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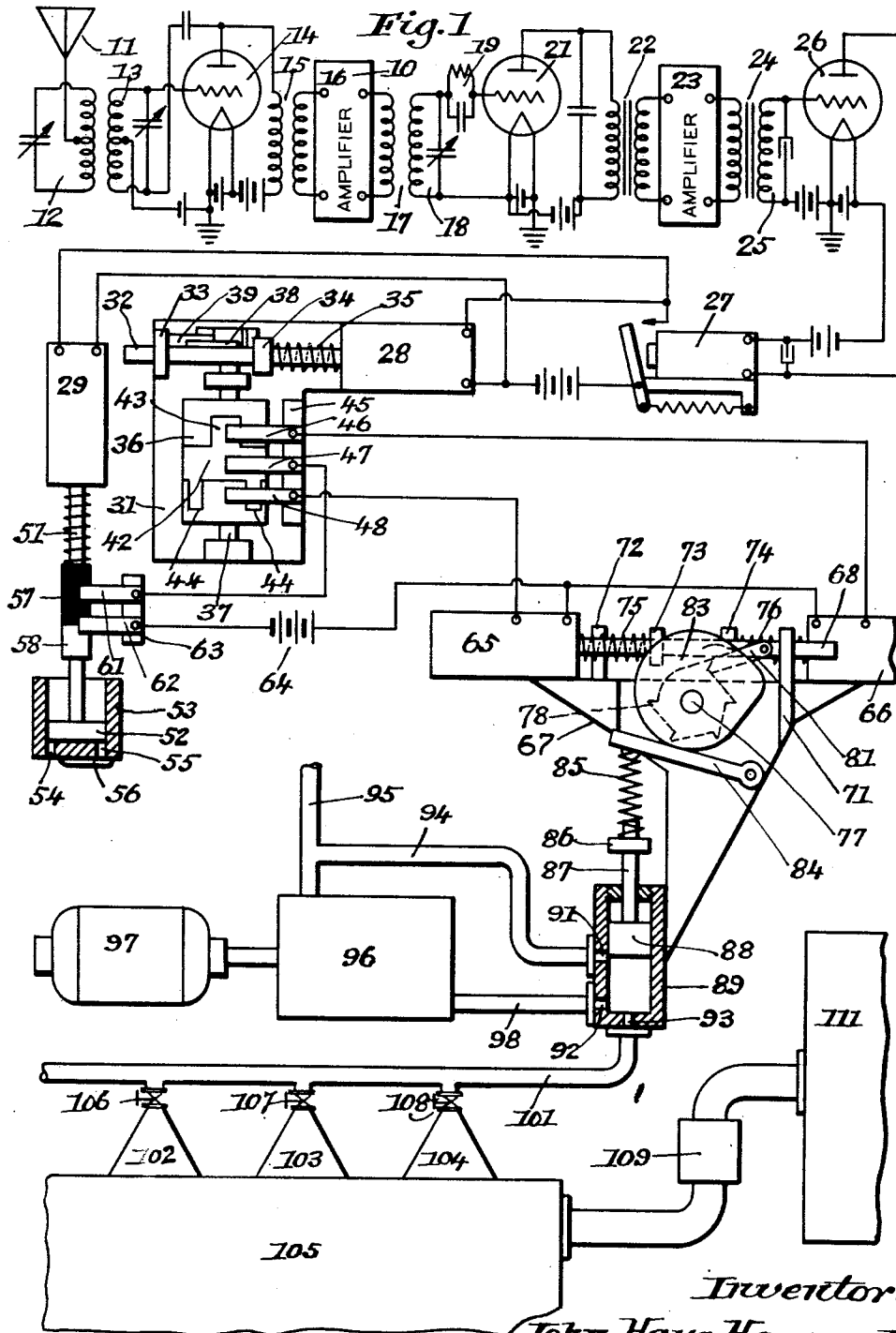
J. H. HAMMOND, JR

