

A. C. NEFF & E. H. FORD.
ELECTRICAL ATTACHMENT FOR READING METERS.
APPLICATION FILED APR. 16, 1915.

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1,244,634.

Patented Oct. 30, 1917.

5 SHEETS—SHEET 1.

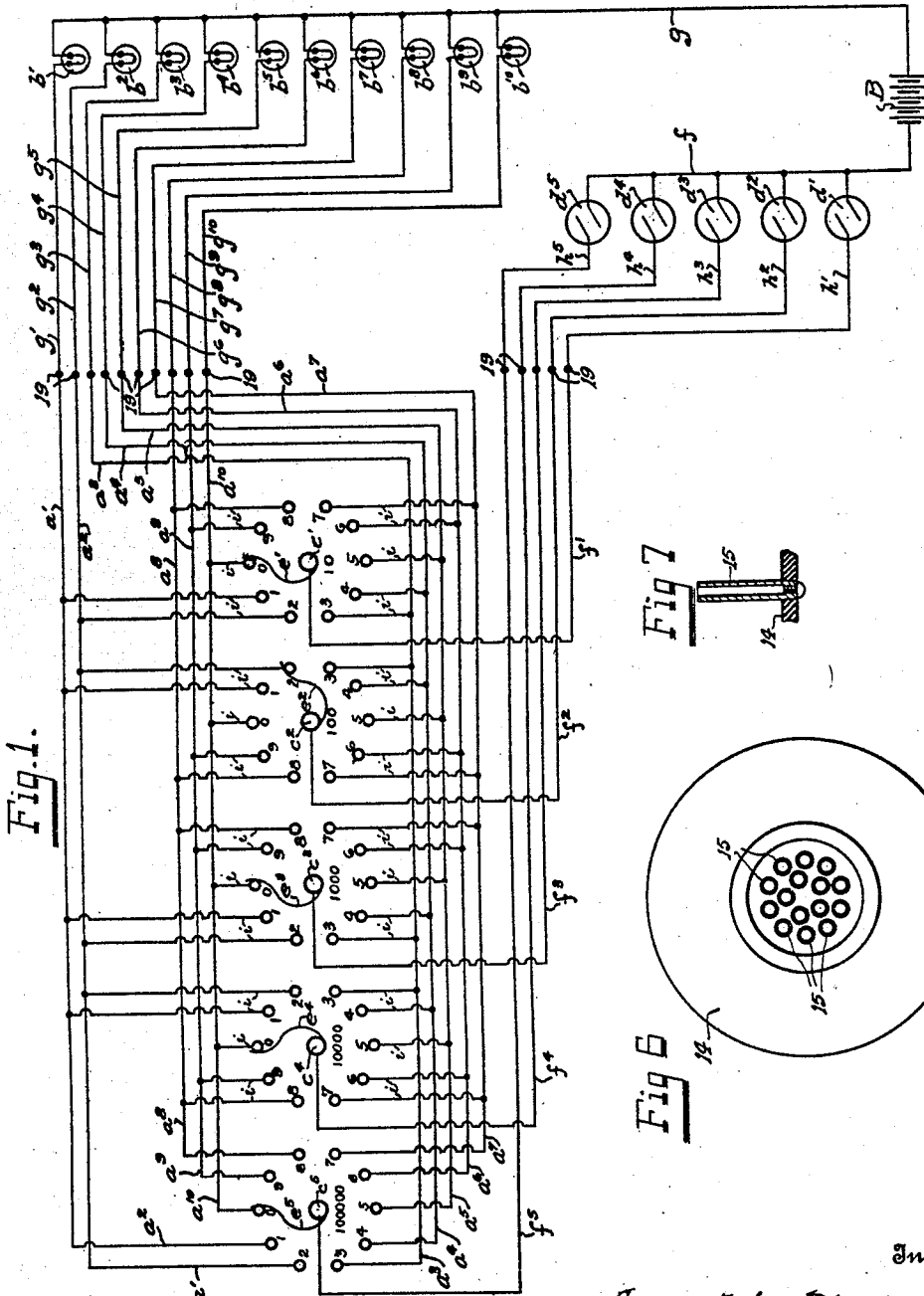


Fig. 1.

