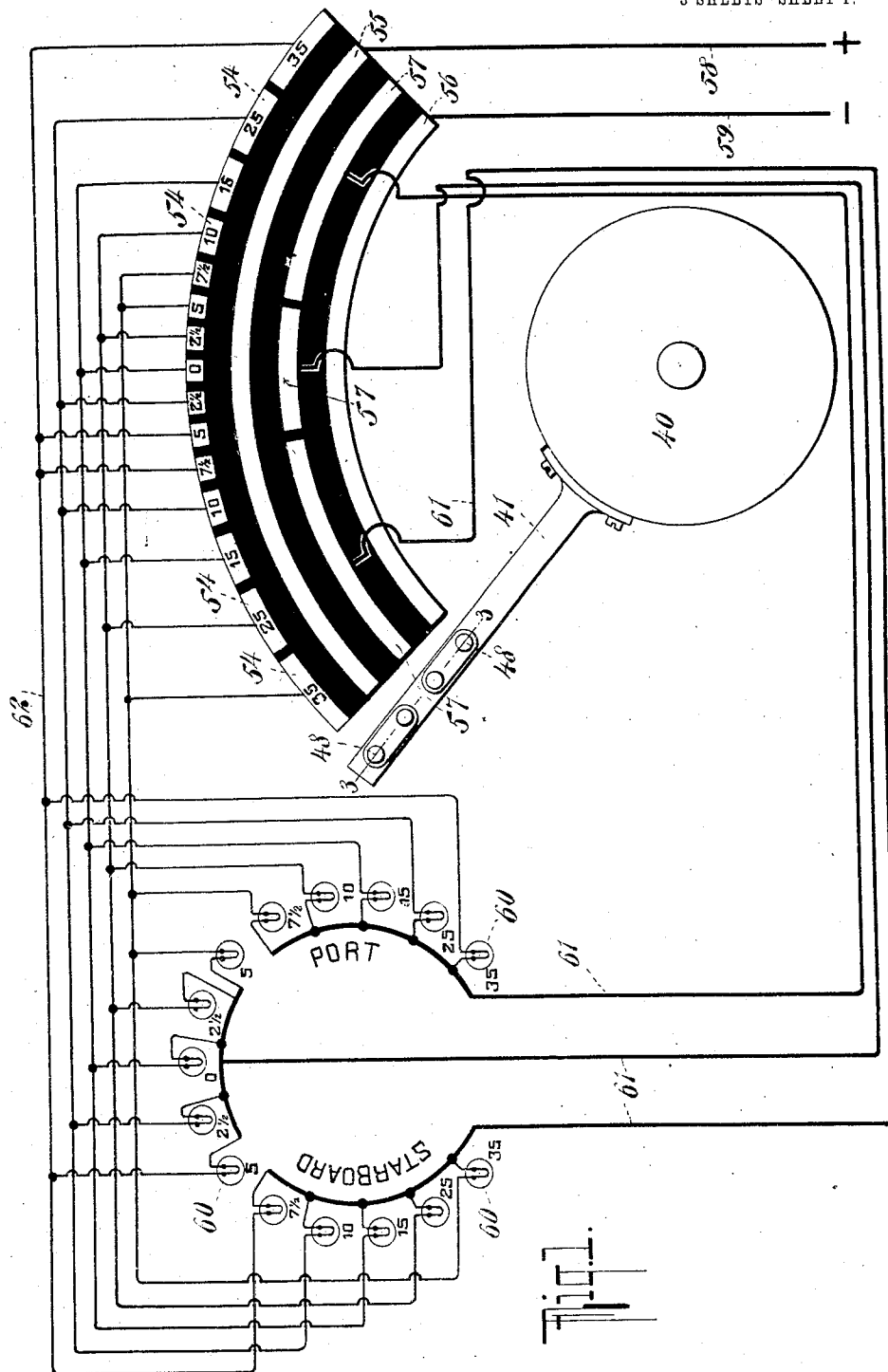


No. 823,164.

PATENTED JUNE 12, 1906.

