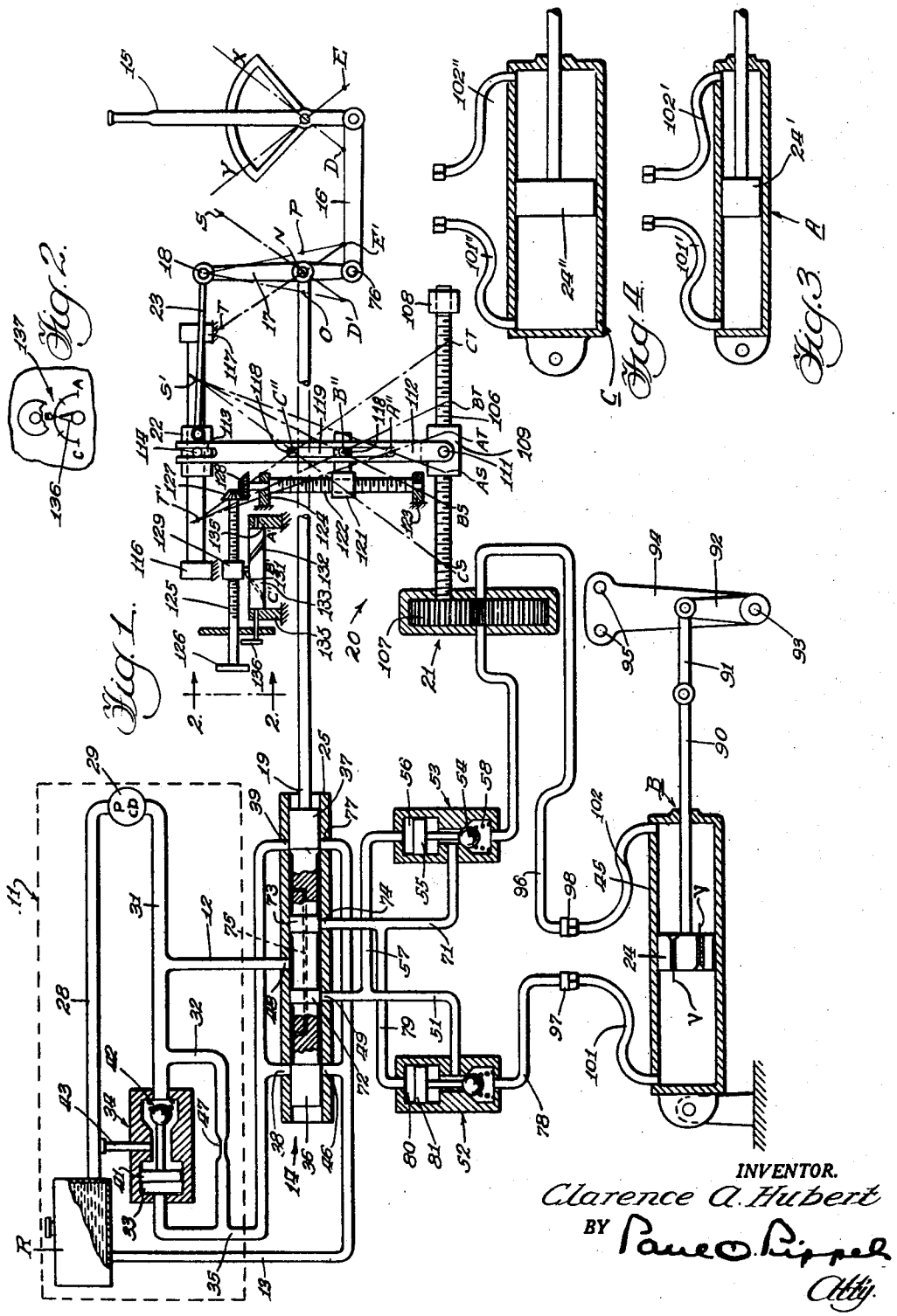
Oct. 3, 1950 C. A. HUBERT 2,524,055

HYDRAULIC TELEMETER SYSTEM WITH VARIABLE-RATE VALVE SHUTOFF UNIT

Filed Dec. 4, 1948



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Patented Oct. 3, 1950 2,524,055

UNITED STATES PATENT OFFICE

2,524,055

HYDRAULIC TELEMETER SYSTEM WITH VARIABLE-RATE VALVE SHUTOFF UNIT

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Application December 4, 1948, Serial No. 63,482

7 Claims. (Cl. 121—41)

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This invention has to do with telemeter type hydraulic power transmitting systems wherein operation of a fluid-driven motor is terminatable by the closing of a control valve therefor, and more particularly concerns an improved control unit quantitatively sensitive to the flow of fluid through the motor and being effective for closing the valve and thus stopping the motor incident to a predeterminable quantity of such flow.

