(No Model.) 4 Sheets—Sheet 1.

B. A. FISKE.

ELECTRICAL SIGNALING SYSTEM.

No. 538,247. Patented Apr. 30, 1895.

Fig. 1.

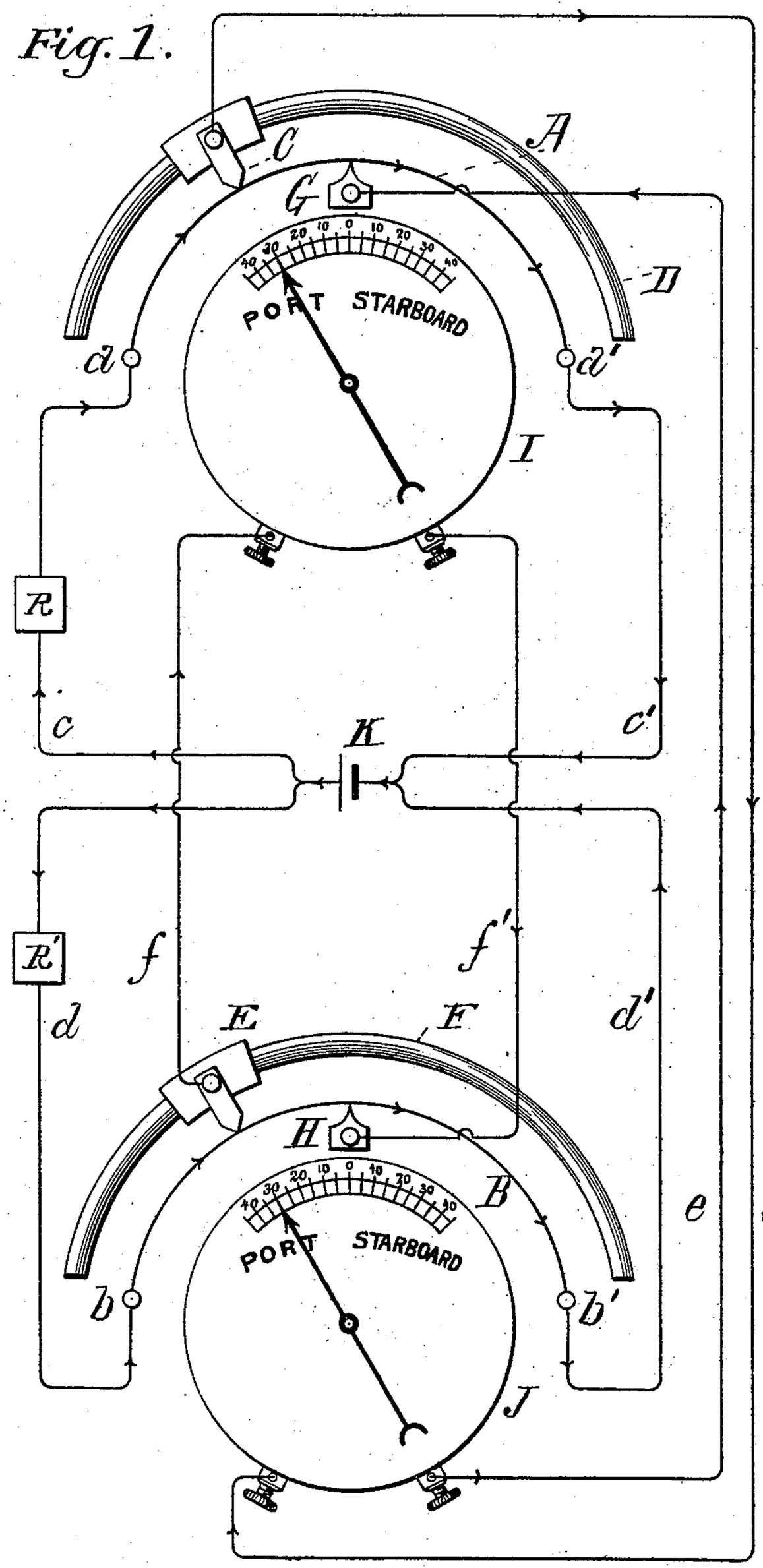

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Fig. 2.

