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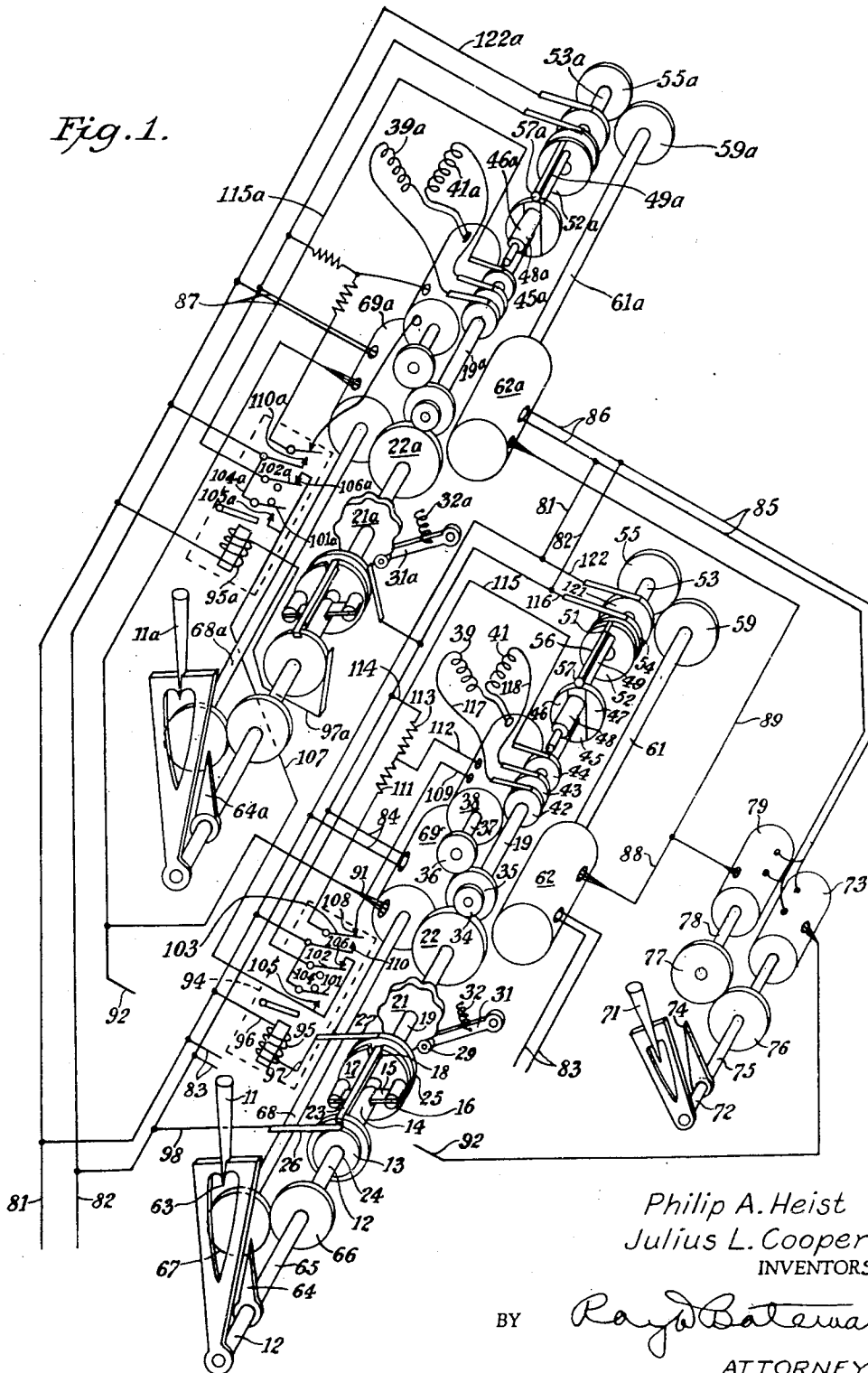
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SYNCHRONOUS ELECTRIC SIGNALING SYSTEM

Filed Oct. 4, 1944

5 Sheets-Sheet 1



June 8, 1948.

