J. MACKINTOSH.

TELEMOTOR GEAR.

APPLICATION FILED JUNE 17, 1911.

1,039,157.

Patented Sept. 24, 1912.

2 SHEETS—SHEET 1.

Fig 1

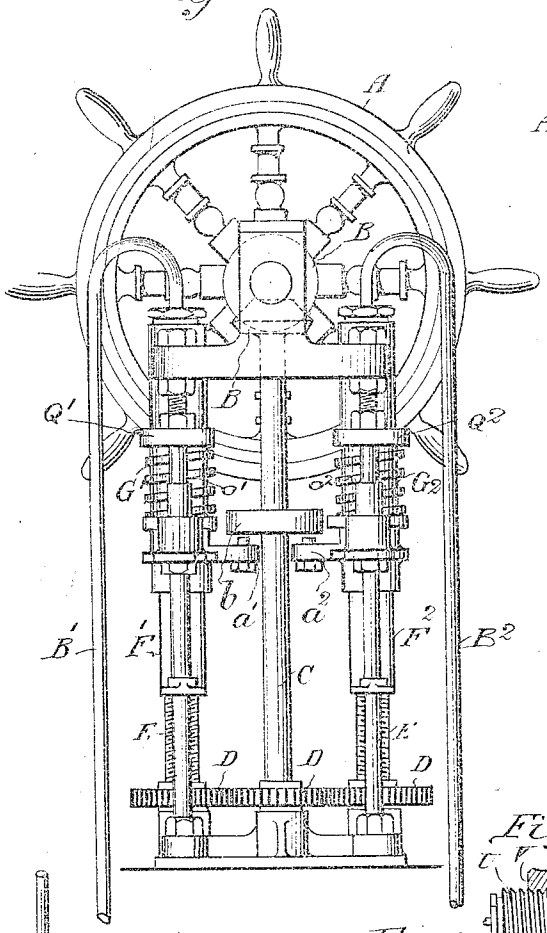


Fig 2

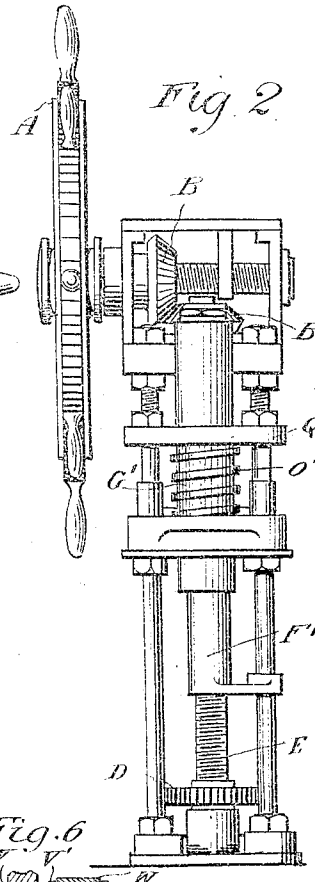


Fig 6

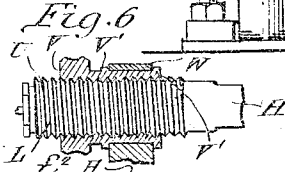
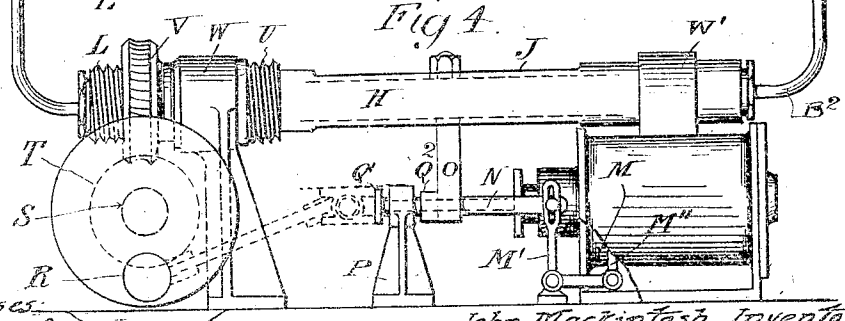


