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MACHINE FOR POURING CONCRETE PIPE IN SITU

Filed Oct. 9, 1957

3 Sheets-Sheet 1

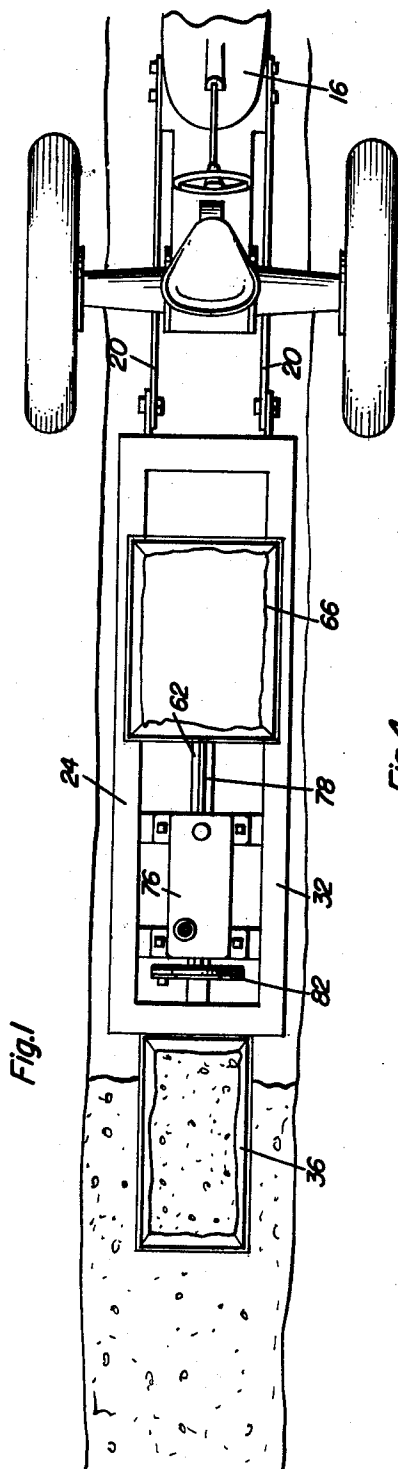
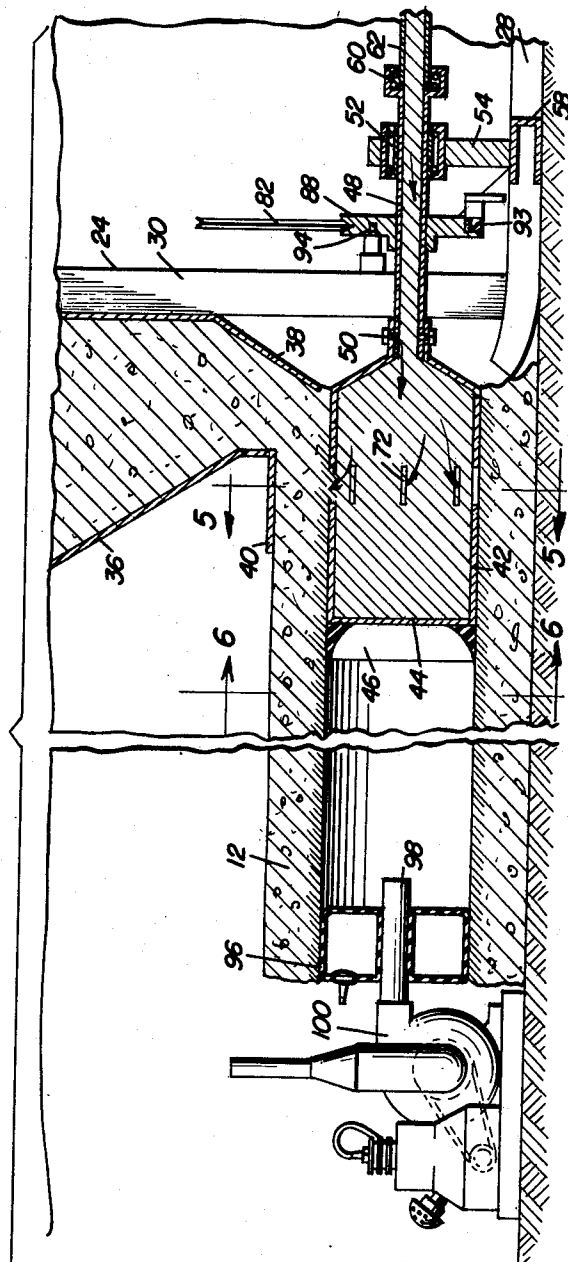