G. S. EBLE.
ELECTRIC INDICATOR.
APPLICATION FILED AUG. 7, 1905.

3 SHEETS—SHEET 1.



WITNESSES:
Julius H. Lutz
John Lotka

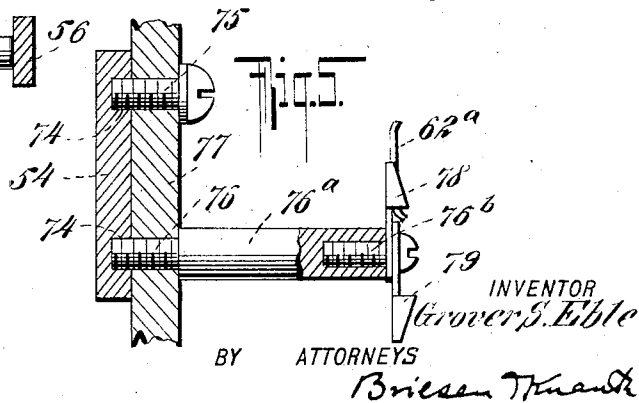
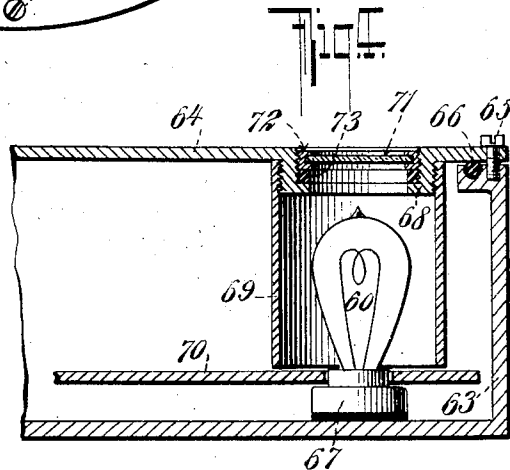
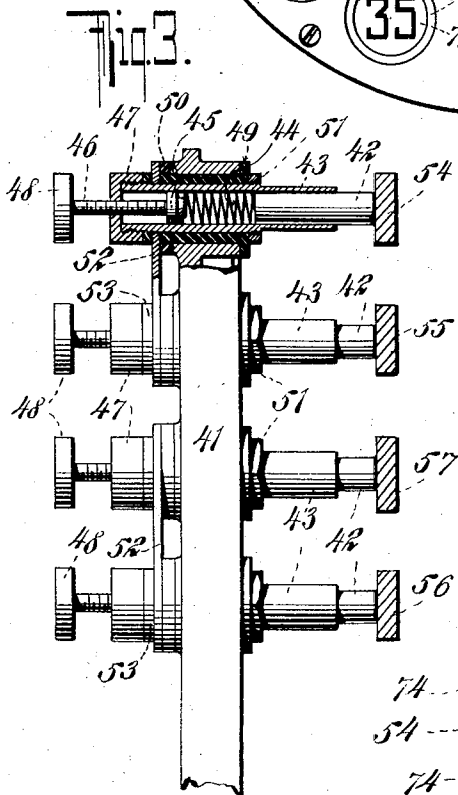
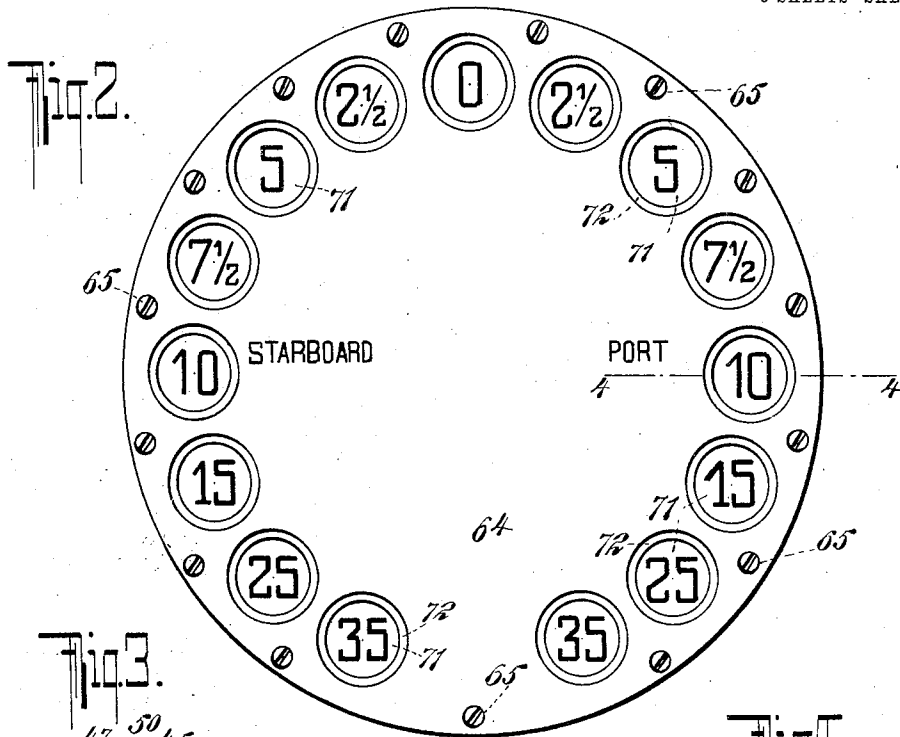
INVENTOR
Grover S. Eble
BY ATTORNEYS
Briesen & Knauff

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3 SHEETS—SHEET 2.