My improvement adapts hydraulic power transmitting systems of the telemeter type to have any fluid capacity motor (within limits) connected therewith for operation in such a fashion that the driven element of the motor will occupy positions respectively corresponding to positions of a manually operated control member of such system, and also in such a fashion that each motor can be caused to operate throughout its entire range of movement pursuant to movement of the control member throughout its entire range of movement.

Another object of this invention is the provision of a fluid driven unit connected in series with a fluid driven motor and a control valve for such motor, and having a driven element connected with said valve for closing the same incident to predetermined movement of the driven element, and the driven unit being regulatable to selectively vary the amount of driven element movement per unit quantity of fluid passed through such driven unit.

A more specific object is the provision in a hydraulic telemeter system of a fluid driven valve-closing unit wherein there is a gear type motor, a running nut driven by such motor, a driven element connected with a control valve of the system, a lever connected between the running nut and the driven element, a fulcrum for said lever, and the fulcrum being adjustable lengthwise of the lever to vary the number of gear pump revolutions necessary to move said driven element far enough to effect closing of the control valve.

These and other desirable objects inherent in and encompassed by the invention will be better understood upon reading the ensuing description with reference to the annexed drawing, wherein:

Fig. 1 is a partially diagrammatic view showing the elements of an hydraulic power transmitting system constituting a preferred embodiment of this invention.

Fig. 2 is a fragmentary view taken at the plane indicated by the line 2—2 in Fig. 1 illustrating adjusting and indicating elements of the system.

Figs. 3 and 4 are diagrammatic views illustrating respective hydraulic rams of different fluid capacity individually substitutable for the hydraulic ram shown in the lower left-hand portion of Fig. 1.

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With continued reference to the drawing, there can be seen in Fig. 1 a source 11 of fluid under pressure and having a high pressure outlet 12 and a low pressure inlet 13. There is also shown a control member 15 operable through a linkage 16 for shifting a motor driven member 17 for swinging the same about a pivot 18 at its upper end and thus endwise moving a plunger 19 of a control valve 14 for opening the same. The control member 15 could also be manipulated oppositely to the direction in which it had been manipulated for opening the control valve and to thus close the control valve, although it is contemplated that in most instances the control member will be allowed to occupy a position into which it has been moved for opening the valve and that thereafter the valve will be closed by the operation of a fluid driven unit 20 which comprises a gear motor 21 and a driven element 22 of such unit connected by a link 23 with the upper end of the motor driven member 17.

The control valve 14 controls communication between the source 11 and a fluid driven motor in the form of a two-way hydraulic ram B. Gear motor 21 is connected in series with the hydraulic ram B so that there is correlation between the amount said ram is caused to operate and the distance the driven element 22 is moved for causing closing of the control valve 14 and termination of operation of the ram.

While the control member 15 and the piston 24 (containing rephasing valves V) of the ram B occupy correlated positions, as illustrated in Fig. 1, the valve plunger 19 will be in the neutral position closing all ports in the valve casing 25. Consequently fluid drawn from the reservoir R through a conduit 28 by a constant delivery pump 29 will be discharged by that pump through a conduit 31 and thence through a conduit 32 into a chamber 33 of a pressure controlling valve 34. The pressure of this pumped fluid is imposed through a conduit 35, but since enlarged portions 36 and 37 of the movable valve element 19 then block valve ports 38 and 39, fluid cannot escape from the conduit 35 and the full pressure of the fluid is imposed upon a valve piston 41 for unseating a valve ball 42. Fluid from the discharge side of the pump 29 can then by-pass past the valve 34 and through conduits 43 and 28 back to the reservoir, or, to the inlet side of the pump.