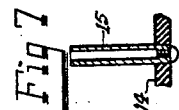
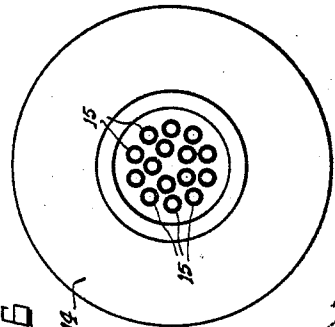


Fig. 6



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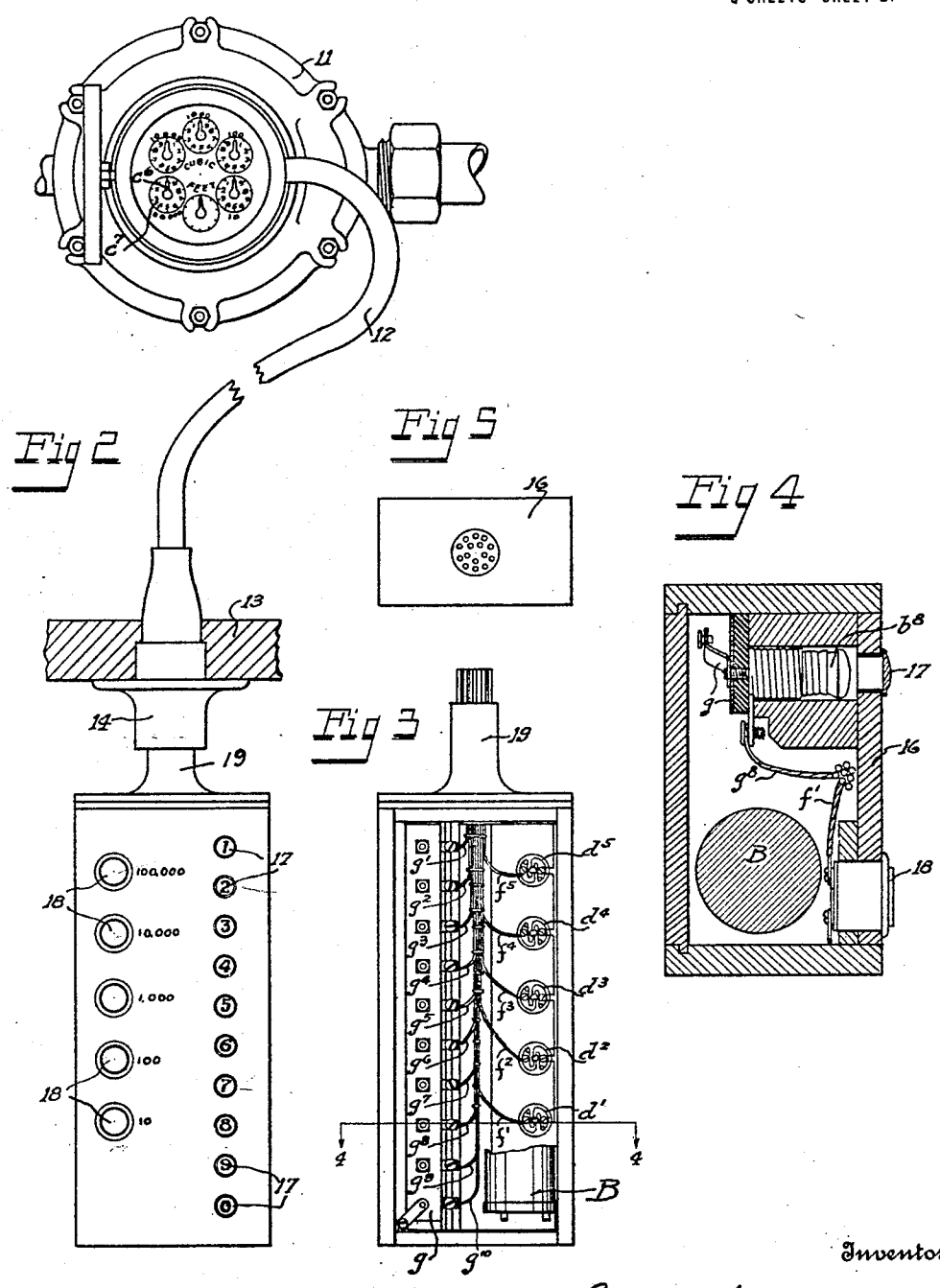
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5 SHEETS—SHEET 2.



