Dec. 19, 1939. J. O. MAGRUDER 2,183,618

MACHINE FOR CLEARING OUT PIPE

Original Filed Aug. 5, 1936 3 Sheets-Sheet 1

Fig. 3

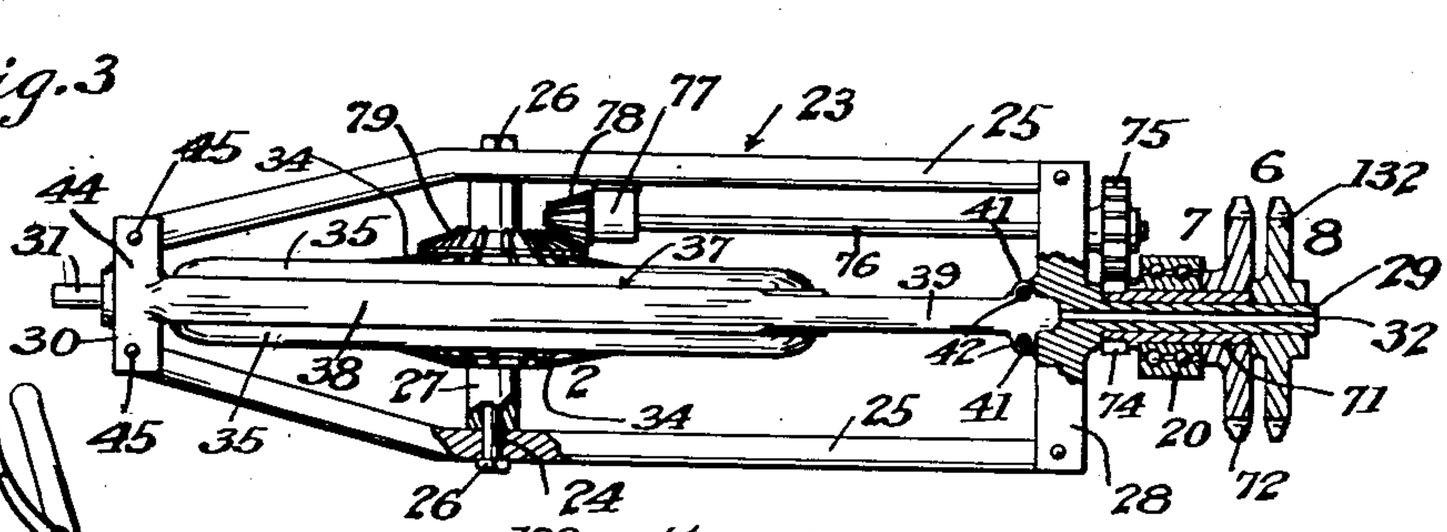

Fig. 4

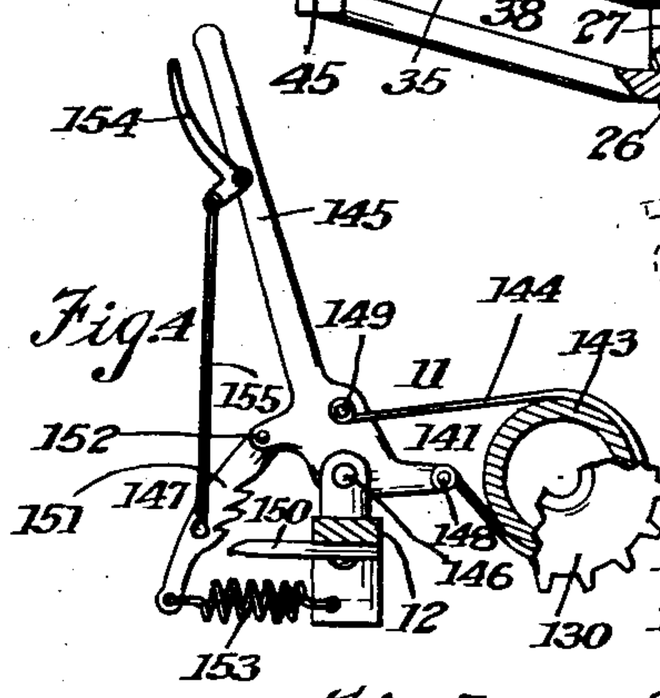

Fig. 5

