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J. WILLS & L. E. IMLAY.

METER.

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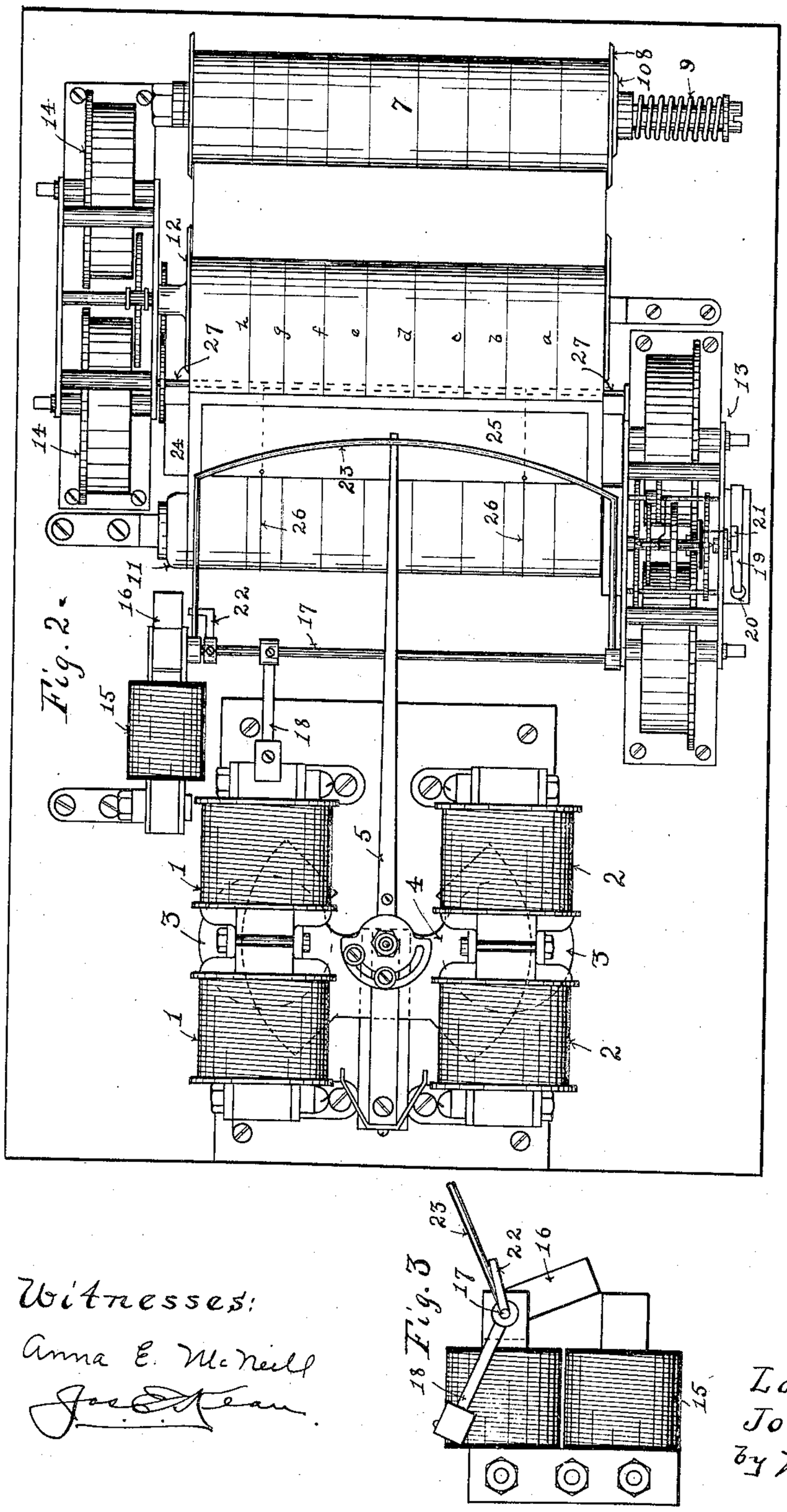

