June 8, 1954 J. A. MISCOVICH 2,680,650

AUTOMATIC HYDRAULIC GIANT

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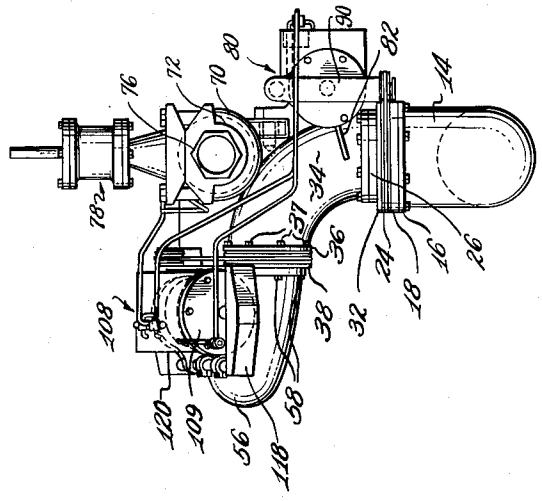


Fig. 3

Fig. 1

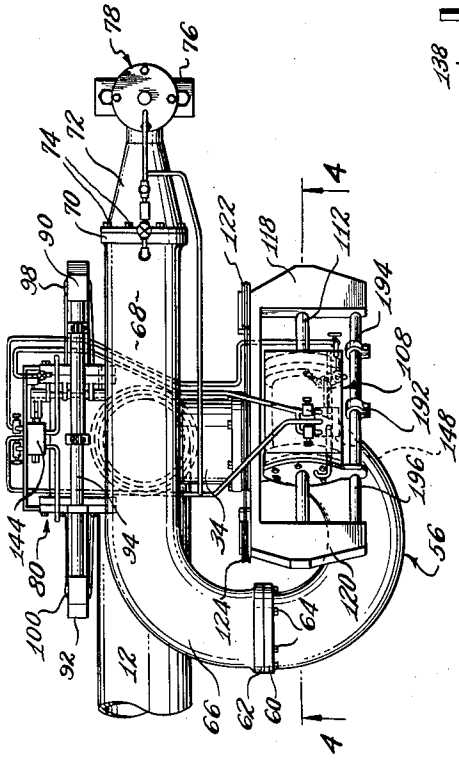
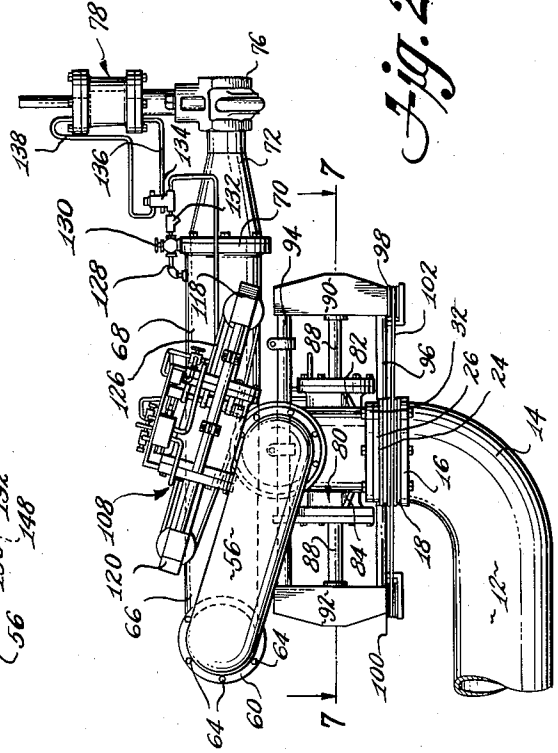


Fig. 2



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Fig. 5

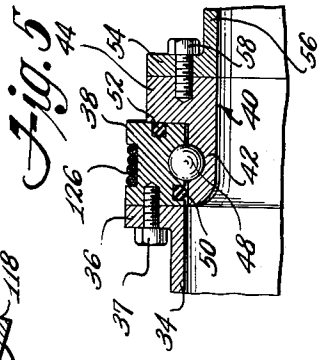
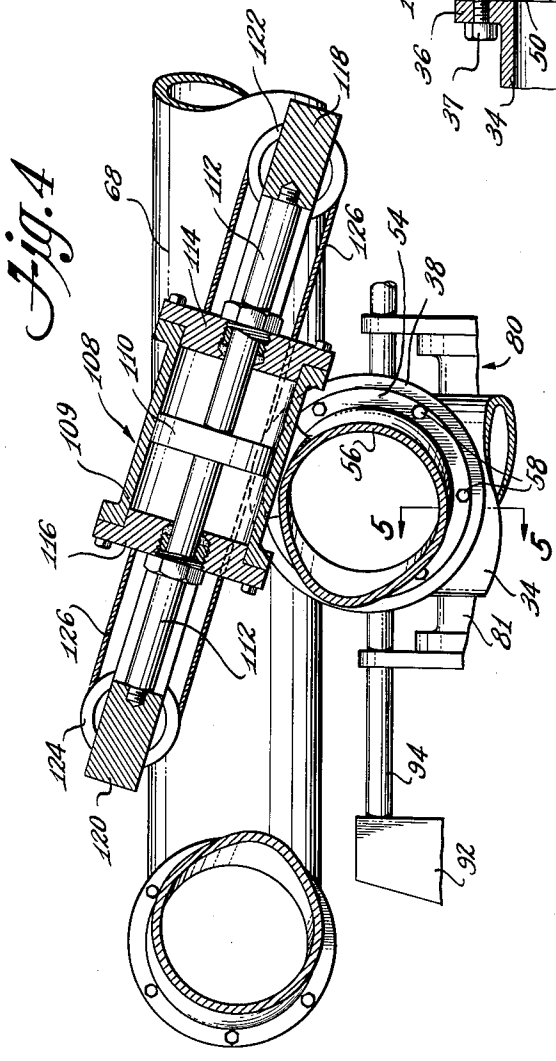


