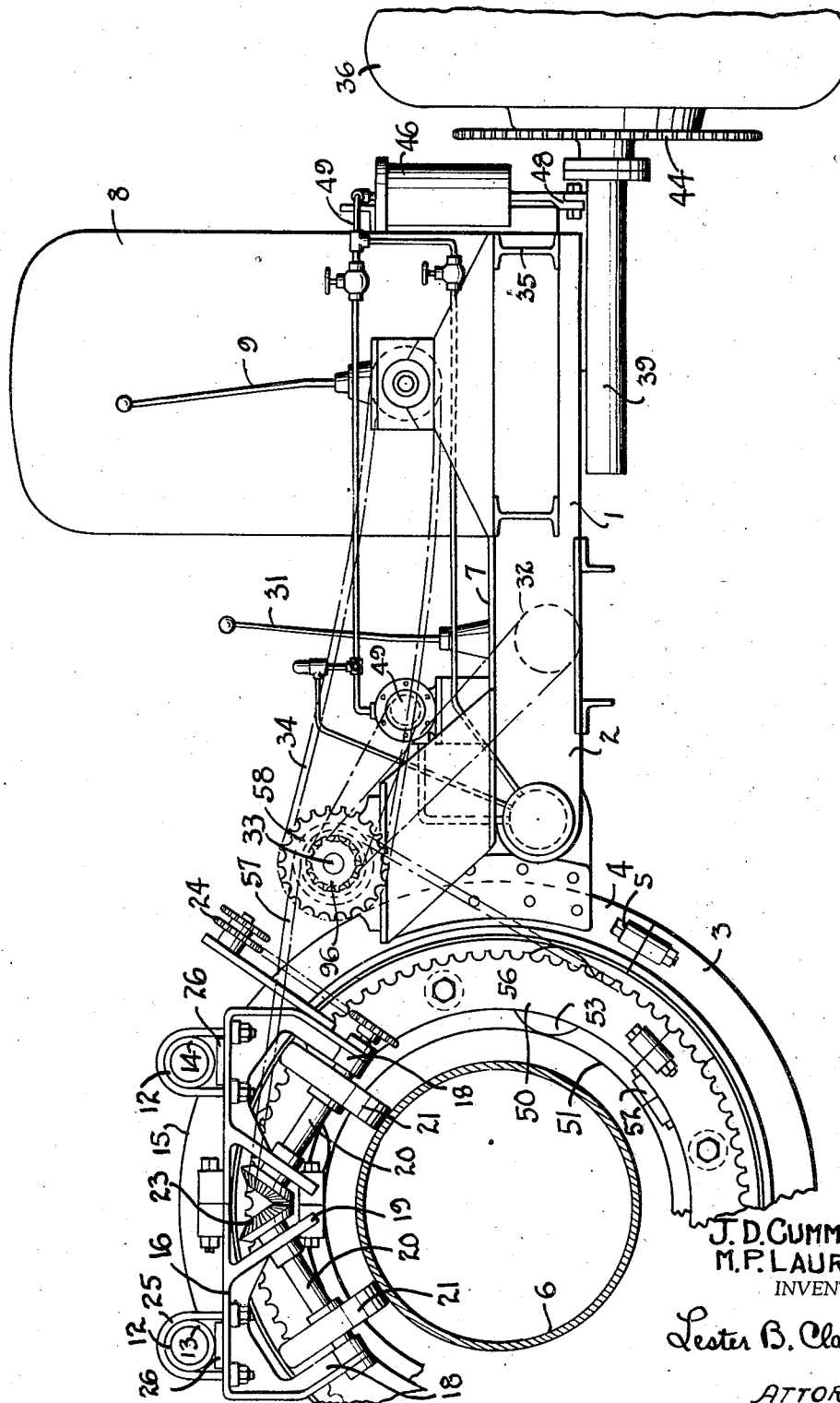
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2,436,099

