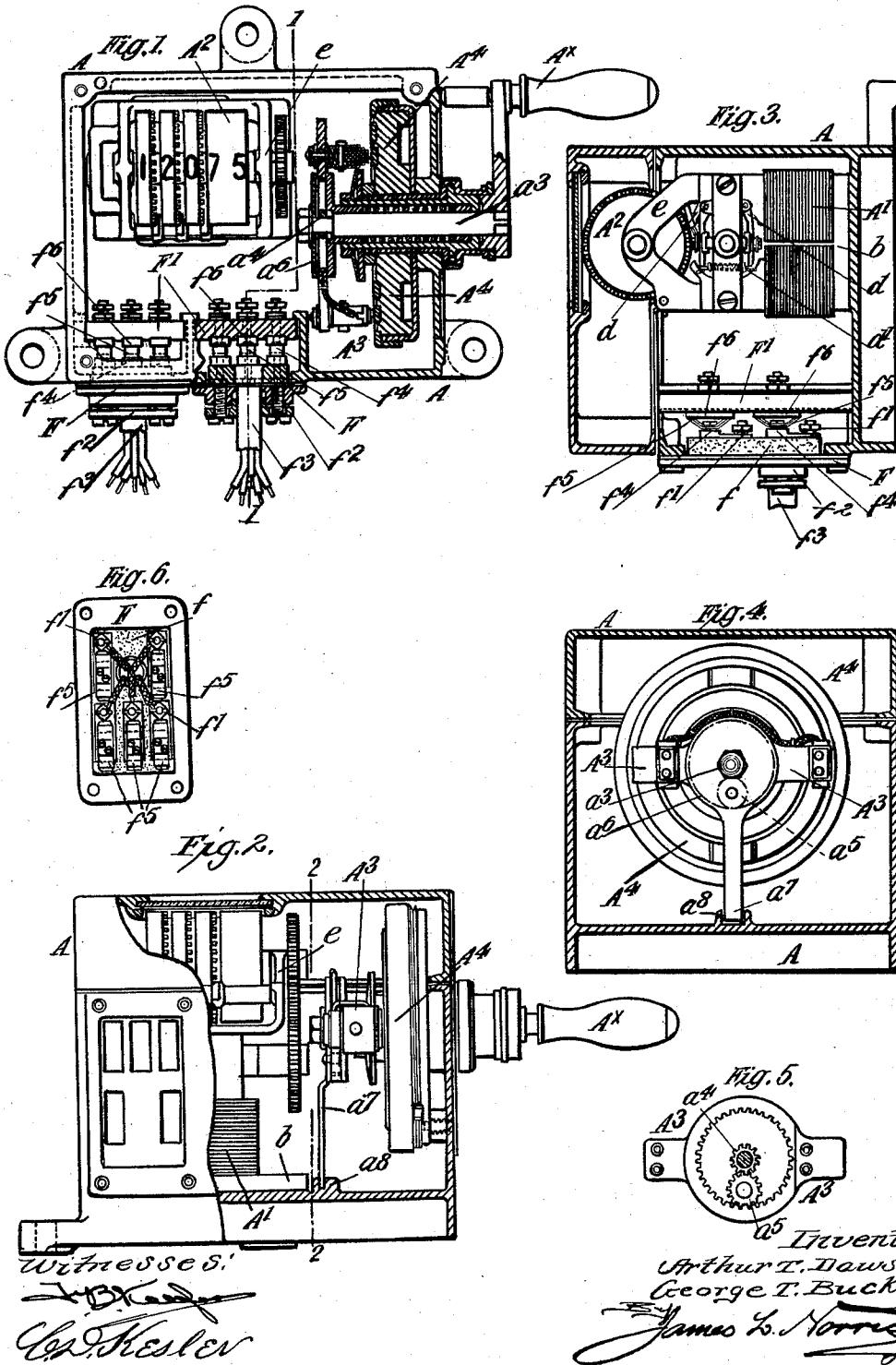


A. T. DAWSON & G. T. BUCKHAM.  
ELECTRICAL APPARATUS FOR TRANSMITTING AND RECEIVING SIGNALS.  
APPLICATION FILED NOV. 26, 1906.