Fig. 4



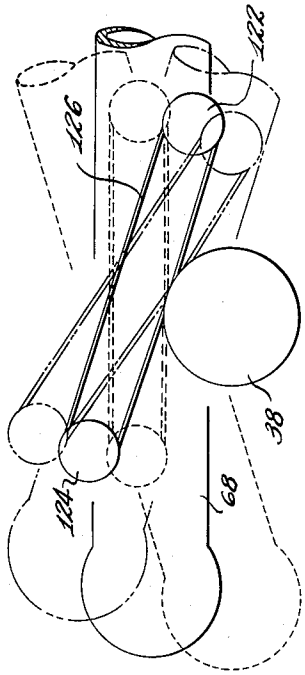


Fig. 6

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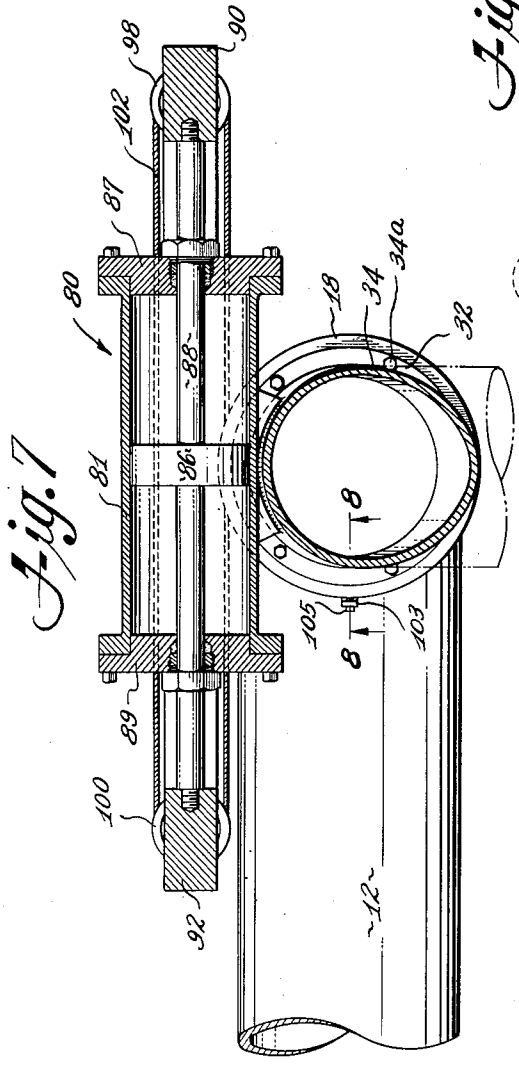


Fig. 7

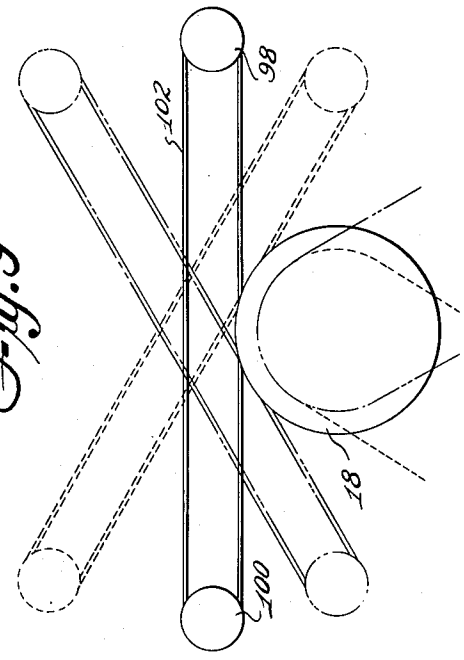


Fig. 9

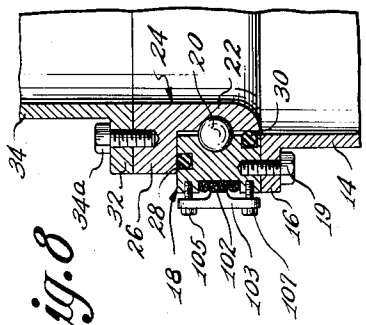


Fig. 8

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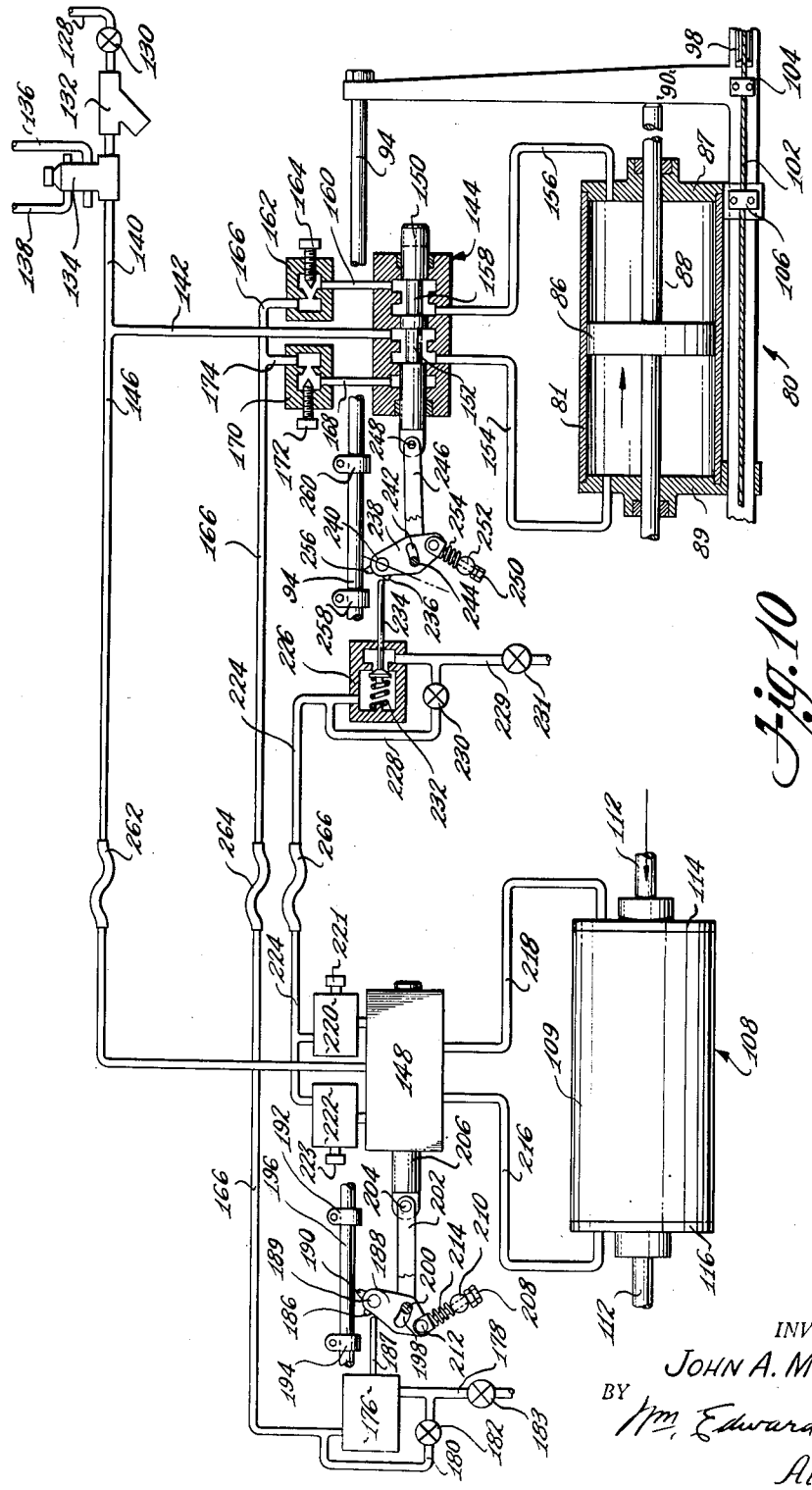