Fig. 4



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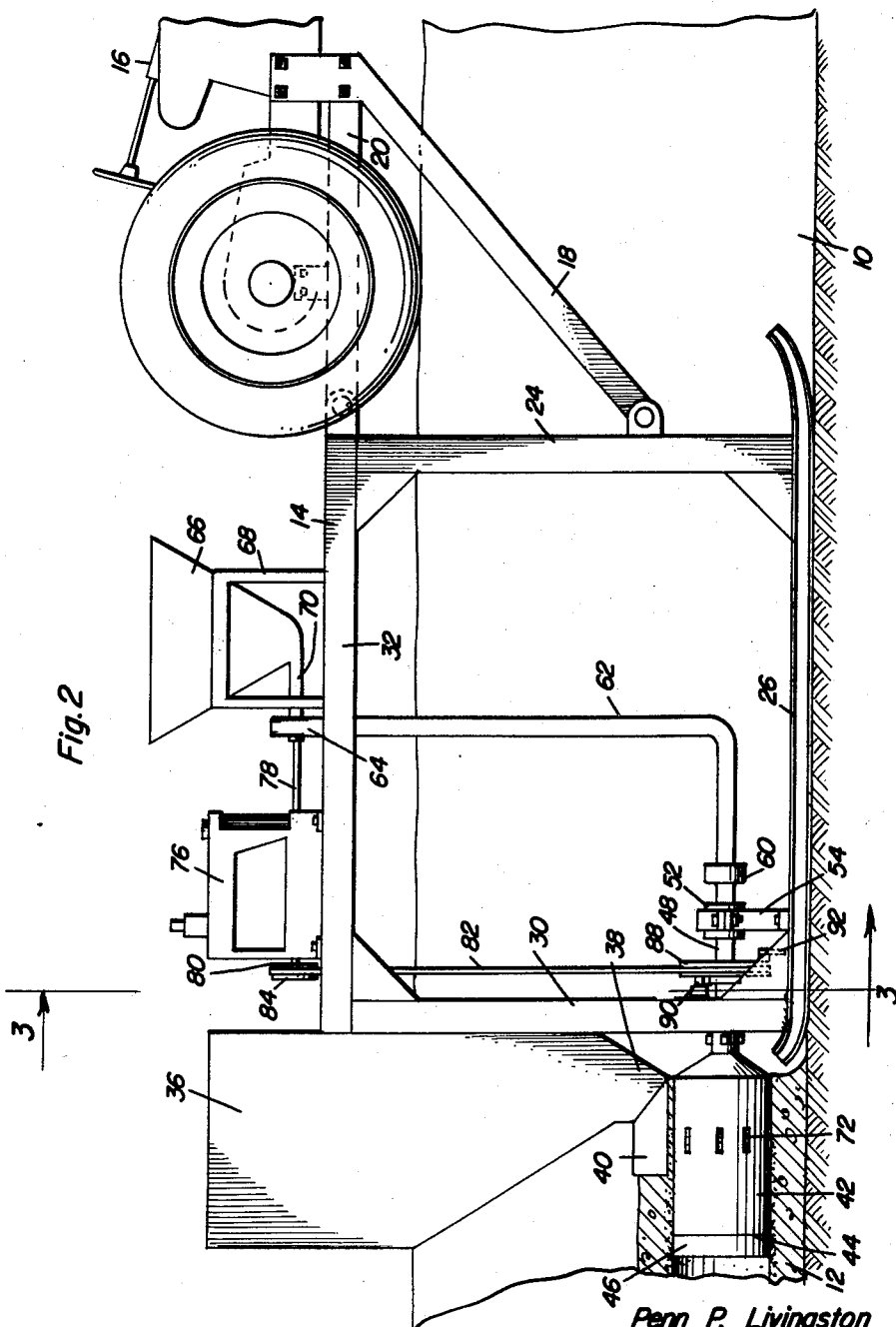
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3 Sheets-Sheet 2



