

(No Model.)
E. OXLEY.
METHOD OF AND APPARATUS FOR MULTIPLE RATE METERING FOR
ELECTRIC CURRENTS.
No. 591,195. Patented Oct. 5, 1897.

Patented Oct. 5, 1897.

Fig. 1.

Inventor.
Eustace Oxley.
By
Chas. B. Tilden
Att'y

UNITED STATES PATENT OFFICE.

EUSTACE OXLEY, OF WASHINGTON, DISTRICT OF COLUMBIA.

METHOD OF AND APPARATUS FOR MULTIPLE RATE-METERING FOR ELECTRIC CURRENTS.

SPECIFICATION forming part of Letters Patent No. 591,195, dated October 5, 1897.

Application filed August 23, 1897. Serial No. 649,270. (No model.)

To all whom it may concern:

Be it known that I, EUSTACE OXLEY, a subject of the Queen of Great Britain, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Methods of and Apparatus for Multiple Rate-Metering for Electric Currents, of which the following is a specification.

My present invention relates to electric meters, and is an improvement upon the subject-matter of two applications for Letters Patent heretofore filed by me upon the 19th day of June and the 19th day of August, 1897, bearing the serial numbers, respectively, of 641,508 and 649,269. The application filed by me June 19, 1897, became Letters Patent August 17, 1897, No. 588,170.

My present application is closely connected with both those named above, the latter having been filed of even date herewith.

My purpose is to simplify and improve the method of and means for metering electric currents during different periods of the day and at different rates and to materially cheapen the manufacture and installation of the apparatus. It is my aim, in other words, to provide a method consisting in the connection of the armature-circuits of a number of meters arranged upon the premises of a corresponding number of consumers either between the two outside wires of a three-wire system or between one of the wires and the neutral, whereby the rate of registration shall be decreased in a predetermined ratio for one period of registration and restored to a normal rate during the other period, the control of said meters in this respect being exercised from a single and, preferably, central point—as, for example, the generating-station.

My invention also comprises the provision of extremely simple apparatus for the purpose set forth, whereby I am able to supply the armature-circuits of a number of meters upon the premises of a corresponding number of consumers with current from the neutral and one of the sides of a three-wire system and from both sides, whereby in the one case the pressure is theoretically about one-half of the pressure supplied in the other case. The armature therefore will have about double the speed energy in the latter case over what it will have in the former.

By my invention I am able to provide consumers of electrical energy with current during the day or hours-of-light load and to meter the energy supplied at the two rates with approximate accuracy, using for such purposes only one meter for each consumer and with an outlay for installation so small as compared with those systems employing a plurality of meters on each consumer's premises that it constitutes an economic feature of some importance.

My present invention also preserves a practical uniformity or approximately uniform measurement at all points without regard to the distance from the central station or other point of control, and in this respect it differs in a marked degree from any system in which a variable speed of the registering mechanism has been attempted by varying the voltage.

To enable others skilled in the art to which my invention pertains to fully understand and practice said invention successfully, I will now proceed to describe the same in detail, reference being had for this purpose to the accompanying drawings, in which—

Figure 1 is a diagram showing an arrangement of circuits and apparatus suitable for the practice of my method. Fig. 2 is a detail elevation showing, on a slightly-enlarged scale, a part of the mechanism.

The reference-numeral 1 in said drawings indicates conventionally the usual type of generators arranged for supplying a three-wire system of electrical distribution.

The numeral 2 denotes a meter or registering apparatus installed upon the premises of one of the consumers to whom energy is supplied both day and night, the current consumed during the day or hours-of-light load being at a reduced cost, while that supplied at night is at the full rate or at a different rate from that used during the day. For the purposes of this explanation we may assume that the night rate is ten cents per kilowatt hour and the day rate five cents.

The meter 2 is of known construction, comprising a motor having field-coils 3 and an armature 4, having brushes 5 and 5^a. A wire 6, forming one of the house-wires of the system, is taken from the positive side of the system to the field-coil, and a branch wire 7 is tapped off this house-wire 6 to the brush 5.

A wire 8 goes from the negative side to the other field-coil. The house-circuit 10, including the lamps or other translating devices, is of the ordinary arrangement.

5 From the brush 5^a of the meter-armature a wire 12 is led to the resistance R, which is usually inserted in the armature-circuit, and from said resistance a continuation of the same wire goes to the blade 13 of a knife-
10 switch. Said blade is mounted on an insulating-bar 14, through which the blade passes, a portion 13^a projecting about equally on the other side of the bar. A second blade 15 15^a is mounted on the same bar somewhat below
15 the first.