Fig. 10

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UNITED STATES PATENT OFFICE

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AUTOMATIC HYDRAULIC GIANT

John A. Miscovich, Fairbanks, Territory of Alaska, assignor of one-half to George S. Allin, Seattle, Wash.

Application November 8, 1948, Serial No. 58,896

8 Claims. (Cl. 299—66)

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This invention relates to hydraulic giants such as are used for hydraulic placer mining and the like.

For many years placer miners have stripped frozen or thawed overburden from gold-bearing ground and have washed the gold-bearing sand and gravel with hydraulic giants. These giants now in current use, have existed in their present form since the latter part of the last century. Water under pressure is supplied to the giant, and the operator manually moves the nozzle vertically and horizontally to direct the stream of water from the nozzle to the desired location. This requires constant attention of a man or operator, and thereby incurs considerable cost of operation. In northern Canada and Alaska where many thousands of these giants are in use, the season of the year in which they may be effectively used is relatively short, usually not over 120 days. As a result, the gold mine operators work the giants in at least two shifts in order to take as much advantage as possible of nature's thawing out of the ground during that short season.

The rising costs of operation, transportation, food and labor has resulted in a situation where only the richer ground may be profitably worked. At the present time there are tremendous areas containing relatively low values for recovery which cannot be and are not being worked because it would be unprofitable.

Also, inasmuch as each giant requires an operator for from 20 to 24 hours a day, this means that considerable capital has to be invested during a relatively short season and many operators cannot finance a large number of these manually controlled and directed giants even though the operation would show a profit if worked to full capacity during the season. Furthermore, many of the operators are prevented from working their property to full capacity merely by a shortage of manual labor, particularly where the properties are located in isolated communities.

Therefore, the main objects of the present invention are to provide an automatically operated, directed and controlled hydraulic giant; to provide an automatic nozzle directing and control mechanism for hydraulic giants which makes possible the economic working of vast areas which heretofore have not been profitable when using manually directed giants; to provide a hydraulic giant which can be set to have continuous oscillating horizontal traverse with the same or different speeds of movement in each direction with a small change in elevation at each end of the traverse movement or to have a continuous oscillating movement in vertical planes with the same or different speeds of movement in the up and down directions with a small change in horizontal direction at each end of the vertical movements or to have continuous oscillating movements in both horizontal and vertical planes depending upon the pattern best suited for the particular job at hand; to provide a completely automatic hydraulic giant which will shut off when the hydraulic head becomes too low to effectively accomplish the desired results thereby permitting the hydraulic head to build up until an effective pressure is available; to provide a hydraulic giant which can be set to cover varying sized areas with any desired pattern of hydraulic stream; to provide an automatically directed hydraulic giant which can be readily set for varying types of operational use from removing overburden to moving pay dirt into a sluice box; to provide a hydraulic giant of such character that a large number of such units may be attended by one person and with a minimum of physical effort for mere adjustment and regulation of the automatic controls; to provide automatic directing mechanism which can be readily re-set to cover different areas of nozzle application; and to provide control mechanism which can be readily set for a very short or zero travel or for an extremely long travel equal to twice the movement of the hydraulic actuating rams.

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An illustrative embodiment of this invention is shown in the accompanying drawings, in which:

Figure 1 is a plan view of the automatically controlled, directed and operated hydraulic giant;

Figure 2 is a view in side elevation of the same;

Figure 3 is a view in front end elevation of the same;

Figure 4 is an enlarged sectional view taken on the line 4—4 of Figure 1, looking in the direction indicated by the arrows;

Figure 5 is a further enlarged fragmentary sectional view taken on the line 5—5 of Figure 4, looking in the direction indicated by the arrows and showing the detail of one of the sealed anti-friction swivel joints between nozzle sections;

Figure 6 is a diagrammatic view showing in full line the medial position of the vertically movable nozzle and in dotted and broken lines, in positions when elevated or depressed, respectively;

Figure 7 is an enlarged sectional view taken on the line 7—7 of Figure 2, looking in the direction indicated by the arrows;

Figure 8 is a further enlarged fragmentary sectional view taken on the line 8—8 of Figure 7, looking in the direction indicated by the arrows,

showing the detail of the other anti-friction swivel joint;

Figure 9 is a diagrammatic view showing in full lines, the medial position of the parts in horizontal traverse and positions at each side of the medial position in dotted and broken lines;

Figure 10 is a view, partly in section and partly in elevation, showing the hydraulic circuit layout and the reversing and control valves for the same.