2,307,583

REMOTE SPEED CONTROL

Filed April 22, 1935

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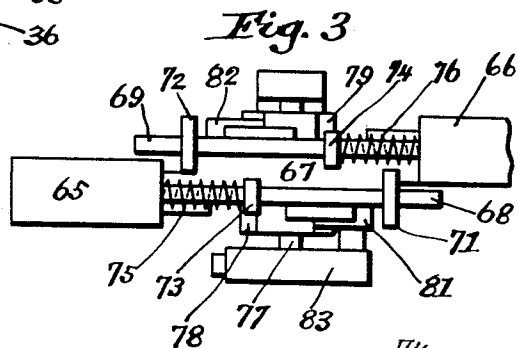
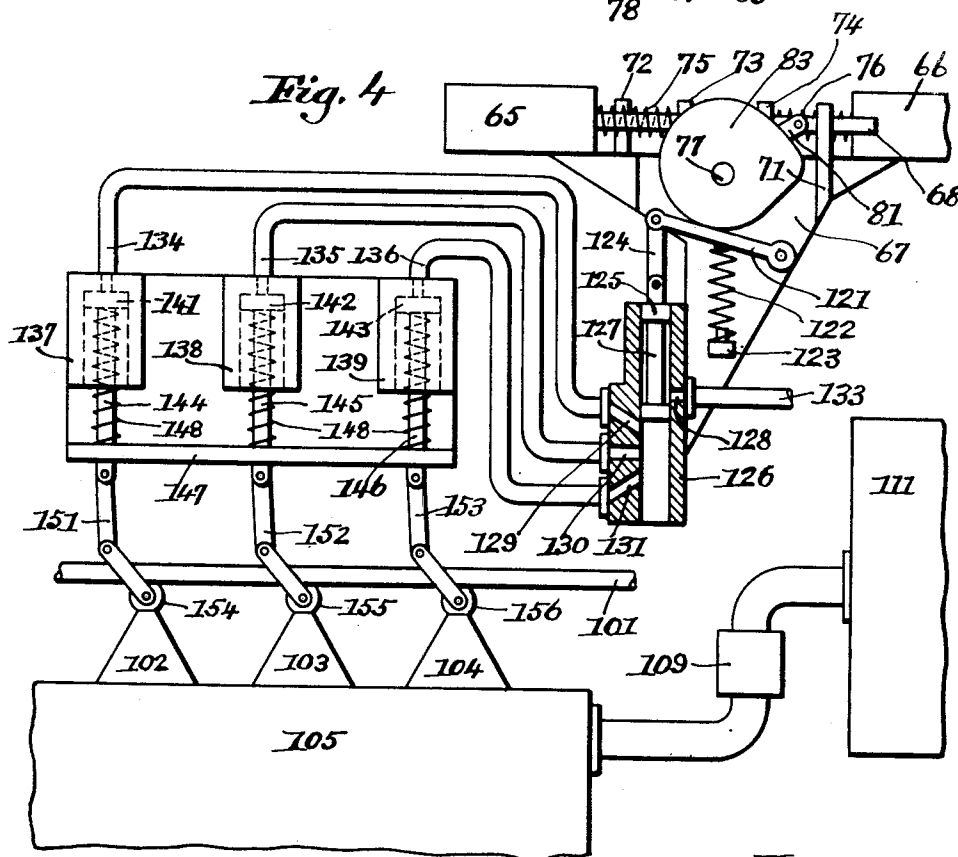