Fig 3

Fig 4



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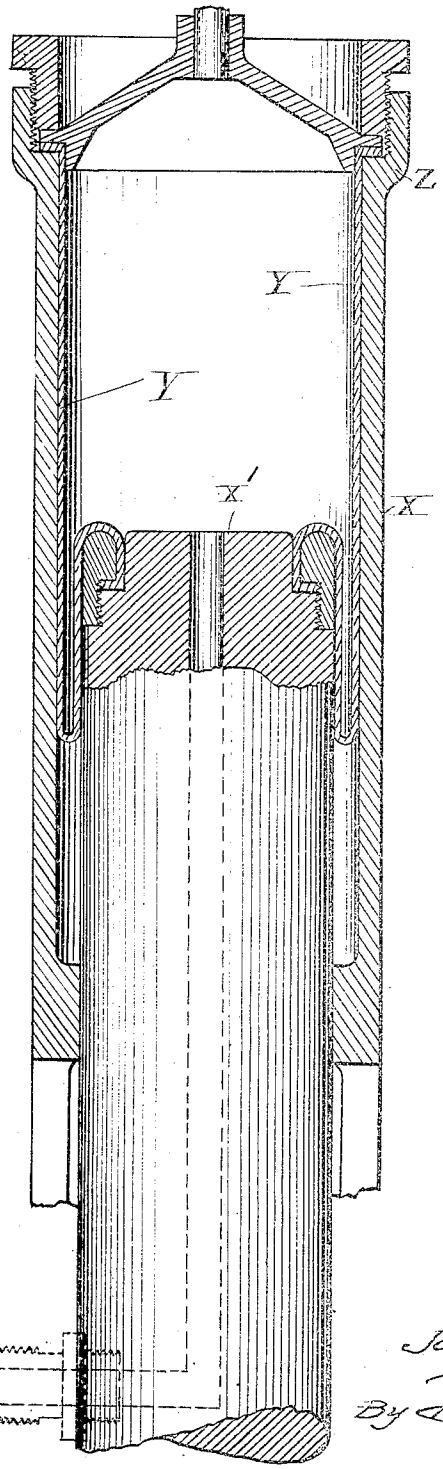
2 SHEETS—SHEET 2.

Fig. 5.



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TELEMOTOR-GEAR.

1,039,157. Specification of Letters Patent. Patented Sept. 24, 1912.

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To all whom it may concern:

Be it known that I, JOHN MACKINTOSH, of 28 Whitehaugh Drive, Paisley, Scotland, have invented certain new and useful improvements in Telemotor-Gear, of which the following is a specification.

The object of this invention is to simplify the design and construction and to reduce the cost of manufacture and maintenance of telemotor gears by causing the telemotor receiving cylinder or cylinders, that is, those whose rams or rods actuate or are operatively connected to the engine control valve, also to form or become the reciprocating or valve returning gear of the engine, and by dispensing with the necessity for glands, gland packings, piston packings or any other packing device, by pass arrangements and other complexities.

In order that my invention may be properly understood and readily carried into effect I have hereunto appended the following drawings, in which:

Figure 1 is a rear elevation of one of the simplest designs of transmitting telemotor and gear. Fig. 2 is a side elevation of the same. Fig. 3 is a plan of the receiving telemotor. Fig. 4 is a side elevation of the same showing its application to a steering engine, parts being broken away to disclose details of construction. Fig. 5 is a section of one of the cylinders showing the means whereby packing, and the like, are dispensed with. Fig. 6 is a central, vertical, sectional view through a supporting standard and actuating nut 4 for the receiving telemotor, a fragment of the latter being disclosed in connection therewith.

Referring to Figs. 1 and 2, the hand wheel A working through the bevel wheels B, B, spindle C, and spur wheels D, D, D, revolves the screws E, E. These screws work internally in rams F^1 F^2 and are so arranged that motion of the handwheel A moves these rams in an axial direction with reference to the cylinders G^1 G^2 in which they reciprocate. The screws E, E, are so cut that motion of the handwheel moves the rams F^1 F^2 in counter directions and through equal distances. For instance, if the handwheel be rotated in one direction and F^1 be moved downwardly through a certain distance, F^2 will be moved upwardly through an equal distance, and if the handwheel be moved in the opposite direction the motions of the rams will be reversed, F^1 will be moved upwardly and F^2 will be moved downwardly. The equivalent devices may be used as the transmitting gear.