1,018,884.

Patented Feb. 27, 1912.

4 SHEETS—SHEET 1.



Witnesses:  
J. B. Kester  
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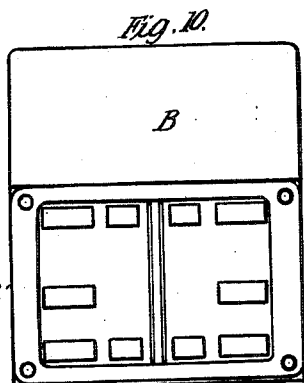
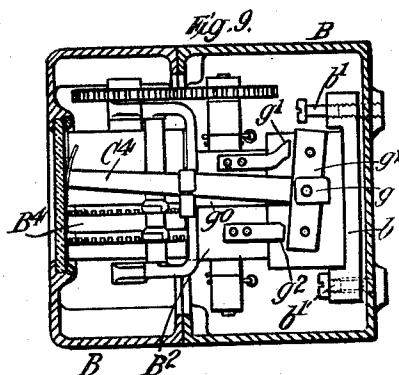
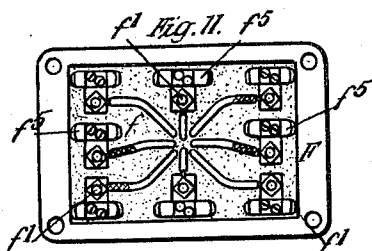
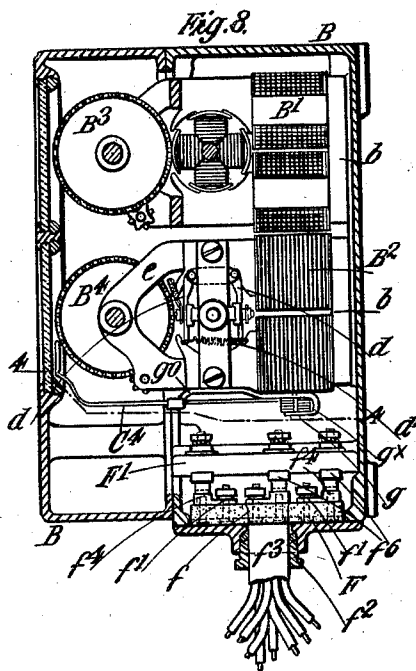
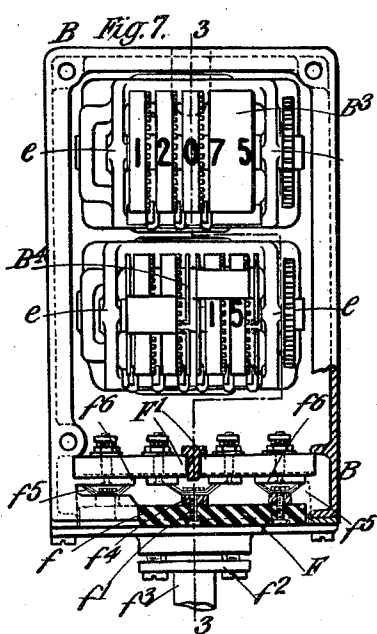
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James L. Norris

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4 SHEETS—SHEET 2.