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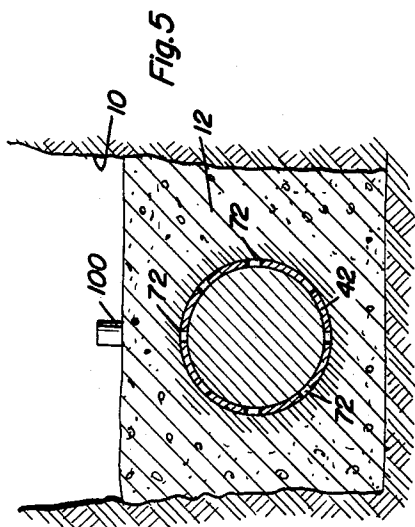
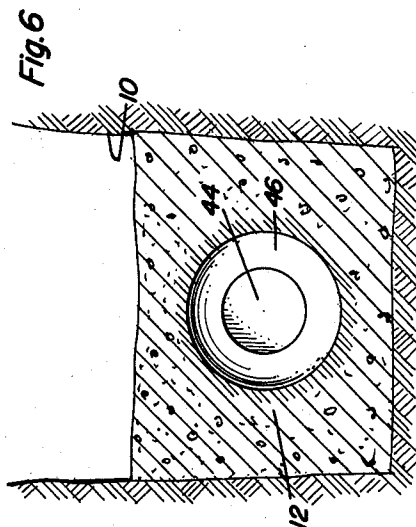
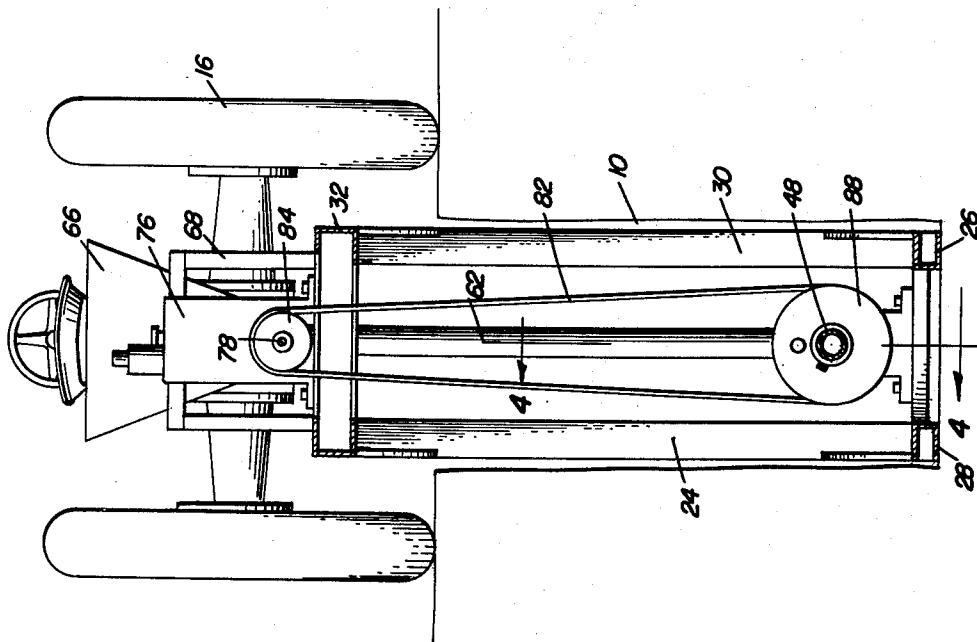
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MACHINE FOR POURING CONCRETE PIPE IN SITU

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3 Sheets-Sheet 3



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MACHINE FOR POURING CONCRETE PIPE IN SITU

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5 Claims. (Cl. 25—32)

This invention relates to a machine for the continuous manufacture of monolithic concrete pipe lines.

Low pressure concrete pipe has become extensively used to distribute water for irrigation and for other purposes. The present practice is to cast pipe, six to twelve inches or more in diameter, in convenient lengths of about three feet, at a factory and after the cement has set, the pipe is hauled to the field where it is laid in a ditch by hand. The pipe lengths are square at one end and have a bell at the other end so that one end can fit with the other in joining the pipe. The joint is filled with cement and the ditch is back filled over the pipe.

I am aware of prior patents which describe machines for constructing concrete pipe directly in a ditch, although all of the pipe line of which I am aware, is handled as described above. The prior concrete pipe forming machines work in a ditch and apply the wet concrete in such a manner that a continuous strip of pipe is formed directly in the ditch. My invention achieves this same end but does so in a manner considered to be a distinct improvement over prior machines.

In considering the nature and substance of my invention, the machine has parts in common with the machines described in prior patents. But, my machine is capable of producing a superior pipe line because I use a low back pressure of air to support the roof of the pipe until the concrete sets sufficiently to be self-supporting. There are no braces, members or like structural parts to achieve this necessary function. My invention can use a fairly dry mixture of coarse aggregate for the body of the pipe and my machine plasters the pipe on the inside with a sand, cement and lime mortar, for example. By the use of air pressure to support the roof of the pipe, optimum mixes for the concrete and the slurry of sand, cement, lime mortar, etc. are permissible.