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2,442,997

SYNCHRONOUS ELECTRIC SIGNALING SYSTEM

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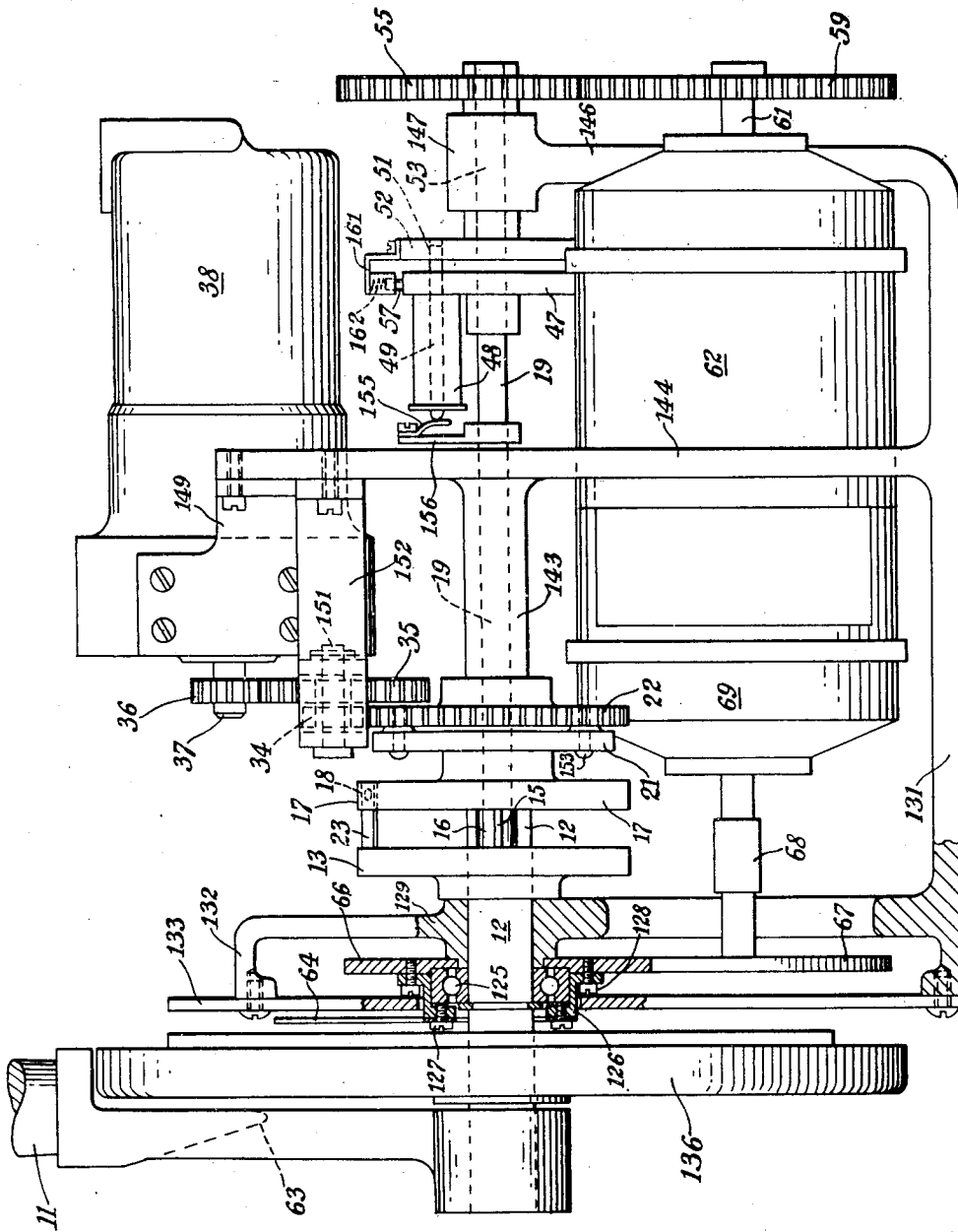


Fig. 2

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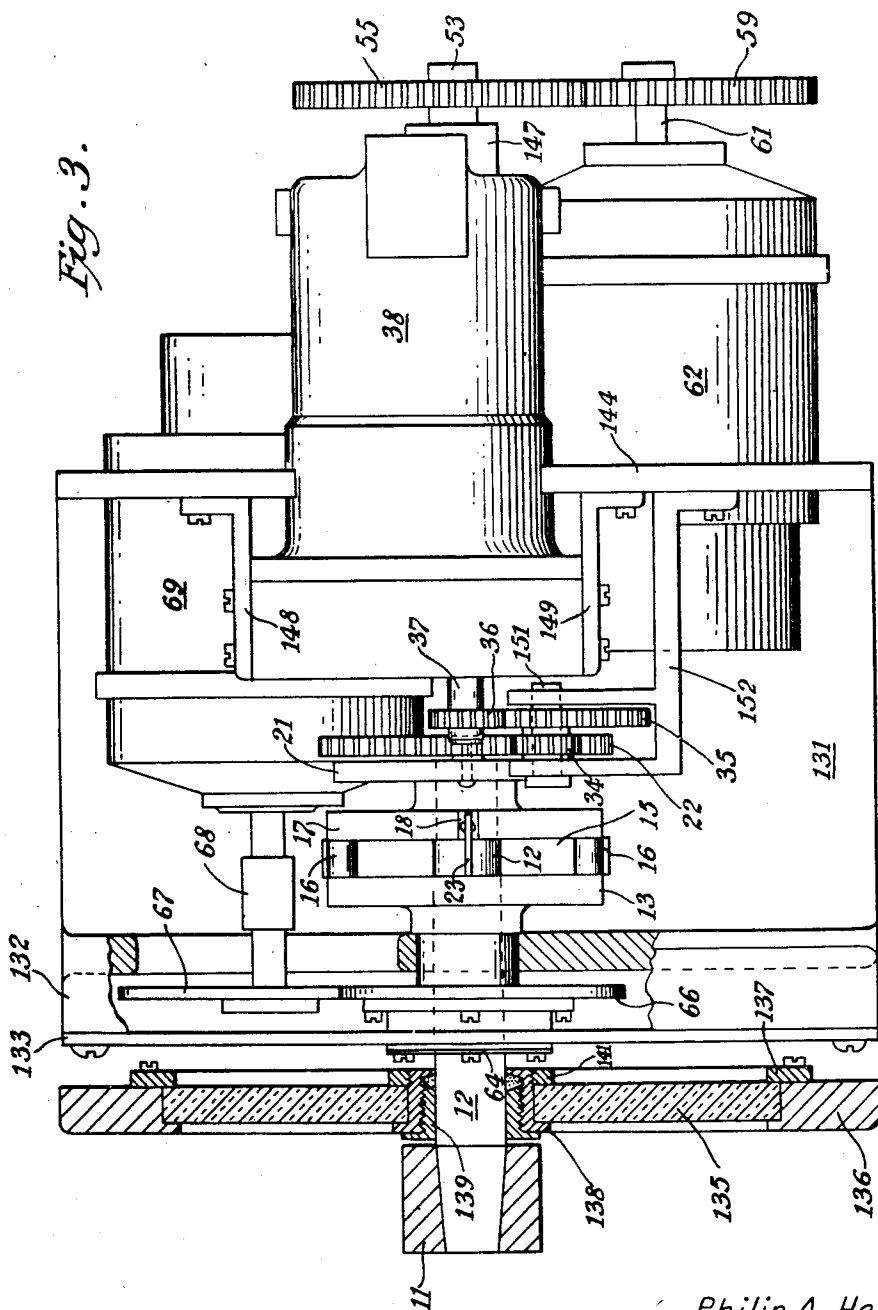
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SYNCHRONOUS ELECTRIC SIGNALING SYSTEM