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Inventors

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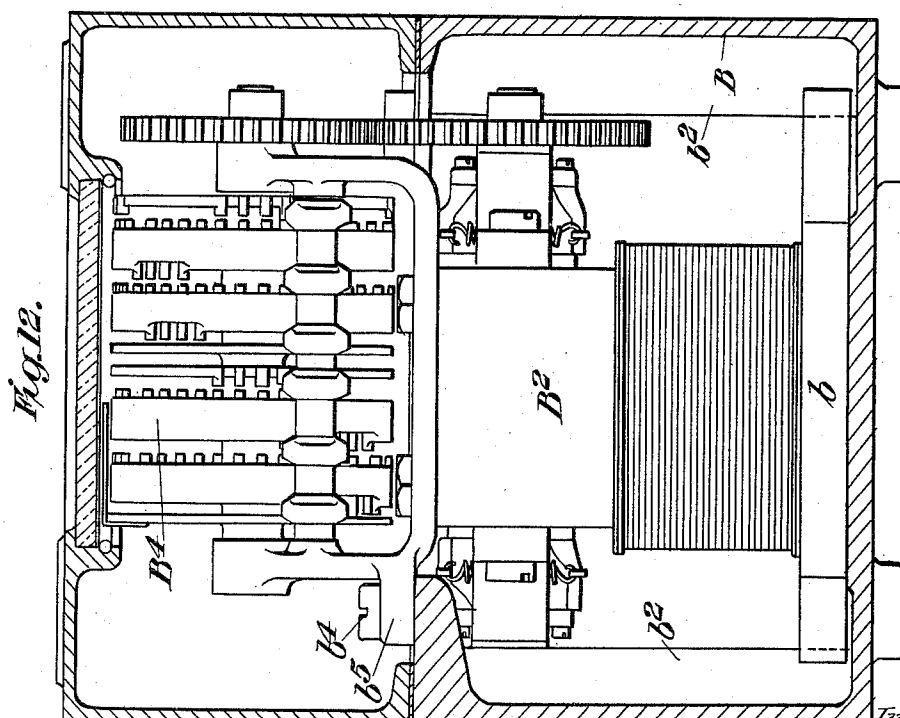
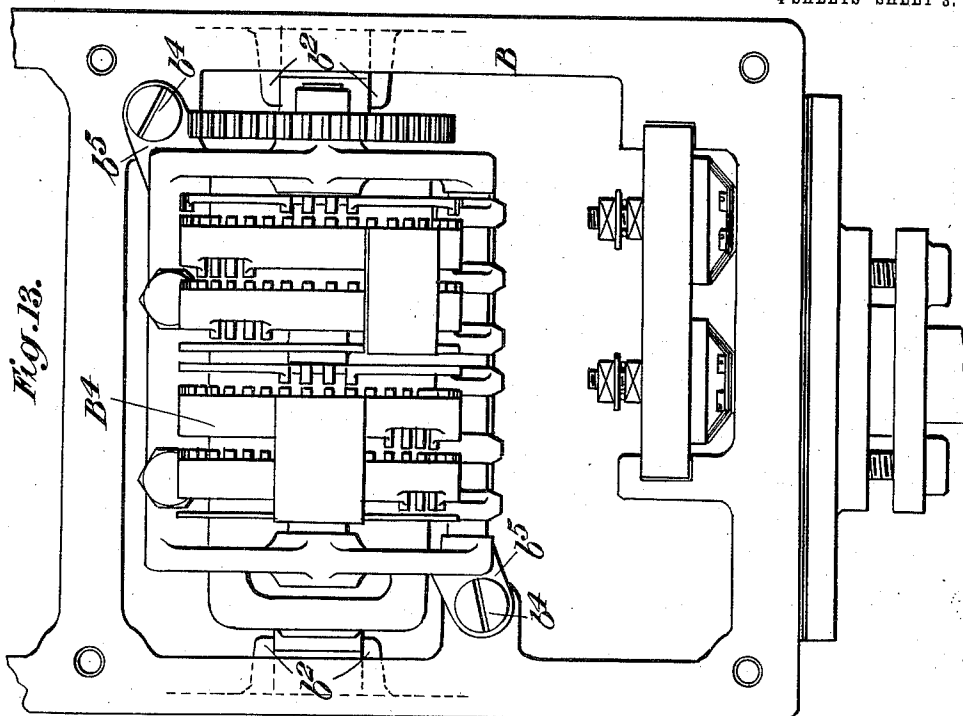
*Att'y*

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4 SHEETS—SHEET 3.