The specific nozzle illustrated herein is the subject matter of my issued Patent No. 2,612,402 granted September 30, 1952, and entitled "Hydraulic Giant Nozzle," but it is to be understood that the automatic controlling, directing and operating mechanism described and claimed herein is equally adaptable for use on all the hydraulic giants now in service.

In the construction shown in the drawings, a horizontally disposed penstock 12 for supplying water under pressure or head has an upwardly curved 90° elbow end 14 which terminates in an upwardly presenting horizontal end face having an outwardly extending, radially disposed, annular flange 16.

The flange 16 is rigidly secured to one end face of an annulus 18 of generally rectangular cross-section which forms the outer member of an anti-friction swivel joint, by a plurality of cap screws 19 which pass through the flange 16 and are threaded into the member 18. The inner face of the ring 18, midway of its ends, is provided with a groove of substantially semi-circular cross-section for receiving a plurality of anti-friction members in the form of balls 20 and thus serves as the outer race of a ball-bearing swivel joint.

The inner race for the bearing is formed by a similar groove formed in the outer surface of the vertical leg 22 of an inner joint member 24. The member 24 is of inverted L-shape in cross-section and is annular so as to fit within the outer member 18. The horizontal leg 26 of the member 24 extends radially outwardly to overlap the upper end face of the member 18 and bears against an O-ring packing 26 which is housed in a groove provided in such end face. The inner surface of the member 18, between the ball race and its lower end face, is also provided with an annular groove for receiving an O-ring packing 30.

The depending leg 22 of the member 24 overlaps the packing 30 and bears thereagainst so as to form a water-tight joint and seal and protect the lubricant packed around the balls 20. The O-ring packing 28 excludes dirt from the bearing and also retains the lubricant in the joint.

The joint member 24 has the upper end face of its horizontal leg 26 rigidly secured to an outwardly extending, radially disposed, flange 32 integrally formed on the lower end of a 90° elbow 34 by a plurality of cap screws 34a which pass through the flange and are threaded into the member.

The elbow 34 extends upwardly and normally to one side, i. e., at a 90° angle to the center line of the penstock 12, and its upper end terminates in a vertically disposed face surrounded by an outwardly extending radial flange 36. The flange 36 is rigidly secured to one end face of an outer member 38 of a second anti-friction swivel joint by a plurality of cap screws 37 which pass through the flange 36 and are threaded into the member 38.

The member 38 is of generally rectangular cross-section and is in the form of an annulus. The inner member of this swivel joint generally designated 40 is of reversed L-shaped cross-section and has a horizontal leg 42 and a vertical leg 44. The horizontal leg 42 has a semi-circular groove in its outer peripheral surface forming the inner race for a plurality of ball bearings 48 which are also received in a similar groove provided in the inner surface of the member 38 midway of its ends. The inner surface of the member 38 is also provided with an annular groove for receiving an O-ring packing 50 which is overlapped by the leg 42 to form a water-tight seal. The free end face of the member 38 is likewise provided with an annular groove for an O-ring packing 52 which is overlapped by the radially extending leg 44 of the swivel joint member 40 so as to exclude dirt from the bearing and retain lubricant therein, while permitting free relative rotation between the swivel joint members.

The axial end face of the member 40 is rigidly secured to outwardly extending, radially disposed, flange 54 of a 180° elbow 56 by a plurality of cap screws 58 which extend through the flange 54 and are threaded into the joint member 40.

The elbow 56 extends rearwardly and is inclined upwardy as shown most clearly in Figures 1, 2 and 3, and terminates in a radial flange 60 and is rigidly secured to a similar flange 62 by a plurality of cap screws 64 which pass through the flange 60 and are threaded into the flange 62. Flange 62 is integrally formed on one end of a 90° elbow 66 which with the elbow 56, thus forms a 270° elbow or bend. The other end of the elbow 66 is extended straight for a substantial distance to form a generally horizontally disposed nozzle section 68, the front end of which is provided with an outwardly extending, radially disposed, flange 70 to which a tapered nozzle tip 72 is rigidly secured by a plurality of cap screws 74.

The discharge end of the nozzle tip 72 is exteriorly threaded to receive an interiorly threaded gate valve body 76 which has a gate therein connected to and operated by the piston of a double-acting hydraulic ram generally designated 78 directly mounted thereon.

Means are provided for automatically rotating or oscillating the elbow 34 relative to the penstock elbow 14 and comprises a double-acting hydraulic ram generally designated 80. A cylinder 81 is rigidly mounted on the elbow 34 by means of brackets 82 and 84 which are welded to the elbow and to the exterior surface of the cylinder 81. The cylinder 81 is provided with a piston 86 having a double-ended piston rod 88 which extends through both of the cylinder heads 87 and 89 of the cylinder 81, and has its opposite ends threaded into cross-heads 90 and 92, as shown most clearly in Figure 7. The cross-heads 90 and 92 are also interconnected by rigidly secured struts 94 and 96 as shown most clearly in Figure 2.

Corresponding ends of the cross-heads 90 and 92 are provided with cable sheaves 98 and 100 about which is trained a wire cable 102. The ends of the cable 102 are wrapped around the swivel joint member 18 as shown most clearly in Figure 8, and lie in a shallow groove formed in the outer peripheral surface thereof. The two ends of the wrapped-around cable 102 may be anchored to the member 18 by a suitable clamp 103 secured by cap screws 105 and 107.

Means are provided for anchoring the cable selectively either to the piston rod cross-heads

or to the hydraulic ram cylinder and comprise clamping straps 104 and 106 mounted on the cross-head 99 and cylinder 81, respectively, as shown most clearly in Figure 10. The straps 104 and 106 are mounted by cap screws so as to pinch or bind the cable under the straps when the cap screws are tightened, or permit free sliding movement with respect thereto when the cap screws are loosened.