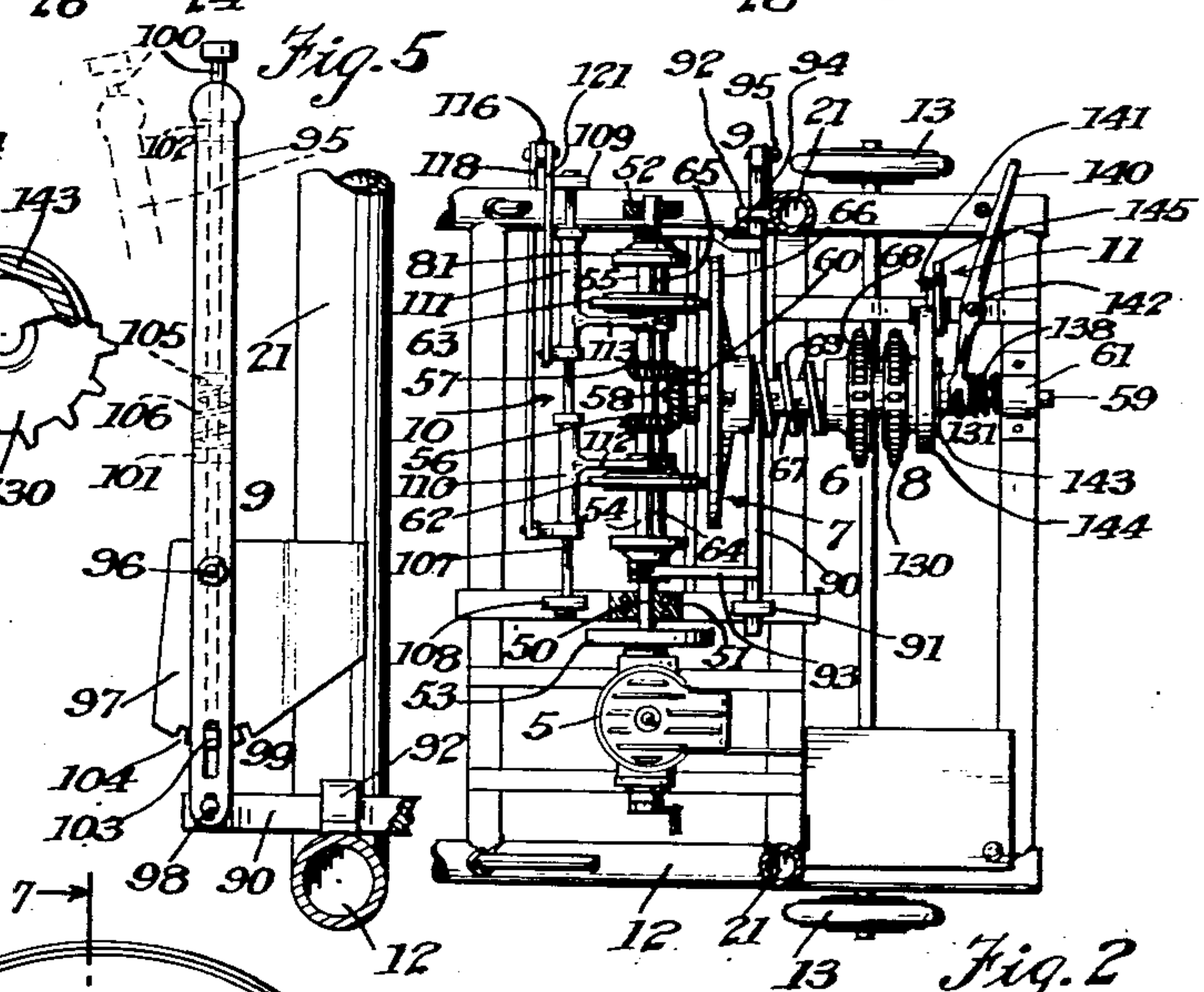

Fig. 7

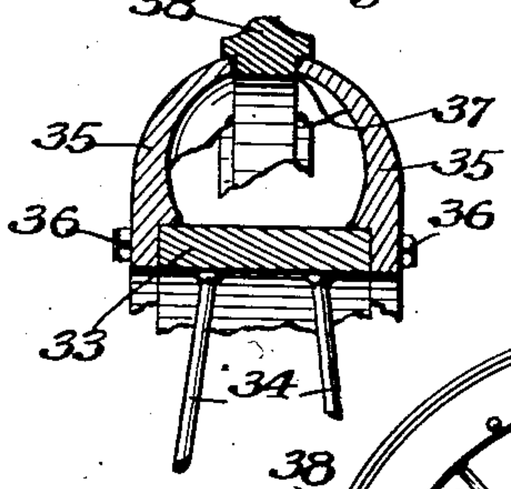

Fig. 2

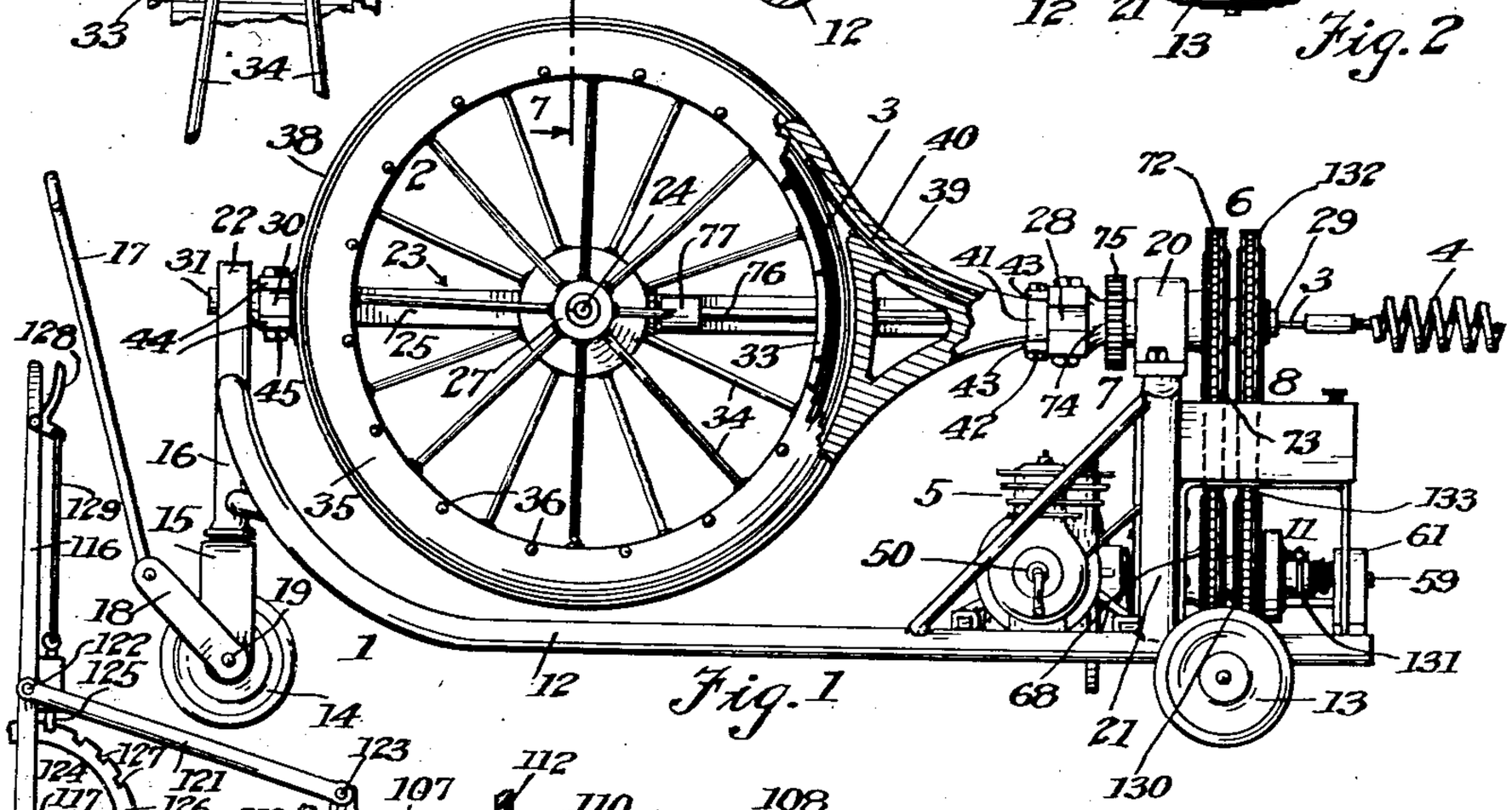

Fig. 1

Fig. 6

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MACHINE FOR CLEARING OUT PIPE