Witnesses  
*[Signature]*  
*[Signature]*

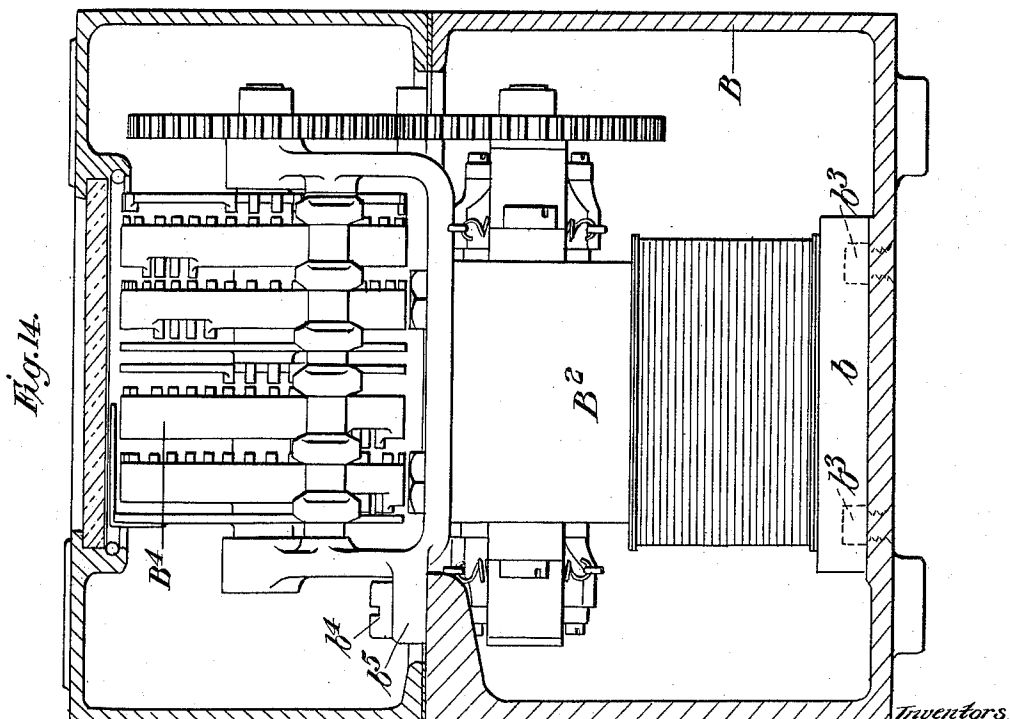
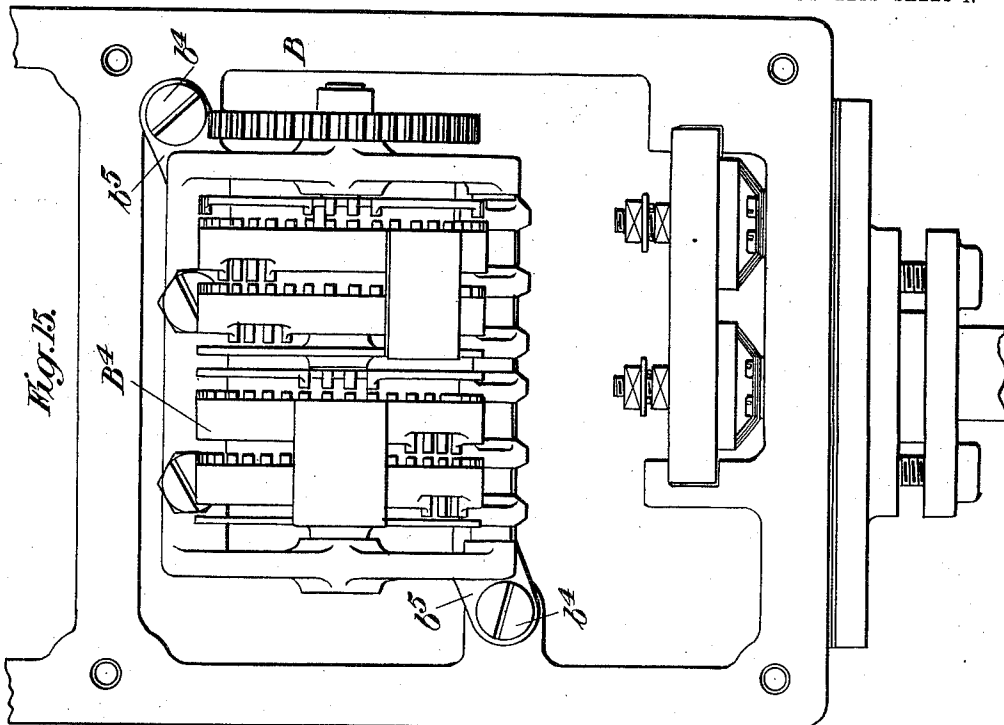
Inventors  
Arthur T. Dawson  
George T. Buckham  
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James L. Norton atty.