WITNESSES:
Julius H. Schatz
John Lotka

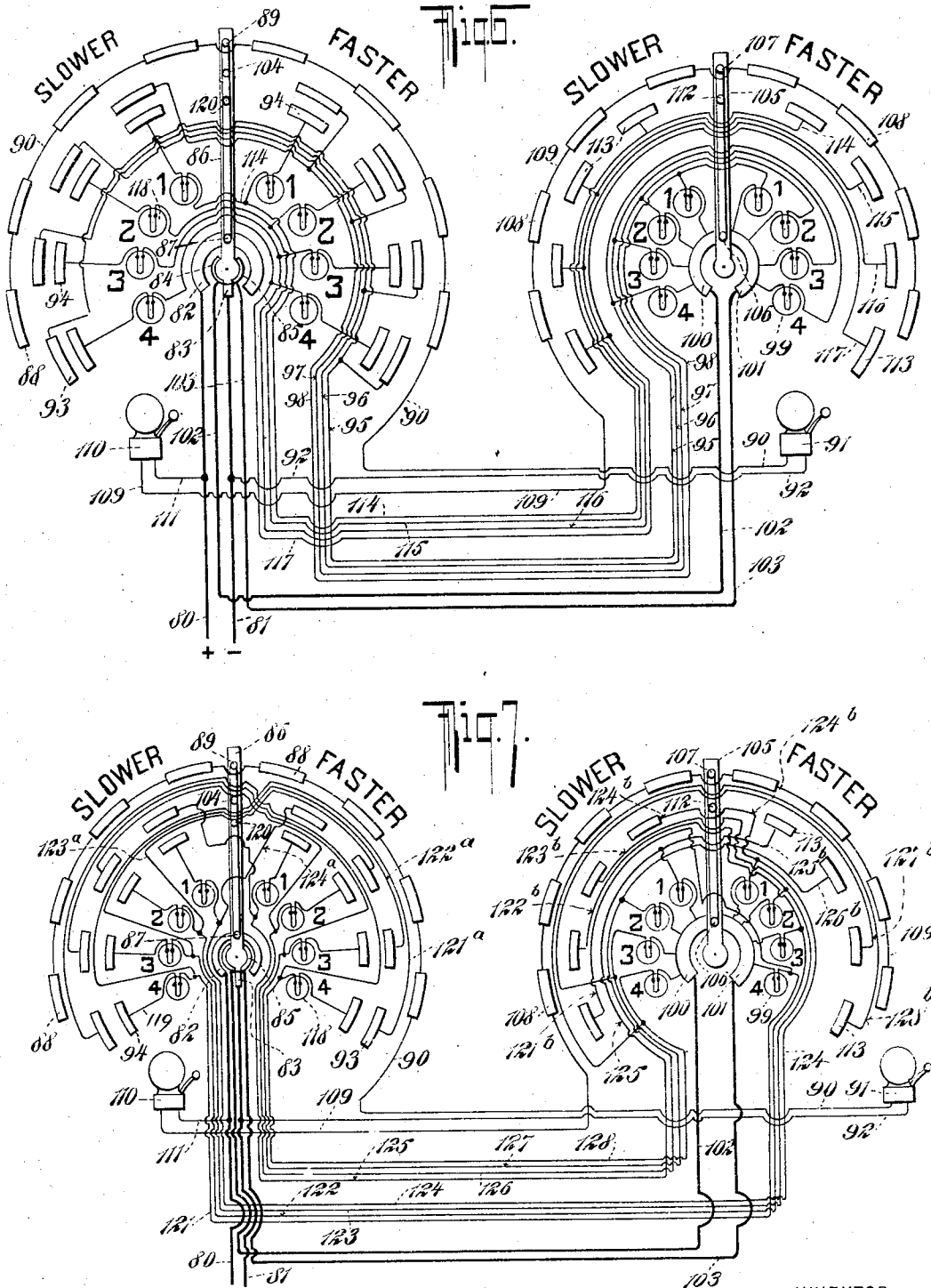
INVENTOR
Grover S. Eble
BY ATTORNEYS
Briese & Thum

No. 823,164.

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G. S. EBLE.
ELECTRIC INDICATOR.
APPLICATION FILED AUG. 7, 1905.

3 SHEETS—SHEET 3.



WITNESSES:
Julius B. Fritz
John L. Latta

INVENTOR
Grover S. Eble
BY ATTORNEYS
Bresen & Kuantz

UNITED STATES PATENT OFFICE.

GROVER S. EBLE, OF NEW YORK, N. Y.

ELECTRIC INDICATOR.

No. 823,164.

Specification of Letters Patent.

Patented June 12, 1906.

Application filed August 7, 1905. Serial No. 272,987.

To all whom it may concern:

Be it known that I, GROVER S. EBLE, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Electric Indicators, of which the following is a specification.

My invention relates to electrically-operated devices for indicating at a distance the position of movable parts—as, for instance, the position of a ship's rudder or the position which is given a handle in order to transmit orders to the engineer of a steamship, particularly a man-of-war. While devised especially for use on board ships, my invention obviously will be applicable wherever it is desired to transmit intelligence to a distance. The object of my invention is to simplify apparatus used hitherto for the purpose named and, above all, to reduce the number of wires or electrical connections required.

I will now proceed to describe in detail three applications of my invention and will then point out its novel features in the appended claims.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is a diagram of a helm-indicator embodying my invention. Fig. 2 is a face view of the indicator proper or what may be termed the "receiver" of the electrical apparatus. Fig. 3 is a sectional view of part of the transmitter, the contact-maker, taken substantially on line 3 3 of Fig. 1. Fig. 4 is a detail section of the receiver on line 4 4 of Fig. 2. Fig. 5 is a detail view of the transmitter. Fig. 6 is a diagram of an engine-telegraph embodying my invention, and Fig. 7 is a diagram showing another form of engine-telegraph.

In Figs. 1 to 5 I have represented a helm-indicator constructed according to my invention. 40 designates the rudder-post, with which is connected an arm 41, extending forward in the construction shown and carrying four contact-making members adapted to cooperate with certain stationary contact-segments to transmit the current to the proper parts of the receiver located at the bridge, pilot-house, conning-tower, or wherever it is desired to have the position of helm indicated. The contact-making members are shown in detail in Fig. 3, each of them comprising a carbon rod or block 42, which is fitted within a metal tube 43 and pressed by a

spring 44 toward the contact-segment. The other end of the spring bears against a plunger or follower 45, adjustable by means of a screw-rod 46, to which the plunger is secured. This rod screws in a cap 47, which is screwed on the end of the tube 43 opposite to that from which the carbon 42 projects. The rod 46 has a milled head 48 for turning it. The tube 43 is fitted in an insulating-sleeve 49, set in a through-opening of the arm 41. The sleeve 49 is held in place by a nut 50 and the tube 43 by a nut 51 on one side. Between the inner end of the cap 47 and the sleeve 49 a conducting-strip 52 engages the tube 43 and extends to the adjacent contact-making member, where it is similarly engaged. Washers 53 may be located, if desired, between the cap 47 and the conducting-strip 52. It will be understood that the two inner or lower carbons 42 are electrically connected through the medium of a strip 52, and so are the two outer or upper carbons; but one set is absolutely insulated from the other.