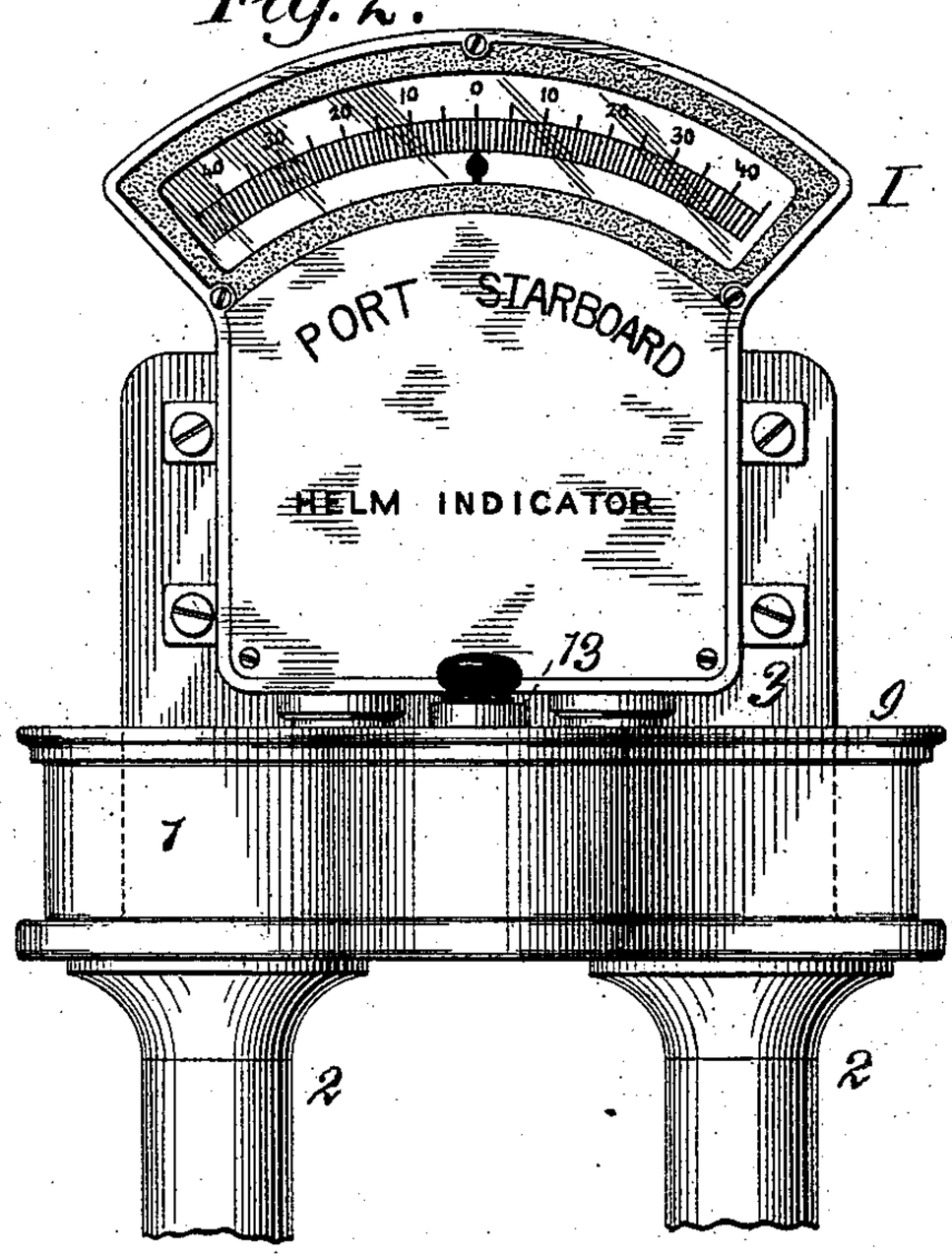

Fig. 3.