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4 SHEETS—SHEET 4.



Witnesses:  
*James L. Norton*  
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# UNITED STATES PATENT OFFICE.

ARTHUR TREVOR DAWSON AND GEORGE THOMAS BUCKHAM, OF WESTMINSTER, LONDON, ENGLAND, ASSIGNORS TO VICKERS LIMITED, OF WESTMINSTER, ENGLAND.

ELECTRICAL APPARATUS FOR TRANSMITTING AND RECEIVING SIGNALS.

1,018,884.

Specification of Letters Patent.

Patented Feb. 27, 1912.

Application filed November 26, 1906. Serial No. 345,231.

*To all whom it may concern:*

Be it known that we, ARTHUR TREVOR DAWSON, lieutenant, Royal Navy, director and superintendent of Ordnance Works, and GEORGE THOMAS BUCKHAM, engineer, both subjects of the King of Great Britain, residing at 32 Victoria street, Westminster, in the county of London, England, have invented certain new and useful Improvements in Electrical Apparatus for Transmitting and Receiving Signals, of which the following is a specification.

Our invention relates to various improvements in electrical signaling apparatus of the kind set forth in the specifications of our prior British Patents Nos. 29422 of 1904 and 4741 of 1905 for communicating from the conning tower of a ship or other fixed position the necessary information as regards range and deflection to a number of receiving instruments situated contiguous to the guns, so that the officer in charge can transmit such information from the conning tower to the sighting numbers of the various guns' crews simultaneously. The apparatus disclosed in these prior specifications comprises a dynamo-electric device and a transmitter at the sending station and a receiving instrument comprising a similar dynamo-electric device at each of the receiving stations. Each of the dynamo electric devices is furnished with a counting or indicating device mechanically connected with its armature, which is caused to intermittently rotate in a magnetic field by electric impulses sent through the armature windings by the actuation of the transmitter which comprises a rotary hand switch coöperating with segmental contacts, the said dynamo-electric devices thus acting like electric motors for operating the counting devices. One set of instruments and circuits is used for sending and receiving the range signals and another set for sending and receiving the deflection signals, each transmitter being provided with its own rotary hand switch. An additional hand switch is also provided at the sending station for reversing the direction of the current through the various instruments, and thus influencing the position of a magnetic indicator or shutter for notifying to the receiving stations when their instruments are about to be worked and the attention of the guns' crews is to be given to them.

One of our present improvements relates to the electric motors, particularly to the field magnets, the commutator brushes and the bearings of the counting-drum shafts.