PIPE CLEANING MACHINE

Filed Feb. 20, 1942

6 Sheets-Sheet 1



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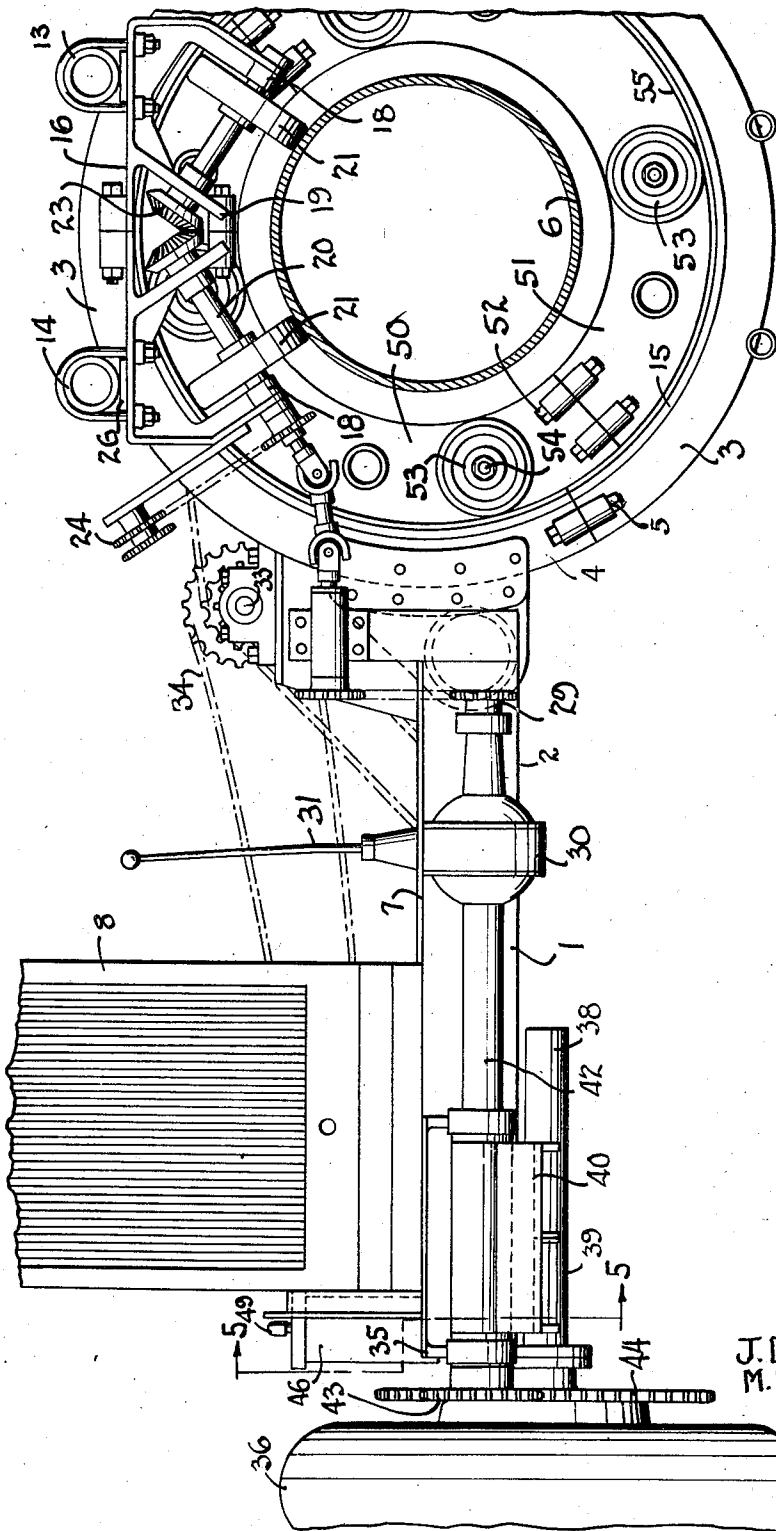
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6 Sheets-Sheet 2



