

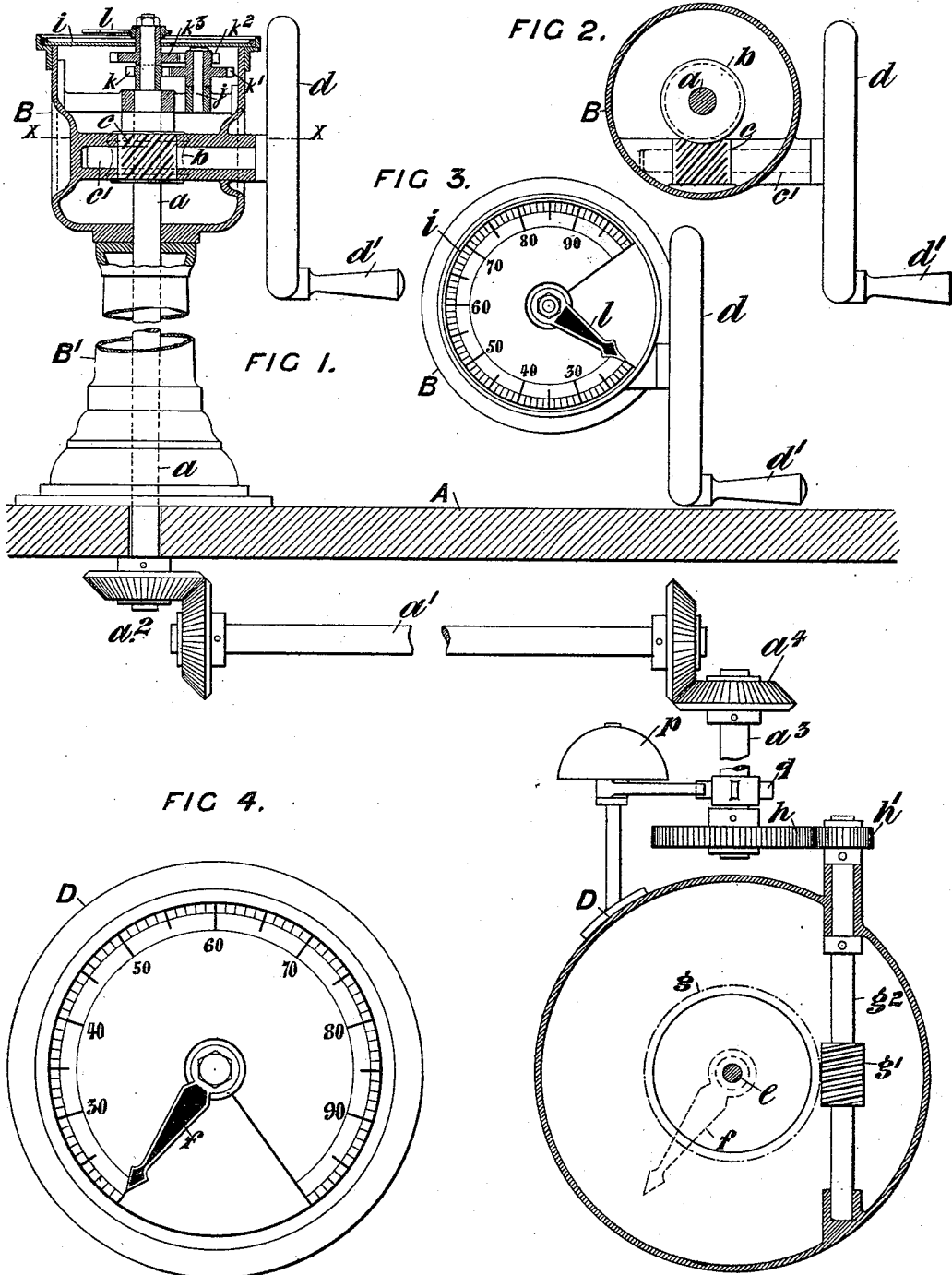
(No Model.)

3 Sheets—Sheet 1.

W. CHADBURN.
SHIP'S TELEGRAPHIC APPARATUS.

No. 451,754.