Another of our present improvements relates to the terminal board to which the various external electric-conductors (termed the cable) are connected. This board is detachable and is furnished with spring or resilient contact pieces which make electric contact with terminal plates mounted on an upper terminal board. An advantage of this construction is that the motors, counting or indicating drums, and upper terminal board with their wired connections, may be removed bodily, without disconnecting the internal connections, while the spring contacts remain undisturbed on the lower terminal board; or the lower terminal board may be removed with the cable without disturbing the upper terminal board and its connections with the motors.

Another of our present improvements relates to the aforesaid magnetic indicator or shutter with the object of rendering its movement more certain when the change in direction of the current through the field windings of the motors occurs.

Another of our present improvements relates to the rotary hand switch of the transmitter which is so arranged in conjunction with suitable gearing that the speed of movement of the switch arm and therefore of the motor-armatures of all the instruments is reduced relatively to that of the movement of the crank handle actuating the switch. The switch arm and motor armatures can thus be caused to rotate once for every two, three, four or other desired number of revolutions of the said crank handle.

In order that our said invention may be clearly understood and readily carried into effect we will proceed to describe the same more fully with reference to the accompanying drawings, in which:—

Figure 1 is a front elevation partly in section of the improved range transmitting apparatus. Fig. 2 is a plan of the same with the cover partly broken away to show the interior. Fig. 3 is a cross section taken approximately on the line 1—1 of Fig. 1, the upper and lower terminal plates being shown in elevation. Fig. 4 is a cross section taken approximately on the line 2—2 of Fig. 2. Fig. 5 is an elevation showing a

detached view of the rotary switch arm and the speed reducing gearing through which it is driven. Fig. 6 is a plan of one of the terminal plates shown separately. Fig. 7 is a front elevation partly in section of one of the range and deflection receivers with the cover plate removed. Fig. 8 is a section taken approximately on the line 3—3 of Fig. 7. Fig. 9 is a section taken approximately on the line 4—4 of Fig. 8 looking upward. Fig. 10 is an end elevation with the lower terminal plate removed. Fig. 11 is a plan of the lower terminal plate. Fig. 12 is a part elevation and Fig. 13 is a plan showing a modified form of attachment of the motor to the apparatus, and Figs. 14 and 15 are corresponding views of a further modified form of attachment.

In all these figures like letters of reference indicate similar parts.

A is the range transmitting apparatus of which A' is the dynamo-electric device or electric motor, A<sup>2</sup> the counting device, and A<sup>3</sup> the rotary switch arm which operates with the segmental contacts A<sup>4</sup> as set forth in our aforesaid prior specifications.

B is one of the combined range and deflection receiving instruments of which B' is the electric motor of the range receiving portion of the instrument and B<sup>2</sup> the electric motor of the deflection receiving portion of the instrument.

B<sup>3</sup> is the range counting device actuated by the motor B<sup>1</sup> and B<sup>4</sup> is the deflection counting device actuated by the motor B<sup>2</sup>.

Each dynamo electric device or motor at the transmitting and various receiving stations has two separate field windings and the pole pieces and cores of the magnets are each made in one piece. The said magnet-cores of each motor are secured to a soft iron magnet base *b* forming the yoke piece which is screwed to the base or bottom of the apparatus with self-retaining screws *b'* (see Fig. 9) inserted from the inside. Or the base of the motor may be arranged to fit between two slides *b<sup>2</sup>* as shown in Figs. 12 and 13, or to fit on to two steadying pins *b<sup>3</sup>* as shown in Figs. 14 and 15 and to be held in place by screws *b<sup>4</sup>* passing through lugs *b<sup>5</sup>* on the bearings of the counting drum.

The armature brushes of bronze or other suitable material, are mounted on hinged brush carriers *d* (Figs. 3 and 8) whose free ends are connected together by a coupling spring *d'* which insures a good rubbing contact on the armature collecting rings.