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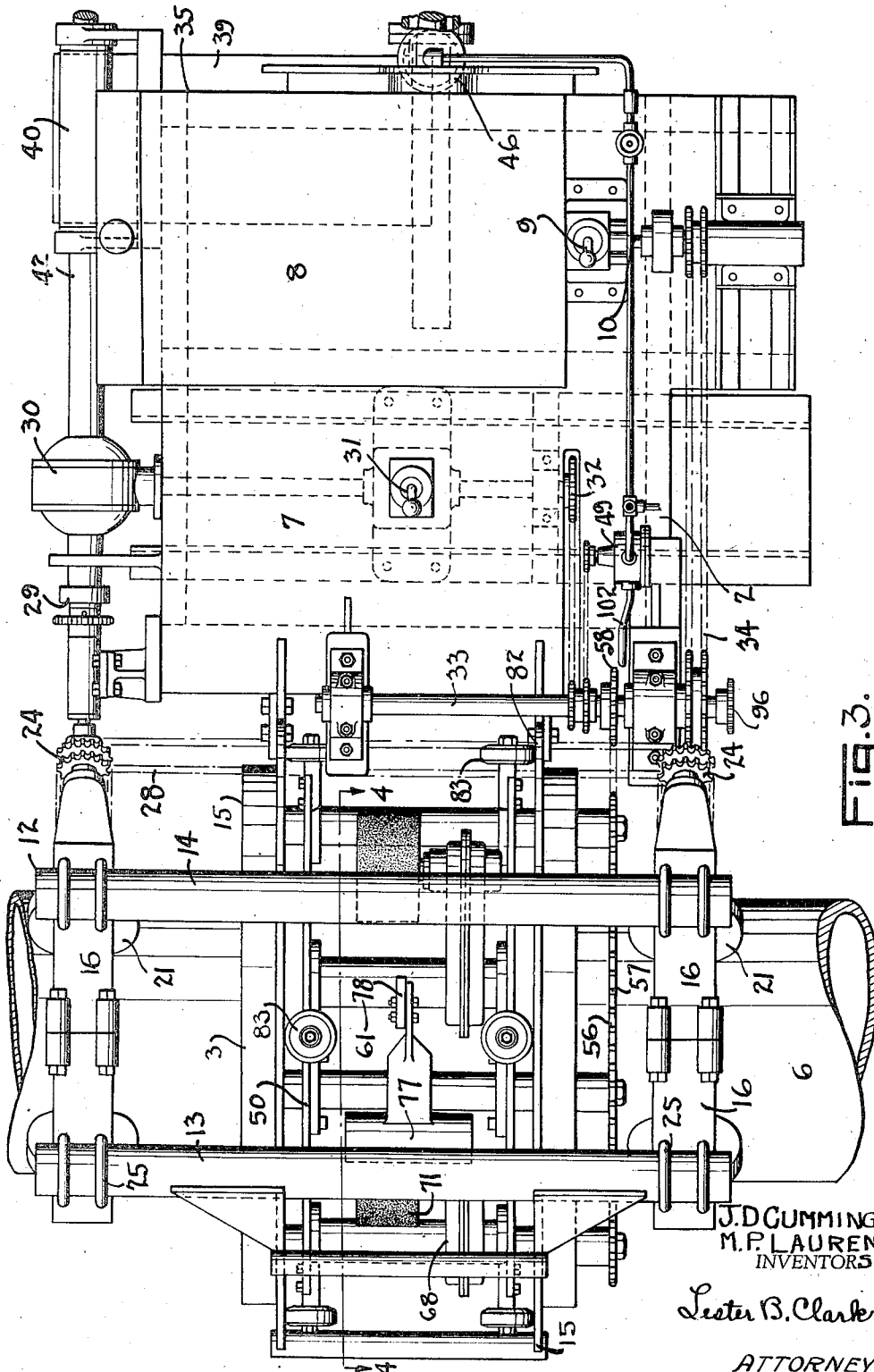
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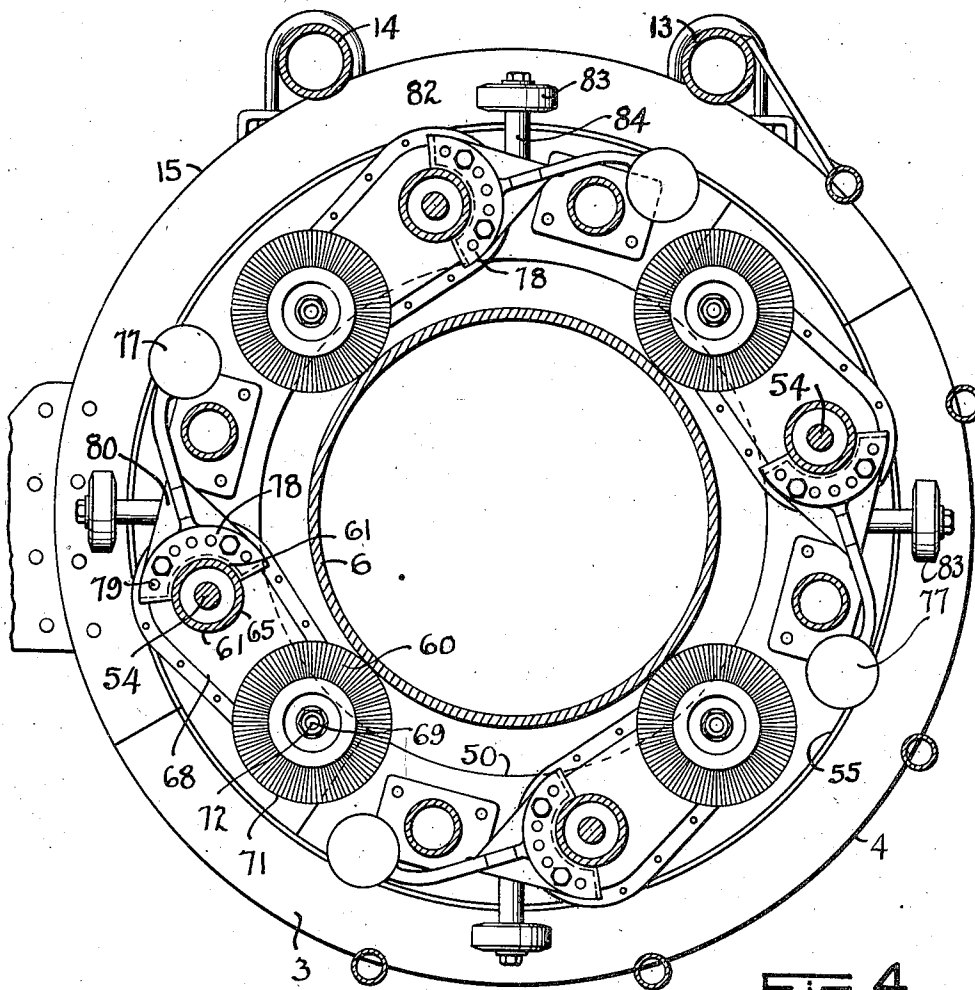


FIG. 4.

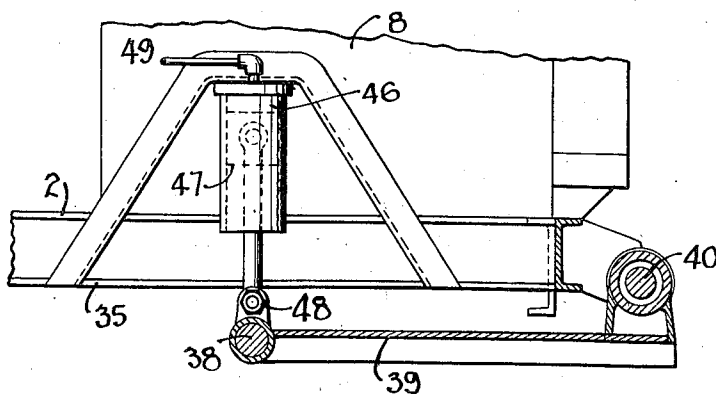


FIG. 5.