The portion of the arrangement described above or some details of it may have been already used and are not specially claimed as being novel.

Referring to Figs. 3 and 4, H is a reciprocable hollow member in which a double ram J is arranged to reciprocate and it will be seen that by this arrangement two alined cylinders K, L, are formed. These may or may not correspond in diameter or length to cylinders G^1 G^2 but they should correspond in volume to these and all four cylinders are preferably rendered fluid tight by means of devices to be hereafter described. The cylinders of the steering engine to which the Fig. 4 shows the telemotor gear applied are indicated by M. A projecting crosshead O is attached to the double ram J at one end and to the spindle N which in turn actuates the bell crank lever M′, operatively connected through link M″ to the engine control valve mechanism, not shown in the drawing, at the other. For instance, the link M″ may be connected to the link of the well-known Stephenson or Goock link motions, whereby the engine is rendered reversible. A bracket P and stoppers Q^1 and Q^2 or equivalent arrangement may be used to determine the motion of the valve in both directions. R is one of the crank pins of the engine. S is the crank shaft, which is connected, in any suitable manner to mechanism, not shown in the drawing, such as a chain barrel carrying chains connected to the rudder, and is adapted to actuate the rudder according to the direction of rotation of the shaft S. T indicates a worm formed on or connected to the shaft. A screw thread U is formed on one end of or is connected to the member H. The worm wheel V is screwed internally to receive this and is prevented from moving in a direction parallel to the axis of the reciprocable member H by having two collars or raised portions V′ formed upon it which bear upon the sides of the fixed standard W. The arrangement of reciprocable member H may be modified by being connected to some other working part of the engine or part worked by the engine. A rack and pinion or other equivalent arrangement may be used instead of the screw and the connection to the valve may be through levers or otherwise instead of direct. The

member H is reciprocable in standard W and capable of reciprocation in standard W', but is held against circumferential movement, as by the cross head O, or in any other suitable manner.

Referring to Fig. 5, which is a section of any of the cylinders, such as indicated by X already mentioned and Y is a fluid tight circular liner or vessel, flexible and inextensible. These liners are fixed in a fluid tight manner at one end of the cylinder Z distant from the ram and also in a fluid tight manner at the other end to the end X^1 of the ram which enters the cylinder or one to each end of a double ram. The liner shown is of the reëntrant form, doubling inward upon itself as the ram moves into the cylinder and unrolling itself as the ram moves outward. It may, however, be made of the bellows or other suitable form. The liners may be made of rubber with a cambric or other lining, or of other fluid tight flexible and inextensible material.

To prepare the apparatus for action the cylinders G^1 G^2 are connected by means of pipes B^1 B^2 to cylinders L and K respectively of member H, and the whole of the two separate systems, consisting in each case of a transmitting cylinder, pipe connection and receiving cylinder, is filled with suitable fluid through suitable filling connections at the highest points of each system, or a pump may be used discharging preferably into the lowest point of each system. If then the wheel be moved in a direction to cause say an upward motion of ram F^1 and a downward motion of ram F^2 the ram J will move from left to right carrying the control valve spindle N with it, opening the control valve and starting the engine shaft in a certain definite direction of rotation. The shaft S and worm T are revolved, the worm wheel V is rotated and acting as a nut upon the screw U moves as one body, from right to left, the reciprocable member H and the ram, carrying the control valve and spindle with them in a direction the reverse of that obtained by the motion of the wheel, shutting the inlet portion of the cylinders and stopping the engine. If the operator continues turning the hand wheel in the same direction these motions will continue simultaneously or nearly so until the member H has reached the extremity of its travel from right to left, the extent of this being determined by what is required to give the control valve an amount of opening sufficient to cause the engine to revolve the number of times required to carry the rudder from mid position to hard over. The motion of the hand wheel being reversed the action of the system is reversed and the rudder carried to its hard over position on the opposite side. The member H will then have traveled to its extreme right hand position. Any intermediate position may be obtained by corresponding intermediate movements of the hand wheel.