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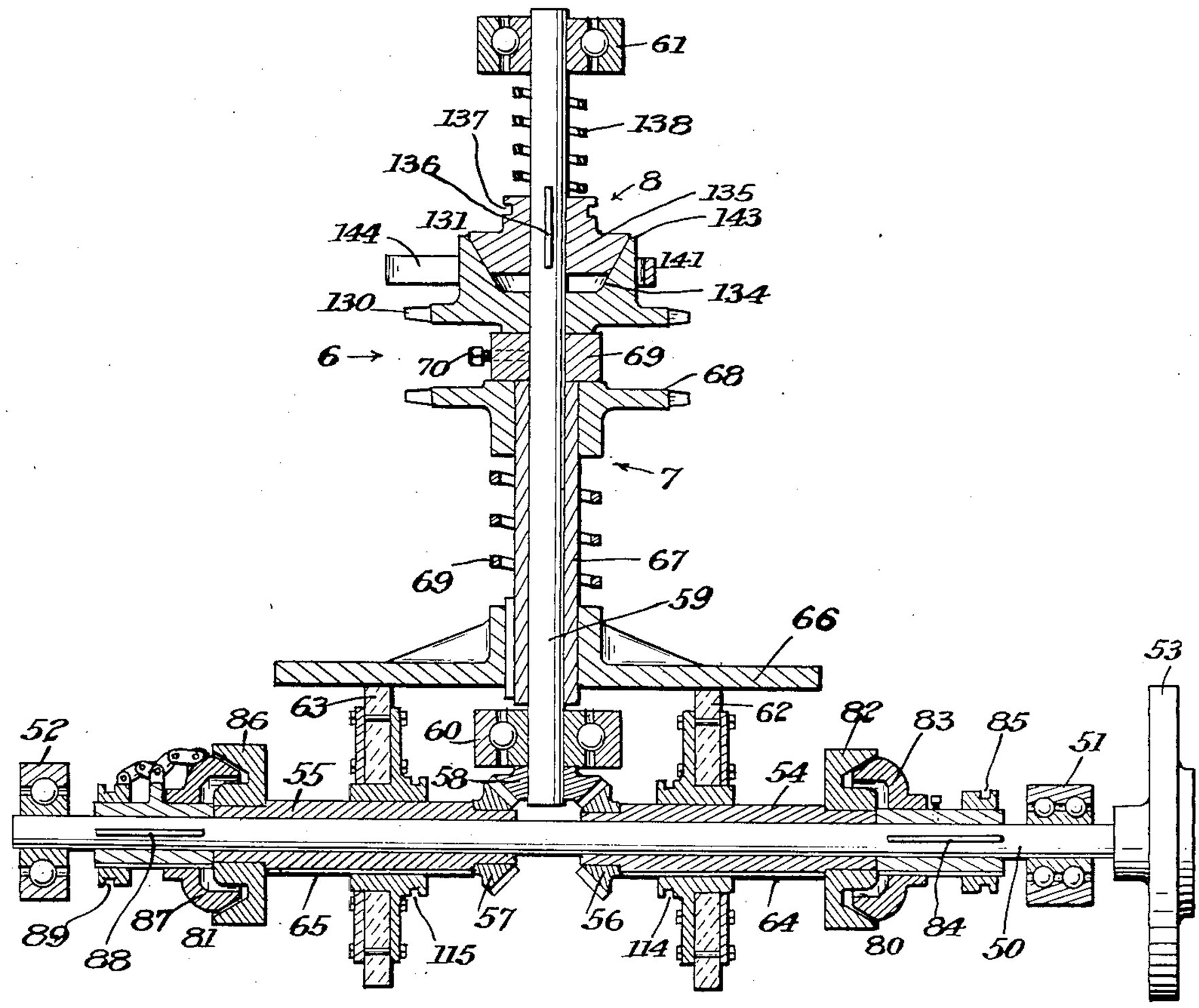

Fig. 8

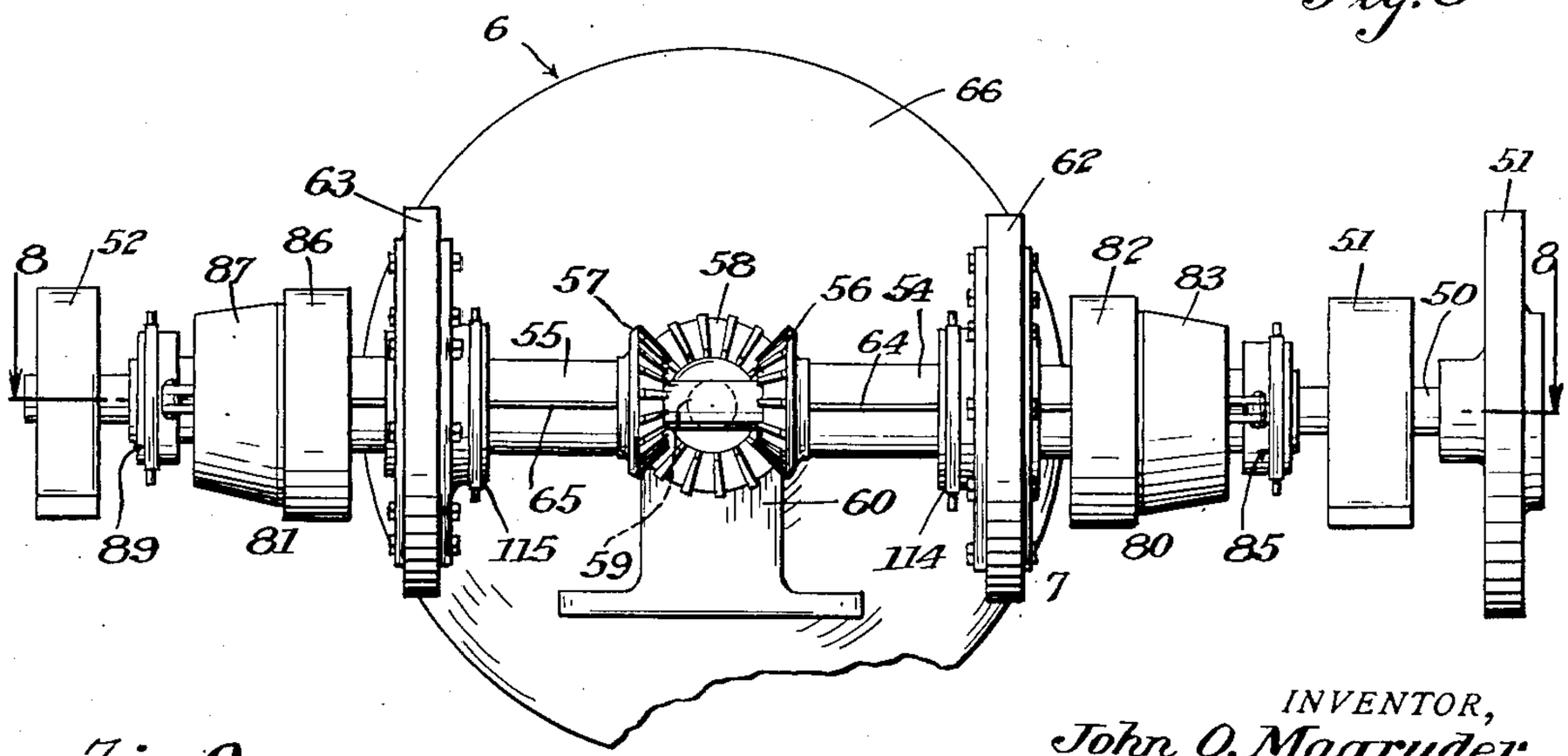

Fig. 9

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MACHINE FOR CLEARING OUT PIPE