Manual movement of the control member 15

toward the limit X of its range of movement will manipulate the valve 14 for causing movement of the motor piston 24 toward the right, or toward the piston rod end of the motor cylinder 45, whereas movement of the member 15 toward the limit Y of its range of movement will adjust the control valve 14 for causing movement of the motor piston 24 toward the opposite end of the motor cylinder. Concurrently with movement of the control member 15, the movable valve element 19 is adjusted from its neutral position for causing termination of the low pressure by-pass condition of the fluid source 11 and creation of a high pressure condition. When, for instance, the control member 15 is moved to the right toward position X, the enlargement 36 of the valve element 19 will be moved out of registry with ports 38 and 46, whereby fluid from the conduit 35 can escape through the ports 38 and 46 from the conduit 35 back to the reservoir R. Because of a restriction 47 in the conduit 32, the fluid can escape through the ports 38 and 46 sufficiently fast to diminish the pressure in the valve chamber 33 so that this pressure will be insufficient to hold the by-pass valve ball 42 unseated. As a consequence this ball 42 will seat and close the by-pass valve and terminate low pressure by-pass.

During this high pressure condition of the source of pressure fluid, fluid at such high pressure will be delivered through the conduit 12 and control valve ports 48 and 49 into a reversible flow conduit 51 which leads through a check valve 52 to the left end of the motor cylinder 45. Fluid thus introduced to the left end of the motor cylinder 45 will force the piston 24 to the right, displacing fluid from the piston rod end of said cylinder through the gear motor 21 and thence through a check valve 53 of which the ball 54 is then held open by the pressure of fluid above a piston 55. This fluid acting upon the piston 55 reaches a piston receiving chamber 56 for such piston from the conduit 51 through a conduit 57. Because of the end area of the piston 55 exceeding the area of the seat for the ball 54, a pressure in the chamber 56 above the piston 55, not necessarily exceeding the pressure in a spring chamber 58 containing the ball 54, will prevail over the pressure upon said ball and cause it to be unseated. Fluid discharged from the piston rod end of the motor B through the gear motor 21 and through the opened check valve 53 enters a second reversible flow conduit 71. Inasmuch as at this time the control valve member 19 is moved to the left from the position shown in Fig. 1, and valve member enlargements 72 and 73 are to the left of their respectively associated ports 49 and 74, the fluid discharged through the conduit 71 will flow through the port 74 and thence into the right end of a channel 75 extending axially through the element 19. Fluid is discharged from the left end of this channel 75 through the port 46 and the conduit 13 back to the reservoir.

Movement of the piston 24 toward the right end of the motor cylinder 45 will continue until the fluid driven unit 20, energized by the gear motor 21, moves the control valve element 19 back to neutral. Upon such movement of the valve element 19 back to neutral, the ports 38 and 46 will be closed again, preventing escape of fluid from the conduit 35 so that the fluid passing through the restriction 47 can again

build up the pressure in the valve chamber 33 causing movement of the piston 41 for unseating the valve ball 42 and recreating the low pressure by-pass condition.

Disregard for the moment the structural details of the fluid driven unit 20 for mechanically moving the upper end of the motor driven member 17 for resetting the control valve element 19 to neutral after the plunger 24 of the hydraulic ram B has been moved a distance correlated with the distance the control member 15 has been manually set, and presume that said control member has been moved from the position shown in Fig. 1 toward position Y. Such movement of the control member toward the position Y will be operable through the linkage 16 and the motor driven walking beam lever 17 for shifting the valve element 19 to the right and thereby uncover valve ports 49, 74, 39 and 77. Such uncovering of the valve ports 39 and 77 again permits fluid to escape from the conduit 35 to cause diminution of pressure in the valve chamber 33 so the by-pass valve ball 42 will again seat and create a high pressure condition. High pressure fluid will then flow through the conduit 12 and through ports 48 and 74 into the reversible flow conduit 71, the direction of fluid through the conduit 71 having been in the opposite direction in the above described operation initiated by the control member 15 toward the position X. The fluid continues from the conduit 71 through the check valve 53 and the gear motor 21 into the right end of the ram cylinder 45. This causes the gear motor 21 to operate in the opposite direction in which it operated when the fluid flowed oppositely therethrough following movement of the valve control element 19 to the left. The fluid introduced into the right end of the ram or motor cylinder 45 forces the piston or plunger 24 to the left thereby forcing fluid outwardly through a conduit 78 past the check valve 52 and into the conduit 51. At this time the check valve 52 is being forced open by the pressure of fluid from the conduit 71 through a lateral conduit 79 into a chamber 80 above a piston 81 of the unit 52 for forcing such piston downwardly so that the stem projecting downwardly from the piston displaces the check valve ball from its seat. At this time the conduit 51 will be communicative through the port 49 with the left end of the valve element passage 75 so the fluid exhausted from the left end of the cylinder 45 passes through said passage 75 and thence through port 77 of the control valve into the conduit 13 for return to the reservoir. In this phase of the operation, the fluid passing through the gear motor for causing movement of the motor piston 24 to the left will energize the fluid driven unit 20 for causing the motor driven walking beam member 17 to swing counter-clockwise about its then fixed pivot 76 for shifting the control valve element 19 toward neutral, that is, toward its valve closing position illustrated in Fig. 1. The distance the piston 24 will have been moved responsive to the movement of the lever 15 toward the position Y is correlated with the distance of such movement of the lever 15. Again when the valve element 19 is returned to neutral both ports 38 and 39 will be closed to prevent escape of fluid from the conduit 35; therefore the fluid introduced through the passage restriction 47 into the valve chamber 33 will be effective for opening the pressure controlling valve 34 and recreating the low pressure by-pass condition.