In order to prevent any damage being done through the hand wheel being moved, and excessive pressure put upon the system, when no steam is on the engine or under any other circumstances, the cylinders G^1 and G^2 may be mounted movably on the columns and springs fitted at o^1 and o^2 between the adjustable crossheads O^1 and O^2 and abutments cast with or fixed to the cylinders so that either cylinder may rise and temporarily increase the capacity of the system in which the excess of pressure is generated returning to its normal capacity when this pressure is removed. A further device may be fitted to prevent damage due to excessive temporary pressure. On each cylinder a projection a^1 a^2 may be cast or fixed. Into each of these projections is screwed a set pin, preferably adjustable, prolonged above the surface of each projection by a predetermined amount. On the spindle C a disk or abutment b is fixed, the lower surface of which may be plain or may be perforated with holes all around into which the set pins referred to may enter when either cylinder rises, or a recess may be turned all around at the necessary radius for the pins to enter. This arrangement acts as follows:—When excessive pressure occurs one of the cylinders G^1 or G^2 rises overcoming the resistance of the springs already mentioned. The point of the set pin attached to this cylinder jams on the bottom of the disk, or enters one of the holes should these be provided, or jams in the recess should such be the arrangement. In any case further motion of the hand wheel in a direction that will cause a further increase of pressure is prevented and the wheel must be turned in the opposite direction and the pressure thus relieved, otherwise the wheel will remain prevented from moving in the direction to increase pressure until this pressure is removed by the working of the engine, or the cause being ascertained and dealt with.

Should it be undesirable in any special case to have the pipe connections to receiving cylinders moving through the travel of these, the pipe connections may be made to enter the ram as shown at f^1 f^2 and holes bored from these points to the ends of the ram for the admission of fluid to the cylinders. This arrangement is also shown in Fig. 5 (dotted).

For convenience in overhauling and replacing liners the cylinders may be made in two pieces and bolted together or other arrangements may be made for these purposes although not specifically described.

If so desired the arrangement may be made as described embodying the advan-

tages to be obtained by making the telemotor receiving cylinders form the control valve reciprocating gear, but omitting the liners. In this case the usual arrangement of glands, packing, and the like, would be substituted for the liners and feed make up tank or tanks, by pass arrangements, and the like, as usually fitted at present, be arranged for where necessary.

Should either system break down the other may still be employed to carry out all the necessary operations by means of the addition of a spring or springs or similar device arranged to move the valve in the direction in which the temporarily defective system should move it. In this way also a very cheap gear may be constructed on the principle described with only one transmission cylinder and ram and one receiving cylinder and ram. With this arrangement, when the hand wheel is moved in one direction the fluid pressure moves the control valve in a direction corresponding. When the hand wheel is moved in the opposite direction the fluid pressure is removed and the spring allowed to act and pull the valve in the opposite direction.

Claims:

1. In a telemotor apparatus, the combination of a suitable frame, two cylinders movably carried by said frame, a ram for each of said cylinders, two receiving cylinders, a ram for each receiving cylinder, conducting means operatively connecting said first mentioned cylinders and receiving cylinders, said first mentioned cylinders, conducting means and receiving cylinders being adapted to confine fluid to transmit movement of one ram to another, and means operatively connected with said first mentioned cylinders opposing movement thereof responsive to actuation of the fluid confined, but yieldable upon pressure upon said fluid beyond a predetermined amount.

2. In a telemotor apparatus, the combination of a suitable frame, two cylinders movably carried by said frame, a ram for each of said cylinders, two receiving cylinders, a ram for each receiving cylinder, conducting means operatively connecting said first mentioned cylinders and receiving cylinders, said first mentioned cylinders, conducting means and receiving cylinders being adapted to confine fluid and transmit movement of one ram to another, and yieldable resilient means operatively connected with said first mentioned cylinders opposing movement thereof responsive to actuation of the confined fluid, but yieldable upon pressure upon said fluid above a predetermined amount.