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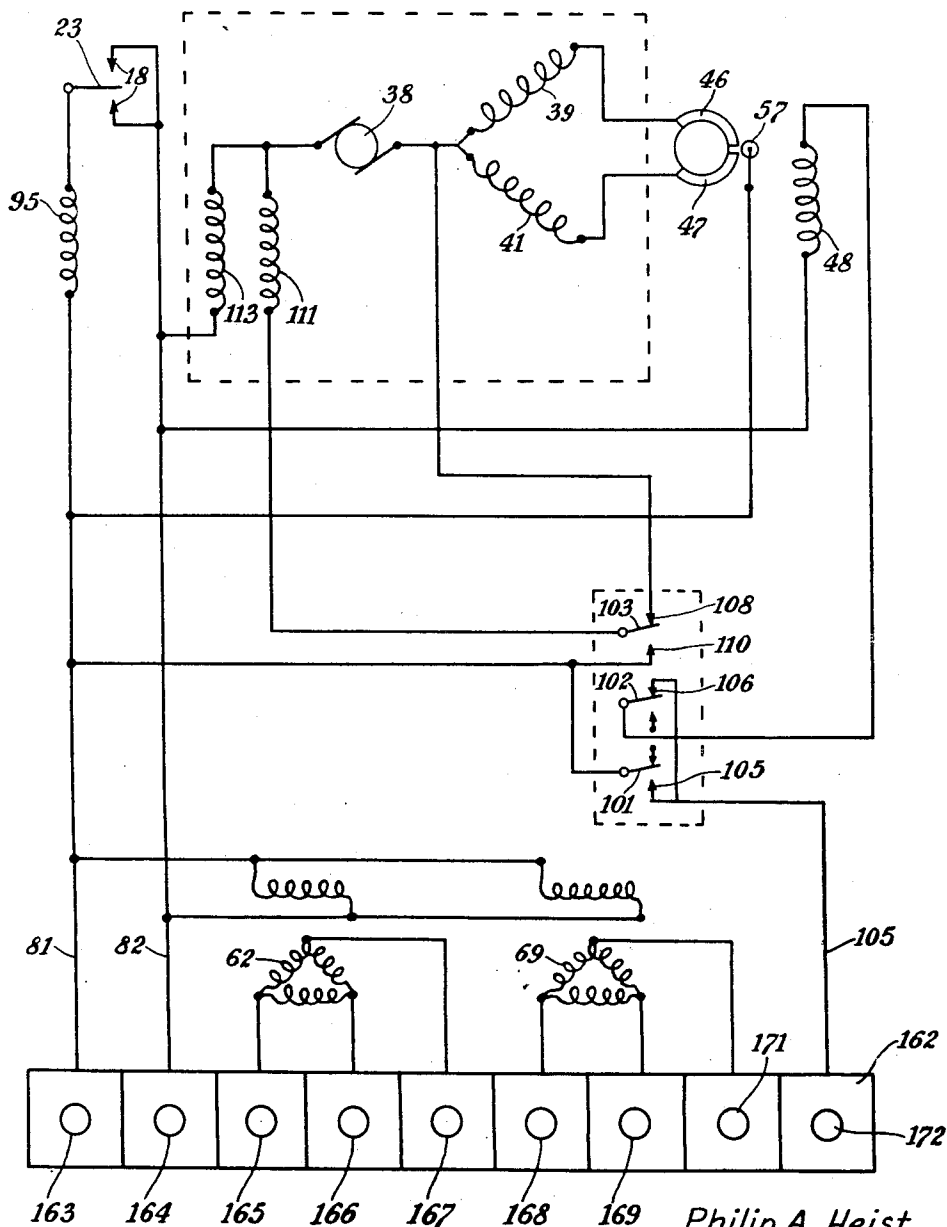
2,442,997

SYNCHRONOUS ELECTRIC SIGNALING SYSTEM

Filed Oct. 4, 1944

5 Sheets-Sheet 4

Fig. 4.



