No. 859,737. PATENTED JULY 9, 1907.

A. B. BROWN, DEC'D.

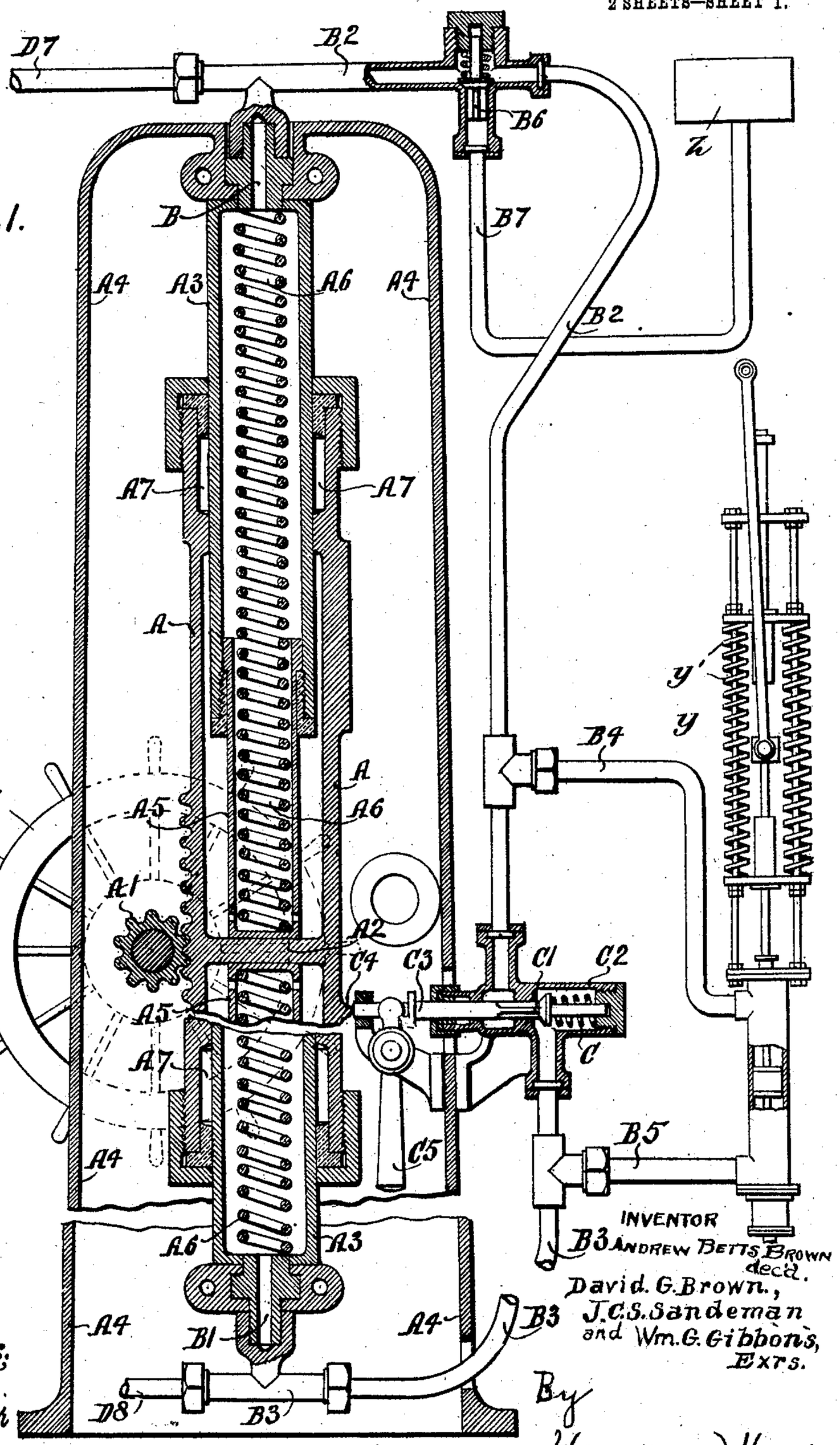
D. G. BROWN, J. C. S. SANDEMAN & W. G. GIBBONS, A MAJORITY AND QUORUM OF THE TRUSTEES AND EXECUTORS.