This hydraulic power transmitting system has

particular utility when installed upon a tractor where the constant delivery pump 29 will be continuously driven from the tractor engine. The hydraulic ram or motor B can be mounted directly upon the tractor and have a piston rod 90 thereof connected through a link 91 and an arm 92 with a tractor mounted rock shaft 93. A power take-off arm 94 which is constrained for rotation with the rock shaft 93 contains holes 95 facilitating the connection therewith of operating linkages to tillage tools, or the like, which may be conventionally mounted upon the tractor. Movement of the ram piston 24 in one direction will, therefore, cause the arm 94 to rock in one direction for increasing the operating depth of the tools whereas movement of the piston in the opposite direction will decrease the depth at which the tools operate or raise the tools to a transport position.

It is also contemplated that the ram B and the rock shaft 93, together with the arms mounted thereon, will be mounted upon an implement towed behind the tractor. In this event, fluid conducting power take-off conduit means, embodied by the conduits 78 and 96, will terminate in conduit coupling devices 97 and 98 on the tractor and long flexible conduits 101 and 102 communicative respectively with the conduits 78 and 96 through the couplings 97 and 98, will lead to the ends of the ram cylinder 45.

Use of the fluid driven unit 20 having a separate gear motor 21 for energizing the same to shift the motor-driven walking beam member 17 for closing the control valve 14, facilitates placement of the ram B at any desired remote position. Since the gear motor 21 and the ram B are connected in series, a driven element 22 of the fluid driven unit 20 will be caused to be moved an amount correlated with the amount of movement of the ram piston 24 and, consequently, with the amount of movement of the rock shaft arm 94 and of any tools connected with such rock shaft arm whereby the movement of such tools will be definitely correlated in direction and amount of movement with the direction and amount of initiating movement of the control member 15.

Adjustment of the fluid driven unit 20 is possible for adapting the use of different size or fluid capacity rams with the control apparatus including the control lever 15 upon the tractor. Said unit 20 includes a threaded shaft 106 constrained for rotation with one of the gears, 107, of the gear motor 21. An end of the shaft is rotatably supported in a bearing 108. This shaft 106 carries a running nut 109 having trunnion bearings 111 projecting diametrically oppositely therefrom for pivoted connection with the lower bifurcated end of a lever 112. The upper end of the lever 112 is also bifurcated and each of the furcations at the upper end of such lever contains a vertical notch 113 for respectively receiving trunnion bearings 114 projecting diametrically oppositely from a driven element of the unit 20 in the form of the sleeve 22 which is slidable endwise upon a rod 115 held at its ends by socket members 116 and 117 suitably mounted upon the tractor.