A further object of the present invention is to provide a portable machine for the construction of continuous concrete pipe line in a ditch, the machine having a steel frame on which there is a group of components including a concrete hopper and a revolving drum at the bottom of the hopper in which there is a group of openings through which slurry is adapted to be pumped. As the entire machine moves forward in the ditch, the drum serves as a form for the concrete and as a means to discharge the slurry onto the inner surface of the pipe line that is being formed. All during this time a sealing ring behind the rotating drum serves as an air trap with rather low pressure air behind the sealing ring to serve as a structural support for the plastered roof of the pipe. The seal serves the secondary function of a screed as it is propelled with the drum.

Other objects and features of importance such as the actual structural organization of my machine, will become apparent in following the description of the illustrated form of the invention.

Figure 1 is a top view of a machine constructed in accordance with the invention, this machine being illustrated in an open ditch and being drawn by a tractor,

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the view also showing the formation of a pipe behind the machine.

Figure 2 is a side view of the equipment in Figure 1.

Figure 3 is a sectional view taken on the line 3—3 of

5 Figure 2.

Figure 4 is a sectional view on an enlarged scale and taken approximately on the line 4—4 of Figure 3.

Figure 5 is a sectional view taken on the line 5—5 of Figure 4.

10 Figure 6 is a sectional view taken on the line 6—6 of Figure 4.

In the accompanying drawings there is shown an upwardly opening ditch 10 within which the pipe 12 is being formed by my machine 14. Tractor 16 is shown straddling ditch 10 and by means of drawbars 18 and 20, pulling machine 14 along the bottom of the ditch.

My machine 14 is made of a frame 24 that has a pair of skids 26 and 28 at its bottom, four corner posts 30 and a rectangular sub-frame 32 at the tops of the posts 30. Any bracing, gussets, etc. that are deemed necessary from a structural standpoint are used. Frame 24 must be strong and reasonably rigid as it is drawn along the bottom of the ditch 10.

25 A special concrete hopper 36 is attached to the back of the frame 24 and it opens upwardly so that it can be filled rather easily with a fairly dry mixture of coarse aggregate, water, Portland cement and sand. Other additives for accelerating the setting of the concrete or for other purposes may be added. The front wall of hopper 36 is attached to the rear part of frame 24 with the spout 38 of the hopper supported above the bottom of ditch 10. A rearwardly directed baffle 40 is secured to the discharge end of hopper 38 and is approximately horizontal. Its purpose is to prevent a blowout by too great slurry pressure as will be described subsequently.

35 A rotating drum 42 is disposed beneath the baffle 40. The rotating drum has a closed end wall 44 on which the circular seal 46 is secured. The opposite end of the rotating drum is tapered and connects to a conduit 48 through which slurry under pressure is passed. Set screws 50 schematically represent means by which to connect the conduit to the drum. This conduit is mounted in a bearing 52 on a bearing stand 54 connected to a cross member 58 of frame 24, the member 58 being secured to the skids 26 and 28. A swivel union 60 connects conduit 48 with pipe 62 that extends from slurry pump 64 mounted at the top part of frame 24.

45 Slurry hopper 66 is carried by a stand 68 on the top part of the frame 24 so that the slurry hopper can be easily filled from a place alongside of the ditch as the machine is progressed slowly along in the ditch. The inlet of pump 64 is connected to the outlet 70 of hopper 66 so that the slurry is delivered through pipe 62 and conduit 48 into rotating drum 42 under a pressure. A plurality of slots 72 are in the side wall of drum 42 and in alignment with baffle 40. As the drum rotates it constitutes a form for the center of the pipe that is constructed by the concrete discharging from hopper 36 and at the same time the inner surface of the pipe under construction is plastered by the slurry. Moreover the rotating drum 42 and the seal 46 function as a screed for the pipe.

50 An engine 76 is secured by motor mounts on the frame 24 and is drivingly connected by shaft 78 to the pump 64. The same shaft or another shaft 80 drives conduit 48 thereby rotating the drum 42. One mechanical way of establishing the drive connection between the engine 78 and conduit 48 is by belt 82 which is entrained around pulley 84 on shaft 80 and around pulley 88 secured to conduit 48. A vibrator for the drum is operatively connected with the pulley 88 and consists of weight arms 90 and 92 that are pivoted on spindles 93 and 94 (Fig. 4)

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attached to pulley 88. By virtue of this construction the rotating drum 42 is vibrated as it is pulled along in the ditch. A commercially available electrical and/or mechanical vibrator could be substituted, and such a vibrator installed on the lower part of hopper 36.