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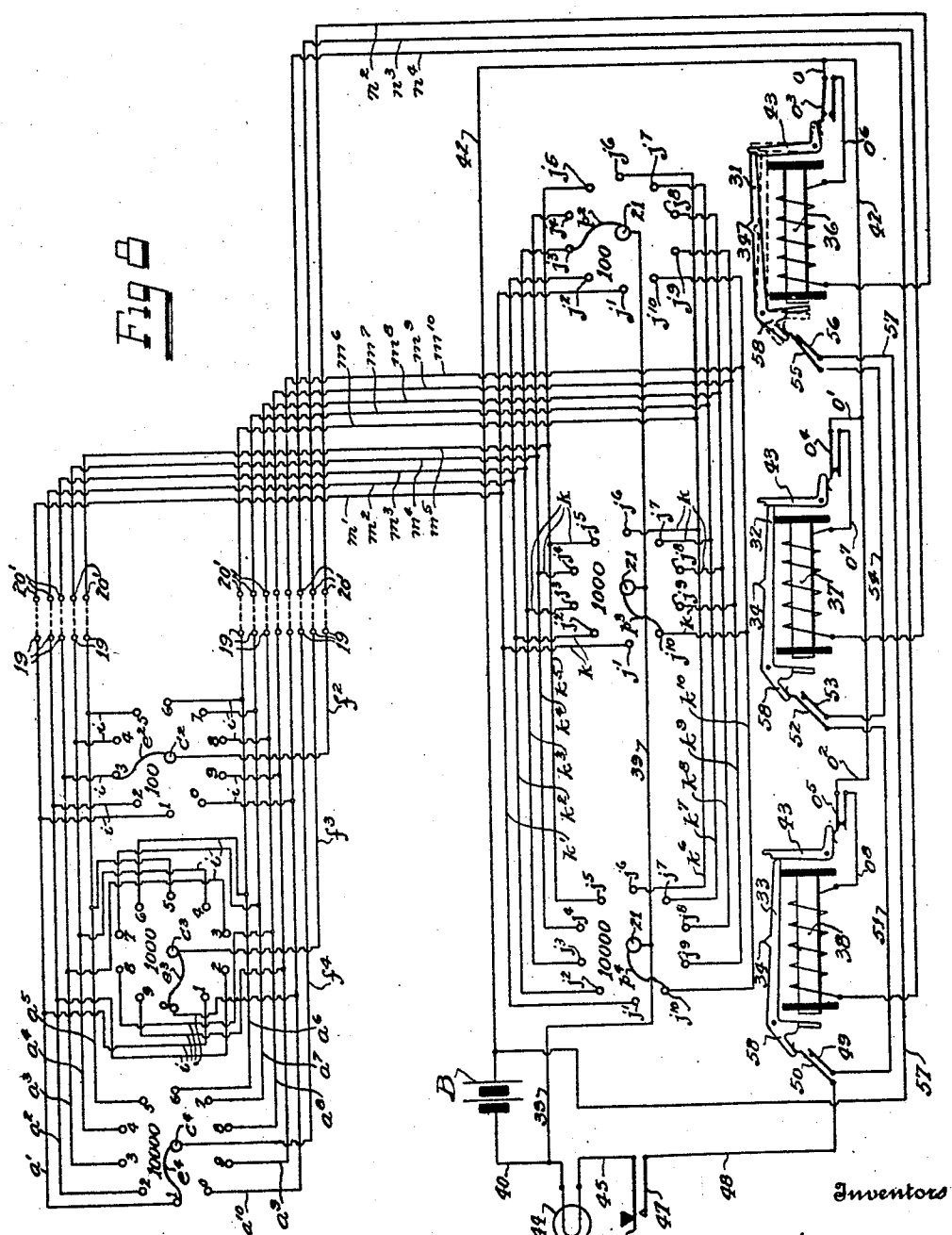
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5 SHEETS—SHEET 3.



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5 SHEETS—SHEET 4.

Fig 9

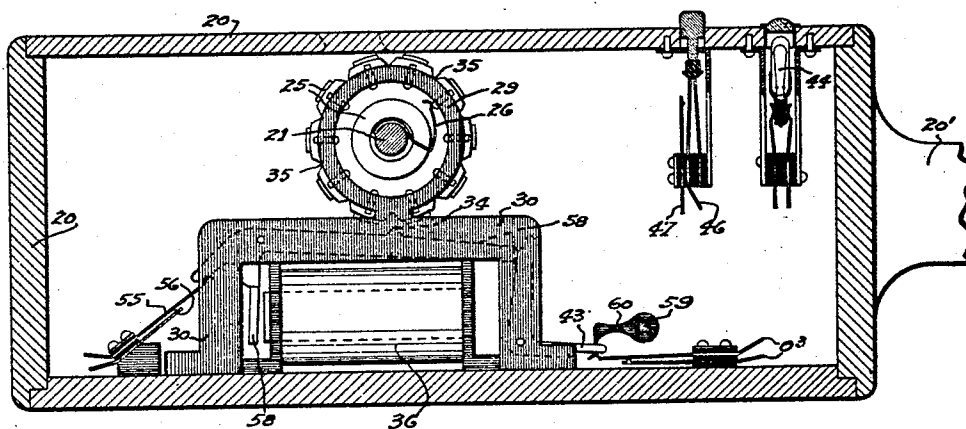
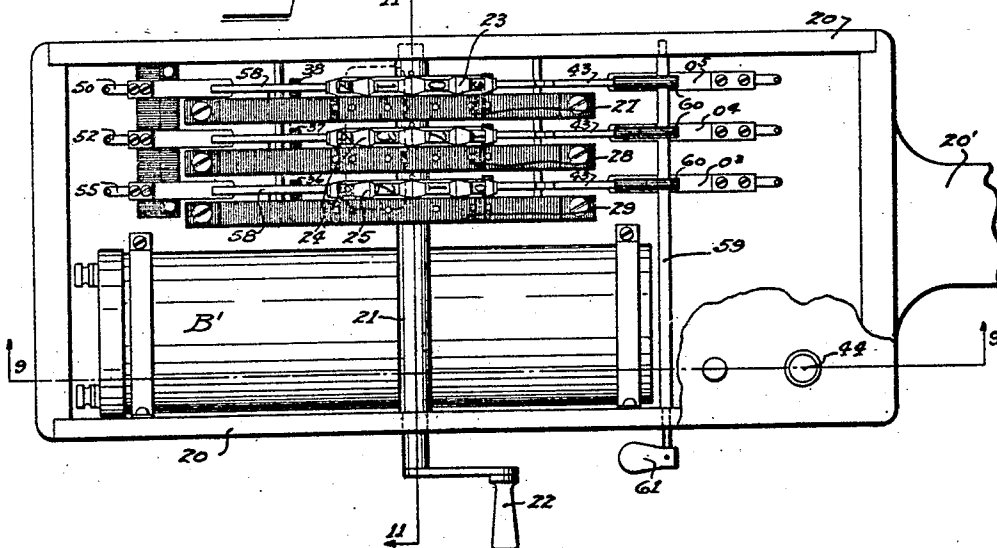