A fulcrum in the form of a pin 118 projects through a slot 119 extending endwise in the lever 112. Said fulcrum is carried by a threaded member 121 mounted upon a threaded vertical shaft 122 which is rotatably supported and held against endwise movement by bearings 123 and 124. Rotation of the shaft 122 and the consequent vertical position of the fulcrum 118 is obtained manually by a thumb screw 125 having a knurled head 126 at one end and a beveled gear 127 at its opposite end meshed with a companion beveled gear 128 fixed on the upper end of the threaded shaft 122. A traveling nut 129 upon the threaded portion of the thumb screw 125 has a projection 131 disposed in a helical groove 132 of a cylindrical element 133 mounted in bearings 134 and 135 for rotation about its principal axis. Movement of the running nut element 129 axially of the members 125 and 133 pursuant to rotation of the thumb screw head 126 will cause the element 133 to rotate an indicator element 135 therewith for indicating on a scale 137, Fig. 2, the vertical position of the fulcrum 118.

Operation of the fluid driven unit 20 in conjunction with the control member 15 and different size rams:

When a medium size ram B is connected with the fluid-conducting power take-off conducted means 78—96 through the detachable couplings 97—98, the unit 20 will be set to place the fulcrum 118 at a position B'' substantially midway between the two ends of the slot 119 in the lever 112. Then assuming the control lever 15 is moved to position X at one limit of its adjusting range, the lower end of this member will be moved to position D. The lower end of the walking beam lever 17 will be swung to position D' incident to being pivoted about the connection 18 which, at that time, remains fixed. Such swinging of the lever 17 moves the control valve element 19 to the left, carrying connection N thereof with the lever 17 to position O. The control valve element 19 is, therefore, moved a distance N—O from the neutral position N. Thus, opened control valve 14 causes fluid to pass downwardly under pressure through the conduit 51, in the above described manner, into the left end of the ram B for causing movement of the piston 24 to the right. Such movement of the ram piston will continue until the valve element 19 is returned to neutral, and moving of such element to the neutral position is obtained by moving the upper end of the walking beam lever 17 from the position shown in Fig. 1, to position S which will carry the pivot between the lever 17 and the right end of the valve element 19 from position O, back to position N. This is accomplished by the gear motor 21 which is driven by the fluid exhausted from the right end of the ram B. Fluid passing through the motor in this direction causes rotation of the threaded shaft 106 in the direction for moving the running nut 109 to the left and when enough fluid has passed through the motor 21 for moving the trunnions 111 to position BS, the lever 112 will have been pivoted clockwise about the fulcrum 118 sufficiently far to carry the trunnions 114 of the driven element 22 to position S'. Pursuant to this movement of the trunnions 114 to the position S', the links 23 connected between the element 22 and the upper end of the walking beam lever 17 will have been moved endwise far enough to place the pivot 18 in position S. This is the amount of movement of the lever 17 to return the element 19 from position O to N and thereby close the control valve 14.

Should it be desired to cause the piston 24 of the ram B to move to the left from its mid-position, illustrated in Fig. 1, the control lever 15 will be moved from its mid-position toward the position Y, and if it is desired to cause the piston to move all the way to the left end of

the cylinder 45, the lever 15 will be thrown to the Y limit of its adjustable range. When the lever 15 is thrown to position Y, the lower end thereof will be moved to position E, swinging the lower end of the walking beam lever 17 to position E', thereby moving the section of the lever 17 connected to the valve element 19 from the neutral position N to position P, causing opening of the valve 14 in such a manner, described above, for fluid under pressure to flow downwardly through the conduit 71 through the check valve 53, the motor 21, and into the right end of the ram B. Fluid exhausted from the left end of the ram cylinder 45 flows upwardly past the opened check valve 52 and through the reversible flow conduit 51 to the reservoir R in the above described manner. The fluid flowing in this direction through the gear motor 21 will reverse the rotation of the shaft 106, causing the running nut 109 to move to the right. When the trunnions 111 on this nut reach the position BT the trunnion 114 on the now driven element 22 of the fluid driven unit 20 will reach the position T', causing the links 23 to pull the upper end of the walking beam lever 17 to position T and return the right end of the control valve element 19 from position P to neutral position N, closing the control valve and stopping operation of the ram B coincidently with the piston 24 reaching the left end of the cylinder 45.