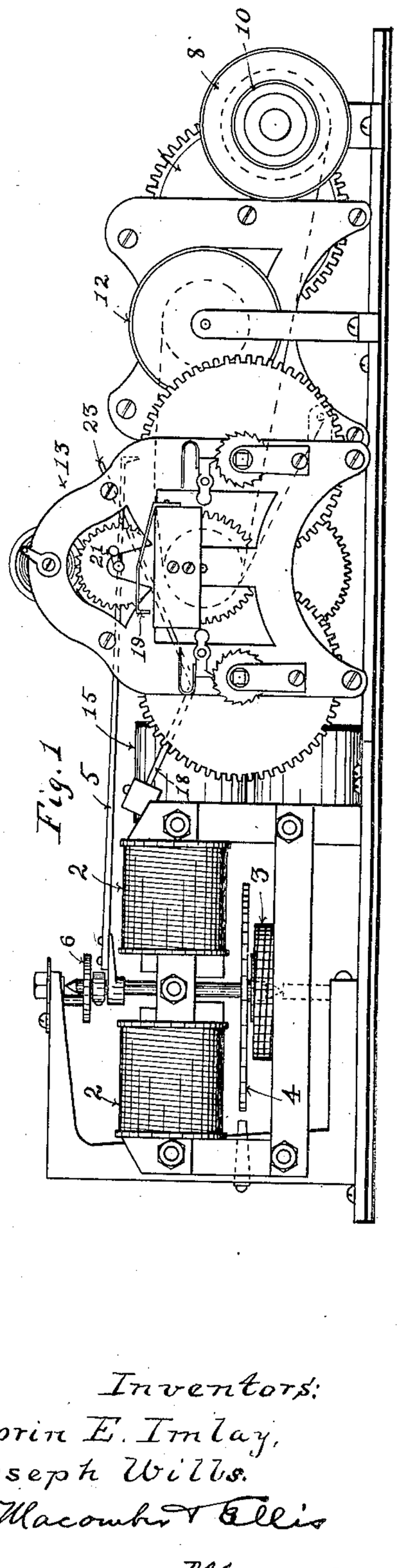

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UNITED STATES PATENT OFFICE.

JOSEPH WILLS AND LORIN E. IMLAY, OF NIAGARA FALLS, NEW YORK, ASSIGNORS OF ONE-THIRD TO THE NIAGARA FALLS POWER COMPANY, OF NIAGARA FALLS, NEW YORK, A CORPORATION OF NEW YORK.

METER.

No. 834,787. Specification of Letters Patent. Patented Oct. 30, 1906.

Application filed June 21, 1904. Serial No. 213,498.

To all whom it may concern:

Be it known that we, JOSEPH WILLS and LORIN E. IMLAY, citizens of the United States, residing at Niagara Falls, in the county of Niagara and State of New York, have invented a new and useful Improvement in Meters, of which the following is a specification.

Our invention relates to meters, and more particularly to wattmeters which are graphic and self-recording. It is adapted to a two or three phase alternating current; but it will be evident to one skilled in the art that it may be readily adapted to a direct current or to electric measurements of watts, current, or voltage.

The object of our invention is to provide an improved self-recording device which will produce a permanent chronological record of the watt value of the electric current which is to be measured. To this end we employ the novel combination of mechanism hereinafter described, and shown in the drawings, in which like characters of reference indicate corresponding parts.

Figure 1 is a side elevation of our improved wattmeter. Fig. 2 is a plan view thereof. Fig. 3 is a detail elevation of the magnet actuating the striker.

1 and 2 are the shunt-coils, and 3 the series coils carrying the coarse windings. 4 is the mutilated or cut-away oscillating secondary disk providing two wings and mounted in jewel-bearings between the shunt-coils and the series coils.

It will thus be seen that we employ first for a wattmeter of the type shown adapted to a two or three phase current two single-phase induction-type wattmeters arranged side by side and acting upon the two wings of the secondary disk 4.