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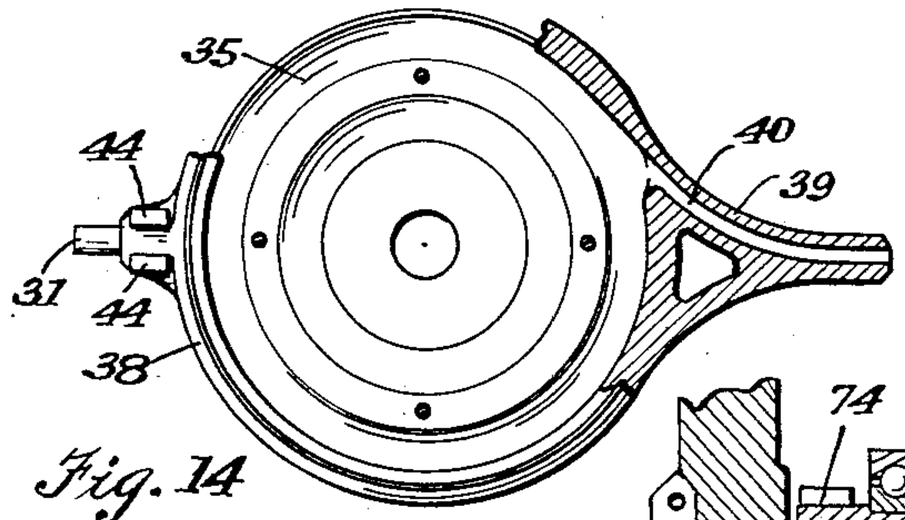
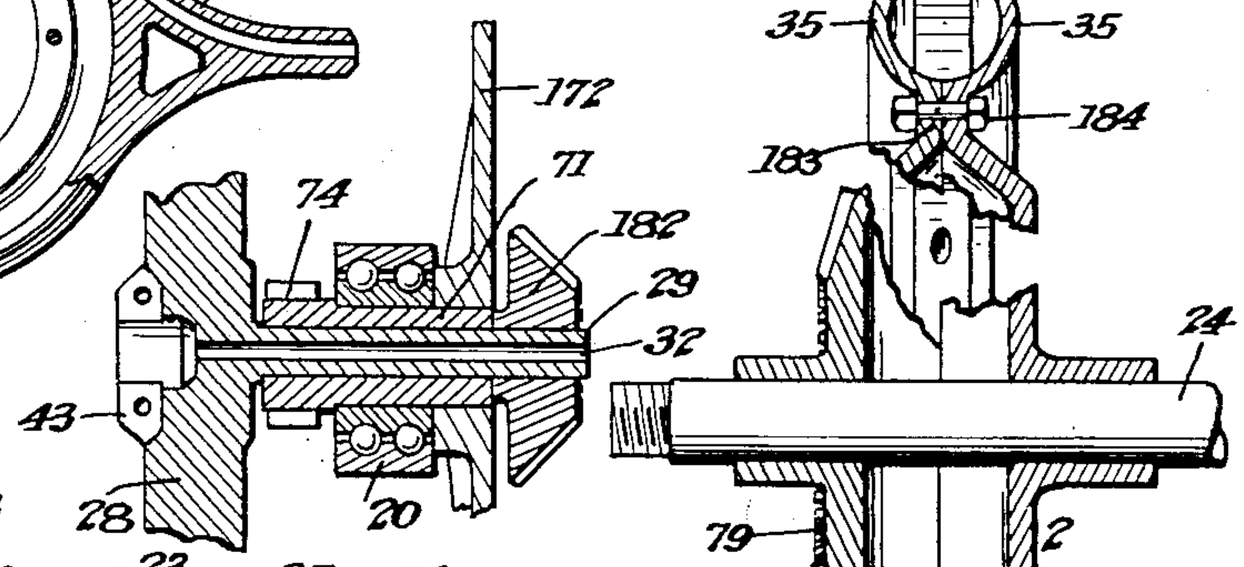