Fig 10



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5 SHEETS—SHEET 5.

Fig 11

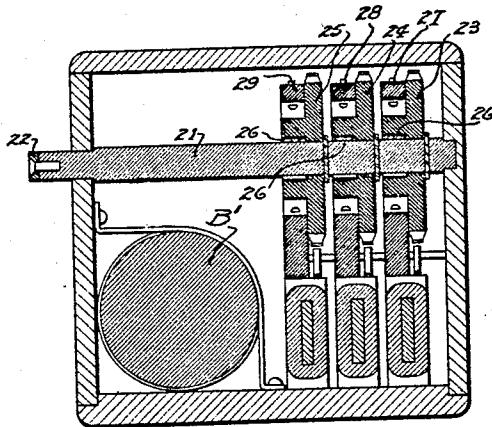
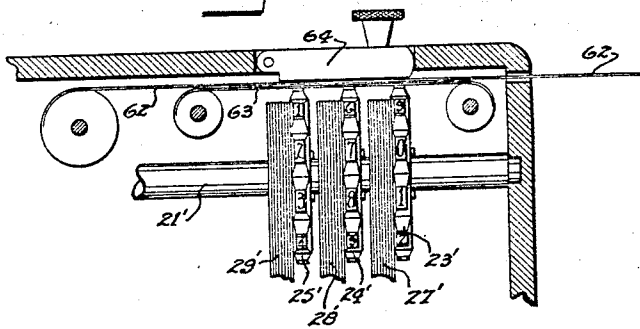


Fig 12



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UNITED STATES PATENT OFFICE.

ALBERT C. NEFF, OF URBANA, OHIO, AND EDWIN H. FORD, OF WABASH, INDIANA.

ELECTRICAL ATTACHMENT FOR READING METERS.

1,244,634.

Specification of Letters Patent.

Patented Oct. 30, 1917.

Application filed April 16, 1915. Serial No. 21,866.

To all whom it may concern:

Be it known that we, ALBERT C. NEFF and EDWIN H. FORD, citizens of the United States, residing at Urbana, in the county of Champaign and State of Ohio, and Wabash, in the county of Wabash and State of Indiana, respectively, have invented certain new and useful Improvements in Electrical Attachments for Reading Meters, of which the following is a specification.

Our invention relates to electrical devices for reading meters, particularly those meters which are located at inconvenient points in residences or other buildings for registering gas, water and the like.

The object of the invention is to provide a portable device which may be electrically connected with the meter at some convenient point remote from the meter, preferably a point on the outside of a building in which the meter is located, such a device being capable of being so manipulated by the operator as to indicate or record the correct reading of the meter.

The invention consists in the constructions and combinations of parts hereinafter described and set forth in the claims.

In the accompanying drawings,

Figure 1 is a diagrammatic view showing the electrical circuits both for the meter and for the reading device.

Fig. 2 is a top plan view of the reading device shown electrically connected with a meter of any usual construction.

Fig. 3 is a bottom plan of same with the bottom of the inclosing casing removed.

Fig. 4 is a vertical section of the same on line 4—4 of Fig. 3.

Fig. 5 is an end view of the same.

Fig. 6 is an end view of the connector for the circuits between the reading device and the meter.

Fig. 7 is a detail sectional view of one of the plugs of the connector.

Fig. 8 is a diagrammatic view showing the electrical circuit for the meter and for a modified reading device.

Fig. 9 is a longitudinal section of the modified reading device, the section being taken on the line 9—9 of Fig. 10.