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B. A. FISKE.

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Fig. 4.

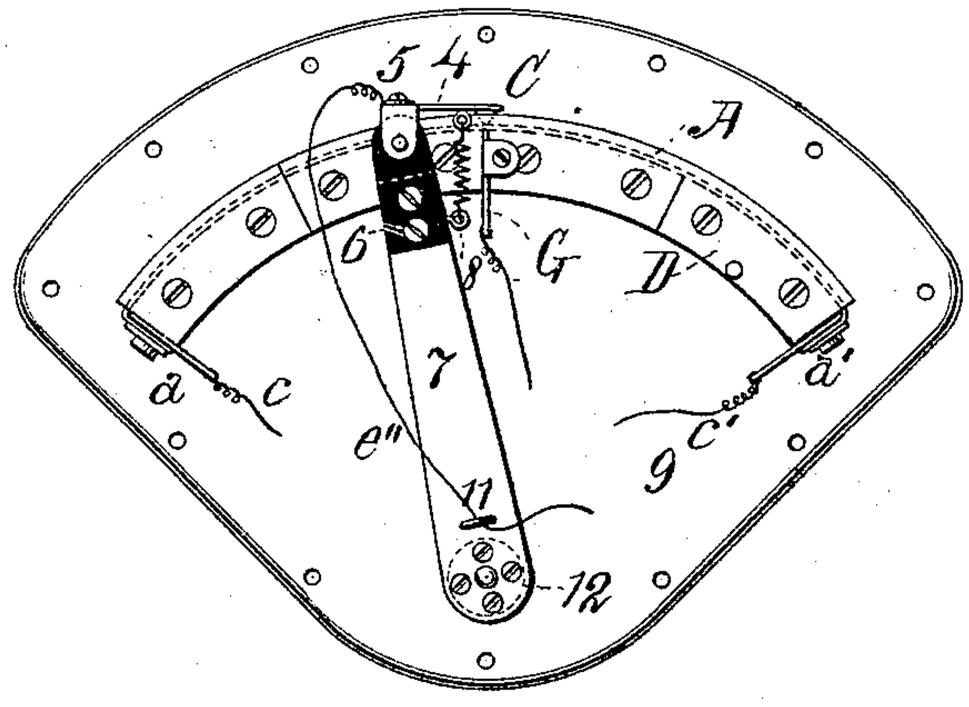

Fig. 5.

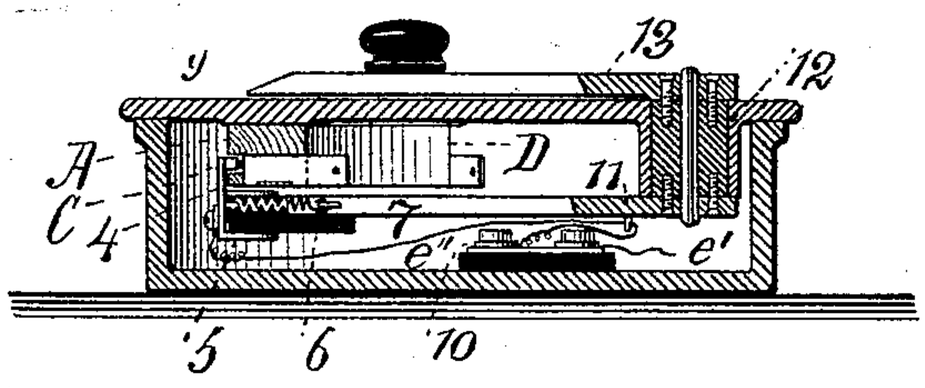

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Fig. 6.