Fig. 14

Fig. 15



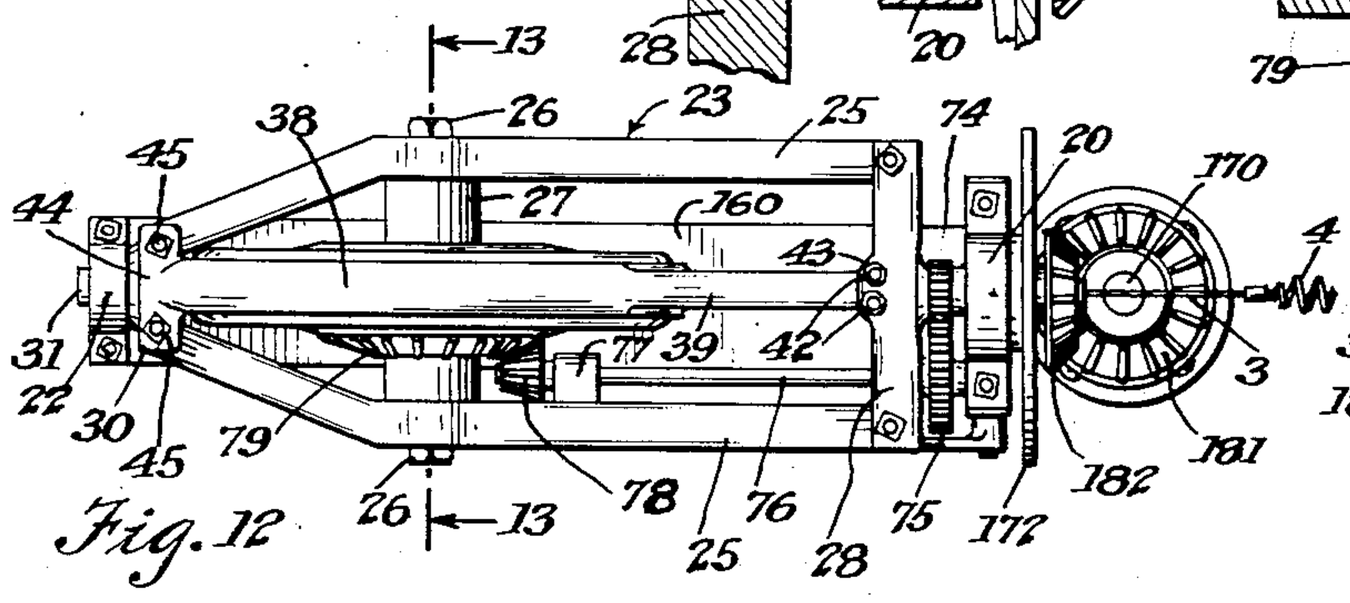


Fig. 12

Fig. 13

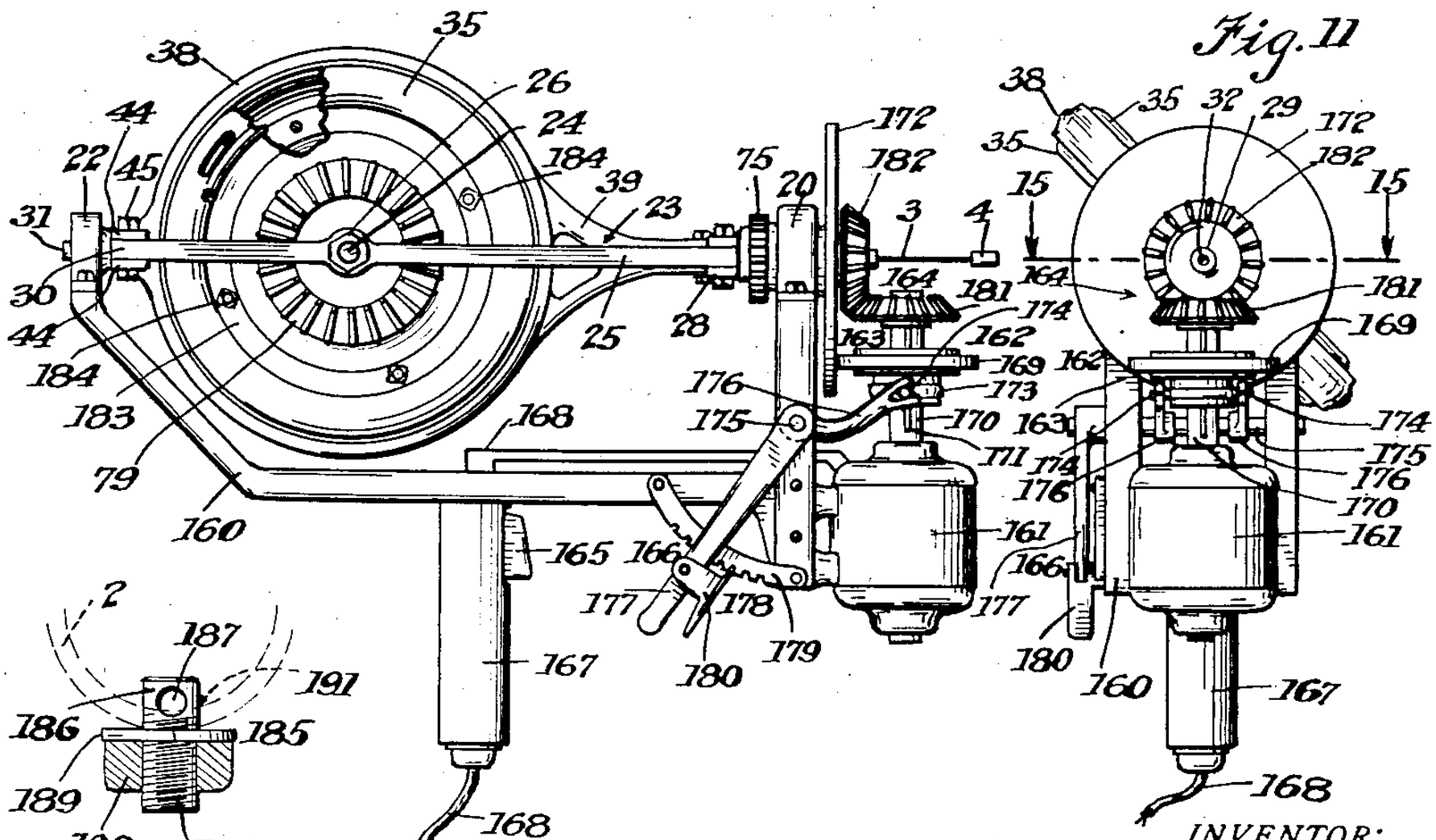


Fig. 11

Fig. 16

Fig. 10

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2,183,618

UNITED STATES PATENT OFFICE

2,183,618

MACHINE FOR CLEARING OUT PIPE

John O. Magruder, Los Angeles, Calif.

Application August 5, 1936, Serial No. 94,325
Renewed May 5, 1939

2 Claims. (Cl. 74—194)

This invention relates to machines for removing obstructions from and cleaning out pipe, such as underground cable ducts, water pipe, sewer pipe and the like, and is an improvement on my Sewer cleaning apparatus disclosed in my application for United States Letters Patent, filed July 24, 1935, Serial No. 32,887.

The general object of the invention is to provide an improved machine of the character stated, by means of which a suitable tool may be introduced through and withdrawn from a pipe, and rotated while within the pipe, for clearing obstructions from and cleaning out the pipe.

A more particular object is to provide improved transmission and control mechanism for operating the machine.

Another object is to provide a novel transmission and control mechanism by means of which the machine may be effectively operated by a gas engine.

Another object is to provide a novel transmission and control mechanism for effecting a wide variation in speed of the machine.

A further object is to provide improved means for preventing the wire, to which the working tool of the machine is connected, from flying off the reel, on which said wire is wound, under the influence of centrifugal force when said reel is rotated rapidly about its diametrical axis, for rotating said tool within a pipe, for clearing obstructions from and cleaning out the pipe.

A further object is to provide novel means for preventing rotation of the reel upon its diametrical axis and consequent rotation of the wire and tool, during rotation of the reel on its transverse axis, and particularly during rotation of the reel for winding the wire thereon and withdrawing the wire and tool from the pipe after clearing the pipe.

Other objects and advantages will appear hereinafter.

The invention is illustrated in the annexed drawings, which form a part of this specification, and in which,

Fig. 1 is a side elevation of my invention, driven by a gas engine and mounted on a truck, shown partly in section to illustrate certain features of construction.

Fig. 2 is a fragmentary plan view of my invention showing the gas engine for driving the same and the control means for said engine.

Fig. 3 is a plan view, partly in section, of the reel, on which the working tool wire is wound, and the parts associated with said reel.

Fig. 4 is a side elevation, partly in section, of one of the brakes of the gas-engine control mechanism.

Fig. 5 is a fragmentary elevation of the operating means for the reel direction clutches.