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3 Sheets-Sheet 2



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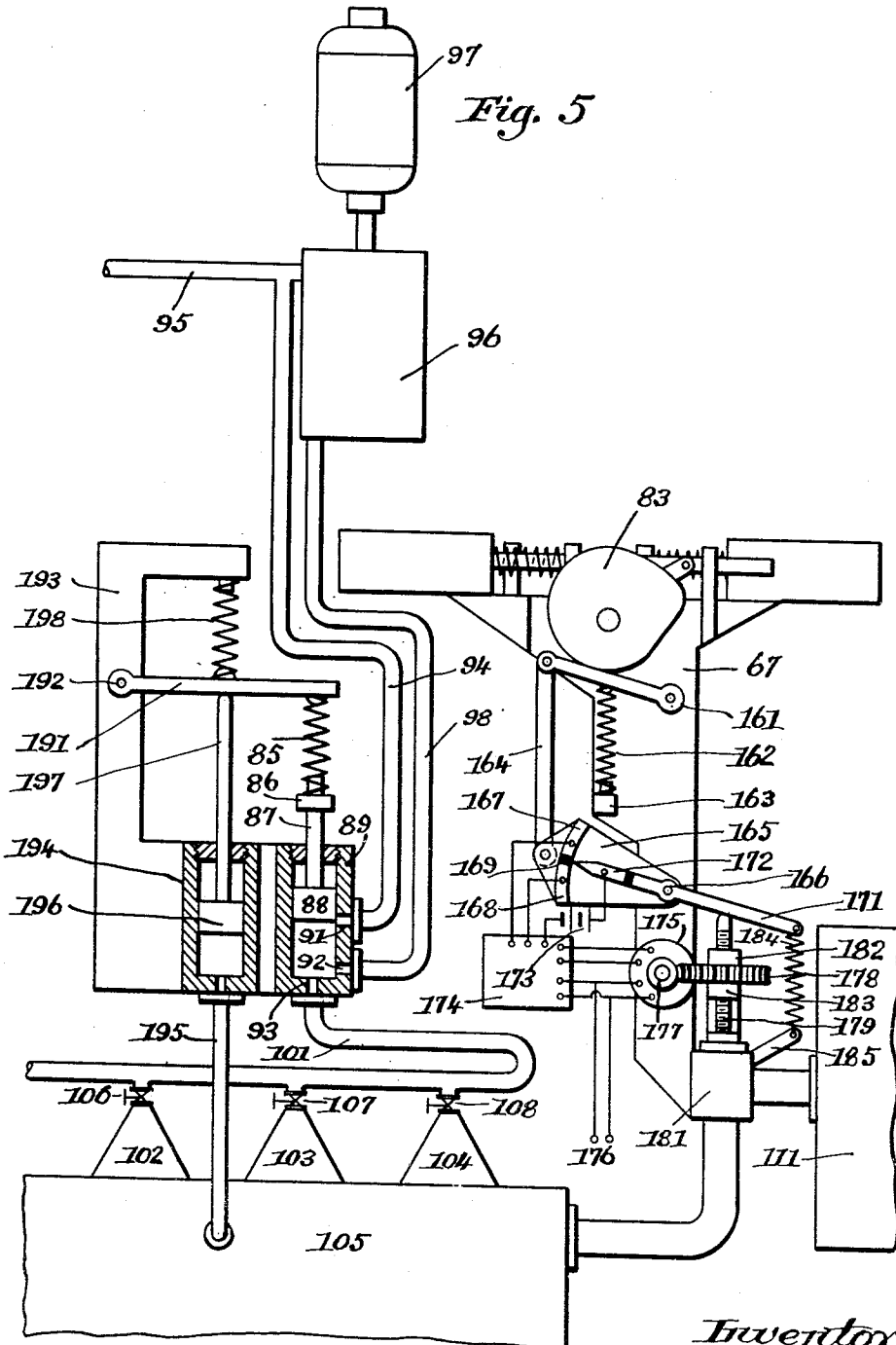
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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REMOTE SPEED CONTROL

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2 Claims. (Cl. 177—353)

This invention relates to remote control systems and more particularly to an improved system for varying the speed of moving bodies.

The invention relates particularly to a remote control means for varying the amount of fluid supplied to a prime mover which in turn may vary the amount of power supplied to the driving means of a moving body.

This object may be accomplished in a number of ways, as for example, by changing the oil pressure to the burner of a steam boiler, by varying the number of burners in use or by controlling the throttle valve of a prime mover.