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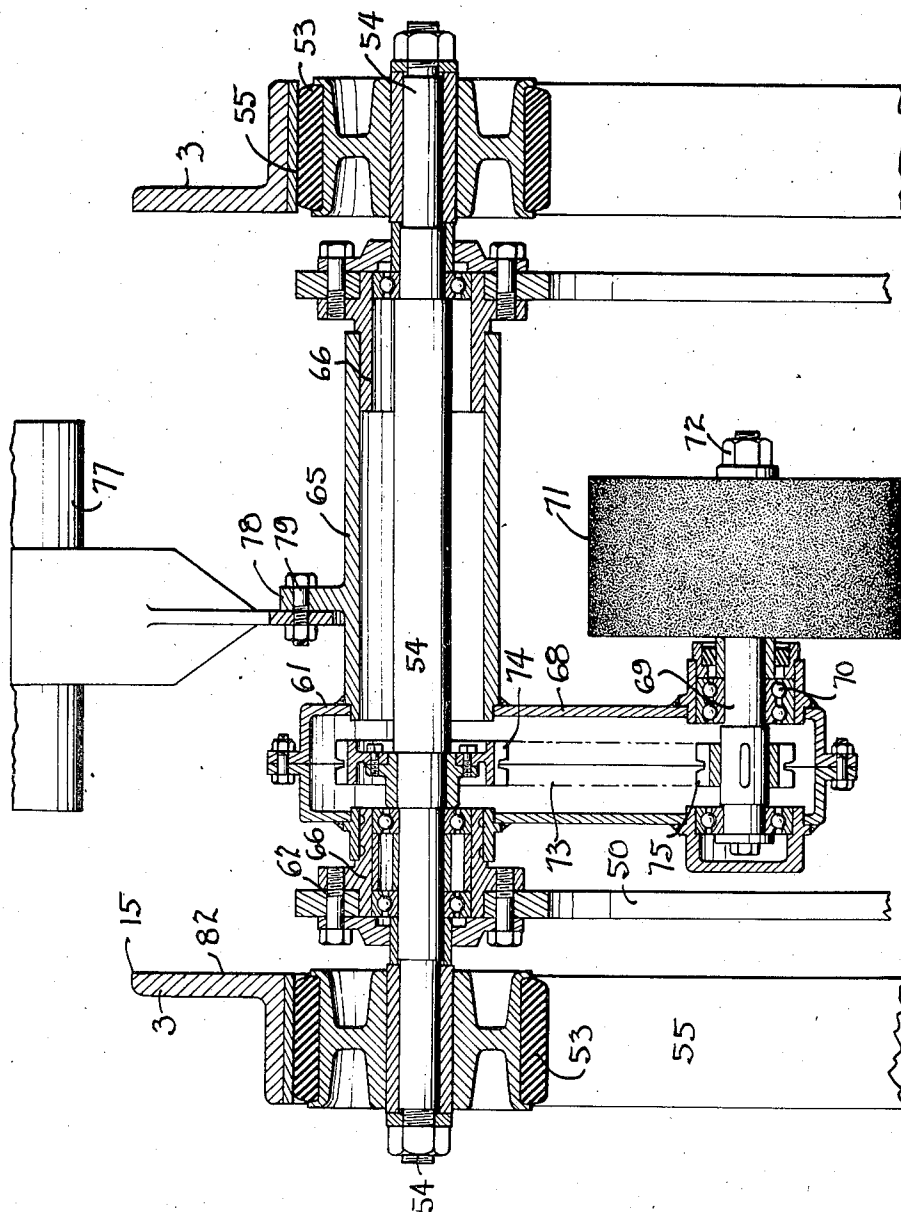


Fig. 6.

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6 Sheets-Sheet 6

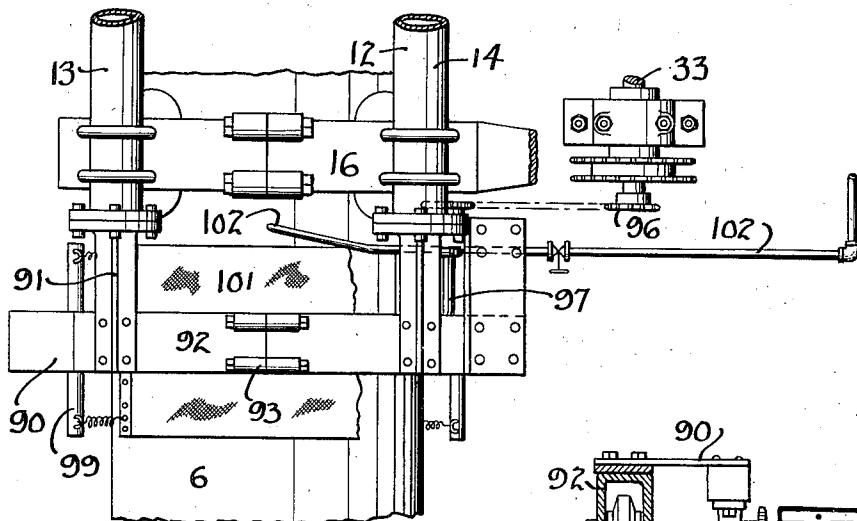


Fig. 7.

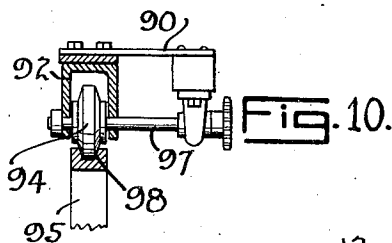


Fig. 10.