Even though quick setting concrete can be used to construct pipe 12, there should be some means to support the roof of the pipe 12 for a brief period to enable it to set while so supported. My invention uses seal 46 together with a barrier 96 in the pipe 12 that is being formed. These form an isolated space in the pipe 12 within which a pressure may be formed to support the pipe roof or top. Barrier 96 is in the form of an inflatable annulus. The material may be rubber or plastic. Discharge pipe 98 from compressor or blower 100 extends through the center of the barrier. The compressor may be mounted directly in the ditch as shown in Fig. 4 or it may be carried by the tractor or set alongside of the ditch, in the latter two alternatives there would have to be hose lines used. In any case, the compressor 100 constitutes means by which to supply air under pressure to the isolated region between the barrier 96 and the seal 46 with the end wall 44 of drum 42 constituting another barrier. This is sufficient to support the plastered upper walls of the pipe line as it is being formed directly in the ditch.

Precast risers and laterals are connected with the pipe line 12 by placing them over a hole broken through the pipe and cementing them in place. This is all that is necessary for the construction of the pipe for irrigation in the areas of the country requiring irrigation practice. My machine is used mainly for placing six, eight, ten and twelve inch pipe but could be used for larger sizes.

It is understood that various changes and alterations may be made without departing from the invention as claimed.

Having described the invention what is claimed as new is as follows:

1. In a machine for continuously constructing concrete pipe in a ditch and wherein the machine has a hopper within which to receive concrete, a frame to which the hopper is secured, a slurry hopper carried by the frame, the improvement comprising a rotating drum located at the discharge end of the concrete hopper, a baffle at the discharge end of said hopper and laterally spaced from said rotating drum, means for conducting slurry from the slurry hopper into the drum as the drum is rotating, said drum having at least one discharge opening through which the slurry is discharged opposite to said baffle, means in the pipe that is being formed and cooperating with said drum for holding trapped a quantity of air under pressure to support the roof of the pipe as it is being formed, the last mentioned means including a pair of spaced barriers, one barrier being connected to said rotating drum and secondarily functioning as a screed, the other barrier being spaced from said drum and disposed in the pipe line that has been constructed.

2. The improvement of claim 1, wherein there is a source of air under pressure, said other barrier having an opening with which said source is registered so that the space isolated by said barriers is maintained under pressure from said source.

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3. The improvement of claim 2, wherein the barrier on said rotating drum is a circular seal of flexible material.

4. In a machine for continuously laying concrete pipe by the formation of the side walls of the pipe and by plastering the inner surfaces of the pipe with a slurry, said machine comprising a frame, a hopper for concrete, a hopper for slurry, the concrete supporting hopper having a baffle which is directed rearwardly with respect to the direction of travel of said frame in the ditch, a rotatable drum located beneath said baffle and having at least one discharge opening in alignment with said baffle, means on the frame and connected with said drum to rotate said drum, a vibrator operatively connected with said drum, means including a pipe for conducting slurry from the slurry hopper into the drum and under pressure to force the slurry out of said discharge opening, a barrier provided in the pipe being formed at a point spaced longitudinally from said drum, and means extending through said barrier for delivering air under pressure into the portion of the pipe being formed between said barrier and said drum for supporting the roof of the pipe until the pipe sets sufficiently to be self-supporting.

5. In a machine for continuously laying concrete pipe by the formation of the side walls of the pipe and by plastering the inner surfaces of the pipe with a slurry, said machine comprising a frame, a hopper for concrete, a hopper for slurry, the concrete supporting hopper having a baffle which is directed rearwardly with respect to the direction of travel of said frame in the ditch, a rotatable drum located beneath said baffle and having at least one discharge opening in alignment with said baffle, means on the frame and connected with said drum to rotate said drum, a vibrator operatively connected with said drum, means including a pipe for conducting slurry from the slurry hopper into the drum and under pressure to force the slurry out of said discharge opening, and mechanical means for delivering air under pressure into the pipe that is being formed and behind said drum for supporting the roof of the pipe until the pipe sets sufficiently to be self-supporting, said mechanical means including a pair of longitudinally spaced barriers provided in the pipe and isolating a region of the pipe being formed and a conduit extending through one of said barriers for delivering air under pressure into the region of the pipe between the barriers.

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