The invention also consists in certain new and original features of construction and combinations of parts hereinafter set forth and claimed.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, the mode of its operation and the manner of its organization may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof, in which

Fig. 1 is a diagrammatic view of a system for controlling the oil pressure to the burners of a boiler;

Fig. 2 is an end elevation of part of the mechanism shown in Fig. 1;

Fig. 3 is a top plan view of another part of the mechanism shown in Fig. 1;

Fig. 4 shows the system as applied to a means for varying the number of burners in use; and

Fig. 5 shows the system as applied to a means for controlling the throttle.

Like reference characters denote like parts in the several figures of the drawings.

In the following description and in the claims, parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit.

Referring more particularly to the form of the invention shown in Figs. 1 to 3, a radio receiving system 10 is provided which consists of an antenna 11 connected to a tuned circuit 12 which is coupled to a second tuned circuit 13. This circuit is connected to the input circuit of a space discharge device 14, the output of which passes through a transformer 15 to the input circuit of an amplifier 16 the output of which passes through a transformer 17 to a tuned circuit 18 which is connected through a grid leak and condenser 19 to the input circuit of a second space

discharge device 21. The output of this device passes through a transformer 22 to the input circuit of an amplifier 23. The output circuit of the amplifier 23 passes through a transformer 24 to a tuned circuit 25. This circuit is connected in the input circuit of a third space discharge device 26, the output circuit of which includes the winding of a relay 27.

This relay controls the operation of two solenoids 28 and 29 which are connected in parallel. The solenoid 28 is mounted on a base 31 (see Fig. 2). The core 32 of this solenoid reciprocates in a bracket 33. Secured to the core 32 is a collar 34, between which and the solenoid 28 is a spring 35. Rotatably mounted on the base 31 is a commutator 36 carried by a shaft 37. To the end of this shaft is secured a six toothed ratchet 38 which is engaged by a spring-pressed pawl 39 carried by the core 32. A spring-pressed click pawl 41 is provided for preventing the reverse motion of the commutator 36.

The commutator 36, which is made of insulating material, is provided with a conducting segment 42 which is provided with alternate projections 43 and 44. Mounted on a block of insulating material 45 are three brushes 46, 47, and 48 which engage the projections 43, the segment 42, and the projections 44 respectively.

The solenoid 29 is provided with a core 51 to the end of which is attached a piston 52 which reciprocates in a cylinder 53. This cylinder is provided with two vents 54 and 55, the former being of very small dimensions and the latter comparatively large and covered by a flexible flap 56. Mounted on the core 51 is a block of insulating material 57 and a block of conducting material 58. Engaging these are two brushes 61 and 62 which are mounted on a block of insulation 63. The brush 61 is connected to the brush 47, and the brush 62 is connected through a battery 64 to the windings of two solenoids 65 and 66, the other sides of which are connected to the brushes 48 and 46 respectively.

The solenoids 65 and 66 are mounted upon a frame 67 and are provided with cores 68 and 69 (see Fig. 3) which reciprocate in brackets 71 and 72. Pinned to these cores are two collars 73 and 74, between which and the solenoids 65 and 66 are two coiled springs 75 and 76. Rotatably mounted in the frame 67 is a shaft 77 to which are pinned two five-toothed ratchets 78 and 79. Carried by the cores 68 and 69 are two spring pressed pawls 81 and 82 which engage ratchets 78 and 79 respectively. Pinned to the end of the shaft 77 is a cam 83 which engages an arm 84

which is pivoted to the frame 67. To the outer end of this arm is connected one end of a spiral spring 85, the other end of which engages a collar 86 pinned to a rod 87 the other end of which is secured to a piston 88 which reciprocates in a cylinder 89. This cylinder is provided with three ports 91, 92 and 93. The port 91 is connected by a pipe 94 to a supply pipe 95 which is connected to any suitable source of fuel oil not shown. The pipe 95 is also connected to the intake of an oil pump 96 which is driven by a motor 97. The outlet port of the pump 96 is connected by pipe 98 to the port 92.

