J. S. GOODWIN.

ELECTRIC CURRENT REGULATOR.

APPLICATION FILED JAN. 6, 1912.

1,031,708.

Patented July 9, 1912

3 SHEETS—SHEET 1.

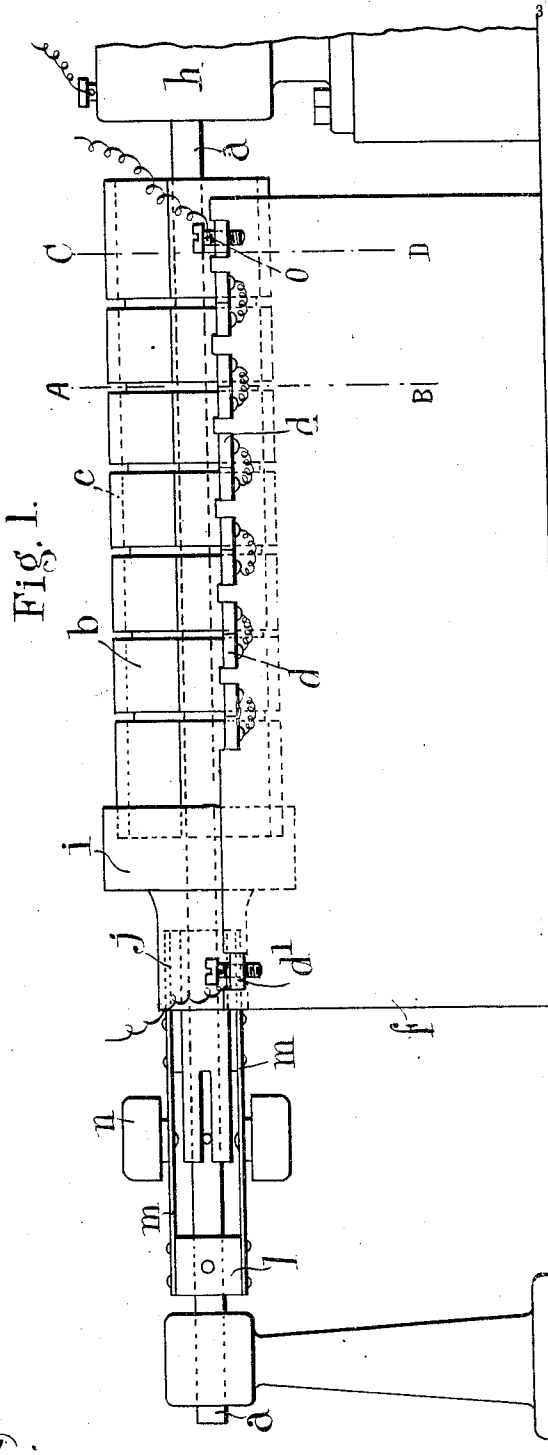

Fig. 1.

