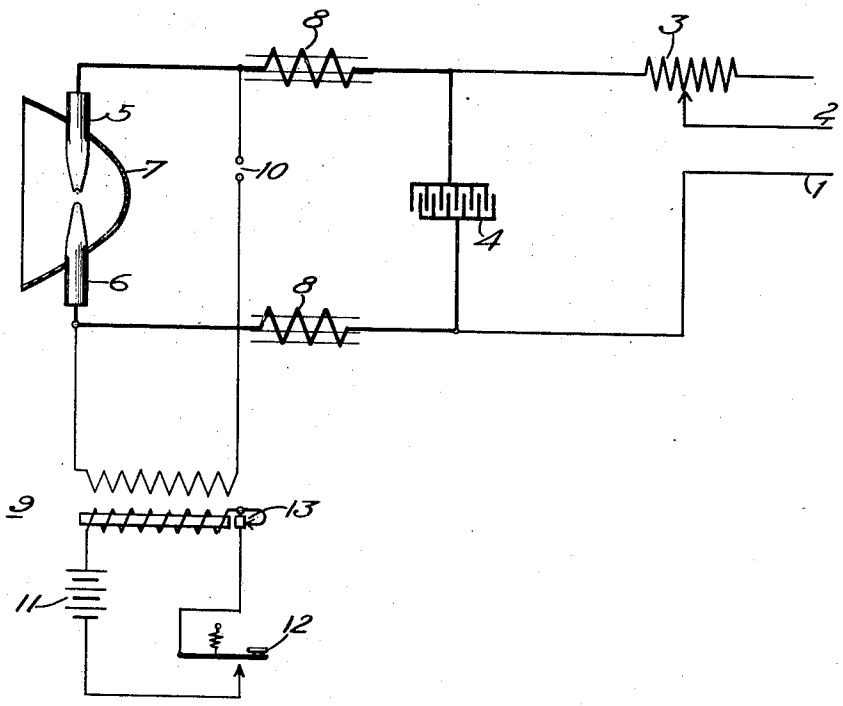
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L. W. CHUBB

SIGNAL LIGHT

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WITNESSES:
J. B. Merrill
H. M. Biebel

INVENTOR
Lewis Warrington Chubb
BY
Wesley G. Carr
ATTORNEY

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UNITED STATES PATENT OFFICE.

LEWIS WARRINGTON CHUBB, OF EDGEWOOD PARK, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

SIGNAL LIGHT.

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To all whom it may concern:

Be it known that I, LEWIS WARRINGTON CHUBB, a citizen of the United States, and a resident of Edgewood Park, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Signal Lights, of which the following is a specification.

My invention relates to signalling means and particularly to electrically-operated signal lights and has for its object to provide electrical means for producing intense flashes of light for signaling purposes.

In signalling between ships or between stations on land by means of periodically interrupted beams of light, it is highly desirable to obtain the maximum intensity of the beam of light. A high intensity of the beam of light not only increases the working range of the signal but it also permits of an appreciable reduction in the duration of the beam of light while still obtaining the desired results. This is for the reason that the effect, upon the eye of an observer, of a beam of light of relatively high intensity maintained for a relatively brief interval of time is equal to, or greater than, that of a beam of light of lesser intensity but maintained over a considerably longer time interval. This fact becomes of great importance when it is desired to transmit messages by means of flashes of light of different lengths arranged according to one of the codes used for such purposes.

In certain of the heavy-current-arc searchlights now in use for signalling purposes, it is necessary to use water cooling of the electrodes, and the light of the continuously-burning arc is periodically interrupted by means of a suitable shutter mechanism. I have found that, in signal work, the light is used less than 50% of the time and that great operative improvements may be obtained by extinguishing the arc between successive flashes of light and dispensing with the shutter mechanism. I prefer also to produce, during the working period of the light, a succession of heavy-current pulses so close together that the light appears substantially continuous because of the retinal persistance of the eye of the observer.

In practicing my invention, I provide a pair of spaced electrodes, which may be located in a reflector, and connect them to a source of stored electrical energy, which is, in turn, connected to a source of relatively high direct-current electromotive force. The secondary terminals of a spark coil are connected to the spaced electrodes, a spark gap being included in the circuit. A source of electromotive force is provided for the primary circuit of the spark coil and suitable mechanism is provided for periodically closing and interrupting the primary circuit. This mechanism may comprise a a hand-operated key or a motor-driven commutator, the former being provided where it is desired to send messages from one station to another and the latter being provided where the device is to be used in a lighthouse.

Referring to the single figure of the drawing, conductors 1 and 2 represent a supply circuit of relatively high direct-current electromotive force, and 3 an adjustable rheostat connected in circuit with the conductor 2. A condenser 4, having a relatively high capacitance, is connected across the circuit, which comprises two spaced electrodes 5 and 6 suitably mounted in a reflector 7, and two reactors 8, 8, which are connected between the electrodes and the condenser. The electrodes may be either of metal or of carbon and are so located that the gap therebetween is relatively small. The reactors 8, 8 may consist of relatively small numbers of turns of conductors having air cores.