The port 93 is connected to a pipe 101 which supplies the fuel oil to the burners 102, 103 and 104 of the steam boiler 105. Hand operated valves 106, 107 and 108 are provided for controlling the supply of oil to the burners 102, 103 and 104 respectively. The steam from the boiler passes through a hand operated throttle valve 109 to the turbine or other driving means 111, which in this case is the motive power of a moving body, such for example, as a marine vessel.

In the operation of the form of the invention shown in Figs. 1-3, the motor 97 is started thus operating the pump 96 which supplies fuel oil through the pipe 98, cylinder 89 and pipe 101 to the burners 102, 103 and 104 which are lighted in the usual manner. The pressure of the oil supply to the pipe 101 is determined by the compression of the spring 85 which maintains a given pressure on the piston 88. As the pressure of the oil in the cylinder 89 increases, the piston 88 will be moved upwardly against the action of the spring 85, thereby uncovering the port 91 and allowing some of the oil to be returned to the feed line 95, thus reducing the pressure in the pipe 101. If this pressure drops below the predetermined amount, the piston moves downwardly, thereby covering up more of the port 91 so that less of the oil is by-passed, thereby increasing the pressure to that desired. In this way it is seen that the pressure of the oil supply to the burners is determined by the compression of the spring 85 so that with this set at a definite amount, these burners will use a given quantity of oil per hour, thus producing a proportional amount of steam in the boiler 105. This steam passes through the throttle valve 109, which in this case is left fully open, to the turbine 111, thus causing this to rotate at a speed depending upon the production of steam in the boiler 105, which in turn is dependent upon the pressure of the oil in the cylinder 89.

When it is desired to operate the mechanism shown in Figs. 1-3, a suitable radio wave is transmitted from a transmitting station. This signal preferably consisting of a high frequency carrier wave, modulated at a low frequency tone. This transmitter can be of any well-known and standard construction for producing this signal, and need not be more fully described herein. This signal is received by the antenna 11 and is detected and amplified by the receiver in a well-known manner. The amplified output of this receiver then passes through the relay 27 which is thereby energized, thus causing the energization of the solenoids 28 and 29. When the solenoid 28 is energized it causes a rapid motion of the core 32 to the left as seen in Fig. 2, this by means of the pawl 39 and ratchet 38 causes a rotation of the commutator 36 through one-sixth of a revolution from the position shown in Fig. 1. At the same time the solenoid 29 causes the core

51 to be moved upwardly as seen in Fig. 1. This motion, however, is retarded, due to the dash pot action of the piston 52 in the cylinder 53, as air can only enter this cylinder very slowly through the small hole 54. As the core 51 moves upwardly the brush 61 will in time engage the block of conducting material 58, thus closing the circuit from the battery 64, through brush 62, block 58, brush 61, brush 47, projection 44, brush 48, solenoid 65 and back to the battery 64. This energizes solenoid 65 which causes the core 68 to be moved to the left which, by means of the pawl 81 and ratchet 78 causes the shaft 77, together with the cam 83 to be rotated through one-sixth of a revolution in a counterclockwise direction as seen in Fig. 1. This rotation of the cam 83 causes a rotation of the arm 84 through a small angle in a counterclockwise direction thus increasing the compression of the spring 85. This increases the pressure on the piston 88 which is moved downwardly, thus decreasing the oil by-passing through the port 91, so that the oil pressure is increased an amount proportional to the motion of the arm 84. This increase of oil pressure causes an increase in the size of the flames of the burners 102, 103 and 104 thus increasing the steam produced by the boiler 105 which in turn increases the speed of the turbine, thereby increasing the speed of the ship a proportional amount.