Fig. 10 is a top plan view of the same with a portion of the casing broken away.

Fig. 11 is a vertical section on the line 11—11 of Fig. 10.

Fig. 12 is a detail of a modification showing a printing attachment.

Like parts are represented by similar characters of reference in the several views.

In Fig. 2, we have illustrated a meter of a well known construction, represented by 60 11, and associated with this meter are a number of electrical circuits, the wires of which run in the form of a cable 12 to any suitable point, such as the outside wall 13 of the building in which the meter is located, the cable entering a suitable connecting device 14. Referring now to Fig. 1, we have shown the meter equipped with electrical contacts, ten contacts for each denomination represented upon the meter, indicated by the Figs. 1 to 10 inclusive; these contacts being arranged equi-distance about the shaft of each denomination, which shafts are marked respectively c^1, c^2, c^3, c^4, c^5 . Each shaft carries the index-hand 75 which coöperates with a disk c^7 and each of the shafts c^1 , etc., also carries a spring wiper marked, respectively, e^1, e^2, e^3, e^4 , and e^5 , which, as the shafts revolve, are brought successively in contact with the respective 80 contact points. The contacts of each denomination are connected to a series of wires $a^1, a^2, a^3, a^4, a^5, a^6, a^7, a^8, a^9$ and a^{10} , by wires i , the wires a^1 , etc., being carried in the cable 12 before referred to to the 85 connector 14, where they are connected with hollow sleeves or sockets 15 arranged in a convenient manner to receive the electrical connections of the reading device to be described. It will be observed that the same 90 unit contacts of the respective denominations are connected in the same circuit; that is to say, the unit contacts marked 1 of the respective denominations are all connected to the wire a^1 , the unit contacts 95 marked 2 of the respective denominations are all connected to the wire a^2 , etc. The respective wipers e^1 , etc., are connected to the wires f^1, f^2, f^3, f^4, f^5 , which wires are also contained in the cable 12 and brought 100 to the connecting point 14 where they are each connected with a socket or sleeve 15 in a similar manner to the wires a^1 , etc.

The reading device has a series of indicators, shown in Figs. 2, 3 and 4 as small 105 incandescent lights, indicated by $b^1, b^2, b^3, b^4, b^5, b^6, b^7, b^8, b^9$, and b^{10} , one for each unit of the respective denominations. These lights are connected to the battery B through the common conductor g and from the respective lights extend the wires $g^1, g^2, g^3, g^4, g^5, g^6, g^7, g^8, g^9, g^{10}$, which project through 110

one end of the casing 16, and are arranged in a similar manner to the sockets 15 so as to be placed in electrical connection therewith, the wire g^1 connecting with the wire a^1 , the wire g^2 with the wire a^2 , and so on. The casing 16 is provided with a series of windows 17 marked respectively with numerals from 1 to 10, the first light b^1 having a window with the numeral 1 thereon, the second light b^2 , a window with a numeral 2 thereon, etc. It will be noticed that the light b^1 is connected with all the contacts 1 of the respective denominations, the light b^2 with all the contacts 2 of the respective denominations, and so on up to the light b^{10} which is connected to all the contacts 10 of the respective denominations.

Also located in the box or casing 16 of the reading device is a series of normally open spring contacts d^1, d^2, d^3, d^4, d^5 , located in the respective circuits h^1, h^2, h^3, h^4, h^5 , which circuits are all connected to the battery B by the wire f . These contacts are arranged to be closed by the push buttons 18 located in the upper wall of the casing 16.

In the operation of the device the stem 19, through which passes the various wires g^1 to g^{10} , inclusive, and wires h^1 to h^5 , inclusive, is inserted in the connector 14 so that said wires will be put in proper electrical connection with the wires a^1 to a^{10} , inclusive, and f^1 to f^5 , inclusive, in the manner before described, the connections being indicated at 19 in Fig. 1. The operator then closes the circuits in consecutive order. When the contacts d^1 are closed, a circuit will be established from wiper e^1 , wire f^1 , wire h^1 , contacts d^1 , wire f , battery B, wire g , and with the incandescent light which is in circuit with the wiper e^1 , which in the present case would be the one b^{10} which is connected to the contact 10 by the wires g^{10} and a^{10} , it being observed that the wiper e^1 is resting on the contact 10 of the tens denomination. This would cause an illumination of the window 17 which covers the light b^{10} and thereby indicates 0 to the operator. The operator after making note of this indication then closes the contacts d^2 , corresponding to the hundreds denomination, thus closing the circuit within which is located the light b^2 , thus illuminating the light b^2 , through wire f , battery B, wire g , light b^2 , wire g^2 , wire a^2 , wire i , contact 2, wiper e^2 , wire f^2 , and wire h^2 . This indicates the figure 2 to the operator. In like manner, the other contacts are closed, illuminating the light corresponding to the contact which is in electrical communication with the wiper of that denomination controlled by the contacts closed.