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2,442,997

SYNCHRONOUS ELECTRIC SIGNALING SYSTEM

Filed Oct. 4, 1944

5 Sheets-Sheet 5

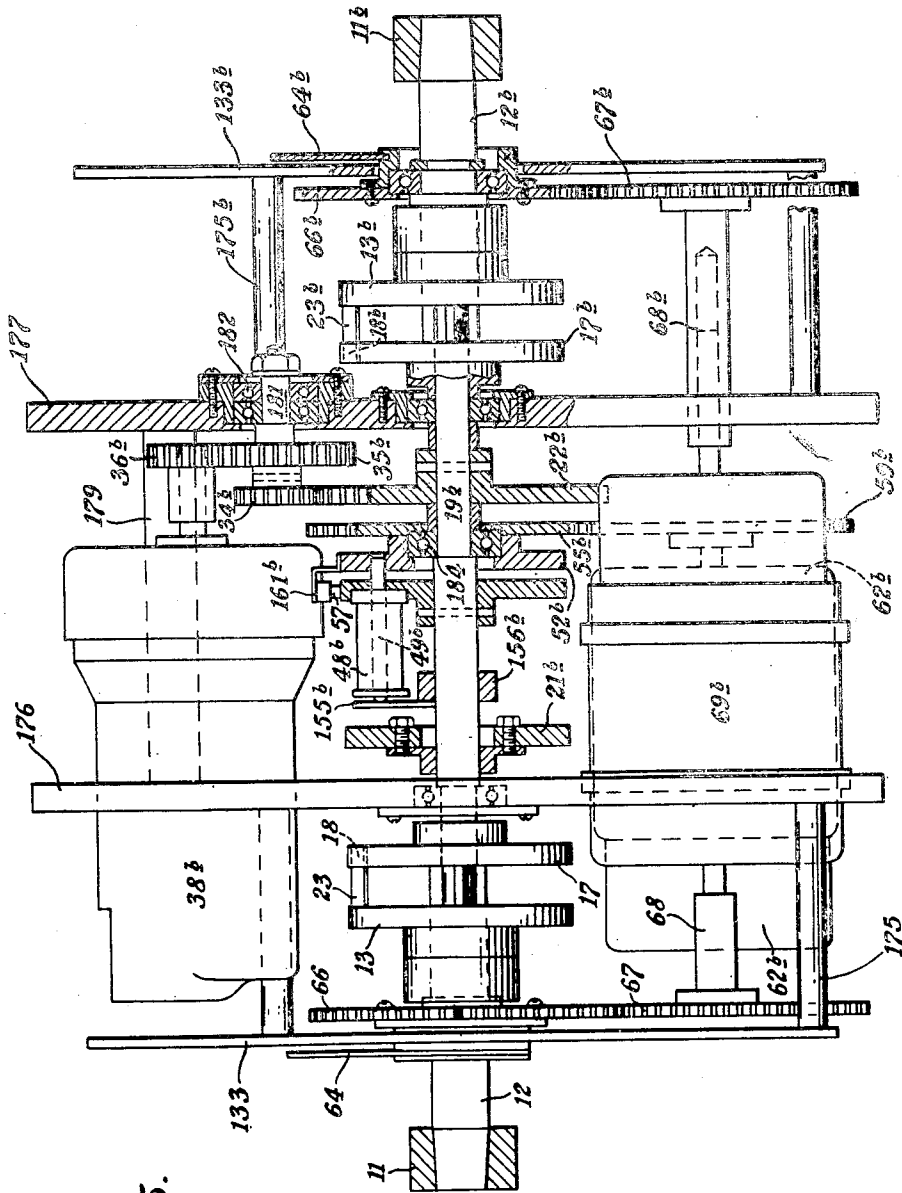


Fig. 5.

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2,442,997

SYNCHRONOUS ELECTRIC SIGNALING
SYSTEM

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Application October 4, 1944, Serial No. 557,140

13 Claims. (Cl. 177—337)

1

The present invention relates to signalling systems, more particularly of the character employed on shipboard for sending orders from the bridge to the engine room, although it is not limited to such use.

Although both mechanical and electric telegraphs have been heretofore proposed, and a number of designs have gone into wide use, they are open to the objection that when a plurality of transmitting stations are involved, it is necessary for the operator in going from one transmitting station to another, for instance when a transmitter is located in each wing of the bridge, to bear in mind the last order given. In emergencies this is not always done, with the result that a confusion of orders ensues.

It has been proposed to overcome this difficulty in mechanical telegraphs by mechanically interconnecting all of the transmitters for synchronous movement. This is not wholly satisfactory however, in view of the tremendous effort which must be exerted upon the telegraph transmitter handle. In electric telegraphs it has been proposed to mechanically interconnect the transmitter handles to secure synchronous operation, but here again excessive transmitter forces are involved.

We have found that by associating with each self-synchronous transmitter motor, a clutch normally coupling it to its actuator handle, and drivingly connecting a reversible power motor to each actuator, and providing novel control and circuit means interconnecting all of the transmitter stations, any one of the several transmitter handles may be actuated to transmit an order and all of the remaining handles will promptly and automatically move through substantially the same angular distance, with the result that all of the transmitter stations, no matter where they may be located on the ship, indicate at all times the last order given to the engine room.

It is accordingly the major object of this invention to provide a signalling system in which any one of the several transmitter handles may be actuated to transmit an order, and all of the remaining transmitter handles will undergo an automatic follow-up motion, regardless of where they may be located.

Another important object is to provide a multi-transmitting-station signalling system, in which each self-synchronous transmitter motor functions at times to transmit the order, and at other times to cause its actuating handle to undergo

2

a follow-up action into positional agreement with the handles at the other stations.

A further object is to provide a novel follow-up mechanism for a ship's telegraph or the like embodying a power motor and a self-synchronous motor respectively driving the relatively rotatable parts of a commutator device, a circuit interconnecting the forward and reverse windings of the power motor so that whenever the contactor is disposed either side of a central insulated segment, the power motor will be rotated in the proper direction to bring about synchronism.

Further subordinate objects are to provide novel relay and circuit assemblies and a yieldable clutch of novel form embodying switch means for closing a circuit in response to predetermined yield and to devise further electric telegraph improvements and refinements.

Further objects will become apparent as the specification proceeds in conjunction with the annexed drawings, and from the appended claims.

In the drawings—

Fig. 1 is a schematic view illustrating a complete signalling system embodying the invention;

Fig. 2 is a vertical sectional view through one of the transmitter units of the invention;

Fig. 3 is a top plan view, with parts in section, of the transmitter shown in Fig. 2.

Fig. 4 is a diagrammatic view of the wiring diagram for the transmitter of Fig. 2; and

Fig. 5 is a view similar to Fig. 2, but illustrates a modified form of transmitter unit of the invention.

With continued reference to the drawings in which like reference characters have been employed to designate similar parts throughout the several views, and referring first to Fig. 1, the two transmitter units shown are of identically similar constructions, and therefore the same reference characters, with the subscript *a* will be employed to designate the parts of the second unit.

Taking up the first unit, a transmitter handle or actuator 11 is rigidly secured to a shaft 12 which is journaled in any suitable manner, and rigidly carries a disc 13. Shaft 12 terminates in a slotted end 14 which fits over a leaf spring 15 carried by two retainers 16 mounted on a disc 17 having a notch 18. Disc 17 is rigidly carried on the end of a shaft 19 which also carries a star wheel 21 and a drive gear 22.

When shaft 19 manifests sufficient resistance

to rotation, spring 15 will flex and permit a contactor 23 carried by disc 13, to engage one wall or the other of notch 18, and complete a circuit between slip rings 24 and 25 carried by shafts 12 and 19 respectively, brushes 26 and 27 transmitting the current in well known manner.