If it is desired to increase the speed again, a short and long impulse is sent, the first of which rotates the commutator 36 through another one-sixth of a revolution, but is not held on long enough to cause the block of conducting material 58 to engage the brush 61 so that neither solenoid 65 or 66 is energized. The second long impulse, however, rotates the commutator 36 through still another one-sixth of a revolution and is held on long enough to have the block 58 engage the brush 61, thus again closing the circuit through the solenoid 65 which, as already described, causes the cam 83 to be rotated a sixth of a revolution in a counterclockwise direction, thus moving the arm 84 downwardly through an additional small angle which increases the compression of the spring 85. This in turn, as already described, causes an increase of the oil pressure, thus increasing the speed of the ship a given amount.

If it is desired to decrease the speed of the ship, a single long impulse is sent which turns the commutator 36 through an additional sixth of a revolution and closes the circuit between the brushes 61 and 62. This closes the circuit from the battery 64 through the brush 62, block 58, brush 61, brush 47, projection 43, brush 46, solenoid 66 and back to the battery 64. This energizes the solenoid 66 thus causing the core 69 to be moved to the right, which by means of the pawl 82 and ratchet 79 causes a rotation of the shaft 77, together with the cam 83 through a sixth of a revolution in a clockwise direction, thus allowing the arm 84 to be moved upwardly through a small angle, which in turn decreases the compression of the spring 85, thereby decreasing the pressure of the oil fed to the burners 102, 103, and 104 in a manner already described. This causes a decrease of evaporation in the boiler 105 which, therefore, supplies less steam to the turbine 111 causing a reduction of speed of this turbine and, therefore, a reduction of speed of the ship.

If it is desired to further reduce the speed of the ship, a short and long impulse is transmitted

which causes the commutator 36 to be rotated through two steps or 120° which again causes the energization of solenoid 66, thus further reducing the compression of the spring 85, thus decreasing the oil pressure to the burners and slowing down the ship's speed.

In the modified form of the invention shown in Fig. 4 the radio receiver, commutator, delay action mechanism and control mechanism up to and including the cam 83 are the same as those already described in connection with Fig. 1. The cam 83 engages an arm 121 which is pivotally mounted on the frame 67. This arm is held against the cam 83 by means of a spring 122 the other end of which is supported by a bracket 123 carried by the frame 67. To the end of the arm 121 is pivoted a link 124, the other end of which is pivoted to a valve 125 which reciprocates in a valve casing 126. The valve 125 is provided with a central groove 127, and the valve casing 126 is provided with four ports 128, 129, 130 and 131. The port 128 is connected to a supply pipe 133 which is supplied with fluid under pressure from any suitable source. The ports 129, 130 and 131 are connected by three pipes 134, 135 and 136 to three cylinders 137, 138 and 139. Reciprocating in these cylinders are three pistons 141, 142 and 143 which are connected to three piston rods 144, 145 and 146 which have bearings in a frame 147. Between the pistons 141, 142 and 143 and the frame 147 are three coiled springs 148. Connected to the ends of the piston rods 144, 145 and 146 are three links 151, 152 and 153 the other ends of which are connected to the arms of three fuel valves 154, 155 and 156 which, in this form of the invention, replace the hand operated valves 106, 107 and 108 shown in Fig. 1. In this form of the invention the pipe 101 is connected to the fuel supply which may be maintained at a uniform pressure by any well-known and standard means.

The operation of the form of the invention shown in Fig. 4 is the same as that described in connection with Fig. 1 up to and including the rotation of the cam 83. As this cam is rotated in a counterclockwise direction through steps of one-sixth of a revolution, the valve 125 will be moved downwardly in successive steps, the first step will connect the supply pipe 133 to the pipe 134 by means of the ports 128 and 129 and groove 127. This will allow fluid under pressure to enter the cylinder 137 thus forcing the piston 141 downwardly against the action of spring 148. This, by means of the link 151 causes the valve 154 to be opened so that oil under pressure will be supplied to the burner 102. This will be ignited either by a pilot flame which is kept constantly going adjacent to this burner, or from the burner next to it on the left (not shown) which it is understood is kept going constantly so as to maintain a minimum amount of evaporation in the boiler 105, thus maintaining a minimum speed of the ship. As soon as the burner 102 is ignited the evaporation in the boiler 105 is increased, thereby feeding more steam to the turbine 111 which drives the ship at a higher speed.