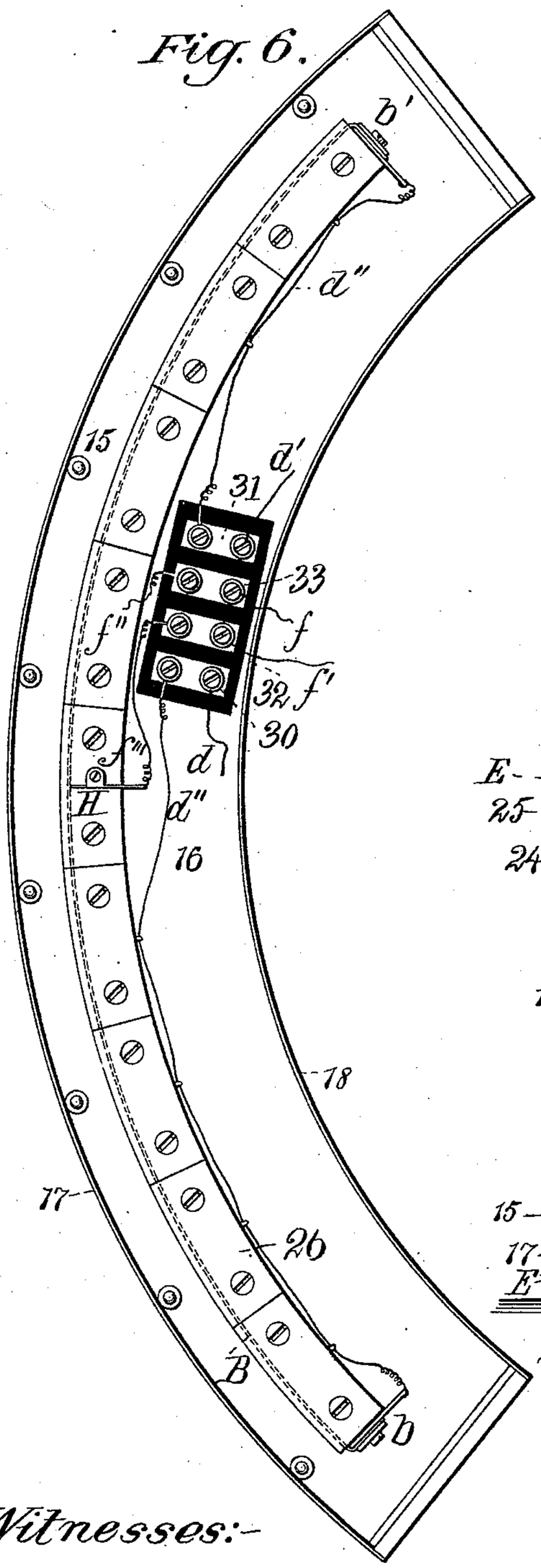


Fig. 7.