A roller 29 carried by a pivot arm 31 is urged by spring 32 into cooperation with the star wheel recesses in well-known manner. The star wheel is not absolutely essential to the invention, but is preferably employed to give the operator the "feel" of the rocked position of the handle.

Drive gear 22 meshes with a pinion 34 carried by drive gear 35 journaled in any suitable manner. Gear 35 meshes with a pinion 36 carried by shaft 37 of a reversible motor 38 having forward and reverse windings 39 and 41 which are automatically actuated in a manner to be hereinafter described, to achieve the proper follow-up action.

Shaft 19 also carries slip rings 42, 43, and 44 and terminates in a disc made up of a central insulated section 45 and two live segments 46 and 47. The disc also supports a spring-pressed solenoid unit 48 having a locking or clutching bolt 49 which is projectible into opening 51 in a disc 52 rigidly carried by a shaft 53. Shaft 53 is journaled in any suitable manner and also rigidly carries a slip ring 54 and a drive gear 55. Also carried by disc 52 is an arm 56 electrically connected to slip ring 54 and carrying a roller 57 at its free end which rides on the disc periphery and is engageable with the insulated and live segments in response to relative rotation of shafts 19 and 53. Preferably insulated segment 45 is comparatively narrow so that unless shafts 19 and 53 are in substantially exact angular agreement, contact will be made and the power motor operated to bring about synchronism.

Gear 55 meshes with a gear 59 carried by shaft 61 of a transmitter motor 62, the latter functioning both as a transmitter motor and a follow-up actuator motor, as will be hereinafter pointed out.

Transmitter handle 11 carries a pointer 63 cooperating with a dial (not shown in Fig. 1) on which the orders to be transmitted are carried. Also cooperating with the dial is a reply indicator pointer 64 carried by a sleeve 65 journaled on shaft 12 and rigidly carrying a gear 66. The latter meshes with a gear 67 carried by shaft 68 of a reply indicator motor 69.

In the engine room or the other point to which it is desired to transmit the message is also included a transmitter having a handle 71 carried by shaft 72 of a reply transmitter motor 73. Also cooperating with the reply instrument dial is a pointer 74 secured to a sleeve 75 which is journaled on shaft 72 and carries a gear 76. The latter meshes with gear 77 carried by shaft 78 of a reply indicator motor 79.

The several self-synchronous motors disclosed are of well-known type, embodying primaries energized by constant frequency alternating current and relatively rotatable secondaries connected in delta or Y to the secondaries of the motors at which it is desired to reproduce the transmitted motions.

We have shown a source of 110 volt 60 cycle alternating current at 81 and 82, the primaries of motors 62, 69, 73, and 79 being energized through branched pairs of lines 83, 84, and 85. The primaries of motors 62a and 69a are energized by way of lines 86 and 87 respectively.

The secondaries of transmitter motors 62 and

62a are connected to indicator motor 79 by two triple leads 88 and 89 respectively, so that pointer 74 will follow the motions of shafts 61 and 61a. The secondaries of indicator motors 69 and 69a are connected to the secondary of transmitter motor 73 by lines 91 and 92 respectively, so that indicators 64 and 64a will accurately follow the movement of reply transmitter handle 71.

Operatively associated with each transmitter unit is a relay 94 which is automatically actuated in response to predetermined yield of the yieldable coupling to place the remaining transmitters under control of the selected transmitter, in the manner to be now set forth, and bring about synchronous following of the other transmitter handles.

Solenoid 95 of the relay is energized by a line 96 from bus 81, a line 97 connected to brush 27 and thence through contact arm 23 and brush 26, a line 98 to bus 82.

Relay 94 embodies three blades 101, 102, and 103. Blade 101 is energized from bus 81 by means of a line 104 and coacts with a contact 105 which is electrically connected to a contact 106 coacting with blade 102. As seen in Fig. 1, a line 107 connects contacts 105 and 106 of one unit to contacts 105a and 106a of the other unit.

Blade 103 coacts with a contact 110 connected to bus 81 and also with a contact 108 connected by line 109 to the armature circuit of power motor 38. Blade 103 is connected to shunt brake winding 111 of the power motor, which as seen in Fig. 1 is in turn connected to a line 112 of the armature circuit and series brake winding 113 which is connected to bus 82 by a line 114.

Blade 102 is connected by line 115 to slip ring 44 which is connected to one side of solenoid 48. The other side of the solenoid is connected to slip ring 54 which in turn is connected by line 116 to bus 82. From the foregoing, it is apparent that whenever the relay is energized, blade 102 will move away from contact 106, while blade 101 will engage contact 105, thereby permitting solenoid 48 to remain deenergized, with its plunger 49 engaged in the recess of disc 52. At the same time line 107 is energized from bus 81 through line 104, which in turn through blade 102a and line 115a energizes solenoid 48a of the other unit, causing it to withdraw its plunger 49a from disc 52a in coupling shafts 19a and 53a.

Commutator segments 46 and 47 are electrically connected to slip rings 43 and 44 respectively, and the latter are connected by way of leads 117 and 118 to power motor fields 39 and 41 respectively. Accordingly whenever roller 57 is moved one way or the other off of insulated segment 45, it will energize field winding 49 or 41 and rotate the power motor in one direction or the other. Roller 57 is electrically connected to a slip ring 121 which in turn is connected to bus 81 by a lead 122.

Taking up the operation of the device, and assuming that the parts are disposed in the positions shown in Fig. 1, the relays are deenergized along with solenoids 48. The reply indicators 64 and 64a are also disposed in angular agreement with transmitter handles 11 and 11a showing that the order has been properly acknowledged by operation of reply transmitter handle 71.