Corresponding to the four contact-making members and in the paths of the carbons 42 are four sets or arcs of contact-segments. The outermost set comprises a series of segments 54 of varying lengths, according to the angles it is desired to indicate, the usual angle indications for helm-indicators being "0°," "2½°," "5°," "7½°," "10°," "15°," "25°," and "35°." The second and the innermost carbons 42 are adapted to engage a single continuous segment 55 and 56, respectively. The third arc is formed by a plurality of segments 57, the spaces between which should be in line (radially) with the intervals between certain of the outer segments 54, as will be fully explained presently. The segments 55 and 56 are connected, as by wires 58 and 59, with the terminals of a dynamo or other source of electricity. The other two sets of segments 54 and 57 are connected with the receiver.

In principle the receiver comprises as many signal devices—for instance, incandescent electric lamps 60—as there are segments 54, these signals being arranged in as many groups as there are segments 57. All of the lamps of one set have one terminal connected with the same one of the three return-wires 61, leading to the respective segments 57. The central segment 57, which corresponds in extent (in degrees) to the five central segments 54, is connected with five lamps 60 by

one of the wires 61, these five lamps being connected with said five segments 54 in the manner to be stated presently. Similarly each of the two end segments 57 corresponds to or registers with five of the outer segments 54, and the five lamps connected with these outer segments are connected by one of the return-wires 61 with the corresponding segment 57.

10 The connection of the segments 54 with the terminals of the lamps 60, opposite to those connected with the wires 61, is effected by section-wires 62, of which there are one-third as many as there are lamps and segments, or, 15 in other words, with the same number of lamps (five) in each set, there are as many wires 62 as there are lamps in one set. The inclusion of the same number of lamps in each set is preferred, as this allows of the greatest 20 economy in the number of return-wires. The adjacent end segments 54 of two different groups or sets and the corresponding lamps are connected with the same wire 62, as are also the segment 54 at the opposite end of the 25 third group and the lamp corresponding to such segment. Thus in the arrangement illustrated by Fig. 1 the gap occurs between the two lamps marked "5°" and "7½°," respectively, and it will be seen that the two 30 lamps adjacent to the gap and the lamp marked "35°" of the third group or set are connected with the same wire 62, and the same thing is true, of course, of the three corresponding segments 54. Similarly the lamps marked 35 "2½°" and "10°" of two adjacent sets and the lamp marked "25°" of the third set are connected with the same wire 62, and so on—that is, those lamps of adjacent sets which are at the same distance from the gap intervening between said two sets are connected with the same wire 62. This rule of course applies 40 only when the arrangement of the lamps at the receiver is the same as the arrangement of the corresponding segments 54. I prefer this arrangement, which has been shown in the drawings.

The details of the receiver are shown in Figs. 2 and 4. Said receiver comprises a box 63, having a suitable cover 64, held down by 50 screws 65, a washer 66 being employed at the joint. Upon the back of the casing are located a series of receptacles 67, adapted to receive the lamps 60. In registry with each of the lamps 60 the cover 64 is provided with 55 an opening and a short screw-threaded sleeve 68, which receives a tube 69, surrounding a lamp 60 and forming a screen therefor. The ends of the tubes 69 fit close to a partition 70. Each of the openings of the cover is preferably 60 designated in some suitable way—as, for instance, by means of the transparent disk 71—which bears a numeral, such as shown in Figs. 1 and 2, such disk being held in a ring 72, screwed inside the sleeve 68 and bearing 65 against the washer 73. This simple construc-

tion of the receiver enables every part thereof to be readily removed for repairs or renewal.

In Fig. 5 I have shown in detail the preferred way of securing the segments 54, 55, 56, or 57 to the base carrying them. 54 indicates one of the contact-segments, having a smooth face on that side which is adapted to be engaged by the carbon 42 and provided on the other side with two or more screw-threaded recesses 74, adapted to receive one end of 75 screws 75 and 76, respectively, which extend through the base or support 77. The screw 76 has an enlarged portion 76^a tapped to receive a screw 76^b, which fastens a wire-holding terminal 78, connected by a wire 62^a with 80 a corresponding wire-holder on the other segment 54, which is to be connected therewith. A second wire-holding terminal 79 is also applied to the screw 76 to connect it either with the third segment of the three that are con- 85 nected, as hereinbefore described, or with the line-wire 62. It will be seen that two of the three connected segments 54 will require two wire-holding terminals 78 79, while for the third segment one such terminal will be suffi- 90 cient.

The operation of my improved helm-indicator will now be readily understood. Let us assume that the position of the rudder is such as to cause the arm 41 with its carbons 54 to stand in line with the left-hand segment 54, marked "7½°" in Fig. 1. The current will then pass from the positive wire 58 to the contact-segment 55, the corresponding carbon 42, the outermost carbon 42, the segment 54, 100 marked "7½°," the corresponding section-wire 62, the lamp marked "7½°" at the left-hand side, the return-wire 61, corresponding to said set, the left-hand segment 57, the carbon 42 in contact therewith, the innermost 105 carbon 42, the innermost segment 56, and the negative wire 59. This will cause the lamp marked "7½° starboard" to be lighted. Inasmuch as the contact-arm 41 extends forward from the rudder-post in the construction shown, it will be obvious that the position of said arm is contrary to the position of the helm—that is, a position of the arm 41 to the left, as shown in Fig. 1, or a port position 115 of said arm will correspond to the starboard position of the helm—and therefore all the lamps connected with the left-hand half of the segments 54 will indicate starboard positions of the helm. In case the contact-arm 41 should be differently arranged, the connection will be properly altered, so that the right lamps will be lighted for each position. In passing from one segment 54 to another the outermost carbon 42 will temporarily engage two such segments, and consequently 120 two lamps will be lighted, thus showing that the position of the helm is exactly between two of the indications. In passing from one segment 57 to the other the return-circuit will be thrown from one wire 61 to the next. If 130