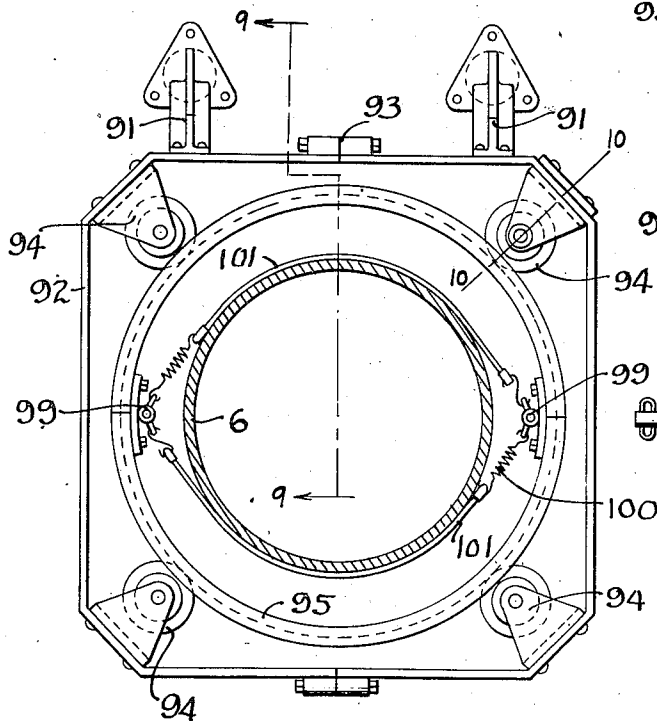


Fig. 8.

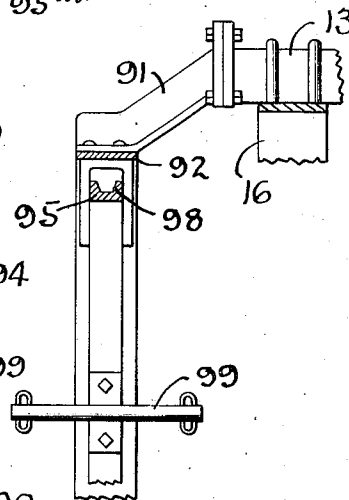


Fig. 9.

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## UNITED STATES PATENT OFFICE

2,436,099

## PIPE CLEANING MACHINE

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Application February 20, 1942, Serial No. 431,650

12 Claims. (Cl. 15—104.04)

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The invention relates to a pipe cleaning machine and particularly to a machine which is to travel along the pipe being cleaned. In the cleaning of pipelines it is desirable to insure that the surface of the pipe is properly cleaned, and it is therefore necessary to apply considerable pressure to the cleaning devices and to drive them at a high speed so that there is practically a grinding operation on the surface of the pipe.

Quite often a pipe surface is pitted and corroded and it is necessary that the cleaning operations extend into these pits so that the pipe may be properly coated and insulated.

In pipe cleaning operations where the pipe is incorporated in a pipeline extending across the country it has been the practice to maintain the pipe cleaning machine directly upon a pipe. This has been difficult because of the weight of the pipe cleaning machine and the difficulty of maintaining it in proper position upon the pipe.

The present invention contemplates a pipe cleaning machine including a frame wherein one edge of the frame is mounted to travel on the pipeline and the other edge of the frame is mounted on an outrigger wheel to travel over the earth surface along the pipeline.

It is one of the objects of the invention to provide a frame for pipe cleaning machines which will travel along the side of the pipe and support all of the mechanisms for supplying power and for cleaning the pipe.

Another object of the invention is to provide an outrigger wheel for pipe cleaning machines wherein the wheel is adjustable to accommodate the terrain being traveled.

Another object of the invention is to provide a housing for pipe cleaning machines which will be disposed about the pipe wherein the housing is adjustable relative to the pipe so as to accommodate different sized pipe.

Another object of the invention is to provide the combination of a housing and a rotatable cage therein wherein the cleaning members are power driven by engagement of the cage with the housing.

Another object of the invention is to provide power driven cleaning members for a traveling type pipe cleaning machine.

Another object of the invention is to provide a pipe cleaner member which is mounted for turning movement toward and away from the pipe but which is urged toward the pipe as a function of the speed of rotation of the cleaner.

Another object of the invention is to provide an adjustable mechanism for the housing of a

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pipe cleaning machine so that the housing may be adjusted to accommodate different sized pipe.

Another object of the invention is to provide a power mechanism for the cleaner cage of a pipe cleaning machine wherein the cleaner elements are driven independently of the rotation of such cage.

Another object of the invention is to provide a painting or primer coating attachment for pipe cleaning machines.

Other and further objects of the invention will be more readily apparent when considered in connection with the following description and the accompanying drawings wherein

Fig. 1 is a front elevation of a pipe cleaning machine mounted in operative position upon a pipe;

Fig. 2 is a rear end elevation of the pipe cleaning machine;

Fig. 3 is a top plan view looking down on the pipe cleaning machine;

Fig. 4 is a section taken on the line 4—4 of Fig. 3 and showing a transverse arrangement of the housing, cage and cleaner members;

Fig. 5 is a broken detail view showing the adjusting mechanism for the outrigger wheel;

Fig. 6 is a broken detail section through the housing, cage, and the cleaner member driving or supporting mechanism;

Fig. 7 is a top plan view looking down on the rear yoke to which a painting attachment has been affixed;

Fig. 8 is an end view of the painting attachment of Fig. 7 with the pipe shown in section;

Fig. 9 is a broken detailed view along the line 9—9 of Fig. 8 of the attachment to illustrate the arrangement of the parts;

Fig. 10 is a broken sectional view on the line 10—10 of Fig. 8.