With the parts in the positions just described, and assuming that it is desired to transmit an order by rocking transmitter handle 11 through say 30° clockwise, initial movements of the han-

5

dle through a few degrees flexes spring 15, in view of the resistance imposed by the reduction gearing interconnecting power motor 38 and shaft 19, together with the resistance of star wheel roller 29, and causes contact arm 23 to engage the right-hand wall of slot 18 in disc 17. This closes the relay solenoid circuit 96 and 97, and causes blades 101 and 103 to be pulled down into engagement with contacts 105 and 110. As previously pointed out, this causes solenoid 48 to remain deenergized and simultaneously through line 107, energizes solenoid 48a. Therefore the immediate result is to uncouple shaft 19a from shaft 53a, while leaving shaft 19 coupled to shaft 53.

Energization of the solenoid in the manner just described also through blade 103 and contacts 110 and 108, disconnects shunt wound brake coil 111 from its normal position across the armature, and is energized from bus 82 through series brake coil 113. Accordingly the brake of the power motor in the unit selected to transmit the signal is released.

With the parts in the condition just described, it is apparent that further movement of handle 11, through shaft 19 and solenoid plunger 49 produces rotation of shaft 53, and the latter through gears 55 and 59 produces an identically similar but opposite rotation of shaft 61. The latter through lines 88 and 89 produces identically similar rotation of shaft 61a of motor 62a and through gears 55a and 59a produces similar rotation of shaft 53a. Since shafts 19a and 53a are uncoupled through energization of solenoid 48a, roller 57a is moved off of its insulated segment on to live segment 47a which energizes field 41a and causes motor 69a to effect clockwise rotation of shaft 19a. It should be noted that whenever the power motor is energized from either one of the commutator segments, the series and shunt brake coils are energized, thus releasing the motor independently of operation of the relay unit. The power motor will remain energized as just described and will continue to rotate shaft 19 until the latter brings insulated segment 45a into contact with roller 57a, when the motor will stop and be automatically braked. We have found as a matter of actual practice that a rather quick acting power motor is desirable, and one which will achieve a rapid follow-up action, preferably one which will cause the handles of the other transmitters to lag only slightly behind the one which is being actuated. In other words, there is substantially no delay in rotating all of the transmitter handles into the proper position. During the foregoing operation, transmitter motor 62, through line 88, effects an identically similar rotation of motor 79 which through gears 77 and 76 rotates pointer 74 into the desired position, namely, 30° in clockwise direction. The engineer, upon noting the position of indicator 74 rocks his reply transmitter handle 71 through a similar angle to bring it into agreement with pointer 74. This, through shaft 72, motor 73, and line 91 causes indicator motor 69 to rotate through a similar angle. The latter through shaft 68, gears 67 and 66 and sleeve 65 rotates pointer 64 into agreement with transmitter handle 11, showing that the transmitted order has been properly acknowledged.

Assuming now that the parts have been returned to the positions illustrated in Fig. 1, and it is desired to transmit a signal by rotating transmitter handle 11a, the sequence of operations is identically the same as that just de-

6

scribed, except that in this instance relay blades 101a and 102a, and contacts 105a and 106a effect energization of solenoid 48, and maintain solenoid 48a deenergized. This causes shafts 19a and 53a of the transmitting instrument to remain coupled together, and uncouples shafts 19 and 53 of the other instrument. Also, it should be observed that transmitter motor 62a which is now driven in accordance with handle 11a, now functions as a transmitter motor, transmitting the order to lines 88 and 89 to both indicator motor 79 and transmitter motor 62 of the other instrument.

It is to be understood that while we have shown our invention as applied to a signalling system, utilizing only two transmitter stations, it may be readily applied to systems embodying three or more transmitting stations by merely duplicating the units disclosed, it merely being necessary to connect the secondaries of the respective self-synchronous transmitter and indicator motors together, and to connect the additional relays to line 107 so that when one transmitter handle is actuated, the declutching solenoids of the remaining transmitter stations will be energized.

In Fig. 2, we have shown one of the transmitter units as it is actually constructed in practice, it being observed that the major differences from the transmitter shown in Fig. 1 reside in arranging the parts to render the device sufficiently compact to fit into a transmitter housing (not shown).

As seen in Fig. 2, shaft 12 carries an anti-friction bearing 125 on which a flanged collar 126 is mounted. Pointer 64 is secured to the forward end of collar 126 by screws 127, and gear 66 is secured to its rear end by screws 128. Pointer 64 and gear 66 are accordingly mounted for free rotation with respect to shaft 12, and collar 126 and bearing 125 obviates the need for sleeve 65 of Fig. 1. Shaft 12 is journaled in hub portion 129 of a frame or base structure 131, having arms 132 supporting a dial 133 in cooperative relationship with pointer 64.

Referring now to Fig. 3, shaft 12, carrying handle 11, projects through a central opening in a window 135, which is operatively mounted in a frame 136 by clamp ring 137. The joint between the window and shaft 12 is sealed in any well known manner, as for instance by means of a flanged collar 138 and a gland nut 139. A nut 141 maintains the seal assembly in assembled relationship to the window. As seen in Fig. 2, pointer 63 carried by handle 11 also cooperates with dial 133.

Referring again to Fig. 2, shaft 19 is journaled in a tubular portion 143 of an upright extension 144 of frame 131, and the latter also has a second support 146 terminating in a bearing portion 147 in which shaft 53 is journaled.

Motor 38 is operatively supported by a pair of brackets 148 and 149 which are rigidly secured to support 144. The countershaft gearing, namely, pinion 34 and gear 35, are rigidly secured together and the unitary assembly is journaled on a shaft 151, which is supported by a bracket 152 also mounted on support 144. As shown in Fig. 2, disc 17 is integrally formed with star wheel 21, and the latter is rigidly secured to drive gear 22 by rivets 153. However, it is to be understood that these parts may be formed in other ways without departing from the spirit of the invention.