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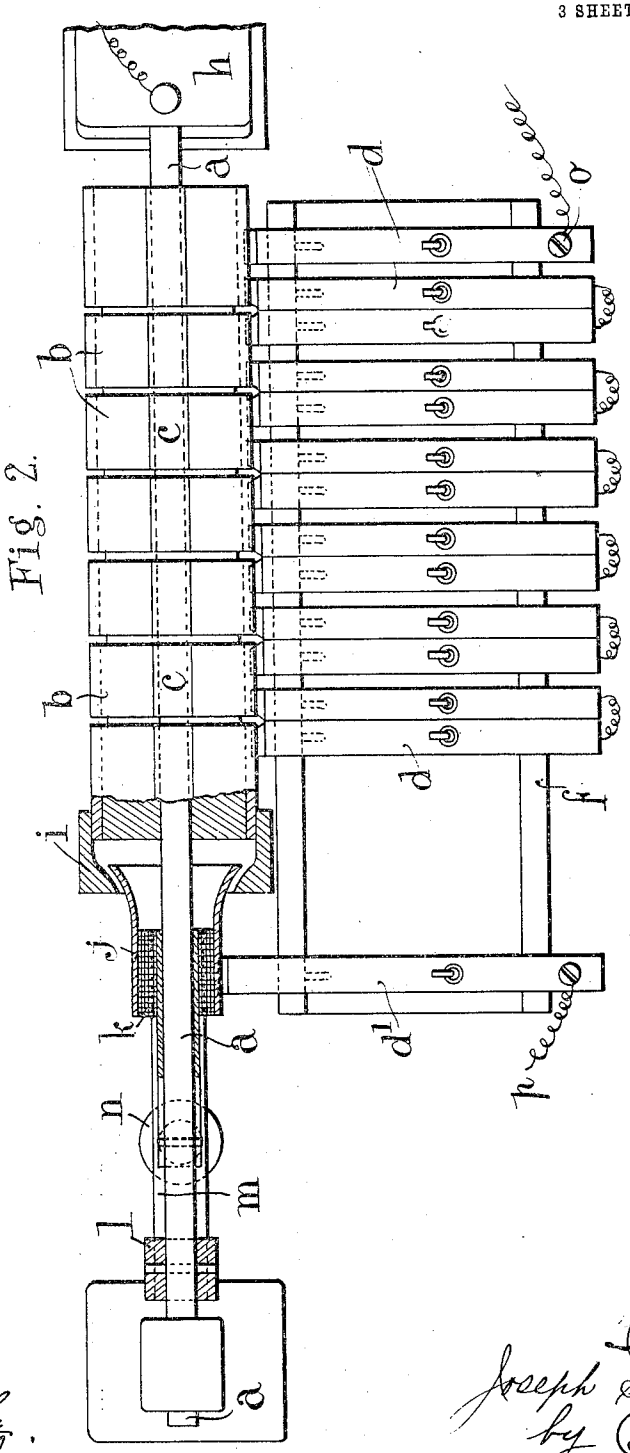
3 SHEETS—SHEET 2.

Fig. 2.



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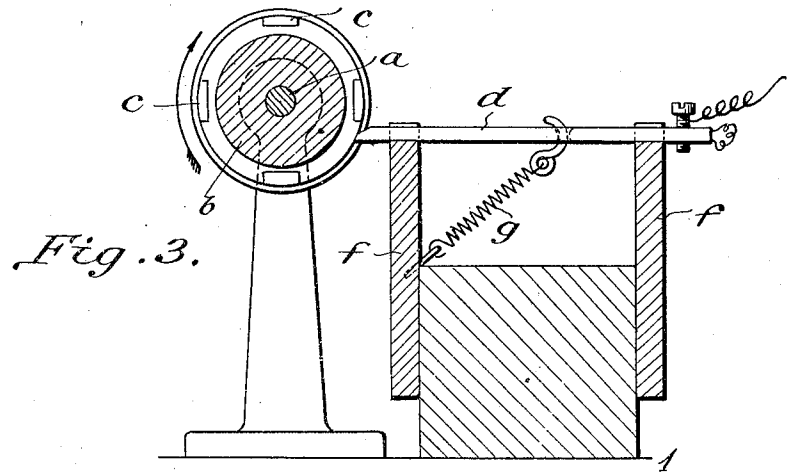