Patented May 5, 1891



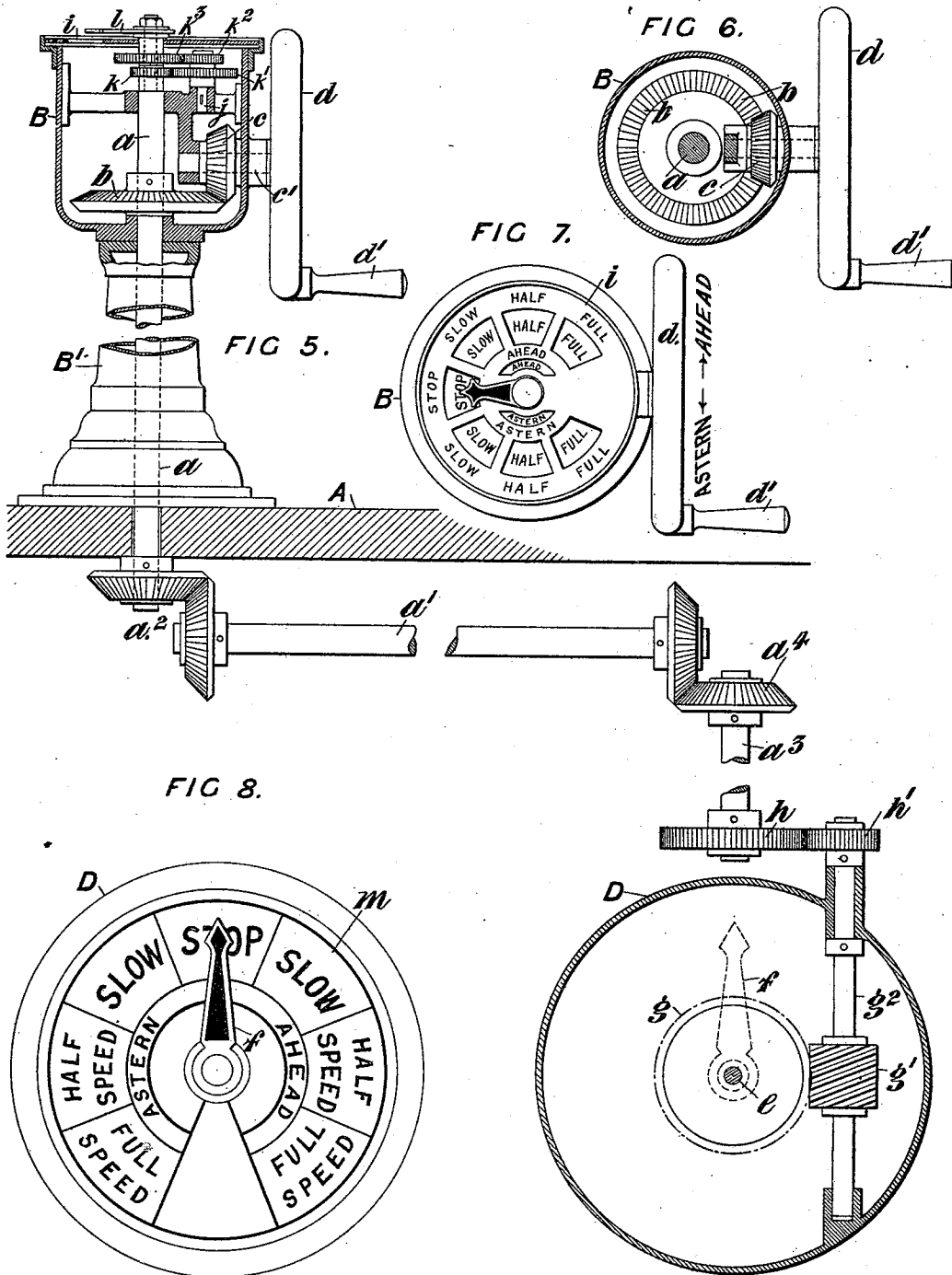
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SHIP'S TELEGRAPHIC APPARATUS.

No. 451,754.

Patented May 5, 1891.



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(No Model.)

3 Sheets—Sheet 3.

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FIG 9.

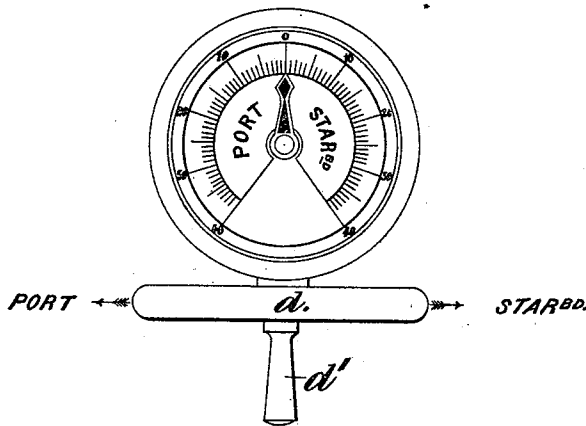
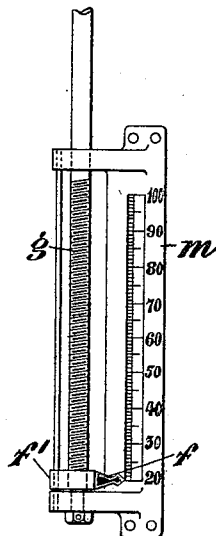


FIG 10.