Fig. 1 illustrates the pipe cleaning machine generally at 1, and this machine includes the frame 2. This frame is of peculiar construction in that it incorporates the housing 3 at one edge thereof, which housing is made up of the sections 4 which may be clamped together by the bolts 5 in disposing the housing about the pipe such as 6.

This frame 2 is best seen in top plan view in Fig. 3 and includes a platform area 7 which carries an engine or other power source 8. A suitable transmission mechanism 9 controls the power from the source 8 and serves to operate a drive shaft 10 which will be later described.

This frame 2 is mounted to travel on the pipe 6 by means of a bridge construction 12. This

bridge incorporates the pipes or beams 13 and 14 which are spaced apart and are suitably connected to the circular flanges 15 which form the housing 3 about the pipe.

Fig. 3 illustrates these pipes or beams 13 and 14 as carrying the yoke pieces 16 at the end thereof. Each of these yokes is of peculiar construction and extends over the top of the pipe 6. Each yoke carries the extensions 18 and 19 which serve as bearings for the traction wheel shafts 20. It will be noted from Fig. 1 that the roller 21 mounted on each of these shafts 20 is slidable along the shaft, even though it is keyed thereto. It should be noted that the shaft 20 is substantially tangent to the pipe and that the opposite shafts 20 are connected together by the bevel gears 23 so that the power connection 24 to one of the shafts serves to drive both shafts, and therefore both wheels.

The yoke 16 is connected to the beams or pipes 14 and 13 by the U-bolts 25. A shim or block 26 can be placed under the pipe or beam so as to adjust the position of the yoke relative to the beam.

If a pipe smaller than the pipe shown at 6 in Fig. 1 is to be cleaned, it is only necessary to mount a suitable number of the blocks 26 under the U-bolts so as to space the housing 3 concentrically about the pipe. If the pipe is smaller, the wheels 21 will slide along the shafts 20 and accommodate themselves to the small diameter pipe. In this manner a variation in the size of the pipe will not cause any wedging or binding action of these traction or supporting wheels. The connection 24 may extend over to the drive shaft 19 in any suitable manner, but is preferably in the form of a chain 28 connected between the driving connection 24 at each end of the bridge. The rear driving connection 24 will be connected to the end 29 of the differential 30. The differential 30, in turn, receives its power through a transmission 31 and the driven connection 32 from a stub shaft 33 which is, in turn, driven by the chain 34 from the drive shaft 10. In this manner it will be noted that there are two transmissions, 9 and 31, so that a considerable number of variations in speed may be obtained.

The mechanism thus described supports and drives one edge of the frame 2 upon the pipe. As best seen in Figs. 1 and 2, the opposite or outboard edge 35 of the frame 2 is supported by an outrigger wheel 36. This wheel may be of any suitable construction, but is preferably mounted upon a stub shaft 38 which is journaled in the end of the arm 39 which arm, in turn, is pivoted on the shaft 40 carried by the rear edge of the frame 2.

Fig. 2 shows that one side 42 of the differential 30 carries a sprocket wheel 43 by which a chain will drive another sprocket wheel 44 on the hub of the wheel 36. In this manner it seems obvious that there will be the differential 30 between the traction wheel 21 on the pipe and the outrigger wheel 36.

In a machine of this type which travels along a pipeline across the country, it seems obvious that the terrain being traversed by the outrigger wheel 36 may be uneven, and with this in mind, the arm 39 has been pivoted and may be adjusted relative to the frame 2 by any suitable means. Fig. 5 shows an hydraulic cylinder 46 which carries the piston and rod assembly 47 which is connected at 48 to the end of the arm 39 carrying the stub shaft 38. A circulating system 49 including a suitable pump, a source of liquid, relief

valves, and pipe connections may be connected to the cylinder, as seen in Fig. 1. This system will serve to operate the piston 47 and to move the arm 39 relative to the frame. Thus, if a depression is encountered, liquid can be forced into the cylinder to such an extent that the frame will remain at the same elevation while the outrigger wheel will travel down into the depression. When the depression has been traversed the hydraulic liquid can be released from the cylinder to again allow the arm 39 to move to a suitable position such that the frame 2 is substantially horizontal. It seems obvious that this arm 39 may be adjusted in any desired manner to permit satisfactory operation of the machine.

The transverse sectional view of Fig. 4 illustrates the pipe cleaning portion of the machine and shows the housing 3 as being assembled about the pipe 6. This housing is, of course, supported by the beams or pipes 12 and 13 and the traction wheels 21, as previously described, so that this housing 3 merely slides along the pipe, but is concentrically disposed about the pipe due to the adjustment of the yoke 16 relative to the supporting pipes.

As indicated hereinbefore, it is very desirable to provide power driven cleaner members, and to this end the applicant has provided a rotatable cage 50 which is best seen in end elevation in Fig. 2. This cage is made up of a pair of semi-circular members 51 clamped together with the bolts 52 in position about the pipe 6. In order to support this cage for rotation, the supporting rollers 53 are mounted on the shafts 54 on the cage and these rollers are arranged to travel on the trackway 55 which forms a part of the housing 3. This trackway 55 acts as a support to allow a rolling action of the rollers 53.