3. In a telemotor apparatus, the combination of a suitable frame, two cylinders movably carried by said frame, abutments carried by said cylinders, adjustable cross heads carried by said frame, a ram for each of said cylinders, two receiving cylinders, a ram for each receiving cylinder, conducting means operatively connecting said first mentioned cylinders and receiving cylinders, said first mentioned cylinders, conducting means and receiving cylinders being adapted to confine fluid to transmit movement of one ram to another, and compression springs interposed between said abutments of said first mentioned cylinders and cross heads, opposing movement of said first mentioned cylinders responsive to actuation of the confined fluid, but yieldable upon pressure upon said fluid above a predetermined amount.

4. In a telemotor apparatus, the combination of a suitable frame, two cylinders movably carried by said frame, a ram for each of said cylinders, two receiving cylinders, a ram for each receiving cylinder, conducting means operatively connecting said first mentioned cylinders and receiving cylinders, said first mentioned cylinders, conducting means and said receiving cylinders adapted to confine fluid to transmit movement of one ram to another, means operatively connected with said first mentioned cylinders opposing movement thereof responsive to actuation of the confined fluid, but yieldable upon pressure upon said fluid above a predetermined amount, and mechanism adapted to rigidly hold said first mentioned cylinders against movement after movement thereof to a predetermined extent.

5. In a telemotor apparatus, the combination of a suitable frame, a cylinder movably carried by said frame, a ram for said cylinder, a receiving cylinder, a ram for said receiving cylinder, conducting means operatively connecting said first mentioned cylinder and receiving cylinder, said first mentioned cylinder, conducting means and receiving cylinder being adapted to confine fluid to transmit movement of one ram to the other, and means operatively connected with said first mentioned cylinder opposing movement thereof responsive to actuation of the confined fluid, but yieldable pressure upon said fluid above a predetermined amount.

6. In a telemotor apparatus, the combination of a suitable frame, a cylinder movably carried by said frame, an abutment carried by said cylinder, an adjustable crosshead carried by said frame, a ram for said cylinder, a receiving cylinder, a ram for said receiving cylinder, conducting means operatively connecting said first mentioned cylinder and receiving cylinder, said first mentioned cylinder, conducting means and receiving cylinder being adapted to confine fluid to transmit movement of one ram to the other, and a compression spring interposed between said abutment of said first mentioned cylinder and said crosshead, opposing movement of said first mentioned cyl-

inder responsive to actuation of the confined fluid, but yieldable upon pressure upon said fluid above a predetermined amount.

7. In a telemotor apparatus, the combination of a suitable frame, a cylinder movably carried thereby, a ram for said cylinder, a receiving cylinder, a ram for said receiving cylinder, conducting means operatively connecting said cylinders, said first mentioned cylinder, conducting means and receiving cylinder being adapted to confine fluid to transmit movement of one ram to the other, means operatively connected with said first mentioned cylinder opposing movement thereof responsive to actuation of the confined fluid, but yieldable upon pressure upon said fluid above a predetermined amount, and mechanism adapted to rigidly hold said first mentioned cylinder against movement after movement thereof to a predetermined extent.

8. In a telemotor apparatus, the combination of a suitable frame, two cylinders movably carried by said frame, a ram for each of said cylinders, means for simultaneously actuating said rams in counter directions, two receiving cylinders, a ram for each receiving cylinder, conducting means operatively connecting said first mentioned cylinders and receiving cylinders, said first mentioned cylinders, conducting means and receiving cylinders adapted to confine fluid to transmit movement of one ram to another, means operatively connected with said first mentioned cylinders opposing movement thereof responsive to actuation of the confined fluid, but yieldable upon pressure upon said fluid above a predetermined amount, and mechanism adapted to effect movement of said actuating means of said first mentioned rams, after movement of said cylinders to a predetermined extent.

9. In a telemotor apparatus, the combination of a suitable frame, two cylinders movably carried by said frame, a ram for each of said cylinders, a rotatable shaft, means operatively connected with said shaft and said rams for simultaneously actuating the same in counter directions, two receiving cylinders, a ram for each receiving cylinder, conducting means operatively connected to said first mentioned cylinders and receiving cylinders, said first mentioned cylinders, conducting means and receiving cylinders being adapted to confine fluid to transmit movement of one ram to another, means operatively connected to said first mentioned cylinders opposing movement thereof responsive to actuation of the confined fluid, but yieldable upon pressure upon said fluid of a predetermined amount, an abutment carried by said shaft, means carried by said first mentioned cylinders adapted to engage with said abutment on said shaft, to check movement of the latter after movement of said cylinders to a predetermined extent.