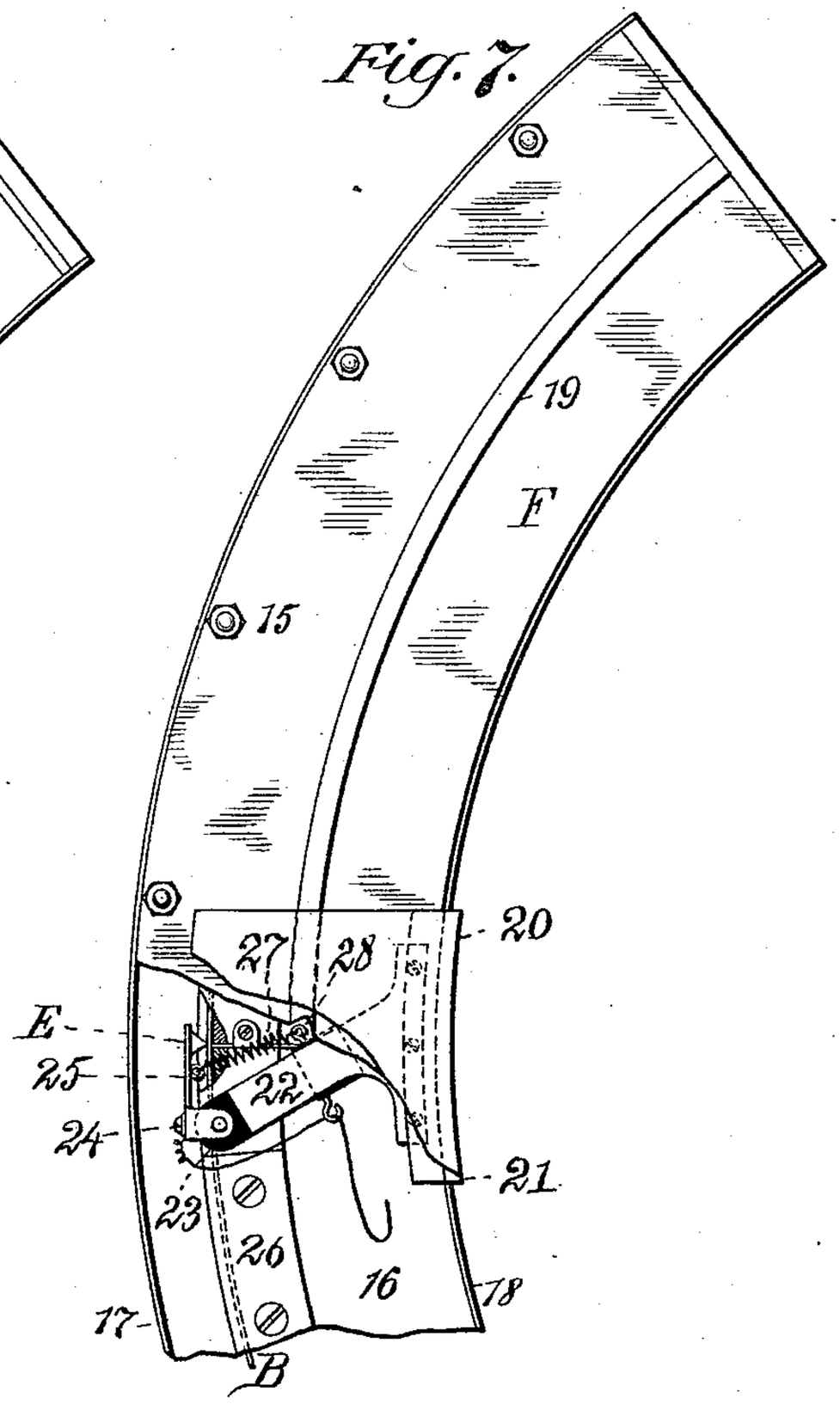
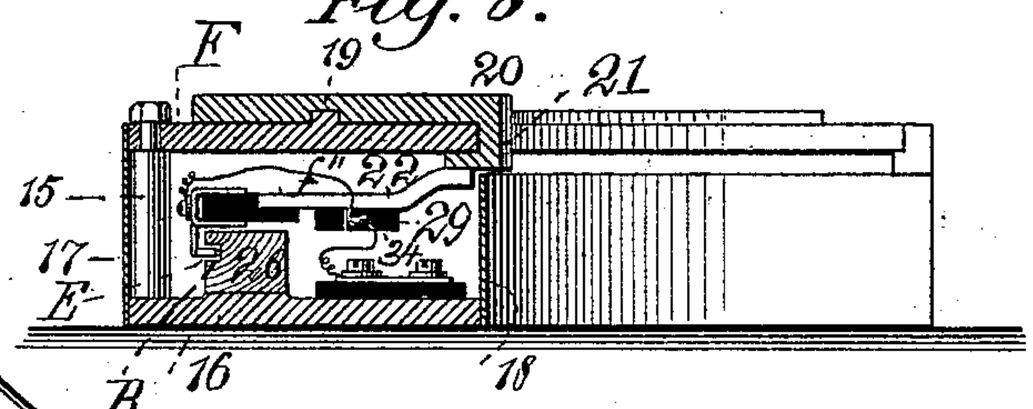


Fig. 8.