TELEMOTOR APPARATUS.

APPLICATION FILED SEPT. 20, 1906.

2 SHEETS—SHEET 1.

FIG. 1.



WITNESSES;

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By Howson and Howson Attys.

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TELEMOTOR APPARATUS.

APPLICATION FILED SEPT. 29, 1906.

2 SHEETS—SHEET 2.

FIG. 2.

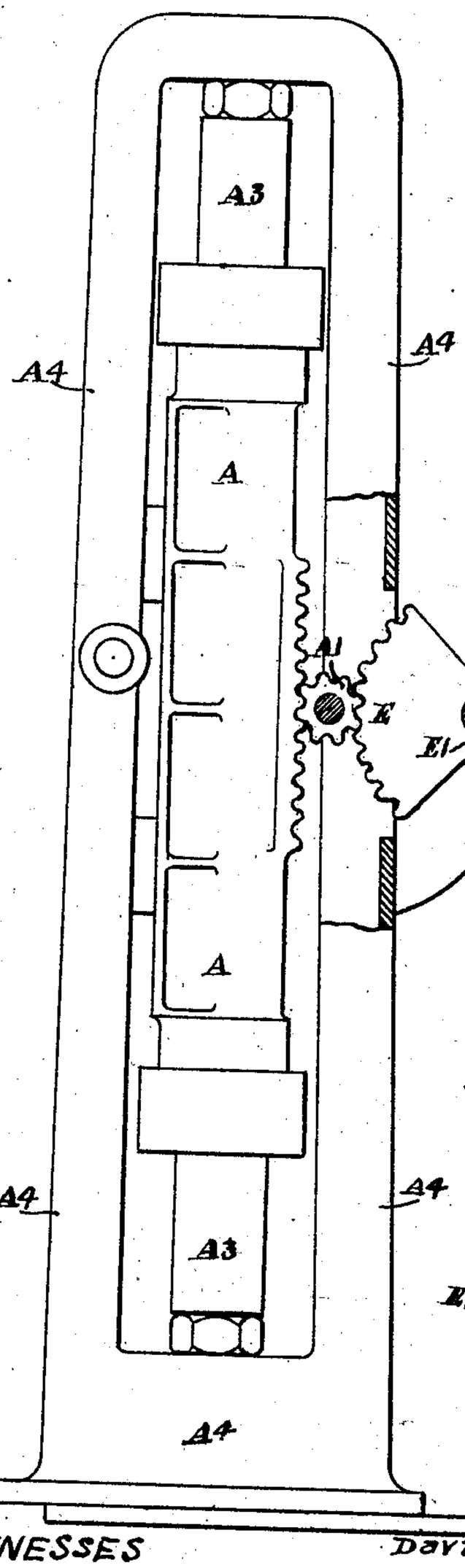
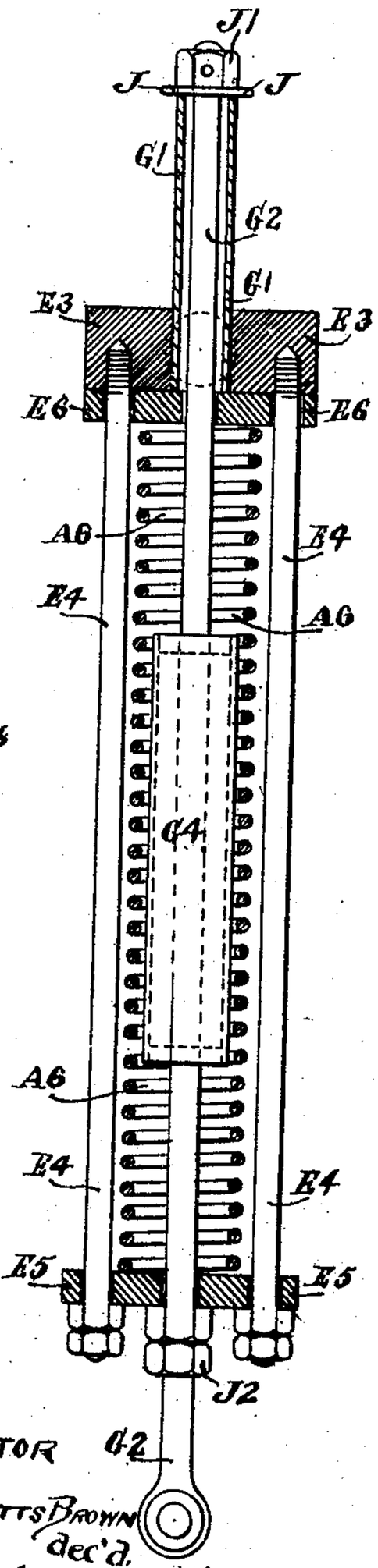
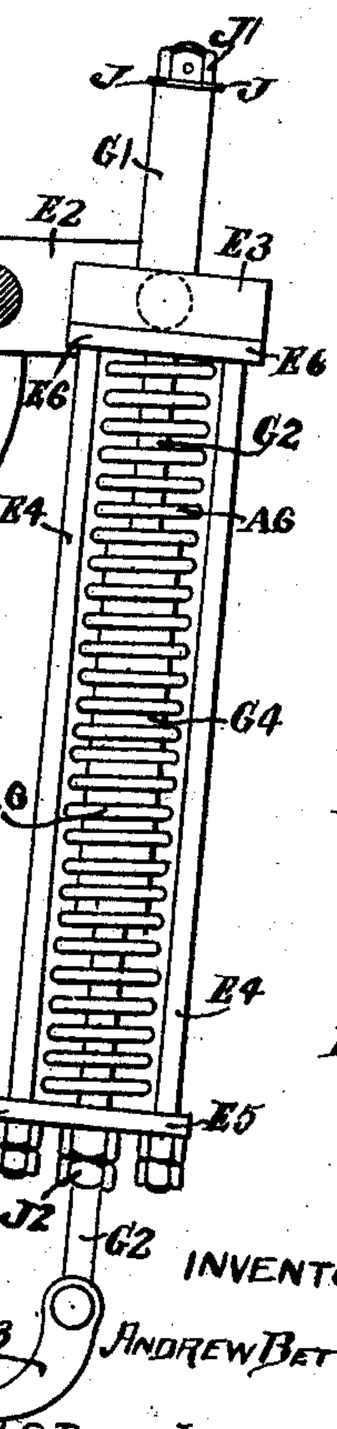


