May 26, 1931. C. A. CAMPBELL 1,806,669

REMOTE CONTROL MECHANISM

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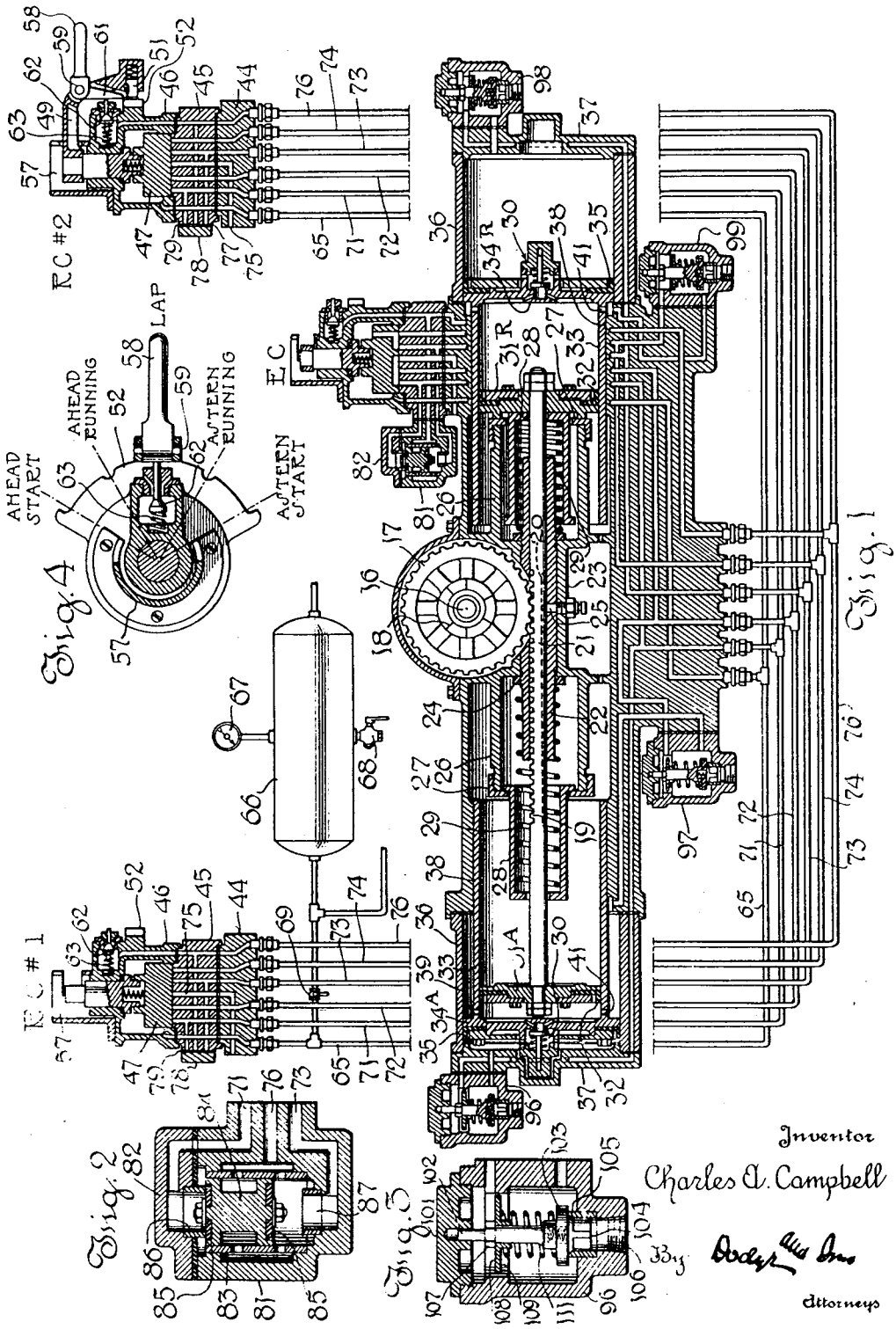


