L. H. DES ISLES.

MULTICONTACT ELECTRICAL CONNECTION.

APPLICATION FILED JAN. 21, 1918.

1,435,819. Patented Nov. 14, 1922.

2 SHEETS—SHEET 1.

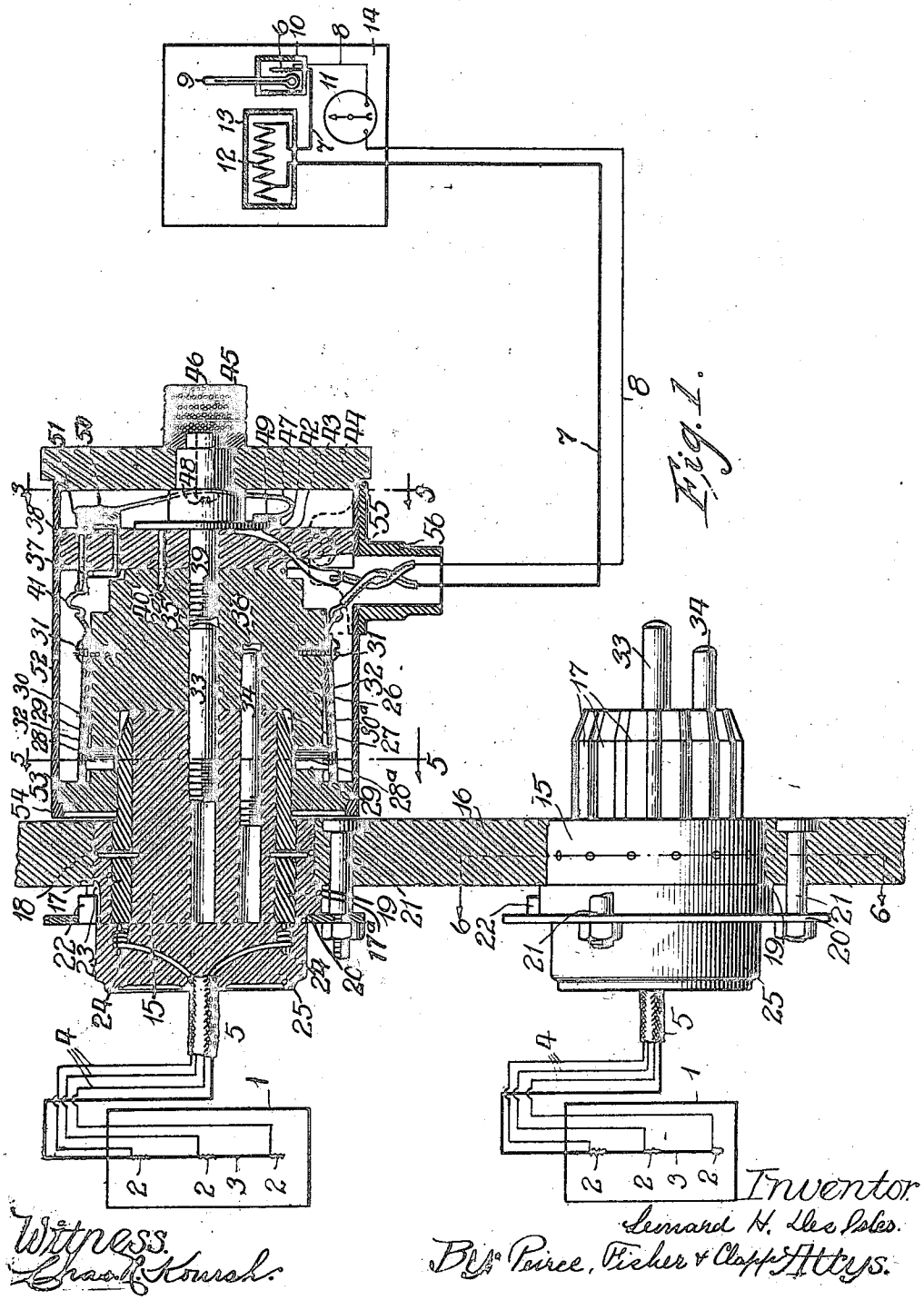


Fig. 1.

Witness.
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2 SHEETS—SHEET 2.