Fig. 6 is an elevation, partly in section, of the shift mechanism for the shiftable friction discs of the variable speed transmission.

Fig. 7 is a cross section of the wire reel taken on line 7—7 of Fig. 1.

Fig. 8 is a longitudinal horizontal section of the variable speed transmission.

Fig. 9 is a rear elevation of the variable speed transmission.

Fig. 10 is a side elevation of another form of my invention to be held in the hand of the operator when operated, and which is electrically driven.

Fig. 11 is a front end elevation of Fig. 10.

Fig. 12 is a plan view of Fig. 10.

Fig. 13 is a transverse vertical section of the wire reel, of my invention, as illustrated in Figs. 10, 11 and 12, taken on line 13—13 of Fig. 12.

Fig. 14 is a view, partly in elevation and partly in section, of the wire reel shown in Fig. 10.

Fig. 15 is a fragmentary horizontal section of the drive mechanism taken on line 15—15 of Fig. 11.

Fig. 16 is a view, partly in section and partly in elevation of the wire fastener for fastening the inner end of the wire wound in the reel.

Referring more particularly to the drawings, my invention, as illustrated in Figs. 1 to 9 inclusive, comprises generally a truck 1, a reel 2 operatively mounted on said truck, a wire 3 wound on said reel, a clearing tool 4 connected to the forward end of said wire, a gas engine 5 mounted on the forward end of said truck 1, a transmission mechanism 6 mounted on said truck comprising a variable speed transmission 7, for enabling the gas engine 5 to rotate the reel 2 on its normal transverse axis to wind the wire 3 thereon or to unwind said wire from said reel, and a rotary transmission 8 for enabling the gas engine 5 to rotate the reel 2 on a diametrical axis to rotate the wire 3 and tool 4 on their longitudinal axes; said transmission mechanism 6 including a control means 9; said variable speed transmission including a control means 10; and said rotary transmission including a control means 11.

The truck 1 comprises a frame 12, a pair of front wheels 13, on which the front end of said frame is mounted, and a steering wheel 14 on which the rear end of said frame is mounted, said steering wheel being journaled in the lower end of a steering post 15, which is journaled in a

vertical bearing 16 on the rear end of the frame 12, there being a handle bar 17 connected by means of links 18, to the journals 19 of the steering wheel 14, for pulling or pushing the truck. A front reel frame bearing 20 is mounted on a standard 21 on the front end of the truck frame 12, and a rear reel frame bearing 22 is mounted on the upper end of the steering post bearing 16.

The reel 2 is journaled in a rotary reel frame 23, on its normal transverse axis, by means of a transverse shaft 24, secured at its ends in the frame side members 25, by nuts 26, which journal extends through the hub 27 of the reel. The front end frame member 28 is formed with a trunnion 29, which extends through the front reel frame bearing 20 on the truck 1, and the rear end frame member 30 is formed with a trunnion 31 which extends through and is journaled in the rear reel frame bearing 22 on said truck, which bearings and trunnions are arranged on a horizontal axis extending longitudinally of the truck and diametrically of the reel 2, and intersecting the transverse axis of the reel and its journal 24. The front reel frame trunnion 29 is formed with a longitudinal or axial bore 32 through which the wire 3 extends.

The reel 2 comprises the hub 27, a rim 33, spokes 34 connecting said hub and said rim, and a pair of annular side rim members 35 which are bolted to the side edges of the rim 33 by bolts 36, the outer edges of said side rim members being spaced apart and forming a space 37 therebetween, in which space is loosely fitted an annular guard 38, which is formed at its forward side with a guide 39 having a conduit 40, which extends at a tangent from the reel 2 and forwardly to the rear end of the bore 32 in the forward trunnion 29 of the reel frame 23, through which conduit the wire 3 extends from the reel. From the forward end of said conduit the wire extends through the trunnion bore 32. The forward end of the guide 39 is formed with ears 41 which are bolted, by bolts 42, to ears 43 on the inner side of the front member 28 of the reel frame 23, while the guard 38 is formed at its rear side with flanges 44 which are bolted to the rear end member 30 of the reel frame, whereby the guard 38 and guide 45 are maintained in position with relation to the reel 2.

The variable speed transmission 7 will now be described. The crank shaft 50 of the gas engine 5 extends transversely of the truck 1 and is journaled in bearings 51 and 52 on the truck frame 12, there being a conventional fly wheel 53 secured on said crank shaft adjacent said engine 5. On the engine crank shaft 50 are turnably fitted a pair of sleeves 54 and 55, and on the adjacent inner ends of said sleeves are secured bevel gears 56 and 57 in mesh with a bevel gear 58, which is secured on the rear end of a transmission shaft 59 extending longitudinally of the truck 1 and journaled in bearings 60 and 61 on the truck frame 12. A pair of friction discs 62 and 63 are splined on the sleeves 54 and 55 respectively, by splines 64 and 65, which discs frictionally engage at their peripheries the rear side of a larger friction disc 66 which is splined by a spline 66' on the rear end of a sleeve 67 turnably fitted on the transmission shaft 59. On the forward end of the sleeve 67 is secured a sprocket 68. A spring 69 surrounds the sleeve 67 with its ends bearing against the hubs of the friction disc 66 and sprocket 68 respectively, whereby the disc 66 is maintained in frictional contact with the peripheries of the discs 62 and 63. On the shaft 59 is secured a collar 69', by means of a set screw 70, at the forward ends of the sleeve 67 and hub of the sprocket 68. Journaled in and extending through the forward reel frame bearing 20 is a sleeve 71, through which sleeve extends the forward reel frame trunnion 29, and in which sleeve said trunnion is journaled. On the forward end of the sleeve 71 is secured a sprocket 72, and a chain 73 extends over said sprocket and the sprocket 68. A pinion 74 is secured on the rear end of the sleeve 71 in mesh with a gear 75 secured on the forward end of a reel transmission shaft 76, which is journaled at its forward end in the front reel frame member 28 and at its rear end in a bearing 77 on a side member 25 of the reel frame 23. On the rear end of said reel transmission shaft 76 is secured a bevel pinion 78 in mesh with a bevel gear 79 secured on one side of the hub 27 of the reel 2. Clutches 80 and 81 are provided for clutching the sleeves 54 and 55 respectively to the engine crank shaft 50. The clutch 80 comprises a female clutch member 82, secured on the outer end of the sleeve 54, and a male clutch member 83, splined on the engine crank shaft 50 by a spline 84, which male member is formed with an external annular groove 85. The clutch 81 comprises a female member 86, secured on the outer end of the sleeve 55, and a male member 87 splined on the engine crank shaft 50, by a spline 88, which male member is formed with an annular external groove 89.