In order to turn this cage a drive sprocket 56 forms part of the cage and is driven by the chain 57 from the drive sprocket 58.

It seems obvious that as the cage 50 is driven by the sprocket 56 that the rollers 53 will turn and follow the trackway 55.

It is desirable that the cleaner members be power driven so that they may turn at a relatively high rate of speed as they rotate about the pipe. To accomplish this operation, the cleaner members 60, as seen in Fig. 4, are mounted upon a sleeve or cleaner member supporting assembly indicated generally at 61. This assembly is best seen in Fig. 6.

The wheels 53 are shown as traveling on the trackway 55 and these wheels are affixed to the shaft 54. This shaft 54 is rotatably mounted in the cage 50 by means of the antifriction bearings 62, and is of a length to extend from end to end of the housing 3 and carries an identical set of wheels 53 on the other end thereof. The pipe cleaner member assembly includes the sleeve 65 which is mounted for turning movement upon the hubs 66 of the cage 50. This sleeve 65 has an extension 68 thereon which extends laterally from the sleeve and serves to support the cleaner spindle 69 in the antifriction bearings 70. The spindle 69 carries a cleaner member 71 which is preferably in the form of wire bristles or other suitable members which will brush against the surface of the pipe to perform the cleaning operation. This member 71 is held in place by the nut 72 which can be readily removed in order to change the member either as to type, size or construction.

In order that this cleaner member 71 may turn at a relatively high speed against the surface of

the pipe, a driving connection 73 extends from the sprocket wheel 74 on the shaft 54 to a similar sprocket 75 on the spindle 69. In this manner a positive and powerful driving connection is made to the cleaner member 71. The turning of the sleeve 65 and extension 68 causes the cleaner member 71 to move toward and away from the outer surface of the pipe 6.

Inasmuch as it is desirable to force this cleaner member against the pipe with at least a predetermined force, and in view of the fact that the entire cage is rotated at a relatively high rate of speed, a counterweight or counterbalance 77 is shown as having been mounted upon the segment 78 on the housing 65. This segment is best seen in Fig. 4 as having a plurality of openings 79 therein so as to adjustably receive the shank 80 of the counterweight 77.

It seems obvious that by adjustment of this weight 77 the centrifugal action of the weight can be varied and utilized to force the cleaner member 71 against the pipe. The adjustment of this weight can be made in accordance with the size and type of the cleaner member, the size and condition of the pipe to be cleaned, and the speed of rotation of the cage. Fig. 4 shows four of these cleaner assemblies.

It will be noted that the rollers 53 serve a dual purpose. That is, they serve to rotatably support the cage 50 in the housing 3 and they also serve to drive the shaft 54 to impart power to the cleaner members 71.

In order to guide the rotation of the cage to prevent end sway, it will be noted that the circular flanges of the housing 3 are provided with an additional trackway 82 on the inner face thereof. This internal trackway receives the guide rollers 83 which are carried on the shafts 84 extending from the periphery of the cage 50. These rollers are seen in operation in Fig. 3.

It seems obvious that the cleaner 71 may turn about its supports on the cage 50 in any desired amount so as to contact different sized pipe. That is, the brush portion 71 can move inwardly and the counterweight 77 move outwardly if a small pipe is being cleaned. The counterweight can then be adjusted to force the cleaner or brush against the periphery of the pipe with the suitable pressure, whereas, if a larger pipe is being cleaned, the normal position of the cleaner brush 71 will be approximately that shown in the drawings, and again adjustment of the counterweight can be made. The size of the counterweight 77 is so designed that a suitable centrifugal force or action will hold the cleaner brush against the pipe.

When a water gap is encountered during the cleaning of a pipeline it seems obvious that the outrigger wheel 36 can be suitably supported upon a cable as a cathead, or the tire of the wheel might be removed and the rim could travel upon such supporting cable so as to keep the machine in equilibrium.

Figs. 7 to 10, inclusive, illustrate an arrangement or attachment which may be affixed to the rear of the frame, and particularly to the beams 13 and 14 and the yoke piece 16.

This attachment is illustrated generally at 90 and is for the purpose of applying a primer coating to the pipe immediately following the cleaning operation so as to forestall corrosion and to protect the pipe until a protective coating can be applied.

This attachment includes the arms 91 which are shown in Fig. 7 as having been affixed to the

beams 13 and 14. These arms extend outwardly and downwardly, as seen in Fig. 9, and are arranged to support the housing 92. This housing is separable by the bolted connections 93 and has a series of rollers or wheels 94 arranged therein. These rollers or wheels support a rotatable cage 95 which is driven by the power connection 96 and the stub shaft 97. The power connection 96 is an extension of the power shaft 33 and the shaft 97 extends into one of the wheel assemblies 94. As seen in Fig. 10, the wheel fits into a groove 98 in the periphery of the cage so as to impart rotation to the cage.

The cage, in turn, has a bracket 99 therein having the springs 100 connected thereto. These springs in turn carry a spreader device such as a piece of carpet or other similar material 101. Fig. 8 shows two of these pieces which extend about the pipe on opposite sides. These two spreaders extend about the pipe and are arranged to receive and spread a paint or primer coating material from the pipe 102. This pipe 102 is seen in Fig. 3 extending from the pump 49. This pump may be used to force the primer material through the pipe to a position just in advance of the ragging device or spreaders 101, as seen in Fig. 7. It seems obvious that the pump 49 can be used to apply the pressure to force this paint material through the pipe 102 and that, by manipulation of the valves, can also be used to operate the cylinder 46 to control the elevation of the outrigger wheel.