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UNITED STATES PATENT OFFICE.

BRADLEY A. FISKE, OF THE UNITED STATES NAVY.

ELECTRICAL SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 538,247, dated April 30, 1895.

Application filed December 20, 1894. Serial No. 532,448. (No model.)

To all whom it may concern:

Be it known that I, BRADLEY A. FISKE, of the United States Navy, have invented a new and useful Improvement in Electrical Signaling Systems for Marine Use, of which the following is a specification.

The object of my invention is to provide a signaling system whereby, from a given station, an order may be sent to a distant point, and whereby, through the mechanical execution of said order, a knowledge that the same has been obeyed will be transmitted back to the said station.

My invention consists in the instrumentalities and combinations more particularly hereinafter pointed out in the claims.

In my present application I describe my said invention as specifically embodied in a steering telegraph and helm indicator for use on board ship.

In the accompanying drawings Figure 1 is an electrical diagram illustrating the general arrangement of apparatus and the circuits therein symbolically. Fig. 2 is a front elevation of the instrument at the transmitting station. Fig. 3 is a plan view thereof. Fig. 4 is a plan view of the under side of the cover of the inclosing case 1 with the apparatus thereon supported. Fig. 5 is a transverse section of the said box and mechanism therein. Fig. 6 is a plan view of the bottom plate 16 and the mechanism thereon supported of the apparatus located at the distant station. Fig. 7 is a top view of the same, and Fig. 8 is a transverse section.

Similar letters and numerals of reference indicate like parts.

A and B represent two arcs of conducting material extending between the points *a a'* and *b b'*.

C is a movable contact piece touching the arc A, and traveling along the curved guide D.

E is a movable contact piece touching the arc B and traveling along the curved guide F.

G and H are fixed contact pieces touching respectively the middle or datum points of the arcs A and B.

I and J are galvanometers of any suitable construction having identically-marked dial plates, showing angles in degrees.

The leads are as follows: from battery or dynamo at K, to the terminals *a a'* of arc A by wires *c c'*, and also to the terminals *b b'* of arc B by wires *d d'*; from contact piece C by wire *e* to one terminal of galvanometer J, and by wire *e'* from the other terminal of galvanometer J to fixed contact G; from contact piece E by wire *f* to one terminal of galvanometer I, and by wire *f'* from the other terminal of galvanometer I to fixed contact H.

The operation is as follows: The operator at the arc A moves the contact piece C toward or from the fixed contact piece G on either side thereof. Therefore he throws into the circuit K, *c*, *a*, C, *e'*, galvanometer J, *e*, G, *a'*, *c'*, K, (which I will call "signaling circuit") a greater or less length of the arc A, and hence varies the fall of potential between the terminals of galvanometer J, which indicates this fall by the movement of its index-needle, say to point 30° on its scale. The operator at the arc B, having the movable contact piece E, say originally coinciding with the fixed contact piece H and hence bearing on the middle or datum point of arc B, moves said contact piece over the distance indicated by the needle of galvanometer J and in the direction shown—that is, in the drawings, a distance of thirty degrees to the left. When he does this he will have thrown into the circuit K, *d*, *b*, E, *f*, galvanometer I, *f'*, H, *b'*, *d'*, K, (which I will call "indicating circuit,") exactly the same length of arc, and hence have caused therein the same drop in potential as the operator A had previously caused in the signaling circuit, and he will have moved contact piece E in the same direction as the observer at A has moved contact piece G. Therefore the galvanometer I will show the same deflection in the same direction as galvanometer J.