In Fig. 2 plunger 49 of solenoid 48 is illustrated as being resiliently urged into opening 51

of disc 52 by means of a leaf spring 155 carried by an arm 156 mounted on shaft 19, but if desired the solenoid may include a built-in compression spring for carrying out this function.

As seen in Figs. 2 and 3, self-synchronous motors 62 and 69 project through openings in support 144, and if desired any suitable auxiliary support means may be employed. The external casing for the unit may assume any desired form, depending upon the requirements of the particular installation, which is usually determined by the nature of the station aboard the ship where the instrument is to be located.

The various slip ring assemblies shown in Fig. 1 for facilitating an understanding of the invention have been omitted from Figs. 2 and 3 as it has been found that since none of the parts make a full rotation, ordinary flexible conductors can be successfully employed to connect the parts. Since such connections are well known in the art, they have been omitted from Figs. 2 and 3 to simplify the showing.

In Fig. 4 we have shown the schematic wiring diagram for the single unit shown in Fig. 2.

The wiring diagram is largely self-explanatory, it being observed that the walls of notch 18 of disc 17 are represented by two arrows, contact arm 23 closing the circuit when it is moved through a predetermined angle in either direction. Contact 57, which controls the follow-up action of the power motor may assume any well known form. In Figs. 1 and 4 it has been represented as a roller riding on the peripheries of segments 46 and 47, while in Fig. 2 it has been shown as a brush carried by a pocketed arm 161 on disc 52 and backed up by a compression spring 162.

With continued reference to Fig. 4, a terminal block has been diagrammatically illustrated at 162 and it is observed that power supply lines 81 and 82 terminate in binding posts 163 and 164 respectively. The secondaries of transmitter motor 62 terminate in binding posts 165, 166 and 167, while indicator motor 69 has its secondaries connected to binding posts 168, 169, and 171. Line 105 from the relay terminates in a binding post 172.

From the foregoing it is apparent that by connecting the binding posts of one transmitter to the corresponding binding posts of all of the other transmitters of the particular installation involved, all of the functions previously described will be carried out, it being particularly observed that when the binding posts 172 of the units are electrically connected, rocking transmitter handle of a selected unit will operatively clutch it to its transmitter motor and will declutch the other units from their transmitter motors.

The invention may also be applied to telegraph transmitters of the double-face type, and in Fig. 5 we have illustrated a device of this character. Inasmuch as many of the parts are identical or similar to parts of the constructions previously described, similar reference characters with the subscript b will be used to denote them.

With continued reference to Fig. 5, the device embodies a pair of shafts 12 and 12b carrying transmitter handles 11 and 11b respectively, which are journaled for rocking movement in any desired manner. In this instance, indicator pointers 64 and 64b cooperate with dials 133 and 133b, the latter being carried by studs 175 and 175b supported from vertical frame members 176 and 177. The latter are rigidly secured to each

other by cross members 179, to provide a rigid unitary frame structure.

In this instance motor 38b is supported by frame member 176 and is reversed end-for-end, with its pinion 36b meshing with a gear 35b carrying an integral pinion 34b. The unitary pinion and gear are pinned to a shaft 181 which is journaled in a pair of ball bearings 182 carried by frame member 177. Pinion 34b meshes with a gear 22b rigidly carried by a central shaft section 19b which is journaled in ball bearings carried by frame members 176 and 177.

It should be particularly observed that in this form of the invention shaft 19b extends from one unit to the other and rigidly carries the contact making discs 17 and 17b at its opposite ends, with the result that upon rocking either shaft 12 or 12b of one of the transmitters, contact finger 23 or 23b will engage the walls of the notch 18 or 18b in its disc 17 or 17b, and energize the solenoid 48b of the other transmitters, and withdraw plungers 49b from their openings in discs 52b. By reason of the wiring connections previously discussed, plunger 49b of the selected transmitter remains coupled to disc 52b when the relay is operated, with the result that the latter is rotated directly in accordance with handle 11 or 11b, whichever one happens to be actuated, because either finger 23 or 23b is operable to actuate the relay.

In this form of the invention it will be observed that shaft 53 has been eliminated. Disc 52b in this instance is rigidly secured to gear 55b and the assembly is mounted for rotation on a bearing 184 carried by shaft 19b. Gear 55b meshes with gear 59b of transmitter motor 62b, so that motor 62b will exactly follow rotation of shaft 19b irrespective of whether it is rotated by handle 11 or 11b. Accordingly, as contact shoes 57 of the other units are rotated by their discs 52b, their power motors 38b will be rotated in the proper directions to bring their shafts 19b, and consequently their transmitter handles 11 and 11b, into synchronism with the position of the handle of the selected transmitter.

As seen in Fig. 5 gear 55b meshes with gear 59b of transmitter motor 62b, the latter being disposed behind indicator motor 69b. The latter is, in this form of the invention, a double-shafted motor, one of the shafts 68 driving gear 67. Gear 66 meshing with gear 67 actuates pointer 64 in the manner previously described. The other shaft 68b of motor 62b drives gears 67b and 66b, and the latter drives the pointer 64b associated with dial 133b.

The structure of Fig. 5 accordingly provides a double-face transmitter in which the parts are so related in novel manner that single indicator, transmitter, and power motors are used and yet all the highly desirable functions discussed in conjunction with the other forms of the invention may be effectively carried out.

From the foregoing detailed disclosure, it is apparent that we have provided a signalling system of novel form embodying a plurality of transmitting stations and in which any one of the several transmitter handles may be operated to originate the signal, and all the remaining transmitter handles will promptly undergo an automatic follow up action through a like angular distance. A device is accordingly provided in which the last order transmitted to the engine room or other remote point, may be immediately ascertained by observing the position of any one of the transmitter handles.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced thereby.