Fig. 1

Fig. 2

Fig. 3

Fig. 4

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Fig. 5

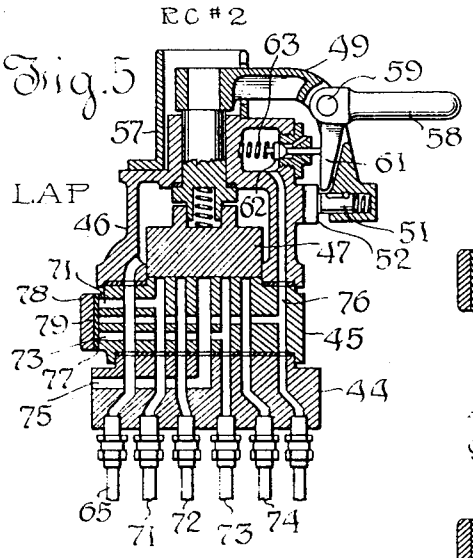


Fig. 6

ASTERN START

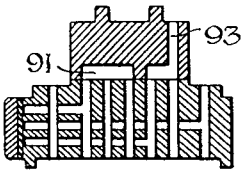


Fig. 7

ASTERN RUNNING

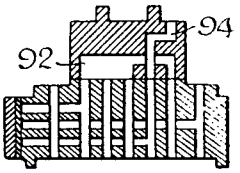


Fig. 8

AHEAD START

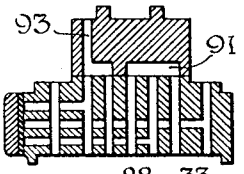


Fig. 9

AHEAD RUNNING

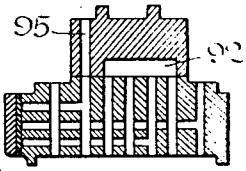
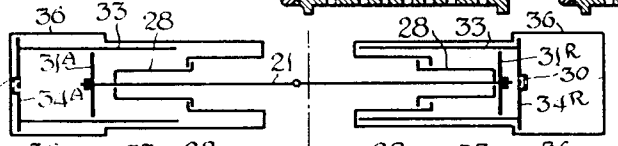
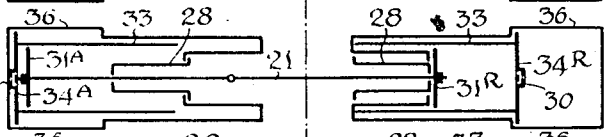


Fig. 10



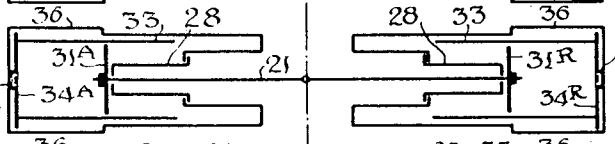
ASTERN RUNNING

Fig. 11



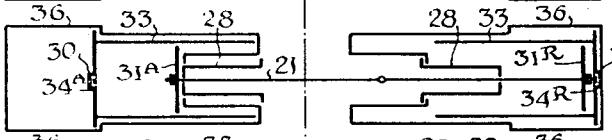
ASTERN START

Fig. 12



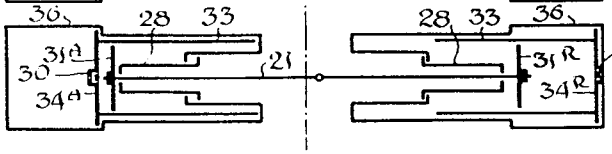
STOP

Fig. 13



AHEAD START

Fig. 14



AHEAD RUNNING

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Patented May 26, 1931 1,806,669

UNITED STATES PATENT OFFICE

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REMOTE CONTROL MECHANISM

Application filed January 29, 1929. Serial No. 335,956.

This invention relates to remote control devices and embodies features of general applicability in remote control installations, but will be described as applied to a remote control for marine Diesel engines. The control is of the pneumatic type which is peculiarly suitable for use with Diesel engines because compressed air is customarily used to start such engines, and consequently is usually available.

The present remote control mechanism is so contrived as to permit alternative control from a plurality of stations, three being illustrated in the drawings, one, for example, to be located on the bridge or in the pilot house, another on the after-deck, and the third adjacent the engine. Obviously other locations are possible and there is no limit to the number of control stations which may be provided. Furthermore, one set of stations may be used if desired for the simultaneous control of the starting mechanisms of a plurality of engines.