Means are also provided for moving the nozzle up and down in a vertical plane and comprise a double-acting hydraulic ram generally designated 108 of the same construction as the ram 80. The cylinder 109 of the ram 108 is rigidly mounted by welding on the lower end of the elbow 56 closely adjacent to and parallel with the swivel joint formed by the members 38 and 40.

The cylinder 109 is provided with a piston 110 having a double-ended piston rod 112 extending through both cylinder heads 114 and 116 and having its ends threaded into cross-heads 118 and 120. Corresponding ends of the cross-heads are provided with cable sheaves 122 and 124 for receiving a flexible wire cable 126 trained thereabout and the ends of which are wrapped around the swivel joint member 38 in a shallow groove provided in its peripheral surface as shown most clearly in Figure 5. The ends of the cable are anchored to the member 38 by a clamp (not shown) of the same construction and arrangement as the clamp 103.

The cable 126 may also be selectively clamped either to the cylinder 109 or to the cross-heads 118—120 as desired in the same manner as heretofore described with respect to the ram 80.

The hydraulic circuit diagram is best illustrated in Figure 10 wherein a conduit 128, which is tapped into the nozzle section 68, furnishes water under pressure from the supply which passes through the nozzle. A manual shut-off valve 130 is provided in the conduit for shutting off the supply to the hydraulic operating mechanism when desired. When the valve 130 is open the water under pressure passes through a strainer 132 and thence to a spring-loaded pressure-operated control valve 134 of well known construction.

When pressure in the conduit is sufficiently high, the valve 134 opens against its spring pressure to permit flow to a conduit 136 which communicates with the lower end of the double-acting hydraulic cylinder 78 for opening the gate valve connected thereto. When the valve 134 thus moves to its open position, water from the top end of the cylinder 78 is vented through a conduit 138 which provides communication between the top end of the cylinder 78 and the valve 134 and is vented to the atmosphere.

Opening of the valve 134 under predetermined adjusted pressure also permits water to flow to a line pipe 140 which has a branch 142 leading to a reversing valve for the ram 80 generally designated 144 and another branch 146 which leads to an identical reversing valve generally designated 148 for controlling the ram 108. Valve 144 is provided with an axially slidable core 150 of well known construction and is usually referred to as a piston type slide valve.

In the position shown in the drawings, water under pressure from the pipe 142 passes around the reduced portion 152 of the valve core 150 and into a pipe 154 which communicates with the left end of the cylinder 81 through cylinder head 89 thus causing the piston 86 to travel to the right as indicated by the arrow. Movement of the piston 86, as indicated by the arrow, forces water from the opposite end of the cylinder through a conduit 156 which connects through the cylinder head 87 to the reversing valve 144 wherein the water passes around a reduced portion 158 of the valve core 150 and out through a pipe 160 to a speed control valve 162.

The valve 162 is adjustable to vary the flow of water therethrough by a manually operable needle valve 164 which may be moved toward or away from its valve seat through which the discharge water passes to a conduit 166. The valve 144 is also provided with a discharge pipe 168 which leads to a speed control valve 170 of identical construction as the valve 162 and which likewise has a manually adjustable needle valve 172. Discharge from the valve 170 is through a pipe 174 which also communicates with the discharge pipe 166.

The conduit 166 leads to a quick-opening, self-closing valve 176 mounted on the other ram assembly and which discharges to the atmosphere through a pipe 178. The pipe 166 is also connected to the discharge pipe 178 by a by-pass conduit 180 having a manually operable valve 182 interposed therein for selectively opening or closing the by-pass around the valve 176. The discharge pipe 178 is also provided with a manually operable valve 183 which may be closed to block operation of the ram 80.

The valve 176 has a valve stem 187 extending therefrom and adapted to be axially moved to the left by a cam 186 of the quick-throw toggle lever 188 pivotally mounted at 189. The lever 188 is provided with an upwardly extending finger 190 located in the path of travel of adjustably positioned stops or dogs 192 and 194 mounted on cross-head strut 196 of the hydraulic ram 108.

Lever 188 is provided with an arcuate shaped lost-motion slot 198 for receiving a pin 200 mounted on one end of a link 202, the other end of which is pivotally connected at 204 to one end of a valve core 206 of the reversing valve 148.

A quick-throw toggle link 208 is pivotally mounted at 210 and connected to the lower end of link 188 by a pin 212 and is provided with a helical compression spring 214 which is compressed as the pivot point 212 is moved into alignment with the pivots 189 and 210. As the link passes over center the stored energy in the spring 214 will cause a quick-throw action of the valve core 206 to its opposite or reversed position, and will cause the cam 186 to move the valve stem 187 and thus briefly open the valve 176. The reversing valve 148 is connected to and through the cylinder heads 114 and 116 of the ram 108 by pipes 216 and 218 which correspond to the conduits 154 and 156 for the ram 80.

It is to be understood that the rams and all their operating and control valves are identical in construction and operation although the sizes and capacities of the various units may vary if so desired.

The reversing valve 148 discharges through speed control valves 220 and 222 having manually adjustable needle valves 221 and 223, respectively, and both of which discharge into a common conduit 224 which leads to a quick-opening, self-closing valve 226, identical with the valve 176. A by-pass conduit 228 is provided around the valve and connected from the conduit 224 to discharge conduit 229 which vents fluid from the valve 226. A manually operable valve 230 is provided in the by-pass 228 for selectively opening or closing the by-pass, and a valve 231 is pro-

vided on the discharge pipe 229 for blocking operation of the ram 108.

The valve 226, as shown in section, is provided with a helical compression spring 232 which normally urges its valve to a closed position on its valve seat. A valve stem 234 extends from the valve 226 in position to be contacted and moved axially to the left by a cam 236 carried by a toggle lever 238. The lever 238 is pivotally mounted at 240 and is provided with an arcuate shaped lost-motion slot 242 for receiving a pin 244 carried at one end of a link 246. The other end of the link 246 is pivoted at 248 to the left end of the valve core 150. A toggle link 250 is pivoted at 252 and provided with a compression spring 254 for causing a quick-throw snap action when the link is moved past center.

The link 238 is also provided with an upstanding finger 256 located in the path of travel of stops or dogs 258 and 260 which are adjustably positioned on the cross-head strut 94.