The control means 9 of the transmission mechanism 6 (Figs. 2 and 5) comprises a slide bar 90, slidably mounted in bearings 91 and 92 on the truck frame 12; a pair of arms 93 and 94 extending from said slide bar and engaging the grooves 85 and 89 respectively of the clutches 80 and 81; a control lever 95, pivoted at 96 to a plate 97, secured to one of the truck frame standards 21, and connected at its lower end at 98 to the outer end of slide bar 90; and a locking device 99 for locking the lever 95 in different positions. Said locking device 99 comprises a rod 100 slidably mounted longitudinally to the lever 95 in bearings 101 and 102 on said lever; a latch 103 on the lower end of said rod 100 for engaging notches 104 in the lower edge of plate 97; a collar 105 secured on the rod 100 above the bearing 101; and a spring 106 surrounding said rod between said bearing and said collar for holding said latch 103 in one of said notches 104.

The control means 10 of the variable speed transmission 7 comprises a rod 107 secured at its ends in brackets 108 and 109 on the truck frame 12; a pair of sleeves 110 and 111 slidable on said rod; arms 112 and 113 extending respectively from said sleeves and engaging annular grooves 114 and 115 in the hubs of the friction discs 62 and 63 respectively; a control lever 116 pivotably mounted at 117 on the bracket 109; a link 118 connected at one end to the lower end of said lever at 119 and at its other end to the sleeve 110 at 120; a link 121 connected at one end to the lever 116 above its pivot 117 at 122 and at its other end to the sleeve 11 at 123; and a locking device 124 for locking said lever 116 in different positions. Said locking device 124 comprises a slide bolt 125 mounted on the lever 116; a notched segment 126 mounted on the bracket 109 and provided with notches 127 to receive the bolt 125 for locking said lever in different positions; a hand grip 123 pivoted to the lever 116 near the upper end thereof; and a link 129 connecting said hand grip and said bolt 125.

The rotary transmission 8 (Fig. 8) includes a sprocket 130 loosely mounted on the shaft 59 forwardly of the collar 69; a clutch 131 for clutching said sprocket to said shaft; a sprocket 132 secured on the forward end of the front reel frame trunnion 29; and a chan 133 extending over said sprockets 130 and 132. The clutch 131 comprises a female member 134 formed in the hub of the sprocket 130; a male member 135 splined on the shaft 59 by a spline 136 and formed in its hub with an annular groove 137; and a spring 138 surrounding said shaft 59 and bearing at its ends respectively against the hub of said male clutch member 135 and the front bearing 61 for normally holding said male clutch member in clutching engagement with said female clutch member 134 and thereby clutching the sprocket 138 to the shaft 59.

The control means 11 (Fig. 4) for the rotary transmission 8 comprises a control lever 140 and a brake 141 for the sprocket 130. The lever 140 is pivoted to the truck frame 12, at 142, and engages the groove 137 in the hub of the male member 135 of the clutch 131. The brake 141 comprises a brake drum 143 formed on the hub of the sprocket 130; a brake band 144 extending over said drum; a brake lever 145 pivoted to the truck frame at 146; and a locking device 147 for said lever; said brake band 144 being connected at its ends to said lever 145 at opposite sides of its pivot 146 at 148 and 149 respectively. The locking device 147 comprises a pawl 150 secured to the truck frame 12; a ratchet 151 pivoted at its upper end to the control lever 145 at 152; a spring 153 connected to the lower end of said ratchet and to the truck frame 12 for holding said ratchet in engagement with said pawl 150; a hand grip 154 pivoted to the lever 145 near the upper end thereof; and a link 155 connected at its ends to said ratchet 151 and said hand grip 154 respectively.

The operation, uses and advantages of my invention, as above described are as follows:

The truck 1 is first rolled into position with the tool 4 at one end of a pipe to be cleared out. The gas engine 5 is started, rotating the crank shaft 50. The clutch 80 is thrown into operation and the clutch 81 out of operation by the control means 9, whereupon the sleeve 54, disc 62 and bevel gear 56 are rotated and the disc 66, sleeve 67 and sprocket 68 are rotated, by the engagement of the disc 62 with disc 66, while the bevel gear 58, shaft 59 and sprocket 130 are rotated by the meshing of bevel gear 56 with bevel gear 58, said sprocket 130 being clutched to the shaft 59 by clutch 131 under the influence of spring 138. Rotation of the sprocket 68 causes the reel 2 to be rotated clockwise (Fig. 1) through the medium of chain 73, sprocket 72, sleeve 71, pinion 74, gear 75, shaft 76, bevel pinion 78 and bevel gear 79, which rotation of the reel unwinds the wire 3 therefrom and pays out the wire through the guide conduit 40 and trunnion bore 32, whereupon the tool 4 is introduced by the wire 3 into the pipe to be cleared. As the tool 4 is introduced through the pipe said tool is rotated by rotation of the reel 2, wire 3, and guard 38 and guide 39 on the trunnions 29 and 31, through the medium of sprocket 130, chain 133, sprocket 132, and trunnion 29, the sprocket 130 being clutched to the shaft 59 by clutch 141 under the influence of clutch spring 138.

The speed of rotation of the reel 2 on its shaft 24, and on its trunnions 29 and 31, to advance or withdraw the wire 3 and tool 4, and to rotate the wire and tool, may be varied by the control means 10. By swinging the lever 116 (Fig. 6) to the right the discs 62 and 63 are moved toward each other, and by swinging said lever to the left said discs are moved away from each other, and maintained at all times equidistant from the center of the disc 66, through the medium of links 118 and 121, sleeves 110 and 111, and the arms 112 and 113, engaging the disc grooves 114 and 115, respectively. When the discs 62 and 63 are moved towards each other from their neutral position shown in Fig. 8, the speed of rotation of the disc 66 and sleeve 67 is increased with relation to the engine shaft 50, and the speed of rotation of the reel 2 on its shaft 24, together with the speed of advancement of the wire 3 from the reel are correspondingly increased, through the medium of the transmission mechanism between the sleeve 67 and the reel. Conversely, when the discs 62 and 63 are moved away from each other, from their neutral position shown in Fig. 8, the speed of rotation of the disc 66, sleeve 67 and sprocket 68, together with the sprocket 72, sleeve 71 and pinion 74, is decreased, while the speed of rotation of the reel frame 23 remains the same, and the pinion 74, instead of rotating the gear 75 resists rotation of said gear and reverses its direction of rotation, which, through shaft 76, beveled pinion 78 and beveled gear 79, reversed the rotation of the reel 2 and causes the reel to wind the wire 3 thereon and withdraw the wire and tool 4 from the pipe which is being cleared by the tool.