Generally stated, the device is applicable in the form shown to any engine or engines having a five-position maneuvering gear. In such gears there is a neutral or mid-position in which the engine stops, a forward starting position and a rearward starting position in which the engine is put into motion in respectively opposite directions by compressed air admitted directly to one or more of the cylinders, and a forward running position and a reverse running position in which fuel is admitted to all the cylinders in relatively reverse sequences according to the firing order of the cylinders.

Starting gears for internal combustion engines, and particularly Diesel engines, differ among themselves in the number of engine cylinders which receive starting air and in the manner in which the valve action is modified to distribute the starting air, and in other details; but these features are not elements of the present invention, the present control gear being available, in the specific form illustrated, for use with any five-position starter regardless of how this starter may function, or for use to control any five position device.

Furthermore, the invention is not necessarily limited to use with five-position devices for certain features of the invention might be used with devices having more or fewer positions. However, most starters are of the five-position type and the invention can best be illustrated as so applied.

Generally stated the invention contemplates a movable element which is shifted to five different positions by the concurrent action of two opposed sets each comprising two fluid pressure expansible chamber motors (for example cylinders with pistons). Preferably one cylinder of each set is fixed and the other cylinder is mounted on the piston of the first cylinder. The device chosen for illustration functions as follows:

When all four cylinders are exhausted a spring mechanism shifts the starting mechanism to stop position. When both cylinders of either pair are subject to pressure the starting mechanism is shifted to one or the other starting position, and when thereafter one of the cylinders of the energized pair is exhausted the starting mechanism is shifted to the corresponding running position.

The above mechanism is controlled by any one of a plurality of control valves. Each of the control valves has four positions in which the four cylinders are charged or exhausted in different relations as just outlined and a lap position in which all ports in the valve are blanked so that the pressure condition last established is permanently maintained. It is contemplated that each control valve will be equipped to receive a removable handle or actuator, and that a guard will be provided so that this handle can be removed and applied only when the valve is in lap position. From this it follows that any control valve which is put out of action by the removal of its handle must be left in lap position, so as not to interfere with the controlling action of other control valves. By limiting the number of handles to one or two the chance of conflicting manipulation of control valves may be eliminated or reduced as occasion may require.

It will be observed that the motion of the

valve to lap position does not stop the engine, but the controlling handle is so arranged that in lap position, and in lap position only, it may be manipulated to open a vent valve associated with the control valve which exhausts any cylinder or cylinders which may be charged, and thus stops the engine.

As there are two cylinders either of which may be charged in running position, and as it is desired to effect stopping by the operation of a single valve, use is made of a double check valve which connects the two cylinders selectively with the stop line according to which one is charged. This double check valve is an important feature of the invention.

It is necessary to provide only six control pipe lines, one for each of the four cylinders, one for the supply of motive fluid and the sixth for the stop or cylinder venting function.

Since some of the control stations are remote from the engine, the volume of the various control lines is considerable, and the friction of flow through the long pipe lines is commonly such as to render the action of the device sluggish if the entire exhaust flows through the line. Accordingly there is provided for each cylinder a quick release valve which upon the venting of the connected pipe volume functions to open a direct exhaust from the corresponding cylinder. In this way immediate complete response of the control mechanism is secured.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which,—

Fig. 1 is a vertical axial section of a starter shifting mechanism equipped with one control valve adjacent the mechanism and two remote control valves, the parts being shown in astern starting position.

Fig. 2 is a vertical axial section of the double check valve controlling the exhaust.

Fig. 3 is a vertical axial section of a quick exhaust valve used on the motor cylinders of the device.

Fig. 4 is a plan view partly in section showing one of the remote control valves.

Fig. 5 is a vertical axial section of one of the remote control valves showing it in lap position.

Fig. 6 is a fragmentary view of the rotary valve and valve seat forming parts of the valve of Fig. 5 but showing them in the astern starting position.

Fig. 7 is a similar view showing the astern running position.

Fig. 8 is a similar view showing the ahead starting position.