10. In a telemotor apparatus, the combination of a suitable frame, two cylinders movably carried by said frame, a ram for each of said cylinders, a rotatable shaft, means operatively connecting said shaft and said rams for simultaneously actuating the latter in counter directions, two receiving cylinders, a ram for each receiving cylinder, conducting means operatively connecting said first mentioned cylinders and receiving cylinders, said first mentioned cylinders, conducting means and receiving cylinders being adapted to confine fluid to transmit movement of one ram to another, means operatively connected with said first mentioned cylinders, opposing movement thereof responsive to actuation of the confined fluid, but yieldable upon pressure upon said fluid above a predetermined amount, an abutment carried by said shaft, offset means carried by each of said cylinders, and a set screw carried by each of said offset means adapted to engage with said abutment on said shaft to check movement of the latter after movement of said cylinders to a predetermined extent.

11. In a telemotor apparatus, the combination of a suitable frame, a cylinder movably carried by said frame, a ram for said cylinder, means for actuating said ram, a receiving cylinder, a ram for said receiving cylinder, conducting means operatively connecting said cylinders with each other, said first mentioned cylinder, conducting means and receiving cylinder being adapted to confine fluid to transmit movement of one ram to another, means operatively connected with said first mentioned cylinder opposing movement thereof responsive to actuation of the confined fluid, but yieldable upon pressure upon said fluid above a predetermined amount, and mechanism adapted to check movement of said actuating means of said first mentioned ram, after movement of said first mentioned cylinder to a predetermined extent.

12. In a telemotor apparatus, the combination of a suitable frame, a cylinder movably carried by said frame, a ram for said cylinder, a rotatable shaft, means operatively connecting said shaft and said ram for actuating the latter, a receiving cylinder, a ram for said receiving cylinder, conducting means operatively connecting said cylinders with each other, said first mentioned cylinder, conducting means and receiving cylinder being adapted to confine fluid to transmit movement of one ram to the other, means operatively connected to said first mentioned cylinder opposing movement thereof responsive to actuation of the confined fluid, but yieldable upon pressure upon said fluid above a predetermined

amount, an abutment carried by said shaft, and means carried by said first mentioned cylinder adapted to engage said abutment on said shaft to check movement of the latter, after movement of said first mentioned cylinder to a predetermined extent.

13. In a telemotor apparatus, the combination of a suitable frame, a cylinder movably carried by said frame, a ram for said cylinder, a rotatable shaft, means operatively connecting said shaft and said ram for actuation of the latter, a receiving cylinder, a ram for said receiving cylinder, conducting means operatively connecting said cylinders with each other, said first mentioned cylinder, conducting means and receiving cylinder being adapted to confine fluid to transmit movement of one ram to the other, means operatively connected with said first mentioned cylinder opposing movement thereof responsive to actuation of the confined fluid but yieldable upon pressure upon said fluid over a predetermined amount, an abutment carried by said shaft, offset means carried by said first mentioned cylinder, and a set screw carried by said offset means adapted to engage said abutment on said shaft, to check movement of the latter after movement of the first mentioned cylinder to a predetermined extent.

14. In a telemotor apparatus, the combination of a suitable frame, two power cylinders carried by said frame, rams for said cylinders, two reciprocable axially alined receiving cylinders, adapted to move in unison and having independent communication with said power cylinders to connect the same in pairs, rams for said receiving cylinders adapted to move in unison, a reversible engine, means actuated by said rams of said receiving cylinders for controlling the engine control valve mechanism of said engine, and mechanism actuated by movement of said engine for bodily moving said receiving cylinders in a direction counter to that imparted to said second mentioned rams by actuating of said first mentioned rams, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN MACKINTOSH.

Witnesses:
JOHN LIDDLE,
JOHN TRAIN LIDDLE.