The secondary disk 4 is cut away upon the portion outside the fields of influence and is so cut away as to lighten the load on the jewel-bearings and also to counterbalance the weight of the pointer 5. The pointer 5 is somewhat flexible in vertical plane and is secured to the pivot of the secondary disk. An adjustable involute spring 6 governs the position of the secondary disk and tends to swing the pointer 5 to the zero-point.

The recording apparatus consists of a roll of paper 7, which has longitudinal rulings *a b c*, &c., which are spaced to the calibration of the meter. We preferably place the line *a* at the zero-point and arrange the lines *b c d*, &c., to designate fifty watts to the line; but this depends on the range to be covered. The paper 7 is wound on an outer roller 8, which is provided with a brake consisting of the spring 9 and the disk 10, bearing on the outer roller 8, so that considerable tension is required to cause the paper to unroll. The paper is passed under the inner roller 11, is brought up over it, and back over the intermediate roller 12. The direction of winding of the paper about these rollers is indicated in broken line in Fig. 1. The inner roller 11 is provided with radial spurs or pin-points (not shown) to cause it to engage the paper 7 and give it positive movement. The shaft of the inner roller 11 connects with clockwork 13, which determines and limits its speed. Since the paper passes over the inner roller 11 and is not wound upon it, it will move with even speed synchronously with the clock-movement. Hence we may employ transverse rulings (not shown) to space off desired intervals of time, so that the record shows both volume and time of power. The intermediate roller 12 is rotated by strong springs 14 and connecting-gearing in the same direction of rotation as the inner roller 11. The function of the springs 14 is to wind up the paper 7 onto the intermediate roller 12 after it has been released from inner roller 11, whose speed is determined by the clock. All the power for driving the paper and the rollers is furnished by the springs 14.

15 is a magnet having a pivoted armature 16. The armature 16 is mounted on one magnet-core by a pivot-rod 17 and is normally in the position shown in Fig. 3. A weighted arm 18, mounted on the rod 17, serves to throw the armature 16 away from the other magnet-core. A circuit including the magnets 15 with a source of energy (the circuit and battery not being shown) is closed by a contact-piece 19, dipping in a mercury-cup 20. The contact-piece 19 is actuated by a crank or cam 21 in rotation with a relatively rapidly rotating arbor of the clockwork, (preferably the arbor making a rotation every minute.) This crank striking the contact-piece 19, which is spring-held out of contact, causes it to dip in the mercury-cup to close the circuit including the magnets 15.

This causes the armature 16 to swing on its core, so as to contact with the other magnet-core, and as soon as the circuit is broken the weighted arm 18 will swing the armature 16 to normal.

Secured to the pivot-rod 17 is an L-shaped arm 22, and loosely pivoted on said rod 17 is a striker 23. The arm 22 engages underneath one of the lateral portions of the striker 23 and holds said striker 23 up when the armature 16 is in normal position. When the magnets 15 are energized, the pivot 17 is rotated in a direction to swing the arm 22 out of contact with the striker 23 and allow it to fall by gravity. The transverse portion of the striker 23 is an arc of a circle concentric with the pivot of the pointer 5 and is positioned to strike the upper side of the pointer 5 near its extremity. The pointer 5 terminates in a stylus or impression-point.

Underneath the paper 7 and between the rollers 11 and 12 is an anvil or platen 24. Carried in a guide-frame directly over this anvil and on top of the paper 7 is a printing ribbon or carbon 25.

With this description of the parts the operation may be briefly indicated. The interaction of the series and shunt coils upon the secondary disk will swing the pointer 5 to correspond to the current carried. This pointer is perfectly free to respond to the influences on the secondary disk, to which it is attached, and does not make contact with the paper or record except as hereinafter described. The clockwork will cause or permit the paper or record to advance at a fixed speed. Periodically the crank 21 will close the circuit of the magnets 15 through the contact and mercury-cup, and the armature 16 will withdraw the arm 22 from supporting the striker 23. The striker 23 will then drop with considerable force upon the pointer 5 and cause its point or stylus to make a sharp impact upon the ribbon or carbon 25. This will produce an impression the same as is done in the ordinary writing-machine.