it were attempted to use a single return-wire instead of the three wires 61, this would cause the three lamps which are connected with the same section-wire 62 to be lighted together whenever the outer carbon 42 would be in contact with one of the three segments 54 corresponding to said lamps. The apparatus would therefore give no reliable indication. With the division of the lamps into groups and the use of a separate wire 61 for each group only one lamp will be lighted at a time, except in cases where the carbon 42 engages two adjacent segments 54, and in such cases the lighting of two adjacent lamps will cause no confusion, since it will mean that the position of the helm is exactly between the two indications. It will be observed that while there are fifteen lamps only eight wires are required for making the necessary connections between the transmitter and receiver parts of the apparatus.

I will now describe the application of my invention to a so-called "engine-telegraph"—that is, a device for enabling orders to be sent from the bridge or other place to the engine-room for the faster or slower running of the engine and for enabling the engineer to give an answering signal, showing that he has understood the order.

The apparatus also, therefore, comprises two separate parts, each of which, however, answers at different times as a receiver and as a transmitter. In Fig. 6, 80 and 81 indicate the main wires connected with the source of electricity. At the ordering instrument the wire 80 is connected with a stationary segment 82, and the wire 81 is connected with a stationary carbon contact 83, which in the normal position engages both of two segments 84 and 85, secured to a lever 86, but insulated from each other. The lever 86 carries four carbon contacts, which may be constructed in detail in the same manner as shown in Fig. 3 and described with reference thereto, except that all of these carbon contacts are electrically connected with each other, but insulated from the segments 84 and 85. The inner carbon contact 87 is always in engagement with the segment 82. The other three carbon contacts on the lever are normally out of engagement with the segments with which they are adapted to make contact. The outer arc of segments 88 is adapted to be engaged by the outer carbon 89, said segments being spaced from each other, but electrically connected, as shown. A wire 90 leads from this outer set of segments at the bridge to one terminal of the call-bell or other signal 91, located at the engine part of the apparatus, the other terminal of said signal being connected by a wire 92 with the main wire 81. It will thus be seen that as soon as the contact-carbon 89 engages one of the segments 88 the current will pass from the main 80 to the segment 82, carbon 87,

carbon 89, contact-segment 88, wire 90, signal 91, and wire 92 to the main 81, thus operating the signal 91 in the engine-room and calling the engineer's attention to the fact that an order is about to be given. The two inner arcs of segments 93 and 94 are arranged so as to be in the spaces radially between the outer segments 88. The segments 93, of which there are eight, as shown in the example—that is, as many as the number of indications to be transmitted—are arranged in two groups and are connected with four section-wires 95, 96, 97, and 98, respectively—that is, two segments 93 are connected with the same wire. One of the groups containing four segments 93 is for transmitting orders for reducing speed, and the other group, which is shown at the right, is for transmitting orders for the increase of speed. The rule as to the connection of said segments is that two segments of different groups, which are at the same distance from the gap separating the groups, should be connected with the same section-wire. Thus the two segments 93 adjacent to the gap are connected with the wire 98. The next two segments are connected with the wire 97, while those farthest away from the normal position of the lever 86 are connected with the wire 95. At the other part of the apparatus in the engine-room the wires 95, 96, 97, and 98 are connected with two groups of lamps 99, bearing suitable indications corresponding to the "Slower" and "Faster" indications of the sending or transmitting apparatus. These lamps are connected with the four section-wires just mentioned, in accordance with the same rule which has been set forth concerning the connection of the segments 93 of said wires—that is, lamps which are at the same distance from the gap separating the two groups are connected with the same section-wire. The other terminals of the lamps 99 are connected with two segments 100 and 101, each corresponding to one of the groups of lamps. These segments 100 and 101 are connected by return-wires 102 and 103, respectively, with the segments 84 and 85, respectively, on the lever 86. The segments 93 are adapted to be engaged by the carbon 104.

Supposing the captain or officer in charge desires to send an order to increase the speed according to indication 1. He then moves the lever 86 over to the right until the carbon 104 engages the first segment 93 of the group marked "Faster." The initial movement of the lever sounds the alarm or signal 91 in the engine-room, as has been described above. As soon as the carbon 104 engages the segment 93 above mentioned the following circuit is closed from the main 80 to segment 82: carbon 87, carbon 104, segment 93, section-wire 98, that lamp 99 of the right-hand group which bears the numeral 1, segment 101, return-wire 103, segment 85, carbon 83, and

main 81. The lamp 1 of the "faster" group is thus lighted, giving the engineer the desired order.

In order that the engineer may be able to give an answering-signal, the following additional parts are provided: In the engine-room is located a lever 105, carrying a carbon contact 106, which in the normal position of the lever engages both of the segments 100 and 101. The lever also carries another carbon contact 107, adapted to engage a series of spaced but electrically-connected segments 180, which correspond in arrangement and function to the segments 88 of the ordering apparatus. The segments 108 are connected by a wire 109 with one terminal of a bell or signal 110, the other terminal of which is connected by a wire 111 with the main 80. Thus whenever the engineer brings the contact-carbon 107 on one of the segments 108 a circuit will be closed as follows: from the main 80 to the wire 111, signal 110, wire 109, one of the segments 108, carbon 107, carbon 106, segment 100 or 101, according to the position of the lever 105 to the left or right, return-wire 102 or 103, respectively, segment 84 or 85, respectively, carbon 83, and main 81. The signal 110 at the bridge is thus operated to call the attention of the officer in charge.