Generally stated, there must be such a definite physical relation between the arcs A and B as that a movement of the contact piece C for a certain distance over arc A shall cause a deflection of the needle of galvanometer J to a certain mark on its scale, and that a corresponding movement of the contact piece E over arc B shall cause a deflection of the needle of galvanometer I to a like mark on its scale. So long as this relation exists the act-

ual proportions of the arcs are immaterial, and the precise relation of the distances on them thrown into circuit becomes immaterial.

I will now describe a specific application of this invention to the purposes of a combined steering telegraph and helm indicator for use on board ship.

The galvanometers I J will be marked "Port" and "Starboard," as shown, on opposite sides of the datum point, and the scale, on each side of that point, will be laid off in a suitable number of degrees of arc. The arc A, with its contacts C G, and the galvanometer I will be located on the bridge, or at any other convenient place from which it is desired to control the helm.

The arc B, with its contacts E and H, will be placed in such suitable proximity to the rudder of the vessel as that the latter, by any suitable mechanism, may move the contact E over the arc B; the disposition of parts being such that the angle of inclination of the rudder from its midship position will be indicated by the position of the contact piece E on one side or the other of the fixed contact piece H. The galvanometer J is placed at the helm in convenient sight of the helmsman. The battery K is situated in any convenient location. Let it now be supposed that the person controlling the vessel desires to direct the helmsman to place his helm thirty degrees to port. With his hand he moves the contact C over arc A a distance to the left from the point G as will cause the needle of the galvanometer J, as already explained, to point to the mark of thirty degrees to port on its scale. The helmsman, seeing this indication of the galvanometer J, manipulates the steering apparatus to place the rudder as directed; and the movement of the rudder causes the contact piece E to travel over the arc B for such a distance as to cause the needle of galvanometer I to point likewise to the mark thirty degrees to port. Consequently the person sending the order is notified, first, that it has been obeyed; second, that it has been obeyed correctly; third, the instant that it is obeyed, and, fourth, the exact position of the rudder at all times; and this by instrumentalities which the helmsman cannot control except by exactly complying with the directions sent him. An especial advantage of this arrangement is the safeguard which it offers against failure of the apparatus to work, or improper working in case of accident. If, for instance, the signaling circuit be broken, the needle of the galvanometer J at once returns to the datum point and thus the helmsman is directed to "steady" his helm; or, in other words, to keep the vessel in the course in which she is moving. Hence the moment the operator at A signals a direction to change the course, he will perceive, by the immobility of his own galvanometer needle, that it is not obeyed, and the impairment of the apparatus is immediately revealed. If, on the other hand, the indicating circuit is injured, that fact will be instantly shown upon the first use of the signaling circuit, for, while the helmsman obeys the order, the operator's galvanometer nevertheless fails to indicate the new position of the rudder.

Referring now to Figs. 2 to 8 inclusive, I have here illustrated in detail certain special instrumentalities wherein I prefer to embody the invention aforesaid for the nautical employment described.

In Figs. 2, 3, 4 and 5 is shown the apparatus which is to be located at the signaling station. It consists of a box, 1, mounted upon standards, 2. Upon a vertical wall or projection 3 on one side of the box 1 is secured the galvanometer I, which I mark preferably with the words "Helm indicator" and "Port" and "Starboard," as shown. The signaling apparatus is inclosed within the box 1. The arc A of wire (dotted lines) is disposed in a groove on the edge of the guide D. The contact point C is supported on a short arm, 4, which is secured to a bracket, 5, pivoted in the end, 6, of an arm 7. The end 6 is made of insulating material. A coiled spring, 8, connected to the short arm 4 and arm 7 serves to hold the contact point C closely against the wire of arc A. The guide D is made in sections and secured to a projection on the under side of the cover 9 of box 1. The terminals of the circuit wires *c c'* are connected by binding screws, or in any other suitable way, to the ends of the arc wire at *a a'*. The fixed contact point G is here a pin, passing through the guide D. The circuit wire *e'* connects with a metal plate 10, supported on a block of insulating material in the bottom of the case, and this plate, by wire *e''*, passing through a fair leading eye, 11, on the under side of arm 7, communicates with contact point C. The cover 9 is provided with a bearing to receive a short shaft, 12, which carries both the arm 7 within the case 1 and a parallel arm, 13, above it. On the upper surface of the cover is a scale laid off in degrees; so that the arm 13, and hence the arm 7 carrying contact point C, may be adjusted at any angle. I preferably mark the scale-plate "Port" and "Starboard" and also "Steering telegraph," as shown. In Figs. 6, 7 and 8 is represented in detail the apparatus which is connected with the rudder of the vessel. This of course is much larger and heavier than the corresponding instrumentalities which have been already described, and which are worked by the operator's hand.