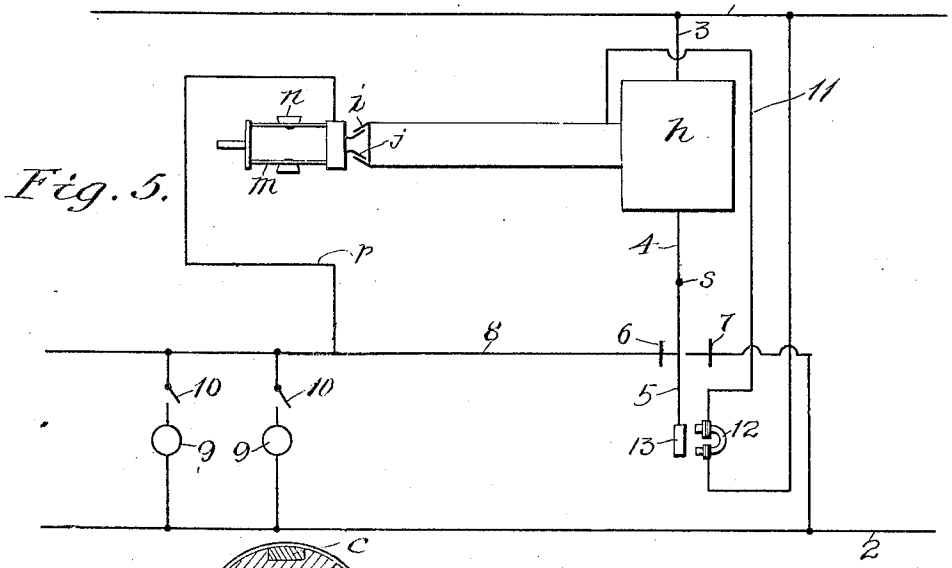

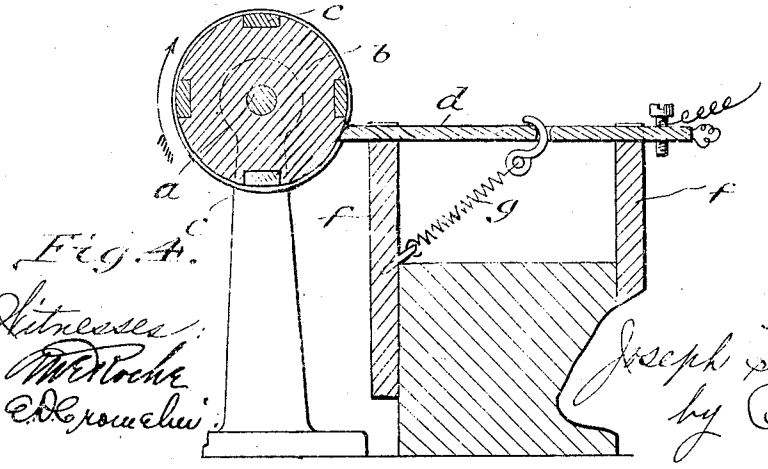

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UNITED STATES PATENT OFFICE.

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ELECTRIC-CURRENT REGULATOR.

1,031,708. Specification of Letters Patent. Patented July 9, 1912.

Application filed January 6, 1912. Serial No. 669,897

To all whom it may concern:

Be it known that I, JOSEPH SOMERS GOODWIN, a subject of the King of Great Britain and Ireland, residing at 4ª Bethune road, Stamford Hill, London, England, have invented certain new and useful Improvements in Electric-Current Regulators, of which the following is a specification.

This invention for improvements in electric current regulators, relates to regulators of the interrupter type, and has for its object to enable an electric consuming device adapted for use on a lower voltage continuous current circuit to be economically used in a higher voltage circuit, for example, to enable a 50 volt lamp to be used on a 200 volt continuous circuit.

The invention consists in a current interrupter comprising a large number of synchronous interrupter contacts connected in series in the circuit, and so arranged that the ratio of the time during which the current is flowing to the time during which it is interrupted is such as to give an average wattage equal to the wattage that the consuming device was constructed to consume.

In a practical way of carrying out my invention, a large number of metal contact pieces are mounted flush with the surface of an insulating cylinder in one or more rows parallel to its axis, and this cylinder is rotated at a high speed by any suitable means, preferably by an electric motor.

Two brushes bear on each contact and the brushes are also connected in alternate pairs not counting the two end brushes. The current to be transformed enters by one end brush and leaves by the other end brush.