Fig. 3

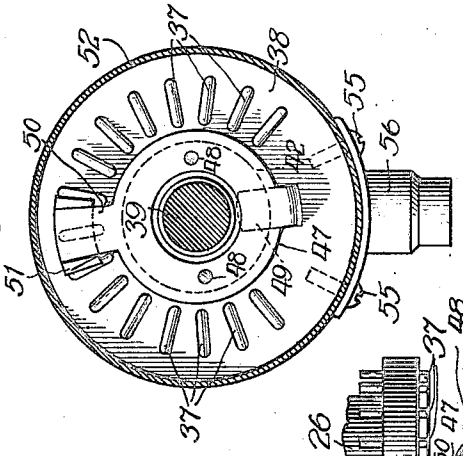


Fig. 6

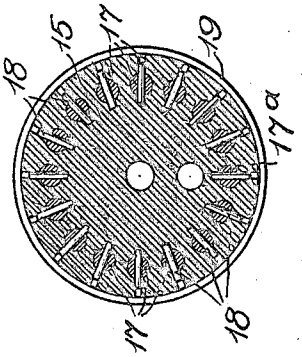


Fig. 4

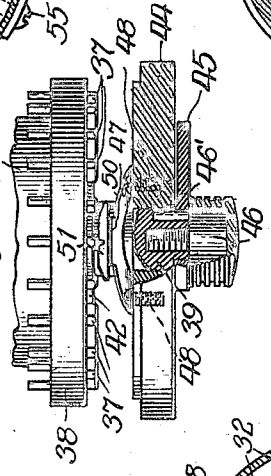


Fig. 2

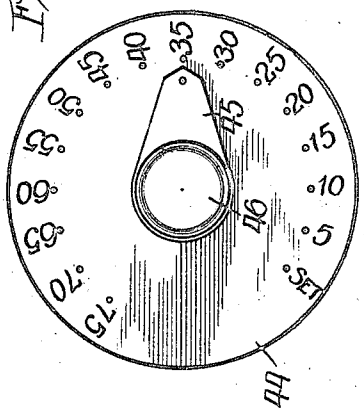
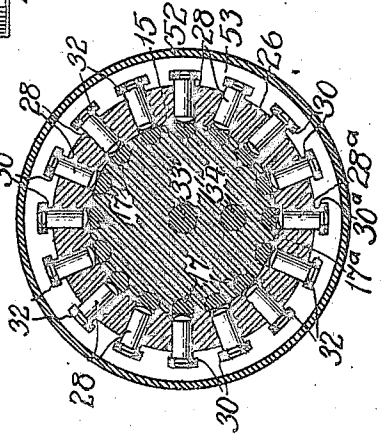


Fig. 5



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UNITED STATES PATENT OFFICE.

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MULTICONTACT ELECTRICAL CONNECTION.

Application filed January 21, 1918. Serial No. 212,992.

To all whom it may concern:

Be it known that I, LEONARD H. DES ISLES, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Multicontact Electrical Connections, of which the following is a specification.

The invention relates to multi-contact electrical connections for connecting a plurality of circuits arranged in different groups to a common electrical device. More particularly, the invention relates to multi-contact coupling means and switch mechanism for electric thermometer or like systems and seeks to provide simple and effective means by which a number of different groups of thermo-electric circuits and the individual circuits of each group can be readily and conveniently connected to a common instrument located at a central reading station.

The invention consists in the features of improvement hereinafter set forth, illustrated in the preferred form in the accompanying drawings, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a view of the improved multi-contact connection, one of the coupling plugs and the cooperating switch being shown in longitudinal section and one of the coupling plugs in elevation. The circuits controlled by the connections are also shown diagrammatically in Fig. 1. Fig. 2 is a face view of the switch dial. Fig. 3 is a cross section on the line 3—3 of Fig. 1. Fig. 4 is a plan view of a portion of the switch mechanism with the casing removed and certain of the parts shown in section. Fig. 5 is a cross section through the coupling members of the connection on the line 5—5 of Fig. 1. Fig. 6 is a section on the line 6—6 of Fig. 1.

The improved multi-contact connections and switch mechanism are more particularly adapted for use in connection with groups of thermo-electric circuits employed for ascertaining the temperature at different points or levels in a series of tanks or bins of a grain elevator. Two grain tanks or bins 1 are indicated diagrammatically in Fig. 1, each being provided with a series or group of thermo-electric junctions 2 arranged at different points throughout the height thereof. The grain elevator is usually provided with quite a number of bins and each bin has a dozen or more junctions preferably located about five feet apart. The junctions of the bin are provided with a set or group of leads of dissimilar metals and each set is entirely segregated or insulated from the other sets or groups. Each set of leads preferably comprises a common lead 3 of German silver and a series of individual copper leads 4, the ends of which are securely connected to the common lead 3 to form the thermo-electric junction 2. Each set or group of leads is formed into a cable 5 that extends to a central station.

The central or reading station is provided with a measuring set or instrument which preferably comprises a common thermo-electric junction 6 having a German silver lead 7 and a copper lead 8. The temperature of this common or comparison junction is ascertained by a thermometer 9, the bulb of which is sealed within an air and moisture-tight casing 10. A galvanometer 11 and an adjustable resistance 12 arranged in a casing 13 are connected in series with the junction 6, these parts being mounted on a common baseboard 14.