Conduits 146, 166 and 224 are all provided with high pressure flexible hose sections 262, 264 and 266, respectively, so that the ram assemblies may move freely with respect to each other when interconnected hydraulically.

In the operation of this automatic giant, the pressure control valve 134 is adjusted to open at a predetermined hydraulic head pressure and then the manually controlled valve 130 is opened to admit water under pressure through the strainer 132 to the valve 134. When the pressure reaches the predetermined point, the valve 134 opens thereby admitting water under pressure to the line 140 and the line 136. As the flow through the line 136 reaches the hydraulic ram 78 the piston therein moves upwardly and opens the gate within the valve 76, the water in the top part of the ram 78 being vented through the pipe 138.

If it is desired to have the nozzle oscillate or traverse back and forth horizontally with a slight elevation at the end of each horizontal movement, the by-pass valve 182 is opened and by-pass valve 230 is closed. The speed control valves 162 and 170 are adjusted by the needles 164 and 172 to give the desired rate of horizontal travel which, of course, may be the same when moving to the right as in moving to the left or may be adjusted to give a faster motion in one direction and a relatively slower motion in the opposite direction.

With the parts in the position shown in section in Figure 10, the water under pressure flows to the reversing valve 144 through the pipe 142, around the reduced portion 152 of core 150, through the pipe 154 and into the left end of cylinder 81. The piston 86 is thereupon moved to the right, as indicated by the arrow, thus carrying the cross-head 90 and strut 94 to the right until the dog 258 engages the upstanding finger 256 and swings the lever 238 slightly past dead center position, at which time the pin 244 reaches the opposite end of the lost-motion slot 242 and the compressed spring 254 of toggle link 250 snaps the lever 258 to the position shown in the drawings of lever 188 for the other ram.

This movement of the lever moves the piston valve core 150 to the left so that water under pressure from the pipe 142 passes around reduced portion 158 of valve core 150 and enters pipe 156 connected to the right-hand end of cylinder 81. At the same time, communication is established between pipes 154 and 168 around the reduced portion 152 of the valve core so as to vent the left end of the cylinder through the speed control valve 170. At the same time that this motion takes place, the cam 236 snaps by the end of valve stem 234 and moves the valve momentarily off its seat, thereby venting a small amount of trapped water from the discharge pipe 224 of ram 108. The spring 232 of valve 226 quickly closes the valve on its seat and thus the ram 108 is permitted to move a small amount. The ram 108, being connected to the nozzle for elevating and depressing it, thereupon moves the nozzle in a vertical plane a small amount and then holds it in that position while the next horizontal traverse takes place.

At the end of this stroke, the dog 260 engages the finger 256 and thereupon again reverses the ram by moving the core 150 back to the position shown in full lines and at the same time kicks open the valve 226 for a short period of time, thus permitting the elevating ram 108 to again change the vertical position of the nozzle.

If it is desired to have the stream of water from the nozzle merely traverse back and forth in the same position, the valve 230 is opened to permit elevating ram 108 to position the nozzle vertically at the desired point whereupon valve 231 is closed. Closing of this valve blocks all further movement of the ram 108 until the discharge is again opened. By opening the valves 182 and 183, the ram 80 is permitted to have discharge through the pipe 166 governed only by the setting of the speed control valves 162 and 170.

Should it be desired to have the nozzle oscillate in a vertical plane with only a slight change of horizontal direction at the end of each stroke, then the valve 182 is closed, valve 183 opened and valves 230 and 231 both opened. This will permit continuous oscillatory movement of elevating ram 188 governed as to speed by setting of the valves 220 and 222 and at the end of each stroke as the dogs 192 and 194, through the finger 190, operate the toggle lever 180 and reverse the valve 148, the ram 80 is permitted to move a small amount each time that the valve 176 is kicked open by cam 186. Cams of various contours may be used for giving different timed openings to the valves 226 and 176.

Should it be desired to continuously oscillate the nozzle in horizontal traverse and in vertical direction then the valves 182 and 183 for governing the discharge from ram 80 and the valves 230 and 231 for governing the discharge from ram 108 are all opened and thereupon both hydraulic rams will oscillate continuously and at speeds determined by the setting of the speed control valves 162, 170, 220 and 222.

By setting the dogs 258, 260, 192 and 194 to different positions on their struts, the reversing of each of the rams will take place at any desired point. Thus the nozzle may be oscillated in horizontal traverse a very short distance back and forth at rapid speed while gradually moving upwardly at slow speed. When it reaches the top limit, it can be brought back to a low point very rapidly and again repeat its former movement.

Also, if it is desired to have a very great amount of movement either horizontally or vertically, the cable clamp 104 is loosened and the clamp 106 tightened so that as the cross-head is moved, there will be twice as much cable pass around the sheave 98 and thus cause a movement twice as much as when the clamp 104 is tightened and the clamp 106 is loosened. In other words, with the one setting there is a one-to-one ratio whereas with the other setting there is a two-to-one ratio

between movement of the cross-head and length of cable travel.

Although but one specific embodiment of this invention has been herein shown and described, it will be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. A hydraulic giant comprising a discharge nozzle having horizontally and vertically axial pivotal mountings; a horizontally movable double-acting hydraulic ram connected to said nozzle for oscillating said nozzle horizontally; a vertically movable double-acting hydraulic ram connected to said nozzle for oscillating said nozzle in a vertical plane; inlet and discharge conduits for each of said rams; control valves in the conduits of each ram to reverse the direction of movement thereof; and another valve in one of said conduits and actuated by movement of one ram for controlling the operation of the other ram.