The lever 105 carries a further contact-carbon 112, electrically connected with the two contact-carbons 106 and 107 and adapted to engage a series of segments 113, arranged in two groups and disposed out of line with the segments 108, so that the lever 105 shall not connect with the segments 108 and 113 at the same time. The segments 113 are connected with four section-wires 114, 115, 116, and 117, according to the same rule which has been explained hereinbefore—that is, segments of the two groups which are at the same distance from the gap separating the groups are connected with the same section-wire. The wires 114, 115, 116, and 117 lead to the ordering apparatus and are connected with two groups of lamps 118, arranged to light proper dials or indications, as shown, each wire being connected with two lamps, which are at the same distance from the gap separating the two groups of lamps. The other terminals of said lamps 118 are connected by wires 119 with the third set of segments 94, arranged in positions corresponding to the segments 93 and adapted to be engaged by the fourth contact-carbon 120 upon the lever 86.

The operation of this part of the apparatus is as follows: Suppose the lever 86 has been moved over to stand over the lamp 118 at the right-hand side marked "1," so as to make contact between the carbons 104 and 120 and the respective segments 93 and 94. This will ring the bell 91 and give the proper signal by lighting one of the lamps 99, as pre-

viously set forth. Then when the engineer moves the lever 105 over the lamp 99 just lighted this will first cause the bell 110 to be rung and will then close the following circuit upon engagement of the carbon 112 with the segment 113, which is in line with the lighted lamp, it being understood that the lever 86 is left in the position to which it has been shifted to give the order: main 80, segment 82, carbon 87, carbon 120, segment 94, that lamp 118 of the right-hand group which is marked "1," section-wire 114, the first segment 113 of the right-hand group, carbon 112, carbon 106, segment 101, return-wire 103, segment 85, carbon 83, and main 81. Thus at the bridge the lamp 118 of the right-hand group marked "1" will be lighted, thereby showing to the officer that his order has been understood. The officer will then move the lever 86 back to its original position, and similarly the engineer will bring the lever 105 to its normal position. If this latter operation were not performed, the carbon 106 would be in contact with only one of the segments 100 or 101, and one side of the apparatus in the engine-room would not respond to any signal intended to be given through the contact 104 and segments 93.

The call apparatus constituted by the bell 91 will, however, work in any event, so that if the bell 91 rings and no lamp 99 is lighted the engineer will know that the lever 105 is not in its proper normal position and will restore it to such position.

It is to be understood that the connection of the carbon 83 with either of the segments 84 or 85 is to be broken before connection is made between the carbon 104 and the first lamp-segment 93. Similarly the connection of the carbon 106 with either of the segments 100 or 101 is to be broken before the carbon 112 engages the first segment 113.

In the form of engine-telegraph shown in Fig. 7 the arrangement of the call apparatus, the levers 86 and 105 and the contacts carried thereby, the signal-lamps, the return-circuits, and the segments 93, 94, and 113 is exactly the same as in Fig. 6. The difference lies entirely in the connection of the lamps and segments with the section-wires. At the ordering apparatus (shown at the left hand) each of the lamps 118 has its individual section-wire, such wires being numbered from 121 to 128. Each of these section-wires is connected by a wire designated by the same numeral, with the addition of the index α , with that segment 93 of the other group which is at the same distance from the gap separating the two groups. This branch connection, as shown, is made between the lamp and the line and not between the lamp and the corresponding segment 94.

At the engine apparatus (shown at the right in Fig. 7) each of the lamps 99 has its outer terminal connected with the said sec-

tion-wires 121 to 128, respectively, each lamp being connected with one section-wire. Each of the said section-wires is also connected by a branch wire, starting off before the lamp is reached, with that segment 113 of the other group which is at the same distance from the gap separating the two groups as the said lamp. These branch wires are designated as 121^b and so on. The operation of this form of my invention is as follows: Supposing the lever 86 is swung to the right, so as to stand over the lamp 1 of the faster group. This will first ring the bell 91 in the same manner as described with reference to Fig. 6. Then as soon as the carbon 104 reaches the segment 93 which is in alinement with the said lamp 1 the following circuit is closed: main 80, segment 82, carbon 87, carbon 104, segment 93, wire 124^a, section-wire 124, the lamp 1 of the faster group at the engine apparatus, segment 101, return-wire 103, segment 85, carbon 83, and main 81. This will therefore cause the lamp 1 of the faster group to be lighted at the engine apparatus. Then in order to inform the officer that the order has been understood the engineer will swing the lever 85 to the right until it stands over the lighted lamp. During such movement the bell 110 will be rung, as previously described, and then upon the carbon 112 coming in contact with the first segment 113 the following circuit will be closed, it being understood that the lever 86 at the ordering apparatus still stands over the lamp 1 of the faster group: main 80, segment 82, carbon 87, carbon 120, segment 94, lamp 1 of the faster group, section-wire 125, segment 113, carbon 112, carbon 106, segment 101, return-wire 103, segment 85, carbon 83, and main 81. It will be seen that each of the section-wires 121 to 128 is connected with one lamp at the ordering apparatus and at the engine apparatus with that segment which corresponds in position with said lamp. Furthermore, at each of the said apparatus each section-wire is connected not only with a lamp, but with a segment 93 or 113, respectively, belonging to the other group and located at the same distance as the said lamp from the gap separating the two groups.