When it is desired to wind the wire 3 on the reel 2 to withdraw the wire and the tool 4 from a pipe, after clearing the pipe, the clutch 80 may be thrown out of operation and the clutch 81 is thrown into operation by the control means 9, whereupon the sleeve 55, disc 63 and bevel gear 57 are rotated, and the disc 66, sleeve 67 and sprocket 68 are rotated by the engagement of the disc 63 with the disc 66, while the bevel gear 58, shaft 59 and sprocket 130 are rotated by the meshing of bevel gear 57 with bevel gear 58, said sprocket 130 being clutched to the shaft 59 by the clutch 131 under the influence of the spring 138. Rotation of sprocket 68 causes the reel 2 to be rotated counterclockwise (Fig. 1), through the medium of chain 73, sprocket 72, sleeve 71, pinion 74, gear 75, shaft 76, bevel pinion 78 and bevel gear 79, which rotation of the reel winds the wire 3 thereupon and withdraws the wire and the tool 4 from the pipe. Rotation of sprocket 130 causes the reel 2 to be rotated on its trunnions 29 and 31 in the opposite direction to that above set forth and the wire 3 and tool 4 to be likewise rotated, while being withdrawn from the pipe, through the medium of chain 133, sprocket 132 and trunnion 29, the sprocket 130 being clutched to the shaft 59 by the clutch 141 under the influence of spring 138. Since the reel may be rotated in either direction by shifting the discs 62 and 63 in or out, it is only necessary to use the clutch 81 to reverse the rotation of the wire and tool.

While the reel 2 is rotated counterclockwise, as above described, and the wire 2 and tool 4 are withdrawn from the pipe, rotation of the reel on its trunnions 29 and 31, together with the wire 3 and tool 4, may be prevented by operation of the control means 11. Said control means is operated for said purpose by swinging the lever 140 counterclockwise (Fig. 2) and disengaging the clutch 131, and by swinging the brake lever 145 counterclockwise and applying the brake

band 144 to the brake drum 143, the ratchet 151 escaping the pawl 150, until the brake is applied, and the pawl engaging the ratchet, when the brake is applied and holding the brake applied.

The modified form of my invention, illustrated in Figs. 10 to 16 inclusive, is a hand machine, or a machine which is held in the hand of the operator during its operation. The construction of this form of my invention is like that shown in Figs. 1 to 9 inclusive, except that a hand-supported frame 160 is substituted for the truck 1, an electric motor 161 is substituted for the gas engine 5, a transmission mechanism 162 is substituted for the transmission mechanism 6, a variable speed transmission 163 forming part of said transmission mechanism is substituted for the variable speed transmission 7, a rotary transmission 164, also forming part of the transmission mechanism 162, is substituted for the rotary transmission 8, a control switch 165 for the motor 161 is substituted for the control means 9, and a variable speed control means 166 is substituted for the variable speed control means 10.

The frame 160 is formed with a depending handle 167 in the upper end of which is mounted the switch 165, the electric wiring 168 for the motor 161 extending through said handle to said switch and from said switch to the motor 161. The variable speed transmission 163 comprises a friction disc 169, splined on the motor shaft 170 by a spline 171, a friction disc 172 secured on the forward end of the sleeve 71 in frictional contact with said disc 169, a ring 173 turnably fitted in the hub of the disc 169 and formed with outwardly projecting pins 174, a shaft 175 journaled in the frame 160, a pair of forked arms 176 secured on said shaft 175 and engaging said pins 174, an operating handle 177 secured on said shaft 175, and a locking device 178 for said handle, which locking device comprises a segmental ratchet 179 secured on the frame 160 and a hand-grip pawl 180 pivoted on the outer portion of said handle for engaging said ratchet. The rotary transmission 164 comprises a bevel gear 181, secured on the upper end of the motor shaft 170, and a bevel gear 182 secured on the forward end of the forward reel trunnion 29 in mesh with said bevel gear 181. In the construction of the reel 2 the rim 33 and bolts 36 may be eliminated and the side members 35 brought together at 183 and bolted by bolts 184.

In Fig. 16 is illustrated the wire fastener 185 for fastening the inner end of the wire 3 to the reel, for winding the wire on the reel, which fastener comprises a stud 186, provided with a wire opening 187 through its inner end, and a thread 188 extending from its outer end, a washer 189 and a nut 190. The inner end of said stud is extended through an opening 191 in one side member 35 of the reel 2 and the inner end of the wire 3 is extended through the stud opening 187, while the washer 188 is fitted on the stud against the outside of said reel member and the nut 189 is screwed on the stud thread 188 against said washer until the wire 3 in said stud opening 187 is clamped by the stud 186 against the inner side of the wall of said reel side member 35.

In operation this form of my invention is held in the hand of the operator by the handle 167 and the switch 165 is operated by the operator's hand to run or stop the motor 161. The variable speed transmission 163 is controlled by the control means 166. By swinging the arm 177 to the right or left the disc 169 is shifted up or down with relation to the disc 172 to increase or decrease the speed of the disc 172 with relation to the speed of the motor shaft 170, whereby the speed of rotation of the reel 2 on its shaft 24 is increased or decreased through the medium of sleeve 71, pinion 74, gear 75, shaft 76, beveled pinion 77 and beveled gear 79.

I claim:

1. In a machine as disclosed, a transmission shaft, a transmission sleeve journaled on said shaft, a friction disc secured on one end of said sleeve, a drive shaft, a pair of sleeves journaled on said drive shaft, beveled pinions secured on the inner ends of said sleeves respectively, a beveled pinion secured on said transmission shaft in mesh with said beveled pinions on said sleeves, clutches for clutching said sleeves respectively to said drive shaft, a pair of friction discs splined on said sleeves respectively in frictional contact with said friction disc on said transmission sleeve, at opposite sides of and equidistantly from the center of said latter disc, and means for shifting said pair of discs equidistantly toward or away from the center of said transmission sleeve disc, for varying the speed of rotation of said transmission sleeve with relation to said drive shaft.

2. In a machine as disclosed, a transmission shaft, a transmission sleeve journaled on said transmission shaft, a friction disc secured on one end of said sleeve, a drive shaft, a pair of sleeves journaled on said drive shaft, beveled pinions secured on the inner ends of said sleeves respectively, a beveled pinion secured on said transmission shaft in mesh with said beveled pinions on said sleeves, clutches for clutching said sleeves respectively to said drive shaft, a pair of friction discs splined on said sleeves respectively in frictional contact with said friction disc on said transmission sleeve, at opposite sides of and equidistantly from the center of said latter disc, means for shifting said pair of discs equidistantly toward or away from the center of said transmission sleeve disc, for varying the speed of rotation of said transmission sleeve with relation to said drive shaft, a sprocket turnably fitted on said transmission shaft, a clutch for clutching said sprocket to said transmission shaft, and a brake for said sprocket to prevent rotation thereof, when said clutch is disengaged from said transmission shaft.

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