What is claimed and desired to be secured by United States Letters Patent is:

1. In a signalling system having at least two handle-operated self synchronous transmitter motors operatively connected to a self-synchronous indicator motor, a power motor drivingly connected to each transmitter handle; circuit means operably interconnecting said transmitter motors and said indicator motors; and follow-up means, automatically operable when one transmitter handle is rocked through a predetermined angle, for causing the power motor of the other transmitter handle to rock the latter through substantially similar angles, said follow-up means embodying clutch means, automatically energized by said circuit means, to cause said one transmitter handle to be coupled to its self-synchronous transmitter motor, and to uncouple the remaining transmitter handles from their self-synchronous transmitter motors.

2. In a signalling system embodying a plurality of transmitting stations and at least one receiving station and a self-synchronous transmitter motor and a manually operable actuator at each transmitting station and a self-synchronous receiver motor at each receiving station; clutch means normally coupling each actuator to its transmitter motor; a power motor drivingly connected to each of said actuators; circuit means operably interconnecting said transmitting and receiving stations; and control means, automatically operable incident to rocking of one of said actuators through a predetermined angular distance for causing said clutch means to uncouple the remaining actuators from their transmitter motors, said control means also being operable to cause the power motors of said uncoupled actuators to rotate the latter angular distances substantially equal to the travel of said one actuator.

3. The signalling system defined in claim 2, wherein each of said power motors is connected to its actuator by means of an angularly yieldable coupling, and said control means comprises switch means, automatically operable in response to predetermined angular yield of said coupling, for disengaging the other actuators from their transmitter motors when said actuator is operated.

4. The signalling system defined in claim 2, wherein said clutch means comprises a plunger adapted to be drivingly engaged by spring means, and solenoid means for moving said plunger into declutched position against the action of said spring means.

5. In a signalling system embodying a plurality of transmitting stations and at least one receiving station, each transmitting station comprising an actuator; a reversible power motor drivingly connected to said actuator through a yieldable coupling; a self-synchronous transmitter motor; coupling means normally connecting said transmitter motor to said power motor; a

solenoid operable to release said coupling when it is energized; circuit means connecting several of said transmitting and receiving stations together; and control means, automatically operable incident to rocking of one of said actuators, and in response to predetermined yield of its yieldable coupling, to energize the solenoids of the other actuators and uncouple their transmitter motors from their power motors.

6. The signalling system defined in claim 5, wherein each of said power motors is provided with a normally engaged brake, and movement of any one of said actuators is operable to release the brake of its power motor.

7. In a selectively operable electrical apparatus, a plurality of self-synchronous transmitter motors operatively connected to at least one self-synchronous indicator motor; a manually operable actuator for rotating each of said transmitter motors in either direction; power means for driving each of said actuators in either direction; and follow-up means, automatically operable when one transmitter motor is manually rocked through a predetermined angle in either direction, for causing the power motors associated with the other transmitter motors to rock the latter in the same direction through substantially similar angles.

8. In a signalling system embodying a plurality of transmitting stations and at least one receiving station, each transmitting station comprising an actuator; a power motor; a yieldable coupling interconnecting said motor and said actuator and embodying switch means which is normally open but is adapted to close in response to predetermined yield of said coupling; a self-synchronous transmitter motor; an electrically operated coupling between the latter and said actuator; relay means; and circuit means operably interconnecting said transmitting and receiving stations; and including connections between the relay, the electrically operated coupling and the switch means of each transmitting station, said circuit means being operable, when one of said actuators is operated, to energize said relay means and actuate said electrically operated coupling and couple said one actuator to its self-synchronous transmitter motor and to uncouple the other actuators from their self-synchronous transmitter motors.

9. In a signalling system embodying a plurality of transmitting stations and at least one receiving station, each transmitting station comprising a self-synchronous transmitter motor adapted to be rotated in accordance with the motion to be transmitted; a power motor having forward and reverse windings; a shaft member driven by each of said motors, said shaft members being disposed in adjacent coaxial relationship; a commutator comprising a pair of circumferentially spaced segments carried by one of said members and electrically connected to the two windings of said power motor; a contact device carried by the other of said members and operable to ride over said commutator segments, and to dwell therebetween when the motors are in synchronism; and means for supplying electrical energy to said contact device and the other sides of said windings; and means, automatically operable incident to movement of one of the transmitter motors, to deenergize the contact devices and the motor windings of the other transmitting stations.

10. The signalling system defined in claim 9, wherein the power motor of each of said trans-

11

mitting stations includes a normally engaged electrically actuated brake, and said contact device is operable to disengage said brake whenever it engages either of said commutator segments.

11. In a signalling system, a plurality of transmitting stations and at least one receiving station, each transmitting station comprising a self-synchronous transmitter motor disposed in cooperative relationship with a manually rockable actuator mounted for bi-directional rotation; a follow-up mechanism including a power motor at each station; and control means, automatically operable incident to manual rocking of the actuator of one of said transmitting stations in either direction to cause it to be mechanically coupled to its transmitter motor for synchronous rocking movement therewith, said control means also being operable to cause the power motors of the follow-up mechanisms at the other transmitting stations to rock their actuators in the same direction through angular distances substantially equal to the travel of said one actuator.

12. The signalling system defined in claim 11, wherein said follow-up mechanism is operable to couple all of said transmitter motors to their actuators when all of the latter are at rest.

13. In a signalling system having at least two handle-operated self-synchronous transmitter motors operatively connected to a self-synchronous indicator motor, said handles being operable to rotate said motors in both directions into a plurality of selected signalling positions, a power motor drivingly connected to each transmitter handle; circuit means operably interconnecting

12

said transmitter and said indicator motors; and control means, including means for causing rotation of one of said handles through a predetermined angle in one direction to effect substantially similar angular rotation of its transmitter motor in the same direction, said control means also including follow-up means, operably associated with each of said transmitter motors and controlled automatically in accordance with rotation of said one transmitter motor, for causing the remaining transmitter motors to so control their associated power motors as to effect angular rotation of their handles through said predetermined angle in said one direction.

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