It is only when the control lever 15 is swung to its range terminal positions X or Y that the lower end of the walking beam lever 17 will be swung about the pivot 18 to the terminal positions D' or E' and necessitate subsequent swinging of the upper end of the lever 17 from its mid-position all the way to the position S, or all the way to the position T for re-establishing the neutral position N on the intermediate section of such lever 17 to reset the control valve element 19 to neutral. Less distant manipulation of the lever 15 will cause corresponding less distant movements of the affected parts for re-establishing the closed condition of the control valve 14. However, it is desired that full swinging of the lever between the terminal positions X and Y will cause full range strokes of the ram piston 24 between the right and left ends of its cylinder 45. When this condition is attained, correspondingly shorter movements of the control lever 15 in either direction from its mid-position will incur correspondingly shorter movements of the ram piston 24 in correlated directions from its mid-position. To attain this condition there must be a definite relation between the distance the driven element 22 of the fluid driven unit 20 is driven per unit of distance that the ram piston 24 moves in response to the application of fluid pressure thereto. This relation between the amount of movement of the piston 24 and the driven element 22 is established by coordinating the number of revolutions of the gear 107 per unit volume of fluid passed through the motor, the pitch of the threaded shaft 106 and the position of the fulcrum 118 lengthwise of the lever 112. Subsequent to selection of the gear motor having a certain gear speed per unit of fluid passed therethrough and the selection of threaded shaft 106 of a certain thread pitch, the variation of the distance which the driven element 22 of the fluid driven unit 20 is driven per unit of linear travel of the ram piston 24 is variable by changing the position of the fulcrum 118 with respect to the lever 112. With the particular gear motor and thread pitch for the shaft 106 herein assumed, the volume of fluid caused to flow through the gear motor 21 as the piston 24 moves back and forth between the ends of the cylinder 45 causes the trunnions 111 of the running nut 109 to move back and forth between the positions BS and BT. With the fulcrum 118 for the lever 112 at position B'', such movement of the trunnions 111 between positions BS and BT will cause the trunnions 114 on the driven element 22 to move back and forth between the positions S' and T'. This range of movement of the driven member 22 between positions S' and T' is that required for re-establishing the neutral position N for the connection of the valve element 19 with the walking beam lever 17, following movement of the control member 15 to either of its limits X or Y. Thus placing the fulcrum 118 at the position B'', the range of movement BS—BT of the running nut 109, which is established by the volumetric capacity of the particular ram B is caused to be commensurate with the maximum required range of movement S'—T' which is fixed with respect to the full range movement X—Y of the control lever 15.

If a smaller volumetric capacity hydraulic ram A should have its associated conduits 101' and 102' connected with the conduit terminals 97—98 in place of the conduits 101 and 102 of the hydraulic ram B, a lesser quantity of fluid would be caused to flow through the gear motor 21 pursuant to movement of the piston 24' of the smaller ram between the ends of its cylinder. Therefore, movement of the piston 24' between the limits of its movable range would be accompanied by endwise movement of the running nut 109 between such limits as AS—AT. Under these circumstances, if the upper end of the lever 112 is to be caused to be moved through the entire range S'T' for maintaining coordination between the range of movement for the driven member 22 and the complete adjustable range X—Y of the control member 15, the fulcrum member 118 will need to be moved downwardly to the position A''. When the fulcrum member 118 is in the position A'' correlation will be preserved between the movement of the control lever 15 and the piston 24' of the smaller hydraulic ram A wherefore movement of the control member 15 to its terminal position X will cause the piston 24' to move exactly to the right end of its cylinder whereas movement of the control member 15 to its terminal position Y will cause the piston 24' to move exactly to the left end of its cylinder. Intermediate positions between the terminal positions X and Y into which the control member 15 is moved will cause the piston 24' to move to corresponding intermediate positions.

Should a hydraulic ram C have its conduits 101'' and 102'' connected with the terminals 97 and 98 in lieu of the conduits 101 and 102 of the ram B, a correspondingly greater amount of fluid would necessarily flow through the gear motor 21 for moving the piston 24'' of this larger ram between the ends of its associated cylinder. This volume of fluid flowing through the gear motor would cause the running nut 109 to operate within the limits between the positions CS and CT, while causing the driven element 22 of the fluid driven unit 20 to operate within the range S'T'. This is the proper distance this driven element should move for having the proper restorative influence upon the control valve element 19 when such element 19 is manipulated by

movement of the control member 15 within the range X—Y.