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UNITED STATES PATENT OFFICE.

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SHIP'S TELEGRAPHIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 451,754, dated May 5, 1891.

Application filed September 8, 1890. Serial No. 364,290. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM CHADBURN, a subject of the Queen of Great Britain and Ireland, residing at Liverpool, in the county of Lancaster, England, have invented certain new and useful Improvements in Ships' or Analogous Mechanical Telegraphic Apparatus; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention has reference more particularly to apparatus used on board ship for communicating between one part of a ship and another, and for transmitting rates of speed, conditions of machinery, and notifications from the part where such machinery is located to another part or other parts where it is desired to show or indicate the same; and the type of such apparatus to which the invention is particularly applicable is that in which the transmission of orders, conditions, or speed is effected by means of rotating shafts or rods and toothed gearing.

The objects of my invention are mainly to make apparatus of the kind herein described more efficient and correct than they are at present. First, a telegraphic apparatus—such as a “bridge and engine-room telegraph,” “docking-telegraph,” “steering-telegraph,” “look-out-telegraph,” “stoke-hold telegraph,” or the like—is so adapted and constructed that to move the pointing or indicating device from one order or change of notification to another the operating device, whether it be a wheel or handle, and the transmitting-shaft must be moved through a considerably greater part of a circle than that traversed by the pointer, the amount of this movement of the shaft before acting upon the pointing devices being reduced by suitable gear, such as bevel or spur wheels or worm-gear. By this means the chance of the pointers in the receiving-instrument not being moved up to the correct or desired point on the dial through torsion on the shaft, or slack gearing, or wear, or straining, or other like cause, or any combination thereof, is diminished the diminution being directly as the amount of movement of such shafting is greater than that of the pointer, and consequently the danger of mistaking orders by

insufficient movement of and undecided position taken up by a pointer from this cause is obviated.

As an example of ship's telegraphic apparatus operating and constructed according to this invention, I will describe one such as is commonly used for communicating between the bridge and engine-room. It consists as follows: The means of actuating the transmitting-instrument is a wheel vertically arranged and mounted on a suitable shaft or spindle. Motion from this shaft is communicated to the shafting connecting the transmitting and receiving instruments, by bevel or worm gearing in the instrument-case. The apparatus is adapted to be operated so that one revolution of the actuating-wheel will move the pointers in both receiving and transmitting instrument a distance equal to the pitch of the orders as provided on the dial, or, in other words, it will move it one order. Hence in the instruments between the main transmitting-shafting and the pointers there is provided and interposed a gear consisting of bevel, spur, or worm or equivalent reducing-gear, by means of which the movement transmitted to the pointer shall be only that required—namely, one order distance for each revolution made by the actuating-wheel of the transmitting-instrument. It will be seen that the movement given the main shafting may be equivalent to that imparted to the actuating-wheel for each order, or it may be less than it, say one-half, or any other suitable proportion. It will now be seen how by increasing the movement of the transmitting-shafting and reducing that movement in the instruments again to that actually required by the pointers, the faults or defects above mentioned respecting inaccuracy in indication are diminished according to the difference of motion imparted to the shafting and that required by the pointers.

It is to be understood that although a moving pointer has been above described as the means of indicating, the converse arrangement may be employed—namely, the pointer or indicating mark may be fixed and the dial moved.

To clearly explain the nature of my invention, I will describe it by the aid of the drawings which accompany the specification and

which illustrate one example of apparatus designed in accordance with and for carrying out the improvements, the nature of which has been above explained.

- 5 Figure 1 illustrates in sectional elevation a transmitting and receiving instrument and intermediary gear of a "revolution-order telegraphic apparatus" for communicating between the bridge or deck of a ship and the engine-room. Fig. 2 is a cross-sectional plan of the apparatus taken through the transmitting-instrument at the lines xx , Fig. 1. Fig. 3 is a plan of the transmitting-instrument viewed from above. Fig. 4 illustrates the face or dial of the receiving-instrument. Figs. 5, 6, 7, and 8 are corresponding views to those illustrated in Figs. 1 to 4, showing the apparatus illustrated in such figures slightly modified. Fig. 9 is a plan of a steering-telegraph transmitting-instrument according to the invention, and Fig. 10 illustrates a modified form of receiving-instrument.

With reference to the drawings, A designates the bridge or deck of a ship.