In Figs. 8 to 11, inclusive, there is illustrated a modification in the form of the reading device in which, instead of the illuminated windows, there is employed indicat-

ing wheels. The wiring of the meter in this modification, however, is the same as that of the meter wiring shown in Fig. 1 so that to save unnecessary description the same reference characters have been used in Fig. 8 as in Fig. 1 to designate the parts and wiring of the meter, the only difference being that in Fig. 8 but three denominations, hundreds, thousands and tens of thousands, have been shown instead of the five denominations of Fig. 1.

The modified reading devices are located in a casing 20 of suitable form. 21 represents a shaft extending transversely across the casing and journaled in its respective sides, one end of the shaft being provided with an operating crank 22. Mounted upon this shaft 21 is a series of indicating wheels 23, 24, and 25, but three wheels being shown in the present case, one for each denomination represented in the meter. These wheels are so connected with the shaft 21 as to rotate therewith when free to do so, but to permit said shaft to rotate independently thereof when the wheels become locked in the manner hereinafter described. The hub of each indicating wheel is extended, as indicated at 26, and arranged about these extensions are rings, 27, 28 and 29, these rings being preferably formed integral with a frame, 30; the rings and frame being made of insulating material.

Each of the rings 27, 28 and 29 is provided with a series of 10 electrical contacts, $j^1, j^2, j^3, j^4, j^5, j^6, j^7, j^8, j^9$ and j^{10} , each contact representing a unit of the denomination to which its ring corresponds. The contacts of the respective rings representing the same units are connected together by the wires $k^1, k^2, k^3, k^4, k^5, k^6, k^7, k^8, k^9, k^{10}$, and the short wires k leading therefrom. Wires $m^1, m^2, m^3, m^4, m^5, m^6, m^7, m^8, m^9, m^{10}$ lead from the wires k^1 , etc., to a connector plug 20' arranged at the end of the casing 20 where they will be so disposed as to be brought in proper electrical contact with the wires a^1 , etc., of the meter when the plug is inserted in the meter socket 14 in the manner previously described in connection with the other reading devices.

Associated with the indicating wheels 23, 24 and 25 is a series of locking levers 31, 32 and 33, each lever being provided with a projection 34 adapted to engage one of a series of notches 35 arranged about the periphery of each indicating wheel. The levers 31, 32 and 33 are the armatures of electro-magnets 36, 37 and 38 which are normally deenergized to permit the locking levers to lie in an inoperative position relatively to the indicating wheels. Wires n^2, n^3 , and n^4 , lead from one pole of the respective magnets to the plug 20' so that when the plug 20' is inserted in the socket 19 there will be placed in electrical connection with the wires f^2, f^3 and f^4 which are

connected with the respective wipers e^2 , e^3 and e^4 . The other poles of the respective magnet are put in electrical communication with the operating shaft 21 through wire 39, wire 40, battery B¹, wire 42, wires o , o^1 and o^2 , contacts o^3 , o^4 and o^5 and wires o^6 , o^7 , and o^8 . The contacts o^3 , o^4 and o^5 are normally held closed by latches 43, associated with the locking levers to hold said levers in locking position when operated by the electro-magnets. Each of these latches 43 is in a nature of a bell crank lever, one arm of which is in contact with the spring member of its associated contacts, o^3 , o^4 , o^5 . The other arm of the latch is formed with a shoulder to engage the free end of its corresponding locking lever when said lever is moved to locking position, by the energization of its magnet, the spring member of its associated contacts swinging the latch about its pivotal point for that purpose. When the locking levers are in their normal inoperative position the shouldered arms of the latches will rest against the free ends of the locking levers so as to maintain the contacts, o^3 , o^4 and o^5 associated therewith closed. So soon as any locking lever is operated and the latch swings to locking position, the contacts associated therewith will be separated to break the circuit and cut out the battery through the magnet.

Connected with each indicating wheel is a wiper p^2 , p^3 , p^4 , this wiper being in the nature of a flat spring inserted in a slot in the hub of the indicating wheel, one end thereof bent partly about and resting frictionally against the shaft 21 and other end thereof being bent so as to wipe about the interior of its associated ring, to make contact with the series of contacts, 27, 28 and 29 and thus be brought successively in electrical connection with the contacts of that ring.