Fig. 9 is a similar view showing the ahead running position.

Fig. 10 is a diagrammatic view showing the positions taken by the motor parts in astern running position.

Fig. 11 is a similar view showing astern starting position.

Fig. 12 is a similar view showing stop position.

Fig. 13 is a similar view showing ahead starting position.

Fig. 14 is a similar view showing ahead running position.

The showing in Figs. 1 to 9 inclusive is diagrammatic to the extent that the ports are drawn as if they all lay in a single plane of section, according to a convention familiar in the pneumatic control art and adopted to permit the tracing of the flow paths throughout the drawings. The exact layout of the ports is immaterial to the invention, but obviously more compact arrangements can be adopted, based on principles which will be familiar to those skilled in the art.

Referring first to Fig. 1, 16 represents a shaft forming part of the engine starting gear. In the example illustrated the two extreme rotary positions of the shaft 16 are those corresponding to the starting functions of the engine (in reverse directions). The shaft turns about 190° in passing from one to the other. The stop position is intermediate the two starting positions and thus approximately at 95° to each. The two running positions are displaced on opposite sides of the stop position 30° or less. These angular displacements are mentioned merely as characteristic of one typical gear with which the controlling mechanism may be used.

Swiveled on the shaft 16 is a gear 17 which might be fast on the shaft, but which in the example illustrated, is releasably clutched thereto by a dental clutch, part of which appears at 18. This clutch is asymmetric as to its engaging jaws so that the gear may be clutched to the shaft 16 only in one definite angular relation to the shaft.

The gear 17 meshes with a rack 19 formed on a longitudinally sliding piston rod 21. The piston rod 21 is guided in a sleeve bushing 22 fixedly locked in the main casting 23 by nuts 24 and held against rotation therein by a stud 25. The stud 25 has also a tongue which enters a keyway 20 in the piston rod 21 and holds this rod against rotation. Formed on the casting 23 are two oppositely directed tubular extensions 26, each of which carries at its end an annular stop nut 27. This stop nut 27 limits the outward motion of respective plunger thimbles 28 which are urged to their outward position by coil springs 29. The piston rod 21 passes through the ends of the thimbles 28 and is provided at opposite ends with identical pistons 31R and 31A. (The letters indicate "ahead" and "reverse" functions of the respective pistons.) The parts are so dimensioned that when the springs 29 are extended to a point at which

the thimbles 28 are arrested by the stop nuts 27 the two thimbles 28 are in engagement with the two pistons 31A, 31R and thus hold the piston rod 21 and consequently the rack 19 in mid-position. In this position the gear 17 and shaft 16 are held in engine stopping position. This is the normal position assumed by the device when freed of pressure.

Each piston 31A, 31R is provided with a peripheral cup leather 32 and is slidable in a corresponding movable cylinder 33 which is formed as an extension on an inner piston 34A or 34R respectively. The pistons 31A, 31R are each single acting, the space between the two pistons being vented to atmosphere. The pistons 34A, 34R have each a peripheral packing cup leather 35 and each works in a corresponding fixed cylinder 36 which is supported by the main casting 23. The outer ends of the cylinders 36 are closed by heads 37. Each cylinder 33 is really a tubular extension on the piston 34A or 34R and has an outside diameter less than the diameter of such piston. At its inner end the extension is guided in a portion of the casting 23 and makes a close fit therewith as indicated at 38. There are thus provided annular spaces 39 each of which communicates with the working space of the corresponding cylinder 33 by means of ports 41. The pistons 34A and 34R are really each a single acting piston, the annular space 39 not entering as a material factor in the force exerted on the piston. Instead, each annular space serves merely as a part of the connection to the working space of the corresponding cylinder 33. This is a convenient way of maintaining this connection regardless of the position of piston 34.

In each of the pistons 34A, 34R there is a check valve 30 opening to permit flow from the space in cylinder 33 to the space in cylinder 36.