FIG. 3.





INVENTOR

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UNITED STATES PATENT OFFICE.

DAVID GEORGE BROWN, OF AVONBRIDGE, AND J. CONDIE S. SANDEMAN AND WILLIAM GREGORY GIBBONS, OF EDINBURGH, SCOTLAND, A MAJORITY AND QUORUM OF THE TRUSTEES AND EXECUTORS OF ANDREW BETTS BROWN, DECEASED.

TELEMOTOR APPARATUS.

No. 859,737. Specification of Letters Patent. Patented July 9, 1907.

Application filed September 29, 1906. Serial No. 336,798.

To all whom it may concern:

Be it known that we, WILLIAM KERR STEEDMAN, writer to the signet, and a resident of Edinburgh, in the county of Midlothian, Scotland; DAVID GEORGE BROWN, gentleman, and a resident of Avonbridge, in the county of Linlithgow, Scotland; ARTHUR WILLIAM WAYMOUTH, captain, R. N., and a resident of Blackheath, in the county of Kent, England, but presently upon the high seas; JAMES CONDIE STEWART SANDEMAN, advocate, and a resident of Edinburgh aforesaid, and WILLIAM GREGORY GIBBONS, engineer, and a resident of Edinburgh aforesaid, all of whom are subjects of the King of Great Britain and Ireland and are trustees and executors of the late ANDREW BETTS BROWN, engineer, Edinburgh aforesaid, who has invented certain new and useful Improvements in Telemotor Apparatus, and of which the following is the specification.