In the operation of the modified reading device as thus described, the plug 20' is inserted in the socket 14 of the meter connection, placing the respective wires in proper electrical circuit. The operator then revolves the shaft 21, which rotates the respective indicating wheels and their wipers p^2 , p^3 and p^4 , causing the wipers to be brought successively in contact with the series of contacts j^1 to j^{10} inclusive of their associated rings. Whenever a wiper makes connection with one of the contacts j^1 , etc., which has been put in electrical communication with one of the contacts of its corresponding denomination in the meter, a circuit will be established through the electro-magnet of that denomination and the locking lever operated to arrest the indicating wheel of that denomination. The shaft 21, however, may continue to revolve independently thereof by reason of the frictional connection between the two before described. As an instance, assume that the wiper e^2 of

the hundreds denomination is resting on contact 3 of that denomination. So soon as the wiper p^2 made connection with contact j^3 , a circuit will be established through shaft 21, wire 39, wire 40, battery B', wire 42, wire o , contacts o^3 , wire o^6 , electro-magnet 36, wire n^2 , wire f^2 , shaft e^2 , wiper e^2 , contact 3, wire a^3 , wire m^3 , wire k^3 and contact j^3 , thus energizing the electro-magnet 36 and causing the associated locking lever to arrest indicating wheel 23. In like manner the indicating wheels of the other denominations are arrested and locked so as to indicate the reading of the meter corresponding to their denominations.

As soon as the electro-magnets operate and the latches 43 swing to locking position, contacts o^3 , o^4 and o^5 will be opened, thus breaking the circuit through the electro-magnets to shut out the battery.

Means are provided for indicating to the operator whether or not all the indications have been properly made; that is to say, whether or not the electro-magnets have all operated upon that particular operation of the device. A light 44 is in a circuit consisting of wire 45, contacts 46 and 47, wire 48, contacts 49 and 50, wire 51, contacts 52 and 53, wire 54, contacts 55 and 56, wire 57, wire 42, battery B', and wire 40. All of the contacts are normally open, but so soon as any one of the electro-magnets is energized a finger 58 on the armature thereof will close the contacts 55 and 56, 52 and 53 or 49 and 50 associated therewith. So soon as all of these contacts are closed the operator may then, by closing the contacts 46 and 47, illuminate the light 44. If for any reason one of the electro-magnets should fail to operate, the contacts associated therewith in the lighting circuit would remain open, thus indicating to the operator, through the failure to illuminate the light, that a proper indication had not been made.

After the indicating wheels have been operated and the reading taken thereof, the indicating wheels may be unlocked ready for a new operation as follows: 59 represents a rock shaft extending transversely across the main casing and having thereon a series of fingers 60, one for each latch 43, these fingers lying on the short arms of the latches. The rock shaft, on the outside of the casing, has a finger piece 61 so that the operator may, by pressing thereon, rock the shaft, causing the fingers to press down on the short arms of the latches and thus cause them to release the locking levers 31, 32 and 33, which are forced back to their inoperative position by the spring contact members 50, 52, and 55.

In Fig. 12 there is shown a further modification in which there is employed type wheels 23', 24' and 25' mounted upon a shaft 21' in exactly the same manner as described

in connection with the indicating wheels 23, 24, and 25 so as to be revolved thereby until arrested by the locking devices. Rings 27', 28' and 29', corresponding to the rings 27, 28 and 29 are associated with the type wheels and carry contacts corresponding in all respects with the contacts carried by the rings 27, 28 and 29 which are associated with the indicating wheels. In fact, the operation of the type wheels is in all respects similar to that of the indicating wheels.

Means are provided for taking an impression from the type wheels after they have been placed in proper position consisting of a tape 62, inking ribbon 63 and a hand operated pivoted hammer 64. Any well known means may be employed for feeding the inking ribbon.

It should be stated that the indicating wheels 23, 24 and 25 are provided about the periphery thereof with numerals from 0 to 9 corresponding to units in the denominations to which the wheels correspond. The type-wheels 23', 24' and 25' are also provided with type having characters from 0 to 9 which likewise represent units of the denominations corresponding to the respective wheels.

Having thus described our invention we claim:

1. In a device of the character described, an integrator meter for measuring values of different denominations, a portable determining device for determining said values, electrically controlled means for causing said determining device to correspond in value to said meter, and a circular connector associated with both the meter and the determining device, said connectors being arranged to be detachably connected together and said meter connector being located at a point distant from said meter.

2. In a device of the character described, an integrator meter for measuring values of different denominations, a series of electrical circuits for a certain denomination, a common connector for said circuits located at a point distant from said meter, means operated by the meter for partially closing one of said circuits to correspond with the measured value of said meter, a portable electrically controlled determining mechanism for determining said values having circuits corresponding to said meter circuits, and a common connector for said determining mechanism circuits, said connectors being capable of being detachably connected together.

3. The combination of an integrator meter for measuring values of different denominations, a portable determining mechanism therefor, a series of electrical circuits associated with said meter and mechanism corresponding to the values of certain denominations including a connector for the re-

spective circuits to said meter and mechanism located at a point distant from said meter and arranged to simultaneously and detachably connect corresponding circuits together, means operated by the meter for successively closing those parts of said circuits associated therewith, and means associated with the determining mechanism for causing the meter closed circuits to determine the value thereof.