A spark coil 9 has one of the terminals of its secondary coil connected to the electrode 6 and the other terminal is connected to one terminal of a spark gap 10, the other terminal of which is connected to the electrode 5. A suitable source of electrical energy 11, here shown as a battery, is connected to the primary winding of the spark coil through a circuit-closing device 12, here shown as a biased key, and an interrupter 13 may also be provided.

The operation of the device is as follows: the electrodes 5 and 6 and the electrodes of the spark gap 10 having been adjusted to obtain the proper operative distance therebetween (it being noted that the distance between the electrodes 5 and 6 is relatively small), the supply circuit, which may have

an electromotive force of 200 volts or higher, is connected to the conductors 1 and 2 through a suitable switch (not shown), and the rheostat 3 is so adjusted as to reduce the current, which the supply circuit may cause to traverse the electrodes 5 and 6, to a relatively small value. As soon as the supply circuit has been connected, the condenser 4 is charged, the charging current flowing through the rheostat 3. If now the key 12 is so moved as to energize the primary winding of the spark coil 9, current will traverse the secondary winding and sparks will occur between the terminals of the electrodes 5 and 6 and across the spark gap 10. If the interrupter 13 is omitted, a single discharge is obtained, under the above conditions, while, if the interrupter is used, a succession of discharges is obtained. The discharge across the air gap between the electrodes 5 and 6 acts as a pilot spark for the discharge of the condenser 4 across this gap. As the capacitance of the condenser 4 is relatively large, the air gap between the electrodes 5 and 6 is relatively small and the inductance of the two reactors 8, 8 is also relatively small, the current traversing the electrodes 5 and 6 is relatively large and results in a flash of light of very high intensity. As the initial current traverses the reactors 8, 8, a small amount of energy is stored in them, and the voltage of the condenser is thereby reduced to a point below the value required to maintain the arc between the electrodes 5 and 6. The condenser 4 is, however, charged again as soon as the arc current ceases, and the condenser is then again ready to discharge across the gap between the electrodes 5 and 6. If the key 12 is operated to close the circuit through the primary winding of the spark coil 9 for only a small interval of time, a relatively small number of intense flashes of light will be produced by the interrupter 13, while, if the circuit be closed for a greater length of time, a proportionately larger number of such flashes of light will be produced. In this way, it is possible to produce, visually, the effect of telegraphic dots and dashes and thus to transmit messages.

The reactors 8—8 are of use not only to assist in causing the main current to tend to oscillate through the electrodes 5 and 6 and extinguish the arc but also operate to prevent the current furnished by the secondary winding of the spark coil from traversing the condenser 4.

The spark gap 10 is effective to prevent part of the current from the condenser 4 traversing the secondary winding of the spark coil and also helps to prevent the current in the secondary winding of the spark coil traversing the condenser 4, by producing a steep-wave-front discharge.

The apparatus embodying my invention thus provides a means of producing very intense flashes of light for varying time intervals by means of which messages or warning signals may be transmitted.

The simplification of the signal-light mechanism and the elimination of the shutter mechanism permits of the application of the principles of remote control to a signal light constructed and operated in accordance with my invention. The signal light may thus be mounted at the top of a mast and be operated from a deck or a cabin of the ship.

If desired or necessary, flame-arc electrodes may be used instead of ordinary arc electrodes to increase the intensity of the light obtained by the use of the device embodying my invention.

Various modifications may be made in the circuit embodying my invention without departing from the spirit and scope thereof, and I desire that only such limitations shall be placed thereon as are imposed by the prior art or are specifically set forth in the appended claims.

I claim as my invention:

1. In a signal light, the combination with two spaced electrodes, a source of direct-current electrical energy connected thereto, and a condenser connected to said source of energy and to said electrodes, of electric means connected to said electrodes for breaking down the resistance of said spaced electrodes and thereby causing said condenser to discharge across said electrodes, the resistance of the circuit containing the electrodes and the source of current being sufficient to prevent the flow of current therethrough after the condenser has become discharged.

2. In a signal light, the combination with a pair of spaced electrodes, a source of electrical energy and a condenser connected to said electrodes and to said source of energy, of electric means for reducing the resistance between said electrodes, and means for permitting the source of energy to fully charge said condenser and for permitting the flow of only a relatively small amount of current from said source of energy through said electrodes insufficient to maintain an arc across the electrodes when said condenser discharges through said electrodes after the resistance therebetween has been reduced by said electric means.

3. In a signal light, the combination with a pair of spaced electrodes, a source of electromotive force connected to said electrodes, and a condenser connected to said source of electromotive force and said electrodes, of a spark coil having its secondary coil operatively connected to said electrodes, means for

energizing said spark coil, a spark gap connected between said secondary coil and one of said electrodes, means for preventing the current traversing said electrodes, spark gap and secondary coil from traversing said condenser, and means for reducing the current value delivered to said electrodes by said source of electromotive force to an amount insufficient to maintain an arc across the electrodes.

In testimony whereof, I have hereunto subscribed my name this 26th day of January, 1920.

LEWIS WARRINGTON CHUBB.