It may be said, therefore, since the fulcrum 118 of the fluid driven unit 20 is adjustable between the positions A'', B'' and C'' for adapting the apparatus different identical control characteristics for the three to have size rams A, B, and C, (or for other size rams accommodated by placing the fulcrum member 118 at different respective positions in the lever slot 119) that said fluid driven unit is adjustable to selectively determine the distance the driven element 22 thereof is driven per volumetric unit of flow of the operating fluid for a ram to thereby selectively calibrate the distance of movement of the control member 15 with the amount of responsive operation of the ram. In other words, the position of the fulcrum member 118 lengthwise in the slot 119 of the lever 112 can be utilized for causing full range control movement X—Y of the control member 15 to incur full range movement of the pistons of different fluid capacity rams connected with the system as illustrated by the hydraulic ram B.

When the thumb screw 125 is rotated for causing the fulcrum member 118 to occupy the position A'', the running nut 129 on the threaded shank of said thumb screw will be moved to position A' and thereby cooperate with the helical groove 122 in the cylindrical member 133 to place the indicator pointer 136 at a position designated A in Fig. 2. This would indicate to the operator of a tractor when proper adjustment had been made for a hydraulic ram A to be connected with the piston. Rotation of the thumb screw 125 for placing the fulcrum 118 at position B'', the running nut 129 will be stationed at position B' and thereby cooperate with the helical groove 132 for placing the indicator pointer 136 at position B on the scale 137, Fig. 2, to indicate that the fluid driven unit 20 is conditioned for the attachment of a ram of the capacity of the ram B to the system; and when the fulcrum 118 is in position C'' the running nut 129 and helical groove 132 will cause the pointer 136 to be at the position C in Fig. 2 for indicating proper adjustment for use of a ram of the capacity of the ram C with the system.

Having thus described a single preferred form of the invention with the view of thoroughly and concisely illustrating the same, I claim:

1. A hydraulic power transmitting system comprising a control valve openable to accommodate flow of fluid therethrough; valve control means including a linkage, and a control member connected with the valve through such linkage and thus manipulatable to open said valve; a hydraulic ram operable under the influence of the flowing fluid responsively to the manipulation of said control member and operable an amount constituting a function of the volume of such flow; a fluid driven unit connected in series with the control valve and including a driven element positively driven by the fluid at a rate proportional to the rate of flow thereof through the valve, said driven element being connected with such linkage and operable therethrough to close the valve when driven a distance correlated with the distance the control member was manipulated when opening the valve, and said fluid driven unit including means adjustable to selectively determine the distance said driven element thereof is driven per volumetric unit of flow of the fluid through the control valve to thereby selectively calibrate the distance of movement of the control member with the amount of responsive operation of the ram.

2. A hydraulic power transmitting system comprising a control valve openable to accommodate flow of fluid therethrough; valve control means including a manually operated control member manipulatable to open such valve, and a motor driven member drivable to close the valve; a hydraulic ram communicatively connected with said valve, said ram being operable under the influence of the flowing fluid responsively to the manipulation of said control member and operable an amount constituting a function of the volume of such flow; a fluid driven unit connected serially with the control valve and ram and including a driven element positively driven by the fluid flowing serially through said valve and ram at a rate proportional to the flow rate of such serially flowing fluid, said driven element being connected with said motor driven element and operable thereof to close the valve when such driven element has been driven a distance correlated with the distance the control member was manipulated when opening the valve, and said fluid driven unit including means adjustable to selectively determine the distance said driven element thereof is driven per volumetric unit of flow of the serially flowing fluid to thereby selectively calibrate the distance of movement of the control member with the amount of responsive operation of the ram.

3. A hydraulic power transmitting system comprising a control valve manipulatable from a neutral setting to accommodate flow of a fluid column therethrough and resettable to neutral to preclude such flow; a hydraulic ram operable subject to the flow of such fluid column; conduit means communicatively connecting the valve and ram for directing the fluid column to flow serially therethrough; a fluid-driven unit interposed in said conduit means and driven by and pursuant to the flow of the fluid column therethrough, said unit including a power output element connected with said control valve to reset the same to neutral when driven pursuant to the driving of such unit; and said fluid-driven unit including means adjustable to selectively determine the amount said output element is driven per volumetric unit of such fluid transferred between said ram and the conduit means.