The bar 14 is a rigid portion of an armature 16, which is pivoted between lugs 17. Upon opposite sides of the bar 14 are two clips 18 and 19, so placed that when swung
20 in one direction the blade portion 13 will enter the clip 18, while in the opposite direction of movement the portion 13^a will be struck into the clip 19. Near said clips are duplicates of the same (denoted by the numerals 20 and 21) so arranged that the clip 20
25 will receive the blade portion 15 simultaneously with the entry of the blade 13 in the clip 18, while the clips 21 will take the blade portion 15^a at the same time that the blade
30 portion 13^a enters the clip 19. The clips 18 and 19 are connected to the neutral and to the negative sides of the system by wires 22 and 23, respectively. The clips 20 and 21 are connected, the former by a wire 24 to one
35 terminal of the winding of an electromagnet 25, placed on the same side of the bar 14 as the clips 19 and 21, and the latter by a wire 26 to one terminal of the coil of an electromagnet 27 on the opposite side of the said
40 bar. From the other terminal of the magnet 25 a wire 28 goes to the wire 6 of the house-circuit, and by said wire to the positive side of the system. From the other terminal of the magnet 27 a wire 30 is led to the house-
45 wire 8, which goes to the negative side of the system.

At a single point, suitably located with reference to the arrangement of control-circuits so as to avoid unnecessary use of wires, is
50 installed a small double-throw double-pole knife-switch 31. The clips which are about to receive the two parallel blades 32 32^a of this switch in the position shown in Fig. 1 are denoted by the reference-numerals 33 and
55 34. The clip 33 is connected by a wire 35 to a binding-post 36 on an indicator 37, which will be described hereinafter. The other clip, 34, is connected to the positive side of the system by a wire 38. The switch-blade 32^a
60 is connected with a single wire 39, which runs the entire length of the conduits or as far as there are consumers who use current both day and night. The other switch-blade, 32, is connected by a wire 40 to the positive or
65 negative side of the system. The two remaining clips 41 and 42 are connected, the first by a wire 43 to a binding-post 44 on the indi-

cator 37 and the latter by a wire 45 to the negative side of the system.

From the wire 39 at each consumer's premises where energy is furnished at two different rates a wire 46 is led to the blade portion
70 15 of the knife-switch.

On the switchboard 31, or near the same, the indicator 37 is placed. It consists of any
75 suitable support, such as a housing having a transparent front 47. Within this housing is a pivoted index or pointer 48, having a V-shaped armature 48^a inverted upon its lower end. Upon the opposite sides of this arma-
80 ture are electromagnets 49 50. To the terminals of these magnet-coils the wires 35 and 43 are connected. Their second terminals 35^a and 43^a are united and both carried to a binding-post 51. From the latter a wire 52 goes
85 to the neutral wire of the system.

Upon a suitable part with reference to the index or pointer 48 are two words, such as "Day rate," and at a near point are the words
90 "Night rate" or the words "Night" and "Day." Any symbol or character that will convey a similar meaning can be used, however, instead. Said words or other characters are so placed that when the electromagnet 49
95 is energized and attracts the armature 48^a the pointer will be upon the word "Day" or "Day rate," where it is brought by bringing the knife-switch 32 32^a into the clips 33 34, which
100 it is about to enter, as shown in Fig. 1. In this position of the switch, which is merely thrown into its clips for one or, perhaps, two, seconds, the circuit established will be from the positive side of the system over wire 40
105 to the blade 32 of the switch, thence to clip 33, wire 35, binding-post 36, magnet-coil 49, wire 35^a, binding-post 51, and wire 52 to the neutral wire.

The switch-circuit is by way of wire 38, clip 34, switch-blade 32^a, wire 39, wire 46, blade
110 portions 15 15^a, wire 26, helix of magnet 27, wire 30, and wire 8 to the negative wire.

By the position of the switch-arm 14, last described, the circuit established for the armature of the meter 2 will be as follows:
115 From the positive side of the system over the wire 6, branch wire 7 to brush 5, armature-winding 4, brush 5^a, resistance R, wire 12 to knife-blade 13^a, clip 18, and wire 22 to the neutral, thus putting the armature 4 between the outside wire and the neutral. By this
120 connection it receives about one-half of the voltage it received when connected between the two outside wires of the system. By such a change the speed of the registering mechanism should be so far reduced that the meter
125 will register about one-half of the actual consumption. Therefore it will readily be understood that such registration will be equivalent to a reduction of about one-half in the charges for consumption during the period
130 that the meter is connected between the neutral wire and one of the outside wires. If, now, the switch 32 32^a be placed in the clips 41 and 42, the circuit will then be over wire

40 to blade 32, clip 41, wire 43, binding-post 44, helix of magnet 50, over wire 43^a, binding-post 51, and wire 52 to the neutral. This will draw the armature 48^a to the magnet 50 and
 5 bring the index-hand into the position seen in Fig. 1.

The circuit for the apparatus at the consumer's station 2 will be from the negative side of the system over wire 45 to clip 42, and
 10 thence to knife-blade 32^a over wire 39, wire 46, knife-blade 15 15^a, clip 20, wire 24, magnet-helix 25, and wire 28 to the positive wire 6. The magnet 25, thus energized, attracts
 15 the armature 16 and throws the blade portions 13 and 15 into the clips 19 21, respectively. In this position the control-circuit is opened at the clip 20, out of which the blade
 20 portion 15 has just been drawn. The armature-circuit of the meter established by this change is as follows: from the positive side of the system over wire 6, brush 5, winding of armature 4, brush 5^a, wire 12, through resistance R, continuation of wire 12 to knife-
 25 blades 13 13^a, thence by clip 19, and over wire 23 to the other or negative side of the system. The armature is thus connected between the two outside wires, so that it receives about double the voltage that it had under
 30 the connection heretofore described. The speed of the registering mechanism will therefore be increased to its normal rate, the assumption being that the meter employed is normally connected between the two outside
 35 wires of the system.