As stated, Fig. 1 shows two remote control valves and one engineer's control valve adjacent the starter shifting mechanism. These are designated on Fig. 1 by the letters RC#1, RC#2 for the two remote control valves and EC for the engineer's control valve. RC#1 and RC#2 are shown in lap position, the handle being removed from RC#1 and applied to RC#2. Most of the handle of EC is invisible in Fig. 1, being forward of the plane of section, but it will be understood that the use of a handle on EC at all times is contemplated on the theory that it is advisable to permit control by the engineer at any time. The provision of a single handle for use on RC#1 and RC#2 selectively will preclude interference in control by either of these stations with control by the other. Where interference can be otherwise guarded against this precaution is unnecessary. The valves EC, RC#1 and RC#2 are essentially identical except that EC is provided with a double check valve which serves all three valves and hence is not duplicated. It might be located in any of the three.

In their general makeup these valves follow standard practice. Each includes as a base member a pipe bracket 44 to which all pipe connections are made, a superposed ported valve seat member 45, a removable cap 46 to which the pressure supply is admitted, and a rotary valve 47 which controls the ports in the said seat. The rotary valve 47 may be rotated to its various positions by a removable handle 49 which has a spring plunger latch 51 coacting with a notched sector 52 fixedly supported on the cap 46. An arcuate guard 57 is provided and prevents the removal of the member 49 except when the valve 47 is in lap position, lap position being that in which all the ports in the seat are closed by the rotary valve (see Fig. 5). In the valve as constructed the member 49 is not strictly the handle member but instead a hand grip 58 is pivoted at 59 on the member 49 so as to swing in a vertical plane. This carries a downward extending arm 61 which in lap position may engage the protruding stem of a valve 62 and force the same open against the resistance of its spring 63 and the pressure sustained by the valve. The valve 62 is the stop valve and is a novel feature.

The purpose of this arrangement is to allow the control valves to be moved to lap position without stopping the engine and yet to provide for the stopping of the engine while the valves are in lap position and only while they are in lap position.

In the case of the valve EC in Fig. 1, the analogue of the pipe head member used on RC#1 and RC#2 is formed directly in the casting 23. It has already been stated that the ports in the member 45 are continuations of ports in the member 44. It will also be apparent from an inspection of Fig. 1 that as to the valve EC the ports are extensions of ports formed in the casting 23. Connections between the pipe brackets 44 and the casting 23 are made by pipes, but to avoid confusion by the use of an excessive number of references, a single continuous passage will be indicated by a single reference numeral.

Air is supplied to the space within the caps 46 by a supply passage 65. This is fed from a reservoir 66 maintained charged at a uniform pressure by any suitable means, not shown. The reservoir may be provided with a pressure gage 67, a drain cock 68 and a stop cock 69 may be inserted in the pipe connecting the reservoir with the line 65.

The passages 71, 72, 73 and 74 all lead from the seats of all three rotary valves 47 to the four working cylinder spaces, as follows: 71 leads to the space to the left of the piston 34A. 72 leads to the space to the left of the piston

31A. 73 leads to the space to the right of the piston 34R and 74 leads to the space to the right of the piston 31R. 75 is an exhaust passage leading from the seat of each rotary valve 47 to the atmosphere. Passage 76 connects the space within the three stop valves 62 together and has branches which lead to the mounting faces 77 on the left hand sides of the seat members 45 of all three control valves. There are also extensions of passages 71 and 73 leading to these faces. These extensions are blanked off in the case of RC#1 and RC#2 by cover plates 78 and gaskets 79, but in the case of the valve EC there is a double check valve whose body is indicated generally by the numeral 81. This valve is illustrated in Fig. 1 and is shown on an enlarged scale in Fig. 2.

The body 81 has a cap 82 and the two together house a cylindrical valve bushing 83 in which is longitudinally slidable a check valve element 84. This has sealing gaskets 85 on its ends which coact alternately with annular valve seats 86 and 87. The valve functions, as will be apparent, to connect either passage 71 or 73 with the passage 76 controlled by the valves 62. The passages 71 and 73 are connected respectively to the working space to the left of piston 34A and the working space to the right of piston 34R. The valve 84 shifts to connect the passage 76 to whichever one of these working spaces is at the time charged. Since only one is charged at a time, the valve 84 operates to place whichever one is charged under control of the valves 62. Any one of the valves 62 when opened will operate to vent the charged working space and allow the mechanism to move to engine stopping position. If working spaces of cylinders 33 and 36 are both charged, as occurs in starting position, the exhaust of 36 will also exhaust 33 through a check valve 30.