This invention relates to telemotor apparatus for use on shipboard, and has for its objects to improve the construction of such apparatus and to provide improved means for insuring the correspondence of the transmitting and receiving instruments.

In order that the nature of the invention may be explained and the manner of performing it be properly understood, there are hereunto appended two sheets of explanatory drawings throughout which like reference letters and numerals indicate like parts and in which

Figure 1, Sheet 1, is a sectional elevation of one example of an improved form of transmitting apparatus, and Fig. 2, Sheet 2, a like view of a second example; while Fig. 3, Sheet 2, is a like view to a larger scale of a constructional detail of that example.

In telemotor apparatus as hitherto generally constructed, springs in the receiving apparatus have been relied upon to bring both it and the transmitting apparatus to mid position when the steering wheel was released by the steersman. Since, to perform this operation, the fluid in the system had to be moved through long lengths of pipe and, further, had then to move the transmitting apparatus and the wheel, great resistance, frictional and otherwise, had to be overcome. Therefore, either springs of such great strength as to be very difficult of compression by the steersman and to put severe strains upon the packing and other parts of the system had to be used, or else the apparatus could not be relied upon to come coincidently in all its parts to the central position.

According to the present invention, and in the example of a transmitting apparatus shown in vertical section in Fig. 1, this disability is overcome by applying to the transmitting apparatus springs or other equivalent devices of lesser effective intensity than those of the receiving apparatus but which are sufficient in intensity to return the transmitting apparatus and steering wheel to mid position, thus eliminating much of the resistance hitherto encountered by the springs of the receiving apparatus.

Again in transmitting and receiving apparatus the cylinders have usually been fixed and the pistons or rams have moved within them. Under many circumstances the packings of the rams have been most difficult of access. According to the present invention, the cylinders move upon fixed pistons or rams. Such a construction is adopted in the transmitter shown in Fig. 1, but it is obviously equally applicable to a receiving apparatus or to modified forms of transmitting apparatus. According to this example, the transmitting cylinder A, which has formed upon it a rack by which it is operated from the steering wheel by the usual pinion, A^1, is divided at its center by a draphragm, A^2. It is carried at either end and upon a hollow ram, A^3, the rams, A^3, being secured to a hollow standard A^4, inclosing the whole. Within the rams A^3, there work hollow ramlike extensions, A^5, butting at their ends upon the diaphragm, A^2. Between the inner ends of these extensions A^5, and seats at the outer ends of the rams, A^3, are arranged the returning springs (A^6) hereinbefore referred to; these springs, A^6, being, as explained, of just sufficient intensity to return the transmitting cylinder A, and the steering wheel x and gearing to mid position. The rams, A^3, are packed in the opposite ends of the cylinder, A, by stuffing boxes, A^7, of ordinary construction and which it will be seen are easily accessible. These transmitter springs, A^6, in conjunction with the usual receiver springs y^1 are sufficient to effect rectification without the employment of other devices; for the receiving and transmitting apparatus become out of correspondence owing to leakage and it follows that if the transmitter as well as, as heretofore, the receiver both tend to come to amidships they will both do so upon the steersman letting go the wheel. But rectification by the springs of receiver and transmitter acting together is slow, and, for use in exceptional circumstances such as when the ship is in narrow waters, they may be supplemented by the following devices which will cause rectification to be performed with very great rapidity:—

Ports, B, B^1, at the ends of the upper and lower rams, A^3, communicate with pipes, B^2, B^3, which in turn communicate with the line pipes, B^4 B^5, proceeding to the receiving apparatus y. The pipe, B^2, has arranged in it a spring-controlled valve, B^6, controlling a port communicating by a pipe, B^7, with the usual make-up tank z, the valve, B^6, being arranged to open when pressure in the pipe, B^2, drops below normal. Between the two line pipes, B^4, B^5, (and so also between the opposite ends of the cylinder,