4. In a device of the character described, an integrating meter for measuring values of different denominations having circuits extending to a point distant therefrom, a common connecting member for said circuits located at said distant point, a portable determining mechanism, a series of normally open circuit parts in said determining mechanism, a connecting member common to said circuit parts, said connecting members being arranged to be detachably connected together, means in said meter for completing one of said circuit parts, manually operated means for independently closing the circuit parts of said determining mechanism so as to make a complete electrical circuit through said meter and mechanism, together with means in said circuit and controlled thereby for determining the value thereof.

5. The combination of an integrating meter and a portable determining mechanism having corresponding normally open separable circuits representing different denominations, the circuits of said meter and determining mechanism each having a common connector member, said connector member being arranged to be detachably connected together with the connector member of said meter located at a distant point therefrom, means associated with said meter and mechanism for closing one of the circuits of each denomination to correspond with the value of said meter, and a device associated with said mechanism and controlled by said closed circuit for determining the value thereof.

6. The combination of an integrating meter and a portable determining mechanism having corresponding normally open separable circuits representing a certain denomination, the circuits of said meter extending to a point distant therefrom, a common connecting member for said circuits located at said distant point arranged to be detachably connected with the circuits of said determining mechanism, a rotatable circuit closer associated with said meter to close the circuit therein corresponding to the value of that denomination of said meter, means associated with the determining mechanism for closing the same circuit, and a device also associated with said mechanism and controlled by the closed circuit for determining the value of said circuit.

7. The combination of an integrating meter and a portable determining mechanism having corresponding normally-open separable circuits representing different denominations, the circuits of said meter extending to a point distant therefrom, a circuit closer associated with each denomination in said meter for closing the circuit therein corresponding to the value of the respective denominations, and a circuit closer for each denomination associated with the determining mechanism for successively closing the closed circuits of the meter, and determining devices associated with said determining mechanism for determining the value of the closed circuit of each denomination.

8. In a device of the character described, an integrating meter and a portable determining mechanism, a series of normally open circuits representing a given denomination associated with said meter and determining mechanism, said circuits being so arranged as to be simultaneously detachably connected together at a point distant from said meter, means operated by the meter for successively closing those portions of the circuits associated therewith, manually operated means associated with the determining mechanism for closing those portions of the circuits located therein so as to cause one of said determining device circuits to make a complete closed circuit with the closed portion of the circuit in said meter, and an electrically controlled determining device associated with the respective circuits and controlled thereby for determining the unit value of the closed circuit.

9. In a device of the character described, an integrating meter and a portable determining mechanism for determining the reading of said meter, a series of normally open circuits representing a given denomination, a part of each circuit being associated with the meter and a part with the determining mechanism, said meter circuits being extended to a point distant therefrom, together with means for simultaneously detachably connecting corresponding circuit parts together, means operated by the meter for successively closing those parts of the circuit located therein, manually operated means associated with the determining mechanism for closing those parts of the circuits located therein, and electrically controlled determining devices associated with the respective circuits and controlled thereby.

10. The combination of an integrating meter having measuring mechanism representing different denominations, a series of electrical circuits associated therewith for each denomination corresponding to the

units of that denomination, and extending to a point distant therefrom, a portable determining mechanism having a series of electrical circuits corresponding to the circuits of said meter and arranged to be simultaneously detachably connected therewith, a circuit closer in the meter for each denomination thereof together with means for causing the same to successively close the circuits corresponding to its denomination in said meter, a circuit closer for each denomination in the determining mechanism arranged to be electrically connected with the meter circuit closers, whereby when the circuits of said meter and determining mechanism are connected together a complete circuit may be established through each denomination by closing the circuits in said determining mechanism, said determining mechanism having determining devices controlled by said circuits to determine the values thereof.

11. The combination of an integrating meter having measuring mechanism representing different denominations, a series of wires associated with said meter one for each unit of any denomination, another series of wires associated with said meter one for each denomination, said wires extending to a point distant from said meter, a series of contacts in each denomination representing units of that denomination, said contacts being electrically connected to corresponding unit wires, a movable contact in each denomination of the meter arranged to be successively brought in electrical connection with the unit contacts of that denomination, said movable contact having an electrical connection with the denomination wire corresponding thereto, a portable determining mechanism, a series of wires in said determining mechanism corresponding to the denomination wires of said meter and arranged to be simultaneously detachably connected therewith at a point distant from said meter, a circuit breaker for each denomination wire in said determining mechanism, an electrical connection between the denomination and unit wires of said determining mechanism, and electrically controlled determining devices in said determining mechanism controlled by the circuits when closed by said circuit closers to determine the values of the closed circuits.

In testimony whereof, we have hereunto set our hands this 8th day of April, 1915.

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EDWIN H. FORD.

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