As best indicated in Figs. 6, 7, 8 and 9, in which the porting is strictly diagrammatic, each rotary valve 47 is provided with recesses 91, 92 and through ports 93, 94 and 95, which serve to subject pistons 31R and 34R to pressure and vent pressure acting against pistons 31A and 34A (Fig. 6); subject piston 34R to pressure and vent pressure acting against pistons 31R, 31A and 34A (Fig. 7); subject pistons 31A and 34A to pressure and vent pressure acting against pistons 31R and 34R (Fig. 8): or subject piston 34A to pressure and vent pressure acting against pistons 31A, 31R and 34R (Fig. 9). Pressure acting against pistons 34A and 34R is manually vented by the valves 62, and if either piston 31A or 31R is subject to pressure, this will be vented by check valve 30 in piston 34A or 34R.

From this it follows that each of the passages 71, 72, 73 and 74 serves as a combined supply and exhaust port for pressure fluid flowing to and from the working spaces of the respective cylinders.

For the purpose of reducing the delay by friction of flow through long passages to the remote control valves, a quick release valve is interposed in each of the passages adjacent the working space served by the passage, the quick release valve being so arranged that it closes a local exhaust when flow toward the working space occurs and opens it immediately that flow from the working space starts. This greatly accelerates the response of the mechanism.

These local release valves are all identical in structure. The one interposed in the passage 71 is indicated on Fig. 1 at 96, the one in the passage 72 at 97, the one in the passage 73 at 98 and the one in the passage 74 at 99.

Valve 96 is illustrated in detail in Fig. 3 and is typical of all the valves. In this figure 96 is applied to the body of the valve and 101 represents a removable cap. This has a guideway for the stem 102 of a check valve 103 which opens inward and is guided by its pilot 104 into and out of seating engagement with the seat 105. Seat 105 surrounds a port 106 leading to atmosphere. Slidably mounted on the stem 101 and limited in its upward motion by a stop nut 107, is a piston-like disk 108 which approximately but not quite fills the short cylindrical space 109. The disk 108 is held upward by a spring 111 against the stop 107 and the parts are so arranged that when the valve 103 is seated and the disk 108 is against the stop 107, this disk is at about mid-length of the restricted cylindrical portion 109.

Valve 96 is interposed in the passage 71 and the connections are such that flow from any control valve RC#1, RC#2 or EC toward the working space to the left of piston 34A will urge the valve 103 closed by forcing the piston member 108 downward against spring 111. On the other hand, reverse flow, that is from the cylinder to a control valve and thence to exhaust, will act upward on the disk 108, unseat the valve 103 and open a large local exhaust from the working space.

Fig. 4 indicates the five positions of the control valves corresponding to Figs. 5 to 9 inclusive.

The device operates as follows:

Assuming that the handle 58 is in lap position, the reservoir 66 is properly charged, valve 69 is open and shaft 16 is held in mid-position by piston rod 21 which is then in mid-position, the operation of starting the engine in reverse running direction is as follows:

The handle 58 is swung clockwise (relatively to Fig. 4) to its limiting position, which is astern starting position. This puts the rotary valve in the position of Fig. 6. In this position ports 71 and 72 are both connected to exhaust port 75 and ports 73 and 74 receive air which is supplied to the space

within cap 46 by passage 65. This action occurs no matter which one of the three control valves is manipulated. The effect is to charge the working spaces of pistons 31R and 34R, thus moving the piston rod to the extreme leftward position indicated in Figs. 1 and 11. This establishes the starting action of the engine starter and as soon as the engine is in proper motion the operator moves the handle 58 to astern running position. The effect of this as illustrated in Fig. 7 is to connect the port 74 also to atmosphere while maintaining the supply to port 73. It follows that the space to the right of piston 31R is exhausted and the parts move to the position indicated diagrammatically in Fig. 10.