While I have described the application of my invention to a helm-indicator and to an engine-telegraph, it will be understood that it is applicable to other apparatus on board ship, such as a so-called "steering-telegraph," or generically to any electric apparatus for transmitting to a distance intelligence or information concerning orders to be given, the position of some movable part, or like purpose.

In regard to the division of the signals into groups each of which has its separate return-wire I desire to explain that the rule for obtaining a minimum of line-wires (which term includes section-wires and return-wires) con-

sists in extracting the square root of the number of signals and making the number of groups and the number of signals in each group as nearly as possible equal to such square root. For instance, in the apparatus illustrated by Fig. 1 there are fifteen signals. The square root of fifteen lies between three and four. I have accordingly arranged the signals in three groups of five each. The number of wires would of course be the same if the signals were arranged in five groups of three each; but it is preferable to reduce the number of return-wires as far as possible, and therefore the arrangement of three groups of five each has been selected. Similarly, in Figs. 6 and 7 there are eight signals. The square root of eight lies between two and three. Accordingly the lamps have been arranged in two groups of four each, thus obtaining two return-wires. The number of groups is therefore determined by the square root of the number of signals. This is done at least when it is desired to reduce the number of wires to an absolute minimum in accordance with my invention. The ordinary arrangement requires a separate section-wire for each signal and a common return-wire for all—that is, a number of line-wires which is equal to the number of signals plus one. With my invention the number of line-wires is reduced to little more than twice the square root of the number of signals and in some cases to exactly twice the square root, (when the number of signals is an exact square.)

I claim as my invention—

1. An electric apparatus for indicating the position of a movable part at a distance, comprising a transmitter and a receiver; said transmitter including the movable part, a plurality of contact-making means arranged to move in unison with said part, a set of contact-plates adapted to be engaged by one of said contact-making means and divided into groups, another set of contact-plates adapted to be engaged by the other contact-making means and corresponding in number and position to the groups of the first-named contact-plates; the said receiver comprising a set of signals corresponding in number to the contact-plates of the first set and divided into corresponding groups; return-wires extending from the transmitter to the receiver and each connecting one of the contact-plates of the second set with one terminal of each signal of the same group; section-wires each connecting the other terminal of one signal in each group with as many contact-plates of the first set, and means for supplying an electric current to the circuit.

2. An electric apparatus for indicating the position of a movable part at a distance, comprising a transmitter and a receiver; the said transmitter including the movable part and two sets of circuit making and breaking

devices, each of said devices comprising a stationary member and a movable member controlled by said movable part, one member of one of said sets of contact making and breaking devices consisting of a plurality of contact-plates arranged for engagement with the other member of said set and divided into groups, while one member of the other set of contact making and breaking devices consists of contact-plates adapted for engagement with the other member of said set and corresponding in number and extent to the groups of the first-named contact-plates; the said receiver comprising a set of signals corresponding in number to the contact-plates of the first set, and divided into corresponding groups; return-wires extending from the transmitter to the receiver, one for each group and each adapted to connect one of the contact-plates of the second set with one terminal of each signal of the same groups; section-wires each connected with the other terminal of one signal in each group, and also connected with as many contact-plates of the first set, and means for supplying an electric current to the circuit.

3. An electric signaling apparatus comprising a transmitter and a receiver; the said transmitter including two sets of contact making and breaking devices, one of said sets having a number of contact members divided into groups, the other set having a number of contact members equal to the number of groups; the said receiver including as many signals as there are contact members in the first set of the transmitter, the said signals being divided into groups corresponding to those of the transmitter; section-wires each connected with one signal of each group and with the corresponding contact members of the first kind of the transmitter; return-wires extending from the transmitter to the receiver and each connected with all the signals of its own group and with one of the contact members of the second kind on the transmitter.

4. An electric signaling apparatus comprising a transmitter and a receiver; the said transmitter including two sets of contact making and breaking devices, one of such sets having a number of contact members divided into groups, the other set having a number of contact members equal to the number of groups; means for automatically throwing in the proper contact member of the second set whenever one of the contact members of the first set belonging to the corresponding group is thrown in; the said receiver including as many signals as there are contact members in the first set of the transmitter, the said signals being divided into groups corresponding to those of the transmitter; section-wires each connected with one signal of each group and with the corresponding contact members of the first kind of

the transmitter; return-wires each connected with all the signals of its own group and with one of the contact members of the second kind on the transmitter.

5. An electric signaling apparatus comprising a receiver, a transmitter and connections between them; the said receiver including a number of signals arranged in groups; the said connections including a separate return-wire for each group and a number of section-wires equal to the number of signals in one group, each section-wire being connected with signals of different groups, and the signals of one group being all connected with different section-wires; the said transmitter including a set of contact members, one for each signal, arranged in groups corresponding to the signal-groups, each section-wire being also connected with contact members of different groups, and the contact members of one group being all connected with different section-wires, the transmitter further including a second set of contact members, one for each return-wire and connected therewith; means for supplying current to the circuit, and means for completing the circuit at the said contact members.