- 25 B is the head of the transmitting-instrument. B' is a column on which such head is supported.

D is the receiving-instrument.

- 30 a is the transmitting-shaft of the transmitter.

a' is a horizontal shaft worked from the shaft a through the bevel-gear a^2 .

- 35 a^3 is another vertical shaft which transmits motion from the shaft a' through the bevel-wheels a^4 to the transmitting-instrument D. Of course it will be seen that between the shaft a and the transmitting-instrument practically any number and disposition of transmitting shafts and gearing may be employed.

- 40 b is a worm-wheel mounted on the shaft a . c is a worm gearing with the worm-wheel b and mounted on the shaft c' , supported by the head of the instrument B, and d is a wheel mounted and fixed on the shaft c' and having a handle d' , by which it is rotated and by whose rotation motion is transmitted to the shaft a .

- It may for convenience be assumed that for each revolution of the worm c the worm-wheel b and shaft a will be rotated a quarter of a revolution, and that for the transmission of each order one whole revolution of the actuating-wheel d is made. While the dials of the transmitting and receiving instruments are divided in numerical order and into spaces each equal to one-hundredth of a circle—that is to say, the transmitting-instrument dial is divided into a hundred parts, starting, however, from 20 and finishing at 100, and the receiving-instrument dial is similarly divided. Hence, as before stated, the transmitting-shafting being adapted to be rotated a quarter of a revolution for every revolution of the wheel d , if each revolution of the wheel d be used for the transmission of a single order, the amount of the revolution of the pointer-spindles of the transmitting and re-

ceiving instruments must, in order to move a hundredth of a circle, be so reduced below that of the transmitting-shafting that the quarter-revolution of such shafting will move the said pointers such one-hundredth of the circle, or, in other words, one division only on the scale of the dial for each revolution of the wheel d . In the receiving-instrument this is effected by working the shaft e , on which the pointer f is mounted and fixed by worm-gearing consisting of the worm-wheel g and worm g' , said worm g' being mounted on the driving-shaft g^2 , which is driven from the transmitting-shaft a^3 through toothed gearing h h' , the wheel h' being a quarter of the size of the wheel h . The result then of rotating the transmitting-wheel d one revolution and the shafting a' and a^3 a quarter of a revolution is that the wheel h' , shaft g^2 , and worm g' will be driven one revolution, and the pitch of the worm-gear g g' being so constructed that each revolution of the worm g' will rotate the pointer-spindle e a hundredth part of a revolution, the pointer obviously will be moved a distance equivalent to one division of the scale of the dial. Thus through this gearing between the actuating-wheel d and the indicating-pointer f of the receiver for each revolution of the wheel d it will be seen the indicating-pointer f is moved a distance equivalent to one division of the scale upon the dial—that is, for every revolution of the transmitting-wheel d an order for an alteration of speed of one revolution is transmitted to the receiving-instrument. With the ordinary means heretofore in use for moving the indicating-pointer of the receiving-instrument for so small a division as that shown, it would be impossible to make such movement accurately if the transmission-shafting of the apparatus were only revolved a degree equal to that moved by the pointer on account of the existence of backlash, torsion, and other things, which must always render the actuation of the pointer unreliable; but by moving the transmission-shafting a considerable portion of the revolution, as is done in this invention, and the actuating-wheel d a whole revolution for each change of order, the irregularities and deficiency of accuracy of movement of the pointer f is reduced in the ratio the amount of such movement is to the amount of the portion of the revolution moved by the pointer-spindle e .

The dial i of the transmitting-instrument is, as has been stated, divided similarly to that of the receiving-instrument, and consequently the pointer-spindle of this instrument will have to be moved the same portion of a revolution for every revolution of the transmitting-wheel d as the shaft e of the receiving-instrument. This is effected in the present example by the reducing-gearing, consisting of the toothed wheels k k' k^2 k^3 , k being fixed on the reduced end of the spindle a , k' k^2 being loose on the spindle j and connected together, and k^3 being adapted to drive

h^3 , which is loose on the end of the spindle a' and on which the pointer l is mounted. The action of this gearing is that, as the shaft a is rotated a quarter of a revolution for every revolution of the wheel d , the pointer l will be moved only a small, (i. e. the required) portion of such circle—that is, one one-hundredth ($\frac{1}{100}$) thereof.

The modification shown in Figs. 5 to 8 consists in applying the apparatus set forth with reference to Figs. 1 to 4 as a telegraph, in which the ordinary word-orders are used in lieu of numerals in the case of revolution-orders. The dials i and m of the transmitting and receiving instruments, respectively, with their word-orders marked thereon, are illustrated in Figs. 7 and 8. In this arrangement the dials are divided into eight parts, and consequently the pointer-spindles of the two instruments will have to move one-eighth of a revolution at each change of an order, and hence the worm-gearing g in the receiving-instrument is so arranged as to give the pointer f an eighth of a revolution.