With this arrangement it is possible to place a primer coating on the pipe immediately following the cleaning operation and such a procedure is, of course, of advantage.

Broadly, the invention contemplates a pipe cleaning machine which can travel at high speeds either forward or reverse and wherein the speed of operation can be readily adjusted and also wherein a substantial portion of the weight of the machine is carried by an outrigger wheel rather than upon the pipeline.

What is claimed is:

1. A portable pipe cleaning machine including a frame, means to movably support said frame upon the pipe being cleaned including a yoke, rollers carried by said yoke, means to adjust the yoke relative to the frame so that different sized pipe will be centered for cleaning, and means mounting said rollers so that each roller is normal to the pipe at the arc of contact and slidable on a tangent to the periphery of the pipe so as to accommodate different sized pipe without wedging said rollers relative to the different pipe.

2. A portable pipe cleaning machine including a frame, means to movably support said frame upon the pipe being cleaned including a yoke, rollers carried by said yoke including a pair of shafts, and a roller slidable on each shaft so as to roll along the pipe, means to adjust the yoke relative to the frame so that different sized pipe will be centered for cleaning, and means to drive said rollers to move the machine.

3. A pipe cleaning machine having a frame, a housing on said frame disposed about the pipe, adjustable means to support said housing concentrically about different sized pipe, a rotatable cleaner cage, and roller means carried by said cage to roll on the inside of said housing to retain the cage centered for high speed operation.

4. A pipe cleaning machine having a frame, a housing on said frame disposed about the pipe, adjustable means to support said housing con-

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centrically about different sized pipe, a rotatable cleaner cage, rollers on said cage rotatable in said housing as the cage rotates, cleaner members in said cage, and means driven by rotation of said rollers to drive said cleaners as the cage travels around the pipe.

5. In a pipe cleaning machine a cage to rotate about the pipe, a cleaner unit including a sleeve turnably mounted on said cage, an extension laterally of said sleeve, a cleaner member rotatably mounted on said extension, and driving means for said member including a roller running in the machine, a shaft rotatable in said sleeve by said roller, and a connection therefrom to said member.

6. In a pipe cleaning machine a cage to rotate about the pipe, a cleaner unit including a sleeve turnably mounted on said cage, an extension laterally of said sleeve, a cleaner member rotatably mounted on said extension, driving means for said member including a roller running in the machine, a shaft rotatable thereby in said sleeve, and a connection therefrom to said member, and a counterweight extending from said housing opposing the cleaner member so that upon rotation of the cage said counterweight will tend to turn the sleeve and move said cleaner member against the pipe.

7. In a pipe cleaning machine a cage to rotate about the pipe, a cleaner unit including a sleeve turnably mounted on said cage, an extension laterally of said sleeve, a cleaner member rotatably mounted on said extension, driving means for said member including a roller running in the machine, a shaft rotatable thereby in said sleeve, and a connection therefrom to said member, and a counterweight extending from said housing opposing the cleaner member so that upon rotation of the cage said counterweight will tend to turn the sleeve and move said cleaner member against the pipe, said sleeve being turnable to accommodate different sizes of pipe.

8. In a pipe cleaning machine a cage to rotate about the pipe, a cleaner unit including a sleeve turnably mounted on said cage, an extension laterally of said sleeve, a cleaner member rotatably mounted on said extension, driving means for said member including a roller running in the machine, a shaft rotatable thereby in said sleeve, and a connection therefrom to said member, a counterweight extending from said housing opposing the cleaner member so that upon rotation of the cage said counterweight will tend to turn the sleeve and move said cleaner member against the pipe, and means to adjust said counterweight so as to vary the pressure forcing said member against the pipe.

9. In a pipe cleaning machine a cleaner housing to be positioned about the pipe, a cleaner cage rotatable therein, a bridge to support said

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housing and cage about the pipe, said bridge including a yoke at each end and traction members carried by the yoke to travel on the pipe, said yokes being adjustable relative to said housing so as to accommodate the housing to different sizes of pipe, and rollers running in said housing to support and drive said cage.

10. In a pipe cleaning machine a housing to be disposed about the pipe to be cleaned, inside trackways on said housing, a cleaner cage disposed in the housing, cleaner members carried by said cage, and combination driving and supporting rollers on the cage to travel on said inside track and to thereby drive said cleaner members.

11. In a pipe cleaning machine a housing to be disposed about the pipe to be cleaned, inside trackways on said housing, a cleaner cage disposed in the housing, cleaner members carried by said cage, combination driving and supporting rollers on the cage to travel on said inside track and to thereby drive said cleaner members, and means to guide said cage in rotation to prevent end sway including additional rollers on the cage and an additional trackway in said housing.

12. A pipe cleaning machine to travel along a pipe line being cleaned including a frame, driven traction wheels supporting one side of the frame about the pipe, an outrigger wheel supporting the other edge of said frame including an arm pivoted to said frame, means to adjust said wheel relative to the frame including a device to pivot said arm, and means to drive said wheel so that the machine will travel in alignment with the pipe.

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