6. An electric signaling apparatus comprising a receiver, a transmitter and connections between them; the said receiver including a number of signals arranged in groups; the said connections including a separate return-wire for each group, and a number of section-wires equal to the number of signals in one group, each of the section-wires being connected with signals of different groups, the signals of one group being all connected with different section-wires; the said transmitter including a set of contact members, one for each signal, arranged in groups corresponding to the signal-groups, each section-wire being also connected with contact members of different groups, and the contact members of one group being all connected with different section-wires; the transmitter further including a second set of contact members, one for each return-wire and connected therewith; means for automatically throwing in the proper contact member of the second kind whenever a contact member of the first kind belonging to the group which corresponds to said contact member of the second kind is thrown in; means for supplying current to the circuit, and means for completing the circuit at the said contact members.

7. An electric signaling apparatus comprising a receiver, a transmitter and connections between them; the said receiver including a number of signals arranged in groups; the said connections including a separate return-wire for each group and a number of section-wires, said section-wires being connected with signals of different groups, and the signals of one group being all connected

with different section-wires; the said transmitter including a set of contact members, one for each signal, arranged in groups corresponding to the signal-groups, each section-wire being also connected with contact members of different groups, and the contact members of one group being all connected with different section-wires; the transmitter further including a second set of contact members, one for each return-wire and connected therewith; means for supplying current to the circuit, and means for completing the circuit at said contact members.

8. An electric signaling apparatus comprising a receiver, a transmitter and connections between them; the said receiver including a number of signals arranged in groups; the said connections including a separate return-wire for each group and a number of section-wires, said section-wires being connected with signals of different groups, and the signals of one group being all connected with different section-wires; the said transmitter including a set of contact members, one for each signal, arranged in groups corresponding to the signal-groups, each section-wire being also connected with contact members of different groups, and the contact members of one group being all connected with different section-wires; the transmitter further including a second set of contact members, one for each return-wire and connected therewith; means for supplying current to the circuit, means for completing the circuit at said contact members, and means whereby the proper contact member of the second kind is thrown in automatically whenever a contact member of the first kind belonging to the corresponding group is thrown in.

9. An electric signaling apparatus comprising a receiver including a number of signals arranged in groups, a separate return-wire for each group, a set of section-wires connected with said signals, and a transmitter having one set of devices for causing the current to flow through the several section-wires and another set of circuit-controlling devices for governing the connection of the individual return-wires.

10. An electric signaling apparatus comprising a receiver including a number of signals arranged in groups, the number of said groups being determined by the square root of the number of signals, a separate return-wire for each group each of said wires having a break in it, section-wires connected with said signals, and a transmitter having means for controlling the flow of current through the individual section-wires, and also through the return-wires by closing the break therein.

11. An electric signaling apparatus comprising a receiver, a transmitter and connections between them; the said receiver including a number of signals arranged in groups; the said connections including a separate re-

turn-wire for each group and a number of section-wires, the signals of one group being all connected with different section-wires; the said transmitter including a set of contact members, one for each signal, arranged in groups, corresponding to the signal-groups, the contact members of one group being all connected with different section-wires; the transmitter further including a second set of contact members, one for each return-wire and connected therewith, means for supplying current to the circuit, and means for completing the circuit at said contact members.

12. An electric signaling apparatus comprising a receiver, a transmitter, and connections between them; the said receiver including a number of signals arranged in groups; the said connections including a separate return-wire for each group and a number of section-wires, the signals of one group being all connected with different section-wires; the said transmitter including a set of contact members, one for each signal, arranged in groups corresponding to the signal-groups, the contact members of one group being all connected with different section-wires; the transmitter further including a second set of contact members, one for each return-wire and connected therewith; means for supplying current to the circuit, means for completing the circuit at the contact members of the first-named set, and means for automatically throwing in the proper return-wire through the contact member of the second-named set whenever a contact member of the first kind belonging to the corresponding group is thrown in.

13. An electric signaling apparatus comprising a receiver including a number of signals arranged in groups, a separate return-wire for each group, a set of section-wires connected with said signals, and a transmitter having one set of devices for causing the current to flow through the several section-wires, and another set of circuit-controlling devices, operatively connected with the first, for automatically throwing in the particular return-wire corresponding to the group which contains the signal to be actuated.

14. An electric signaling apparatus for ships comprising a receiver including a number of signals arranged in groups, a transmitter having two sets of contact members both controlled by the position of the ship's rudder, one set including a contact member for each signal, and the other a contact member for each group, a separate return-wire for each group of signals, connected with the respective contact members of the second kind, and section-wires connecting the contact members of the first kind with the signals, the signals of one group being all connected with different section-wires.

15. An electric helm-indicator for ships,

comprising a transmitter having two sets of contact members controlled by the position of the rudder, a receiver having a number of signals corresponding to the number of contact members in one set, said signals being arranged in groups the number of which corresponds to the number of contact members in the other set, a separate return-wire for each group of signals, connected with the respective contact members of the second set, and section-wires connecting the signals with the contact members of the first set.

16. An electric signaling apparatus comprising two receiver-transmitters each having a number of signals arranged in groups and also having two sets of contact members, one equal in number to the number of signals, and the other to the number of groups, a separate return-wire for each group of the same apparatus, and section-wires connected with the larger sets of contact members.

17. An electric signaling apparatus com-

prising two receiver-transmitters each having a number of signals arranged in groups, two sets of contact members, one corresponding in number to the number of signals, and the other to the number of groups, and a single device for controlling both sets of contact members; a separate return-wire for each group of the same apparatus; and section-wires each connecting a signal of one apparatus with the corresponding contact member of the other apparatus, and also connecting a signal of the second-named apparatus with the corresponding contact member of the first-named apparatus.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

GROVER S. EBLE.

Witnesses:

JOHN LOTKA,

JOHN A. KEHLENBECK.