2. A hydraulic giant comprising a penstock section having an upwardly presenting end; a swivel joint on said end having a substantially vertical axis; an elbow section having one end swiveled on said joint; a hydraulic ram mounted on one of said sections comprising a cylinder, piston and piston rod therefor; a sheave on the piston rod; a cable having one end anchored to the other of said sections, said cable being reaved around said sheave and extending to said cylinder; a clamp on said cylinder for anchoring said cable; a clamp on said piston rod for anchoring said cable whereby when the cylinder clamp is tightened and the piston rod clamp is loosened, travel of said cable around said sheave is at a two-to-one ratio with respect to movement of said piston rod, and when said piston rod clamp is tightened and said cylinder clamp is loosened, said cable will be moved at a one-to-one ratio with respect to the travel of said piston rod and when both of said clamps are loosened, said sections may be manually adjusted with respect to each other; a second swivel joint on the other end of said elbow having a substantially horizontal axis; a nozzle section swiveled on said second joint; a second hydraulic ram mounted on one of said two last-mentioned sections comprising a cylinder; piston and piston rod therefor; a sheave on the piston rod; a cable having one end anchored to the other of said sections, said cable being reeved around said sheave and extending to said cylinder; a clamp on said cylinder for anchoring said cable; a clamp on said piston rod for anchoring said cable whereby when the cylinder clamp is tightened and the piston rod clamp is loosened, travel of said cable around said sheave is at a two-to-one ratio with respect to movement of said piston rod, and when said piston rod clamp is tightened and said cylinder clamp is loosened, said cable will be moved at a one-to-one ratio with respect to the travel of said piston rod and when both of said clamps are loosened, said sections may be manually adjusted with respect to each other; and means for supplying fluid under pressure to said rams.

3. A hydraulic giant comprising a penstock section having an upwardly presenting end; a swivel joint on said end having a substantially vertical axis; a 90° elbow section having one end swiveled on said joint; a double-acting hydraulic ram mounted on one of said sections comprising a cylinder; a piston in said cylinder; a piston rod extending through both heads of said cylinder; a sheave on each end of said piston rod; a cable operatively connected to the other of said sections and reeved about said sheaves; a cable clamp on said piston rod for selectively anchoring said cable thereto; another cable clamp on said cylinder for selectively anchoring the cable thereto, whereby when the cylinder clamp is tightened and the piston rod clamp is loosened, travel of said cable around said sheaves is at a two-to-one ratio with respect to movement of said piston rod, and when said piston rod clamp is tightened and said cylinder clamp is loosened, said cable will be moved at a one-to-one ratio with respect to the travel of said piston rod and when both of said clamps are loosened, said sections may be manually adjusted with respect to each other; a second swivel joint on the other end of said elbow having a substantially horizontal axis; a nozzle section swiveled on said second joint and extending substantially horizontally with its axis substantially perpendicular to the axis of said second joint; a second double-acting hydraulic ram mounted on one said two last-mentioned sections and comprising a cylinder, a piston in said cylinder; a piston rod extending through both heads of said cylinder; a sheave on each end of said piston rod; a cable operatively connected to the other of said two last-mentioned sections and reeved about said sheaves; a cable clamp on said piston rod for selectively anchoring said cable thereto; another cable clamp on said second cylinder for selectively anchoring a cable thereto whereby when the cylinder clamp is tightened and the piston rod clamp is loosened, travel of said cable around said sheaves is at a two-to-one ratio with respect to movement of said piston rod and when said piston rod clamp is tightened and said cylinder clamp is loosened, said cable will be moved at a one-to-one ratio with respect to the travel of said piston rod, and when both of said clamps are loosened, said sections may be manually adjusted with respect to each other; and means for supplying fluid under pressure to both of said hydraulic rams.

4. A hydraulic giant comprising a penstock section having an upwardly presenting end; a swivel joint on said end having a substantially vertical axis; a 90° elbow section having one end swiveled on said joint; a double-acting hydraulic ram mounted on one of said sections comprising a cylinder; a piston in said cylinder; a piston rod extending through both heads of said cylinder; a sheave on each end of said piston rod; a cable operatively connected to the other of said sections and reeved about said sheaves; a cable clamp on said piston rod for selectively anchoring said cable thereto; another cable clamp on said cylinder for selectively anchoring the cable thereto, whereby when the cylinder clamp is tightened and the piston rod clamp is loosened, travel of said cable around said sheaves is at a two-to-one ratio with respect to movement of said piston rod, and when said piston rod clamp is tightened and said cylinder clamp is loosened, said cable will be moved at a one-to-one ratio with respect to the travel of said piston rod and when both of said clamps are loosened, said sections may be manually adjusted with respect to each other; a second swivel joint on the other end of said elbow having a substantially horizontal axis; a nozzle section swiveled on said second joint and extending substantially horizontally with its axis substantially perpendicular to the axis of said second joint; a second double-acting

hydraulic ram mounted on one of said two last-mentioned sections and comprising a cylinder; a piston in said cylinder; a piston rod extending through both heads of said cylinder; a sheave on each end of said piston rod; a cable operatively connected to the other of said two last-mentioned sections and reeved about said sheaves; a cable clamp on said piston rod for selectively anchoring said cable thereto; another cable clamp on said second cylinder for selectively anchoring a cable thereto whereby when the cylinder clamp is tightened and the piston rod clamp is loosened, travel of said cable around said sheaves is at a two-to-one ratio with respect to movement of said piston rod and when said piston rod clamp is tightened and said cylinder clamp is loosened, said cable will be moved at a one-to-one ratio with respect to the travel of said piston rod, and when both of said clamps are loosened, said sections may be manually adjusted with respect to each other; means for supplying fluid under pressure to both of said hydraulic rams; a control valve in the discharge conduit of one of said rams; and means actuated by the other of said rams for operating said control valve.