It will be seen that when the brushes are on the contacts the current flows from one end brush through a contact and a pair of connected brushes alternately, to the other end brush. Thus when the drum is rotated and the two end brushes are connected in the circuit to be modified, the circuit is broken at a great number of points simultaneously, thus reducing the length of the spark at break in inverse proportion to the number of brushes. It will also be seen that the average wattage of the interrupted current can be determined by the ration of the time during which the current is flowing to the time during which it is interrupted so that by altering the relative length of contact, and length of interruption, the exact required average wattage can be obtained. Thus in the case given above the total length of the contacts in any one circumference is about $\frac{1}{10}$ of the circumference of the drum.

The speed at which the interrupter is run is unimportant so long as it is not so slow as to cause flickering of the lamps, or for the current to flow uninterrupted long enough to burn out the lamps or injuriously strain any consuming device in the circuit; but so long as this minimum is exceeded the speed need not be constant.

The governor on the spindle shaft breaks the circuit when the speed of the drum is reduced below a safe limit.

One form of the invention is illustrated in the accompanying drawings, in which,

Figure 1 is a side elevation of the apparatus. Fig. 2 is a plan of Fig. 1. Fig. 3 is a transverse section of Fig. 1 taken through A. B. Fig. 4 is a transverse section taken through C. D. of Fig. 1. Fig. 5 is a diagrammatic view of the circuit connections showing the relation of the voltage-reducing means or regulator to the supply and consumption circuits, and the relation of the driving motor for the regulator to the said circuits.

The interrupter which is mounted on the shaft *a* comprises a cylinder or drum *b* of insulating material with metallic segments *c* arranged around the periphery, and let in flush with the cylinder surface. These segments are in the form of strips extending from end to end of the cylinder, and divided at intervals by annular grooves in the cylinder.

At the side of the drum *b* and a little below the axis thereof, the contact strips or brushes *d* are arranged. The brushes *d* are connected in pairs, each pair being insulated from the adjacent pair while their ends connect the adjacent segments as they come in contact with them. The brushes are held in the rack or frame *f*, and kept bearing against the cylinder by the springs *g*.

On the shaft *a* the driving motor *h* is arranged to rotate the cylinder at any suitable high speed. At the other end of the shaft *a* a safety cut out device is arranged which opens the circuit when the speed of the cylinder or drum falls below the limit of safety. On the end of the cylinder or drum a sleeve *i* with an inturned conical flange is mounted in contact with the end metallic segments *c*. A corresponding sleeve *j* with an external conical flange is mounted on a fiber

bush *k* to slide on shaft *a*. The bush *k* and a similar bush *l* fixed to the shaft *a* are connected by flat springs *m*, which are loaded at their centers with weights *n*. On rotation of the shaft *a* the sleeve *j* is caused to slide on the shaft, and come in contact with the sleeve *i*, and thus close the circuit. A brush *d'* is also arranged in the rack or frame *f*, to pick up the current from the sleeve. The arrangement of all the brushes and segments is such that the contact is made or broken simultaneously at as many points as there are brushes. Thus the tendency to spark is reduced to a minimum.

The dimensions of the metallic segments on the cylinder and the thickness of the brushes must be so proportioned with relation to the insulating material as to allow the current to pass a sufficient time to give the required average wattage.

The current of the circuit in which the wattage is to be regulated is passed through the brushes from *o* to *p*.