The next time the cam 83 is rotated through a sixth of a revolution the valve 125 will be moved another step downward so as to connect the ports 128 and 130, thus allowing fluid under pressure to enter the cylinder 138 which, in a manner already described, opens the valve 155, thus lighting the burner 103 which in turn increases the evaporation from the boiler 105, thus increasing the speed of the ship. If the cam 83 is rotated

a sixth of a revolution in the opposite direction or clockwise, the valve 125 will be moved up one step thus shutting off the fluid under pressure to the cylinder 138, which is then connected to the atmosphere through the port 130 which allows the piston 142 to be moved upwardly under the action of the spring 148. This causes the valve 155 to be closed, thereby shutting off the burner 103 which decreases the evaporation in the boiler 105 and, therefore, slows down the speed of the ship.

The modified form of the invention shown in Fig. 5 is similar to that shown in Fig. 1 up to and including the cam 83. This cam engages an arm 161 pivoted to the frame 67. This arm is held against the cam by means of a spring 162, the other end of which is supported on the bracket 163 carried by the frame 67. To the end of the arm 161 is pivoted a link 164, the other end of which is pivoted to a segment of insulating material 165 which is pivoted for rotation about a pin 166, carried by the frame 67. Mounted on this segment are two contact segments 167 and 168 between which is located a strip of insulating material 169. Rotatably mounted on the pin 166 is an arm 171. Carried by, but insulated from one end of this arm is a contact 172 which is connected through a battery 173 to the magnets (not shown) of a reversing switch 174. The other sides of the windings of these magnets are connected to the contact segments 167 and 168.

The reversing switch 174 controls the operation of a motor 175 which is supplied with current from a suitable source 176. Secured to the shaft of the motor 175 is a worm 177 which meshes with a worm wheel 178, which is threaded upon the shaft 179 of a throttle valve 181 which controls the supply of steam from the boiler 105 to the turbine 111. The gear 178 is rotatably mounted between two brackets 182 and 183 carried by the casing of the valve 181. The end of the valve stem 179 is rounded, and engages the arm 171 which is held in the position shown by means of a spring 184 which is connected between the end of this arm and a bracket 185, carried by the valve casing 181.

The burners 102, 103 and 104 of the boiler 105 are connected, as described in connection with Fig. 1, by the pipe 101 to the valve 89 which is connected by a pipe 94 to the oil supply pipe 95, and by the pipe 98 to the oil pump 96. In this form of the invention the spring 85 of the valve 89 engages the end of an arm 191 which is pivoted at 192 to a frame 193, on which is mounted the valve 89. Mounted on the frame 193 is a cylinder 194 which communicates at one end by a pipe 195 with the steam chest of the boiler 105. Slidably mounted in the cylinder 194 is a piston 196, to which is attached a piston rod 197, the upper end of which engages the arm 191. Between the arm 191 and the frame 193 is a spring 198.

The operation of the form of the invention shown in Fig. 5 is the same as that described in connection with Fig. 1, up to and including the rotation of the cam 83. As this cam is rotated in a counterclockwise direction through one-sixth of a revolution, the segment 165 will be moved downwardly through a small angle. When this occurs the contact 172 will engage the segment 167, thereby closing the circuit through the reversing switch 174. This will cause the motor 175 to be rotated in such a direction that the stem of the valve 179 will be moved upwardly, thus opening the throttle valve 181 a small amount, thus causing the turbine to be

speeded up, thereby increasing the speed of the ship a corresponding amount. As the valve stem 179 is moved up, it causes a rotation of the arm 171 in a counterclockwise direction, which continues until the contact 172 rests upon the insulation 169 thereby breaking the circuit through the motor 175 which is then stopped, thereby holding the throttle valve in a slightly open position.