A) pipe communication is made with a valve box C, in which a valve, C^1, controls communication between the line pipes, B^4, B^5, through the valve box. This valve is held upon its seat by a spring, C^2, which is of such strength as to resist any usual pressure in the line pipe, B^4, but to allow the valve to open should the pressure in that pipe become excessive. The stem, C^3, of the valve is prolonged through a stuffing box in the valve chamber and is adapted to be encountered by a cam projection, C^4, upon the cylinder, A, when that cylinder is in mid position—in which position it is shown. The valve, C^1, is thus raised from its seat and communication established between the opposite line pipes, B^4, B^5, and between the opposite ends of the cylinder, A, when the last is in mid position. A handled lever, C^5, engaging a collar on the spindle, C^3, is provided in order that the valve, C^1, may be raised from its seat manually when it is desired to do so for purposes apart from automatic rectification. The device thus forms a combined automatic by-pass arrangement and a rectification which may be operated independently at any time. It is further much more rapid in its action than those by-pass devices hitherto used and which have consisted of ports uncovered by the transmitter piston when in mid position, or of mechanically-operated relief valve working in conjunction with such ports. Further, it is to be noted that devices in which the piston works over ports are inefficient in that the constant rubbing of the piston or pistons upon the edges of the ports leads to destruction of the packing and speedy leakage, while where cocks or the like directly operated by the piston rods or other moving parts are used great trouble is experienced owing to their inaccessibility and the impossibility of insuring their continued freedom from leakage. Therefore, in that the parts of the cylinder traversed by the piston or rams are without ports or other like obstructions to the free movements of the rams and in that valves of a type and in a position easily accessible may be used with it, is the improved apparatus superior to those hitherto known or used.

It has been found in practice that to give the best results the intensity of the transmitting cylinder springs should vary inversely—within limits—with the intensity of the receiving cylinder springs throughout the travels of the two parts, that is to say, the effort of the transmitting springs should be as nearly as may be at its maximum upon the transmitter when that is in mid position getting less as the wheel is put hard over in either direction, whereas the effort of the receiver springs is least at mid position and increases as the wheel is put hard over in either direction. By this arrangement as the effort of one set of springs diminishes, the effort of the other set increases so that the resistance they offer to the steering wheel is practically equal throughout its movement. To this end the arrangement of springs in the example of transmitter shown in Fig. 2, is provided. The construction of the cylinder, A, in this example is very similar to that in the example shown in Fig. 1—only differing, in fact, in that there are no springs within the cylinder and, consequently, the construction of the fixed rams, A^3, is much simplified and the extensions, A^5, are dispensed with.

The cylinder, A, is moved to and fro by a pinion A^1, operated by the steering wheel x and engaging a rack on it. This pinion also engages a toothed sector, E, carried on a short shaft, E^1, turning in bearings in the standard, A^4. The sector, E, carries an arm, E^2, upon which is fulcrumed a block, E^3. To this block are fixed two yoke rods, E^4, carrying at their lower ends a yoke E^5. Between this yoke, E^5, and a second yoke, E^6, is arranged a spring, A^6, designed to transmit to the cylinder, A, an effort commensurate as hereinbefore explained with the effort of the usual receiver springs and sufficient to move the cylinder, A, to mid position. Through the block, E^3, there passes a sleeve G^1, the lower end of which presses upon the upper yoke, E^6. Within the sleeve, G^1, is an anchor rod, G^2, passing down through sleeve G^1, and yokes, E^5, E^6, and pivoted to a bracket, G^3, fixed to the standard, A^4. This rod, G^2, carries at its center a cylindrical guide, G^4, for the spring, A^6, at its upper end, a washer, J, bearing upon the upper end of the sleeve, G^1, and secured in place on the rod by a nut, J^1, and split pin, and at its lower end a pair of lock nuts, J^2, forming an adjustable stop for the lower yoke, E^5.