4. A hydraulic power transmitting system comprising a control valve openable to accommodate flow of fluid therethrough for operating rams of different bore and stroke selectively attachable thereto; valve control means including a manually operated control member manipulatable different distances attendant to opening such valve, and a motor-driven member drivable to close such valve; fluid conducting power take-off conduit means leading from the valve for selective communicative connection with said rams; a fluid driven unit interposed in said conduit means and including a driven element which is driven by and at a rate according to the amount of fluid passing through such unit, said driven element being connected with said motor-driven element of the valve control means for driving the same to close the valve when driven an amount determined by the distance of manual setting of the manipulatable member attendant to opening the valve, and said fluid driven unit including means adjustable to selectively determine the amount of movement of its driven element with respect to the volume of fluid passing through the unit for correlating the distance the selectively at-

tachable rams will be operated in accordance with the distance the manipulatable member is set when opening the valve.

5. A hydraulic power transmitting system comprising a control valve manipulatable from a neutral setting to accommodate flow of fluid therethrough and resettable to neutral to preclude the flow of such fluid, a hydraulic ram, conduit means communicatively connecting said valve and ram for directing the fluid to flow therebetween to incur operation of the ram in accordance with the flow of such fluid, a gear motor interposed in said conduit means, a threaded shaft constrained for rotation with a gear of said motor, a running nut meshed with the threads on said shaft for being moved endwise of said shaft pursuant to rotation thereof, a lever fulcrum, a lever mounted on said fulcrum and having a portion spaced from the fulcrum operably connected with the running nut to cause swinging of the lever about said fulcrum pursuant to movement of the nut, an element connected with another portion of the lever for movement thereby when the lever is swung, and means connecting said element with the valve for closing the same pursuant to predetermined movement of the element by the swinging of the lever, and said fulcrum being adjustable lengthwise of the lever for determining the amount of movement of said element per unit volume of fluid passing through the gear motor and consequently determining the amount the hydraulic ram is operated before the valve is closed, and means for adjusting said fulcrum.

6. A hydraulic power transmitting system comprising a control valve openable to accommodate flow of fluid therethrough; valve control means including a manually operated control member manipulatable different distances attendant to opening such valve, and a motor-driven member drivable correspondingly different distances for closing the valve; a hydraulic ram; conduit means communicatively connecting said valve and ram for directing the flow of such fluid therebetween to incur operation of the ram an amount according to the volume of flowed fluid; a gear motor interposed in said conduit means; a threaded shaft constrained for rotation with a gear of such motor; a running nut meshed with the threads on said shaft for being moved endwise of the shaft pursuant to rotation thereof; a lever fulcrum; a lever mounted on said fulcrum and having a portion spaced from the fulcrum operably connected with the running nut to cause swinging of the lever about said fulcrum pursuant to movement of the nut; and means connecting another portion of the lever with said motor-driven member to cause valve-closing movement thereof when the lever is swung; and said fulcrum being adjustable lengthwise of the lever for determining the amount of such valve-closing movement of the motor-driven member per unit volume of fluid passing through the gear motor and consequently for determining the amount the hydraulic ram is operated per unit of manipulative adjustment of the manually operated control member, and means for adjusting said fulcrum.

7. A hydraulic power transmitting system comprising a control valve openable to accommodate flow of fluid therethrough for operating rams of different bore and stroke selectively attachable thereto; valve control means including a manually operated control member manipulatable different distances attendant to opening such valve, and a motor-driven member drivable to close such valve; fluid conducting power take-off conduit means leading from the valve for selective communicative connection with said rams; a gear motor interposed in said conduit means; a threaded shaft constrained for rotation with a gear of said motor; a running nut meshed with the threads of said shaft for being moved endwise of said shaft pursuant to rotation thereof; a lever fulcrum; a lever mounted on said fulcrum and having a portion spaced from the fulcrum operably connected with the running nut to cause swinging of the lever about the fulcrum pursuant to movement of the nut; means connecting another portion of the lever with said motor-driven member of the valve control means for closing the valve pursuant to an amount of movement of said motor-driven member determined by the distance the manually settable member is manipulated attendant to opening the valve; and said fulcrum being adjustable lengthwise of the lever for determining the amount of movement of said motor-driven member per unit quantity of fluid passing through the gear motor and consequently through the conduit means, and means for adjusting said fulcrum.

CLARENCE A. HUBERT.

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