Forward starting is effected in a similar manner by shifting first to ahead starting position to establish the connections shown in Fig. 8 which admits pressure against pistons 31A and 34A, as indicated in Fig. 13, and then moving the valve back to ahead running position to establish the connections illustrated in Fig. 9. This vents the pressure acting on piston 31A and causes the parts to move to the position shown in Fig. 14.

Obviously any of the valves RC#1, RC#2 or EC may be manipulated to produce the above result. If the control is to be maintained at the station at which starting was effected the valve will be left in running position, but if control is to be transferred to another valve the handle is swung to lap position, removed, transferred to the selected other control valve, which is then shifted to running position to preclude loss of pressure through gradual leakage. Whenever it is desired to stop the engine, the control valve is swung to lap position and the handle 58 is depressed to open the valve 62. The effect is to vent the passage 76 and consequently whichever one of the passages 71 or 73 may then be connected to the passage 76 by the check valve 84.

While I prefer cylinders and pistons as the moving elements and prefer to mount the cylinder of one unit on the piston of the other, it is conceivable that other types of expansible chamber motor may be substituted for cylinders and pistons and that they might be otherwise mechanically related.

The important thing is that each of the two motors shall act cumulatively, each adding its increment of motion to that of the other, so that by charging one or both the necessary plurality of positions may be secured.

It is important also to observe that there is no limit on the number of control valves that might be used if necessary.

Where it is desired to start, stop and reverse two engines simultaneously, each engine might have its individual starter actuating mechanism. This might be subjected to common control by a single control valve or a single set of control valves. Ordinarily, however, on multiple screw vessels it is desired to start and stop individual engines independently for maneuvering purposes.

The present disclosure does not go into the question of speed control which may be effected at the engine or otherwise, as may be preferred. The installation of the present apparatus imposes no limitation on speed control either by local or remote control means.

What is claimed is,—

1. Means for actuating a starting gear having a starting position, a running position and a stop position, comprising in combination two expansible chamber motors; means for connecting said motors with said gear whereby each motor may impart independently an increment of motion thereto; valve means operable selectively to admit pressure fluid to both motors, to admit it to one and exhaust the other and to exhaust both; and an exhaust valve associated with each motor and having actuating means in the path of flow of pressure fluid to and from the motor, and arranged to be shifted in a valve closing direction by flow toward the motor and in a valve opening direction by flow from the motor.

2. Means for actuating a starting gear having forward and reverse starting position, forward and reverse running positions and a stop position, comprising in combination a member adapted for connection with said gear; yielding means urging said member to stop position; a forward shifting unit and a reverse shifting unit, each of said units including two expansible chamber motors each connected to said member to impart independently an increment of motion thereto; and means controllable selectively to admit pressure fluid to both motors of one unit while exhausting the motors of the other unit, to admit it to one motor of one unit while exhausting the other motor of that unit and those of the other unit, and to exhaust all the motors.

3. Means for actuating a starting gear having forward and reverse starting position, forward and reverse running positions and a stop position, comprising in combination a member adapted for connection with said gear; yielding means urging said member to stop position; a forward shifting unit and a reverse shifting unit, each of said units including two expansible chamber motors, the second mounted on the moving element of the first and having its moving element connected with said member; and means controllable selectively to admit pressure fluid to both motors of one unit while exhausting the motors of the other unit, to admit it to one motor of one unit while exhausting the

other motor of that unit and those of the other unit, and to exhaust all the motors.

4. The combination with a starting member having starting and running positions and a stop position, of motor means for shifting said member selectively to said positions; a maneuvering valve controlling said motor means and having starting and running positions in which ports are opened selectively, and a lap position in which all ports are closed; an actuator for said maneuvering valve; and a stopping valve independent of said maneuvering valve controlling the stop function of said motor means and operable by said actuator only when the maneuvering valve is in lap position.

5. The combination with a starting member having starting and running positions both forward and reverse and a stop position, of motor means for shifting said member selectively to said positions; a maneuvering valve controlling said motor means and having forward starting and running positions and reverse starting and running positions in which ports are opened selectively, and an intermediate lap position in which all ports are closed; an actuator for said maneuvering valve; and a stop valve independent of said maneuvering valve controlling the stop function of said motor means and operable by said actuator only when the maneuvering valve is in lap position.