In operation, the block, E^3, as it is moved say upwards by the arm, E^2, raises the lower yoke, E^5, through the yoke rods, E^4, and compresses the spring, A^6, between that yoke and the upper yoke, E^6, which is held stationary by the sleeve, G^1, which in turn is held by the anchor rod, G^2, through the washer, J, and nut, J^1. As the block, E^3, is moved downwards from mid position the spring, A^6, is again compressed, this time by the upper yoke, E^6, being moved down by the block while the lower yoke, E^5, is held stationary by engagement with the nuts, J^2, on the anchor rod, G^2. (the yoke rods, E^4, meanwhile sliding freely through the lower yoke, E^5). Thus the spring, A^6, is equally compressed for equal movement of the block, E^3, on either side of mid position and therefore always tends to return that block and with it the arm, E^2, and sector E, and so the cylinder A, to mid position. It will be seen that as the arm, E^2, moves to either side of mid position the effective arm through which the springs acts becomes less and less until at extreme positions the center of the shaft, E^1, the axis upon which the block, E^3, turns, and the pivot of the anchor rod, G^2, come almost into line. The spring, A^6, is of such length and proportion that its effort at its longest effective arm, that is to say, at mid position is sufficient to definitely bring the cylinder A, to mid position while although its direct effort of course increases as it is compressed, its effective arm so much the more rapidly decreases that its effort upon the cylinder A, becomes less and less as the latter is moved from mid position.

Obviously, when the transmitting station is near a compass, steel springs (A^6) cannot well be used. In such cases, therefore, any convenient known equivalent for springs may be used.

What we claim is:—

1. In telemotor apparatus, a telemotor transmitting apparatus comprising a steering wheel, a moving transmitter cylinder operatively connected thereto, fixed rams upon which the cylinder works, line pipes connected to the cylinder ends, a make-up tank connected to the line pipes, valves controlling the passage of the fluid between cylinder make-up tank and line pipes, a tappet on the cylinder

operating a valve and a handled lever for operating them independently of the tappet and springs within the cylinder operating to return the same to mid position.

2. In telemotor apparatus, a telemotor transmitting cylinder a central partition therein, hollow rams upon which the cylinder works, ram-like extensions within the rams and abutting upon the central diaphragm of the cylinder, springs between rams and extensions tending to return the cylinder to mid position and fluid ports in the ram ends, as described.

3. In telemotor apparatus, a telemotor transmitting cylinder, fixed rams upon which the cylinder works a tappet on the cylinder, line and make-up pipe connections, and a valve controlling same and operated by the tappet, as described.

4. In telemotor apparatus, a telemotor transmitting cylinder fixed rams upon which the cylinder works, a tappet on the cylinder, line and make-up pipe connections, a valve controlling same and a handled lever operating said valve and operated by the tappet, as described.

5. In telemotor apparatus, a telemotor transmitting cylinder a tappet moved thereby, line and make-up pipe connections, a valve controlling same and operated by the tappet, as described.

6. In telemotor apparatus, a telemotor transmitting cylinder a tappet moved thereby, line and make-up pipe connections, a valve controlling same and a handled lever operating said valve and operated by the tappet, as described.

7. In telemotor apparatus having a receiving cylinder to which are operatively connected springs tending to return it to mid position; a transmitting apparatus and springs operating to return same to mid position, as described.

8. In telemotor apparatus having a receiving cylinder to which are operatively connected springs tending to return it to mid position, a transmitting apparatus and springs of lesser intensity than those of the receiving apparatus operating to return the transmitting apparatus to mid position, as described.

9. In telemotor apparatus having a receiving cylinder to which springs are operatively connected tending to return it to mid position; a transmitting apparatus and springs operating to return it to mid position and the effective intensity of which upon the transmitting apparatus varies inversely to the effective intensity of the receiver springs upon the receiving apparatus from end to end of the conjoint strokes of transmitting and receiving apparatus, as described.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses.

DAVID GEORGE BROWN,
J. CONDIE S. SANDEMAN,
WILLIAM GREGORY GIBBONS,

A majority and quorum of the trustees and executors of the late Andrew Betts Brown.

Witnesses:
PATRICK SMITH,
CHARLES FELLOWES MONCRIEFFE MACLACHLAN.