It will be understood that upon an actual
 40 installation the service-wires 22 and 23 will connect with the house-wires instead of with the negative and neutral wires of the system. They are shown as having the latter arrangement
 45 merely for the sake of simplicity of the diagram and rendering it easily intelligible.

My present invention effects a marked economy in installation, as it requires only one
 50 meter at each consumer's station and can be operated by a single wire in the control-circuit. This wire may be No. 14 Brown & Sharpe gage or about that size, and the magnets 25 and 27 are usually wound with fine
 55 wire and take only one-twentieth to one-fourtieth of an ampere.

By my invention also I secure practical uniformity of registration without the expense
 60 of laying an additional main. In attempting to regulate the voltage of the armature-circuit by a wire run from the point where control was exercised to the meters the drop in
 65 voltage would be so great as to wholly defeat the object in view unless the controlling-wire was of the same size and material as the wires of the system. The expense of this would be
 70 large and would add so considerably to the standing charges as to go far toward counteracting the dividend-earning capacity of the invention.

65 Having thus described my invention, what

I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The method herein described of metering electric energy consumed during different
 70 periods of a day and at different rates, which consists in varying the speed of the registering mechanism at a number of consumers' stations by connecting the armatures of the
 75 meters between the two outside wires of a three-wire system, for one period and rate, and between the neutral and one of the outside wires for the other period and rate, substantially as described.

2. The method described for metering the consumption of electric energy on a three-
 80 wire system during two different periods of a day and at two different rates, which consists in connecting the armatures of the meters at the consumers' stations between the two outside wires for one period and rate,
 85 and between the neutral and one of the outside wires for the other period and rate, and controlling the connection from a single point, such as a central station, substantially as described.

3. In a three-wire system of electrical distribution, the combination with a number of
 90 single meters arranged at a corresponding number of consumers' premises, of a circuit making and breaking apparatus at each consumer's station, a plurality of circuits including
 95 the armatures of the meters, the wires of the system and the circuit making and breaking apparatus, and a single control-circuit to operate said apparatus and connect the armatures of the meters between the two outside
 100 wires of the system, for one period or rate, and between one of said wires and the neutral for the other period or rate, substantially as described.

4. In a three-wire system of electrical distribution, the combination with a number of
 105 meters upon the premises of a corresponding number of consumers, of a switch at a single point common to all said meters, a control-circuit opened and closed by said switch, a circuit making and breaking apparatus at each
 110 point where a meter is located controlled by the single switch, and a plurality of local circuits at each of said points so arranged that by one movement of said circuit making and
 115 breaking apparatus, the armatures of all the meters will be connected between the positive and negative sides of the system to meter the consumption during one period, and by a second
 120 movement of said apparatus said armatures will be connected between the neutral wire and either the positive or negative wire of the system, to meter the consumption during the other period, and an indicator at the
 125 central station to show which rate is being metered, substantially as described.

5. In a three-wire system of electrical distribution, the combination of a number of meters
 130 installed upon the premises of a corre-

sponding number of consumers, of a circuit making and breaking apparatus consisting of an armature pivoted between four clips, two on each side of a non-conducting bar, vibrated by said armature between said clips, having knife-blades which project upon both sides of said bar, a circuit consisting of a single wire with branches going to one of the knives on the armature-bar and including one of the clips, one of the electromagnets, and one side of the system, a second independent circuit also including both sides of the system, one of the clips, the other knife-blade, the other electromagnet, two separate circuits for the armature of the meter, one including the two outside wires of the system, and switch connections, the other circuit including the neutral and one outside wire and suitable switch connections, means arranged at a single point of control to operate the circuit making and breaking apparatus, and a control-circuit consisting of a single wire, substantially as described.

6. In a three-wire system of electrical distribution the combination of a number of meters, one at each point of consumption, of an apparatus arranged at each point, a control-circuit to operate said apparatus from a single point, a plurality of independent circuits at each point arranged to be closed through the two outside wires of the system, or between the neutral and one outside wire, a switch at

a single point common to all said apparatus, and a control-circuit for the latter and said switch, substantially as described.

7. In a three-wire system of electrical distribution, the combination with a number of meters, one at each point of consumption, of an apparatus arranged at each of said points, a control-circuit, and a switch to actuate said apparatus from a single point, a circuit at each point of consumption including both outside wires, open connections on the apparatus, and a movable conductor to close said circuit, a second circuit at said point comprising one outside wire, the neutral open connections on the apparatus, and a movable conductor to close the circuit at said connections, a meter-armature common to both circuits, and an indicator coupled with the control-switch and having an index hand or pointer to show which rate is being metered, two electromagnets to operate the index in both directions, and independent circuits for said magnets closed and opened alternately by the switch, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EUSTACE OXLEY.

Witnesses:

GEO. G. TILDEN,
CHAS. B. TILDEN.