The guide F is a curved plate of metal, supported by standards, 15, which rise from a base plate, 16. The plate 16, guide F and curved walls or sides 17 and 18 form a box or case for the arc B and movable contact point E. Upon the upper side of the guide F is a rib, 19, which enters a groove in the under side of the traveling plate 20. This plate has a flange, 21, which extends around the edge of the guide F and enters a slot in the wall

18. To the plate 20 the tiller of the rudder may be directly connected, so that, as the rudder is swung from one side to the other, the tiller will move the plate 20 over the guide F; or any suitable intermediate transmitting mechanism may be interposed between rudder and plate 20 to cause the stated motion of said plate.

To the flange 21 is secured an arm, 22, the end, 23, of which is of insulating material and carries a pivoted bracket, 24, which supports a short arm, 25, on the end of which is the contact point E. The arc B is of wire embedded in a groove in the edge of the supporting blocks 26, which are of wood and secured by screws to the upper side of base plate 16. Also to said blocks is secured the fixed contact point H. A spiral spring, 27, connected to the arm 25 and to an eye, 28, held in an insulating block, 29, on arm 22 serves to hold the contact point E against the arc wire B.

The wires *d* and *d'* are secured to plates 30 and 31, and from these plates the wires *d''* and *d'''* lead to the terminals *b b'* of the arc B. The wire *f'* connects to a similar plate, 32, and from this plate the wire *f'''* leads to the fixed contact H. The wire *f* connects to a similar plate, 33, and from this plate the wire *f''* leads through a fair leading eye, 34, on insulating block 29 to the contact piece E.

At R and R', Fig. 1, adjustable resistances may be inserted in circuit.

I claim—

1. In an electrical signaling apparatus a conductor in circuit, and, at a distant station, an indicating instrument having its terminals electrically connected by line to two points on said conductor, one of said terminals being fixed and the other of said terminals being movable on each side of said fixed terminal; whereby the index of said indicating instrument is caused to move in a direction corresponding to that of the movement of said movable terminal and over a distance depending upon the fall of potential on said conductor between said terminals.

2. In an electrical signaling apparatus the combination of conductor A in electrical circuit and, at a distant station, the indicating instrument J and line *e e'* connecting said instrument and said conductor, one terminal, G, of said instrument being fixed and in contact with said conductor A, and the other terminal, C, being movable on said conductor on each side of the said fixed terminals.

3. The combination in an electrical signaling system of the arcs A and B, fixed contacts G and H, movable contacts C and E thereon, respectively movable on each side of the contacts G, H guides, D and F, for said movable contacts, indicating instruments I and J and circuit connections, substantially as described.

4. In the transmitting device of an electrical signaling system a curved inclosing box or case, a similarly-curved conductor therein, a plate, 20, constructed to move upon the upper surface of said box, an arm carried by said plate and entering said box and carrying a contact plate bearing upon said conductors, substantially as described.

5. In an electrical signaling apparatus elongated conductors A, and B, in circuit, fixed contacts G, and H, thereon, contacts C, and E, movable respectively on each side of said contacts G, and H, indicating instruments I, and J, and circuit connections; whereby the movements of contact C, on conductor A, shall cause deflections in instrument J, and corresponding movements of contact E, on conductor B, shall cause like deflections in instrument I, substantially as described.

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