6. The combination with a starting member having starting and running positions and a stop position, of motor means for shifting said member selectively to said positions; a plurality of maneuvering valves each capable of controlling said motor means and having starting and running positions in which ports are opened selectively, and a lap position in which all ports are closed; a stopping valve associated with each maneuvering valve and operable to effect the stopping function; a removable actuator applicable selectively to said maneuvering valves to actuate the same, said actuator being capable of actuating said stopping valve but only when the maneuvering valve is in lap position; and a guard on each maneuvering valve permitting the application and removal of the actuator only when the valve is in lap position.

7. The combination with a starting member having starting and running positions both forward and reverse and a stop position, of motor means for shifting said member selectively to said positions; a plurality of maneuvering valves each capable of controlling said motor means and having forward starting and running positions and reverse starting and running positions in which ports are opened selectively, and an intermediate lap position in which all ports are closed; a stopping valve associated with each maneuvering valve and operable to effect the stopping function; a removable actuator applicable selectively to said maneuvering valves to actuate the same, said actuator being capable of actuating said stopping valve but only when the maneuvering valve is in lap position; and a guard on each maneuvering valve permitting the application and removal of the actuator only when the valve is in lap position.

8. The combination with a starting member having starting and running positions and a stop position, of motor means for shifting said member selectively to said positions; a maneuvering valve controlling said motor means and having starting and running positions in which ports are opened selectively, and a lap position in which all ports are closed; an actuator for said maneuvering valve; an independent stopping valve controlling the stop function of said motor means; and means for actuating said stopping valve, said means being operatively positioned relatively to the stopping valve by the motion of said maneuvering valve to lap position.

9. The combination with a starting member having starting and running positions both forward and reverse and a stop position, of motor means for shifting said member selectively to said positions; a maneuvering valve controlling said motor means and having forward starting and running positions and reverse starting and running positions in which ports are opened selectively, and an intermediate lap position in which all ports are closed; an actuator for said maneuvering valve; an independent stopping valve controlling the stop function of said motor means; and means for operating said stopping valve, said means being operatively positioned relatively to the stopping valve by the motion of said maneuvering valve to lap position.

10. The combination with a starting member having starting and running positions both forward and reverse and a stop position, of motor means for shifting said member selectively to said positions; a maneuvering valve controlling said motor means and having forward starting and running positions and reverse starting and running positions in which ports are opened selectively, and an intermediate lap position in which all ports are closed; an actuator for said maneuvering valve; a single stop valve for controlling the stop functions of said motor means; and a pressure actuated selector valve for connecting said stop valve selectively with whichever of said forward and reverse motor means is under pressure.

11. The combination with a starting member having starting and running positions both forward and reverse and a stop position, of motor means for shifting said member selectively to said positions; a maneuvering valve controlling said motor means and having forward starting and running posi-

tions and reverse starting and running positions in which ports are opened selectively, and an intermediate lap position in which all ports are closed; an actuator for said maneuvering valve; a stop valve independent of said maneuvering valve for controlling the stop function of said motor means and operable by said actuator only when the maneuvering valve is in lap position; and a pressure actuated selector valve for connecting said stop valve selectively with whichever of said forward and reverse motor means is under pressure.

12. The combination with a starting member having starting and running positions and a stop position, of motor means for shifting said member selectively to said positions; a maneuvering valve controlling said motor means and having starting and running positions in which ports are opened selectively, and a lap position in which all ports are closed; an actuator for said maneuvering valve; and a stopping valve distinct from said maneuvering valve and controlling the stop function of said motor means.

13. The combination with a starting member having starting and running positions both forward and reverse and a stop position, of motor means for shifting said member selectively to said positions; a maneuvering valve controlling said motor means and having forward starting and running positions and reverse starting and running positions in which ports are opened selectively, and an intermediate lap position in which all ports are closed; an actuator for said maneuvering valve; and a stop valve distinct from said maneuvering valve and controlling the stop function of said motor means.

In testimony whereof I have signed my name to this specification.

CHARLES A. CAMPBELL.