The bearings *e* of the shafts of the counting drums are directly attached to the pole pieces of the motors to which they are screwed, so that they can be conveniently removed either with or without the motors for inspection or repair.

F is the lower removable terminal board which is placed in the end or side of the apparatus, and consists of a brass plate or cover on which is mounted an ebonite block *f* bearing the terminal screws *f'*, a stuffing box and gland *f<sup>2</sup>* being provided for the cable *f<sup>3</sup>*, thus making a water-tight joint. A sheet of "press-spahn" or other suitable material is placed between the ebonite block and the brass cover, to serve the double purpose of making the cover water-tight and insulating the heads of the terminal screws from the same. Screws are inserted into the ebonite block for securing brass or other suitable contact-holders *f<sup>4</sup>*. These holders are mounted on the upper face and support the resilient contact pieces *f<sup>5</sup>* which are laminated and which when the lower terminal board F is in place form a spring or resilient contact with the terminal plates *f<sup>6</sup>* attached to the under side of the upper terminal board F'. These terminal plates are electrically connected with the motors and their armatures in the receivers and with the motor and the rotary hand switch in the transmitter.

C<sup>4</sup> (Figs. 8 and 9) is the magnetic shutter or indicator arm which is attached directly to the magnet *g<sup>x</sup>* that is pivoted on a central pin *g* carried by a bracket *g<sup>o</sup>*. This magnet *g<sup>x</sup>* is subject to the influence of the current passing through the field windings of the motor B<sup>2</sup> and is moved from one position to another by reversing the direction of the current by means of the hand switch at the sending station as explained in our aforesaid prior specifications. The turning power for effecting this movement is reinforced by an arrangement which consists of two pieces of iron *g'* and *g<sup>2</sup>* screwed to one of the pole pieces of the field magnet of the motor B<sup>2</sup> with one edge of each a short distance from and parallel to the two ends of the pivoted magnet *g<sup>x</sup>* in its mean position. These pieces of iron will partake of the same polarity as the pole piece of the field magnet and will cause one end of the pivoted magnet *g<sup>x</sup>* to be attracted and the other repelled, and vice versa when the magnetism of the pole piece of the field magnet is changed.

On the inner end of the spindle *a<sup>3</sup>* of the rotary switch arm A<sup>3</sup> is a pinion *a<sup>4</sup>* (Figs. 1, 4 and 5) which gears with an intermediate idle wheel *a<sup>5</sup>* revolving on a stud pivoted to a gear plate *a<sup>6</sup>* or cover supported by the said spindle and prevented from rotating by a tail *a<sup>7</sup>* engaging with two stops *a<sup>8</sup>* on the transmitter base. The idle wheel gears with internal teeth on the rotary switch arm A<sup>3</sup>. By these means the said switch arm and consequently the motor armatures will rotate at a reduced speed relatively to that of the crank spindle *a<sup>3</sup>* when the latter is actuated by its crank handle A<sup>x</sup>.

What we claim and desire to secure by Letters Patent of the United States, is:—

1. In electric signaling apparatus, the combination with the transmitting and receiving instruments, of electric motors each having the cores of its field magnet separately wound and secured to a soft iron base forming the yoke piece of the field magnet, means for detachably connecting said base to the casing of the apparatus, counting devices geared with said motors, and means for detachably connecting the said counting devices directly to the pole pieces of the field magnets of said motors substantially as described.

2. In electric signaling apparatus, the combination with the receiving instrument

and its electric motor, of a pivoted magnet lying contiguous to the field windings of said motor, an indicator rigid with said pivoted magnet, and iron pieces attached to one of the pole pieces of said motor and partaking of the polarity of said pole piece to assist in the movement of said indicator, substantially as and for the purpose specified.

In testimony whereof we affix our signatures in presence of two witnesses.

ARTHUR TREVOR DAWSON.  
GEORGE THOMAS BUCKHAM.

Witnesses:

HENRY KING,  
C. A. SEARLE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."