The gear in the transmitter for actuating the motion-transmitting shafting a a' a^3 in this example consists of bevel-gearing b c , the driving-pinion c being half the diameter of the driven wheel b , so that the shaft a will be rotated half a revolution for each revolution of the wheel d , while at the receiving-instrument the tooth-wheel h is twice the diameter of the wheel h' which it drives, and consequently the worm g' is rotated a complete revolution for a revolution of the actuating-wheel d .

In the above-described apparatus the parts are so arranged and placed on board ship that for all orders from "full speed astern" to "full speed ahead," the wheel d is adapted to be turned so that in the upper half-revolution of the handle d' such handle moves in the direction of or toward the bow of the vessel, and in the reverse direction for all orders from "full speed ahead" to "full speed astern." In the steering-telegraph shown in Fig. 9, the plane in which wheel d of the transmitting-instrument is placed lies athwartships, and is so arranged that in the upper half-revolution of its handle d' such handle moves from right to left for "starboard" orders and from left to right for all "port" orders. The divisions of the dial in this figure denote degrees of a circle.

The receiving-instrument shown in Fig. 10 consists of a screwed spindle g , which is actuated by the transmitting-shafting between it and the transmitting-instrument, and its rotation may be effected directly from such shafting, or through intermediary gear, such as the toothed wheels h h' shown in Figs. 1 and 5. The scale or dial m in this case is a straight one, and the pointer f is moved up and down over it by the rotation of the screwed spindle g , the boss f' of the pointer being screwed internally and constitutes a nut thereon. The scale is marked with numerals

and arranged to serve as a "revolution" telegraphic instrument. At the same time it is obvious it may be provided with word-orders in the ordinary way and used as an ordinary word-order telegraph. This type of instrument may also be used in the transmitter as an indicating device therein, if desired.

The sounding devices—such as gongs or bells which may be used in these telegraphs—are worked from the motion-transmission shafting in lieu of the shaft or spindle of the pointer, as in the ordinary ship's telegraphs. The result of so working the bells is that as the shafting has a large amount of rotation for each order transmitted relatively to the amount of movement of the indicating-pointer for each order, the sounding of the gong or bell can be the more easily made to take place at the correct moment and with exactitude, whereas in the ordinary type of telegraph (and particularly in a revolution-telegraph such as herein described) it is extremely difficult to obtain that accuracy of motion and time of sounding.

In Fig. 1 I show diagrammatically an ordinary gong p connected with the receiving-instrument, adapted to be operated by an ordinary star to other wheel q , mounted on the motion-transmission shafting a^3 in any of the well-known ways. It will be plain that any known type of sounding device or devices may be used and adapted to be operated from the motion-transmission shafting, as described.

In applying this invention to "tell-tale" or "reply" mechanisms in this telegraphic apparatus, the instrument herein called the "transmitter" becomes (so far as such mechanism is concerned) the receiver, and, vice versa, the receiver becomes the transmitter, as will be understood.

In conclusion, I wish to state that this invention can be applied to telegraphic apparatus for purposes, such as herein specified, wherein the transmission of motion is effected by chains, cords, or rods instead of rotating shafting, and set forth with reference to the examples illustrated by the drawings; also, that the features or improvements herein described can be modified in various ways according to special requirements or conditions of application.

I claim—

1. The combination, in a ship's or other signal apparatus, of a rotating transmitter having a movable pointer or indicator, and a receiver having a traveling pointer or indicator, with motion-reducing gearing connecting the pointer or indicator of the transmitter with the pointer or indicator of the receiver, substantially as and for the purpose described.

2. The combination, in a ship's or other signal apparatus, of a transmitting-instrument having a movable pointer or indicator and a rotary shaft by which the pointer or indicator is moved, and a receiving-instrument provided with a traveling pointer or indicator,

with motion-reducing gearing connecting the rotary shaft of the transmitting-instrument with the traveling pointer or indicator of the receiving-instrument, substantially as and
5 for the purpose described.

3. The combination, in a ship's or other signal apparatus, of a rotating transmitter comprising a dial and pointer, a rotating wheel or handle, and a shaft rotated by the wheel
10 or handle to move the pointer, with a receiver having a traveling pointer or dial, and mo-

tion-reducing gearing connecting the rotating shaft of the transmitter with the pointer of the receiver, substantially as and for the purpose described. 15

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

WILLIAM CHADBURN.

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