When the cam 83 is rotated through an additional one-sixth of a revolution, the segment 165 will be moved through an additional angle in a downward direction, thereby causing the throttle valve 181 to be opened an additional amount, thus speeding up the ship a corresponding amount. It is thus seen that by sending a succession of proper impulses, (as described in connection with Fig. 1) that the throttle valve 181 would be gradually opened through a number of stages until it is finally fully open, with the ship running full speed ahead.

If it is desired to reduce the speed of the ship, the proper impulses are sent to cause the cam 83 to be rotated in a clockwise direction, thus moving the segment 165 in the same direction through small steps which, in a manner similar to that already described, causes the throttle valve 181 to be gradually closed, thus slowing down the speed of the ship.

In order to prevent the steam pressure from becoming excessive when the throttle valve is not fully opened, the mechanism comprising the cylinder 194 and valve 89 are employed. The oil pressure to the burners is determined by the compression of the spring 85, as already described in connection with Fig. 1. The compression of this spring is in turn determined by the position of the arm 191, which is dependent upon the position of the piston 196 in the cylinder 194. When the steam pressure in the boiler 105 is low, this piston will be forced downwardly under the action of the spring 198, thus compressing the spring 85 which as already described, increases the oil pressure supplied to the burners, thus increasing the amount of heat supplied to the boiler 105 which increases the steam pressure. As this pressure builds up, the piston 196 will be moved upwardly against the action of the spring 198, thus decreasing the compression of the spring 85, which in turn decreases the oil pressure to the burners, thus cutting down the amount of heat supplied to the boiler. It is thus seen that by this mechanism the pressure in the boiler 105 is maintained constant, independent of the amount of steam supplied to the turbine 111.

Although only a few of the various forms in which this invention may be embodied have been shown herein, it is to be understood that the invention is not limited to any specific construction, but might be embodied in various forms without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A mechanism as described, comprising a receiver for radiant energy, a first solenoid operated thereby, circuit closing means actuatable by said first solenoid, second and third solenoids energized when said circuit closing means is operated; first, second and third brushes, a rotatable commutator having a continuous circumferential conducting portion disposed to contact said first brush and conducting portions extending laterally from opposite sides of said continuous conducting portion, the said portions on one side being disposed to contact said second brush and those on the other side being disposed to contact said third brush, the contacts with said second and third brushes occurring alternately as said commutator is rotated; a conducting member connected to be moved by said third solenoid, spaced brushes disposed to be electrically connected when said member is so moved, means to delay movement of said member, means connecting one of said spaced brushes to said first brush and means connecting the other of said spaced brushes through a source of direct current to the common return of a reversibly operable device, means connecting said second brush to one input of said device, means connecting said third brush to the reverse input of said device, a rack connected to said second solenoid to be moved in one direction when said second solenoid is energized, means tending to move said rack in the opposite direction, and means connecting said rack to said commutator to rotate said commutator to move one of said laterally extending conducting portions out of contact with its respective brush and a conducting portion on the opposite side into contact with its respective brush each time said rack is moved by said second solenoid.

2. A mechanism as described, comprising a receiver for radiant energy, circuit closing means connected to be actuated to circuit closing position by current from said receiver, a reversibly operable device, an input connection and a reverse input connection to said device, a source of electric current, a supply circuit including circuit controlling means connected to one side of said source, a common return connected between the other side of said source and said device, means to delay the operation of said circuit controlling means, a rotatable commutator disposed to connect electrically said supply circuit alternately with said input connection and said reverse input connection upon rotation of said commutator in one direction through successive steps each of which is of predetermined angular magnitude, means energized by actuation of said circuit closing means to circuit closing position connected to move said circuit controlling means to circuit closing position upon predetermined duration of such energization, and means energized by each closing of said circuit closing means to rotate said commutator through a said step in said one direction.

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