In Fig. 5, the source of current of high electro-motive force is indicated by the mains 1 and 2, which, of course, will be connected with a generator of any approved type, and the motor *h* is connected by a lead 3 to the main 1, and by a lead 4 to a switch *s* that has a movable contact 5 and fixed contacts 6 and 7. The contact 6 is connected with a wire 8 which is part of the consumption circuit that includes lamps or other translating means 9 which can be connected into and out of circuit by switches, push buttons or the like 10, said translating devices being connected also with the main 2. Thus, current can flow through the motor and translating devices by the path consisting of the main 1, lead 3, motor *h*, lead 4, switch contacts 5 and 6, wire 8, switch 10, lamp 9, and main 2. The motor is thus caused to rotate, and when the speed attains a suitable value, the speed-responsive device connected with the shaft of the motor will close the switch *j*, *i*, of the voltage reducing device or regulator. The wire *p* leads from this speed controlled switch to the consumption devices 9. The other terminal of the regulator is connected by a wire 11 with the main 1, and in this wire 11 is an electro-magnet 12 which operates on an armature 13 carried by the movable member 5 of the switch S to cause said member to move into engagement with the fixed contact 7 when the current flows through the voltage-reducing device or regulator. That is to say, when the speed of the motor reaches a given point, current will flow from the main 1, through the wire 11, voltage-reducing device or regulator, switch *j*, *i*, wire *p*, consumption device 9, and main 2. As the result, the electro-magnet will cause the switch S to cut the motor *h* out of series relation with the consumption device 9 and close the motor circuit across the mains. The electro-magnet 12 will remain energized as long as the speed of the motor is maintained. When it falls, the circuit will open at *j*, *i*, and thereby deënergize the electro-magnet 12 so that the member 5 of the switch S will return to engagement with the contact 6, thereby completing the circuit of the consumption device through the motor, the resistance of the motor being relied on to prevent the destruction of the consumption device by current of too high voltage.

What I claim and desire to secure by Letters Patent is:—

1. In a system of the class described, the combination of a source of relatively high energy, a consumption device adapted to operate at lower voltage than the said source, a regulator for reducing the voltage between the said source and device, said regulator comprising means for making and breaking the circuit between the said source and device at a number of points simultaneously and in rapid succession, and an automatic means for opening the circuit when the periods of current flow through the said means exceeds a predetermined duration.

2. In a system of the class described, the combination of a source of current of comparatively high voltage, a current consumption device adapted for a lower voltage, a regulator comprising a plurality of sets of relatively movable contacts for opening and closing the circuit at a plurality of points simultaneously, and a speed-responsive device for opening the circuit independently of the said contacts when the speed of the movable contacts drops to a predetermined point.

3. In a system of the class described, the combination of a source of current of relatively high electro-motive force, a consumption device adapted to operate at a lower electro-motive force, a regulator of the interrupter type for reducing the voltage between the said source and device, and means in series with the regulator and device for opening the circuit when the periods of current flow through the regulator are prolonged beyond a given duration.

4. A system of the class described comprising a source of current of relatively high voltage, a low voltage consumption device, a voltage reducing means comprising a series of movable contacts, and fixed contacts coöperating with the movable contacts to make and break the circuit at a plurality of points simultaneously, and a speed-responsive device movable with the movable contacts for opening the circuit when the rate of movement of the movable contacts falls below a given point.

5. In a system of the class described, the combination of a source of current of relatively high voltage, a low voltage consump-

tion device, a voltage reducing means consisting of a plurality of movable contacts and a plurality of fixed contacts arranged to make and break the circuit simultaneously, a motor for driving the movable contacts, a switch in series with the said means and consumption device, and means for opening the switch when the motor speed falls below a certain point.

6. A system of the class described comprising a supply circuit of relatively high voltage, a low voltage consumption means, a current-reducing regulator of the interrupter type and including a motor-driven element, a motor for the said element, a switch through which the motor is initially in circuit with the consumption device, a switch controlled by the speed of the motor for closing the circuit through the regulator, and means responsive to current flowing through the regulator for operating the motor switch to connect the motor with the supply circuit independently of the consumption device.

In testimony whereof I have affixed my signature, in presence of two witnesses.

JOSEPH SOMERS GOODWIN.

Witnesses:

ALBERT JONES,

THOMAS HENRY BROWN.