5. A hydraulic giant comprising a penstock section having an upwardly presenting end; a swivel joint on said end having a substantially vertical axis; a 90° elbow section having one end swiveled on said joint; a double-acting hydraulic ram mounted on one of said sections comprising a cylinder; a piston in said cylinder; a piston rod extending through both heads of said cylinder; a sheave on each end of said piston rod; a cable operatively connected to the other of said sections and reaved about said sheaves; a cable clamp on said piston rod for selectively anchoring said cable thereto; another cable clamp on said cylinder for selectively anchoring the cable thereto, whereby when the cylinder clamp is tightened and the piston rod clamp is loosened, travel of said cable around said sheaves is at a two-to-one ratio with respect to movement of said piston rod, and when said piston rod clamp is tightened and said cylinder clamp is loosened, said cable will be moved at a one-to-one ratio with respect to the travel of said piston rod and when both of said clamps are loosened, said sections may be manually adjusted with respect to each other; a second swivel joint on the other end of said elbow having a substantially horizontal axis; a nozzle section swiveled on said second joint and extending substantially horizontally with its axis substantially perpendicular to the axis of said second joint; a second double-acting hydraulic ram mounted on one of said two last-mentioned sections and comprising a cylinder; a piston in said cylinder; a piston rod extending through both heads of said cylinder; a sheave on each end of said piston rod; a cable operatively connected to the other of said two last-mentioned sections and reeved about said sheaves; a cable clamp on said piston rod for selectively anchoring said cable thereto; another cable clamp on said second cylinder for selectively anchoring a cable thereto whereby when the cylinder clamp is tightened and the piston rod clamp is loosened, travel of said cable around said sheaves is at a two-to-one ratio with respect to movement of said piston rod and when said piston rod clamp is tightened and said cylinder clamp is loosened, said cable will be moved at a one-to-one ratio with respect to the travel of said piston rod, and when both of said clamps are loosened, said sections may manually adjusted with respect to each other; means for supplying fluid under pressure to both of said hydraulic rams; a control valve in the discharge conduit of each of said rams; and means actuated by said rams for operating the control valve of the respective other ram.

6. A hydraulic giant comprising a penstock section having an upwardly presenting end; a swivel joint on said end having a substantially vertical axis; a 90° elbow section having one end swiveled on said joint; a double-acting hydraulic ram mounted on one of said sections comprising a cylinder; a piston in said cylinder; a piston rod extending through both heads of said cylinder; a sheave on each end of said piston rod; a cable operatively connected to the other of said sections and reeved about said sheaves; a cable clamp on said piston rod for selectively anchoring said cable thereto; another cable clamp on said cylinder for selectively anchoring the cable thereto, whereby when the cylinder clamp is tightened and the piston rod clamp is loosened, travel of said cable around said sheaves is at a two-to-one ratio with respect to movement of said piston rod, and when said piston rod clamp is tightened and said cylinder clamp is loosened, said cable will be moved at a one-to-one ratio with respect to the travel of said piston rod and when both of said clamps are loosened, said sections may be manually adjusted with respect to each other; a second swivel joint on the other end of said elbow having a substantially horizontal axis; a nozzle section swiveled on said second joint and extending substantially horizontally with its axis substantially perpendicular to the axis of said second joint; a second double-acting hydraulic ram mounted on one of said two last-mentioned sections and comprising a cylinder; a piston in said cylinder; a piston rod extending through both heads of said cylinder; a sheave on each end of said piston rod; a cable operatively connected to the other of said two last-mentioned sections and reeved about said sheaves; a cable clamp on said piston rod for selectively anchoring said cable thereto; another cable clamp on said second cylinder for selectively anchoring a cable thereto whereby when the cylinder clamp is tightened and the piston rod clamp is loosened, travel of said clamp around said sheaves is at a two-to-one ratio with respect to movement of said piston rod and when said piston rod clamp is tightened and said cylinder clamp is loosened, said cable will be moved at a one-to-one ratio with respect to the travel of said piston rod, and when both of said clamps are loosened, said sections may be manually adjusted with respect to each other; means for supplying fluid under pressure to both of said hydraulic rams; a control valve in the discharge conduit of one of said rams; and quick throw toggle mechanism actuated by the other of said rams for operating said control valve.

7. A hydraulic giant comprising a penstock section having an upwardly presenting end; a swivel joint on said end having a substantially vertical axis; a 90° elbow section having one end swiveled on said joint; a double-acting hydraulic ram mounted on one of said sections comprising a cylinder; a piston in said cylinder; a piston rod extending through both heads of said cylinder; a sheave on each end of said piston rod; a cable operatively connected to the other of said sections and reeved about said sheaves; a cable clamp on said piston rod for selectively anchoring said cable thereto; another cable clamp on said cylinder for selectively anchoring the cable

thereto, whereby when the cylinder clamp is tightened and the piston rod clamp is loosened, travel of said cable around said sheaves is at a two-to-one ratio with respect to movement of said piston rod, and when said piston rod clamp is tightened and said cylinder clamp is loosened, said cable will be moved at a one-to-one ratio with respect to the travel of said piston rod and when both of said clamps are loosened, said sections may be manually adjusted with respect to each other; a second swivel joint on the other end of said elbow having a substantially horizontal axis; a nozzle section swiveled on said second joint and extending substantially horizontally with its axis substantially perpendicular to the axis of said second joint; a second double-acting hydraulic ram mounted on one of said two last-mentioned sections and comprising a cylinder; a piston in said cylinder; a piston rod extending through both heads of said cylinder; a sheave on each end of said piston rod; a cable operatively connected to the other of said two last-mentioned sections and reeved about said sheaves; a cable clamp on said piston rod for selectively anchoring said cable thereto; another cable clamp on said second cylinder for selectively anchoring a cable thereto whereby when the cylinder clamp is tightened and the piston rod clamp is loosened, travel of said clamp around said sheaves is at a two-to-one ratio with respect to movement of said piston rod and when said piston rod clamp is tightened and said cylinder clamp is loosened, said cable will be moved at a one-to-one ratio with respect to the travel of said piston rod, and when both of said clamps are loosened, said sections may be manually adjusted with respect to each other; means for supplying fluid under

pressure to both of said hydraulic rams; a control valve in the discharge conduit of each of said rams; and quick throw toggle mechanism actuated by said rams for operating the control valve of the respective other ram.

8. A hydraulic giant comprising a discharge nozzle having horizontally and vertically axial pivotal connections; a hydraulic ram connected to said nozzle for oscillating said nozzle horizontally; a second hydraulic ram connected to said nozzle for oscillating said nozzle in a vertical plane; a control connected to said rams for varying the length of stroke of each ram; a control connected to said rams for controlling the speed of movement of each ram independently in each direction; a connection between the rams and responsive to the movement of one ram for controlling the operation of the other ram.

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