Since the weighted arm 18 will return the striker to substantially the same height after each movement and since the striker is concentric with the pointer movement, the strokes will be uniform and a uniformly plain record will be made.

In order to further secure uniformity, we cause the ribbon or carbon 25 to move very slowly by attaching to one edge two cords 26 and winding them upon a very slow moving arbor 27, driven by the springs 14. This arbor extends transversely the width of the machine, as shown. An almost imperceptible movement of the ribbon is sufficient.

Having thus described our invention, what we claim is—

1. A wattmeter comprising shunt-coils, series coils, a pivoted secondary disk cut away at its inner side and located between the shunt-coils and the series coils, an indicator mounted in rotation with the secondary disk and counterbalanced by the outer side of the disk, means for carrying and imparting regular movement to a record-blank, and means adapted to strike the indicator for making impressions upon the record-blank at regular intervals of time and at points corresponding to the position of said indicator at the moment of impact.

2. The combination of a secondary disk having opposite wings and an indicator, series coils and shunt-coils between which the secondary disk is located arranged to act upon the opposite wings of said disk, means for resisting the rotation of said disk, means for carrying a record-blank, chronometer mechanism, a spring for drawing said blank forward as released by said chronometer mechanism, and means adapted to strike the indicator for imprinting a record of the current measured by the wattmeter on said blank.

3. The combination of a primary coil and a shunt-coil, an oscillating secondary disk located between the primary coil and shunt-coil, an indicator, mounted in rotation with said secondary disk, a printing-point on said indicator, chronometer mechanism for regulating the movement of a record-blank and for making and breaking the circuit of a magnet, a spring for drawing the blank forward, a striker normally held out of contact with said indicator, an armature actuating said striker, a magnet actuating said armature, and means for closing the circuit of said magnet through the movement of said chronometer mechanism.

4. A wattmeter for measuring polyphase currents comprising a secondary disk having opposite wings, primary coils and shunt-coils mounted to act on the opposite wings of said secondary disk, an indicator, chronometer mechanism for moving a record-blank and mechanism for recording chronologically the the record of said indicator.

5. The combination of an oscillating secondary disk, shunt-coils and series coils between which the secondary disk is located, mechanism for permitting regular movement of a record-blank, means for causing movement of a record-blank, a magnet, an indicator mounted in rotation with said secondary disk, a striker governed by said magnet and depending over but normally out of contact with said indicator, and a printing ribbon or carbon, whereby impressions are made on said record-blank at regular intervals longitudinally and transversely at points corresponding to the position of the indicator at the periods of impact.

6. The combination of a wattmeter of the induction type, an oscillating secondary disk, an indicator mounted in rotation with the secondary disk, chronometer mechanism,

spring mechanism for moving a record-blank forward, said indicator swinging transversely over the plane of the blank, means for producing visible marks on said blank by said indicator, and means for producing said marks at regular intervals longitudinally of said blank and at points transversely of said blank to indicate the volume of energy measured at the instant of impact.

7. A wattmeter comprising shunt-coils, series coils, a secondary disk having wings located between the shunt-coils and the series coils, the flexible pointer carried on the axis of the secondary disk, the inner, intermediate, and outer rollers for the record-blank, clockwork whereby the inner roller is controlled, the springs whereby the intermediate roller is rotated, the magnets having cores, the armature, the pivot-rod whereby the armature is mounted on one magnet-core and adapted to contact with the other magnet-core, a weighted arm whereby the armature is retracted, a mercury-cup, a spring contact-piece, a crank adapted to actuate the spring contact-piece to dip the latter in the cup, a striker located over the flexible pointer, and an arm fixed to the pivot-rod and adapted to hold up the striker.

In testimony whereof we have hereunto set our hands in the presence of two witnesses.

JOSEPH WILLS.
LORIN E. IMLAY.

Witnesses:
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W. LOWRY MANN.