The present invention provides means for connecting the different groups of thermo-electric circuits and the individual junctions of any one group to the common measuring set or instrument. As shown, the separate sets of leads or cables 5 extend to a series of multi-contact terminal members which are in the form of cylindrical coupling plugs 15 mounted upon a suitable wall plate or board 16. Each plug is formed of a body of hard rubber or like insulating material and has a circular series of contact pins or terminals 17 extending longitudinally therethrough and held in position therein by short, transverse pins 18. Each coupling plug is inserted through an opening in the base board 16 and its outer projecting portion and the outer portions of the contact pins are cut away to form longitudinally extending contact surfaces. As clearly shown in Figs. 1 and 5, less than half the outer portions of the pins are cut away so that the latter are firmly embedded in the cylindrical body of the contact plug. The inner end of the body portion of the plug is enlarged to form a shoulder 19 that abuts against the inner face of the board and a washer 20 seated in a rabbet on the extreme inner end of the plug is engaged by bolts 21 that ex-

tend through the board 16 and thereby hold the plug in position. To prevent any turning movement of the plug in the board, the washer is provided at one point with a projection 22 which engages a notch 23 in the shoulder 19 at the inner end of the plug.

Since the dissimilar metal leads 3 and 4 of each set or group are of opposite polarity, the terminal members or plugs are provided with double poles of dissimilar metals but like those of the leads. For this reason, one of the terminal contact pins 17ª of each plug is formed of German silver and the other contact pins of copper. The common German silver lead 3 of the corresponding group is soldered to a projection or post 24 on the inner end of the contact pins 17ª and the copper leads 4 of opposite polarity are similarly connected to the other contact pins 17 Preferably as shown, the connections between the leads and contact pins are inclosed in a molded body of wax 25 to thoroughly insulate and protect the same.

The leads 7 and 8 of the measuring instrument or set are connected by a common double pole switch or socket member to the terminal contacts of like polarity of any one of the coupling plugs. One terminal of the switch in the preferred arrangement shown, is connected to the contact pin 17ª of the coupling plug and an adjustable selecting switch member is provided for separately connecting the other terminal of the switch to any one of the other contact pins.

In the preferred construction shown, the common coupling member comprises a cylindrical block or body 26 of hard rubber or like insulating material having a cylindrical bore 27 at its inner end which is adapted to fit over the projecting cylindrical portion of any one of the contact plugs and having a circular series of contact studs or terminals 28 arranged about the bore or socket 27 and adapted to engage the contact pins 17 and 17ª of the plug. The contact studs 28 extend radially through holes 29 formed in the cylindrical wall of the bore 27 and their outer ends are riveted to the free ends of a series of contact strips 30, the opposite ends of which are fixed to the block or body 26 by screws 31. A series of leaf springs 32, preferably formed of brass, are also secured in position at their outer ends by the screws 31 and the inner ends of these springs are provided with openings which fit over the heads of the rivets that secure the studs 28 to the contact strips. When the socket member 26 is not engaged with any of the plugs, the inner rounded ends of the contact studs 28 project into the bore 27. The outer end of each coupling plug is cut away or beveled as shown and when the common coupling socket is engaged with any one of the plugs, this bevelled portion forces the contact studs outwardly against the tension of the springs 32 and the latter react to hold the studs in firm engagement with the faces of the contact pins 17 and 17ª.

One of the contact strips 30ª and its studs 28ª is formed of German silver and the other strips and studs of copper and means is provided for locating the coupling member in definite fixed angular relation when engaged with one of the coupling plugs so that the terminal contacts of the same polarity of the engaged members are in engagement. For this purpose, each plug is provided with an axial projecting pin 33 and with a shorter eccentric pin 34 which are adapted to engage respectively with axial and central holes or seats 35 and 36 extending longitudinally from the end of the bore or socket 27 into the body of the coupling member 26. When the common coupling member or switch is engaged with any one of the plugs, the axial or central hole 35 thereof must first be engaged with the end of the pin 33 and the socket member then rotated to bring the eccentric hole or opening 36 in line with the pin 34 before the contacts of the coupling members can be engaged. In this engaged position the coupling members are held in fixed angular relation with the pair of German silver terminal contacts and the individual pairs of copper terminal contacts in engagement so that the connections of opposite polarity through the engaged coupling members are properly formed.

The German silver contact strip 30ª is directly connected to the German silver lead 7 that extends to the measuring set or instrument and a rotating selecting switch is provided for connecting the lead or conductor 8 to any one of the copper terminal contacts. In the preferred construction shown, a series of switch contacts 37 are mounted upon a disk 38 of hard rubber or like insulated material, which is fixed to the outer end of the plug 26 by means of a central post 39 and an eccentric pin 40. The contacts 37 are preferably formed of a series of U-shaped copper wires, inserted through two circular series of holes formed in the disk 38 adjacent its outer periphery. One of the inner ends of each contact wire is bent over into snug engagement with the inner face of the disk and the other projecting ends of the contact wires are connected by a series of copper conductors 41 to the copper contact strips 30. The outer portions of the contact wires form a series of radial contact strips upon the outer face of the disk 38.

The central post 39 is concentric with the series of contacts 17, 28 and 37 and is provided with an enlarged portion which holds a copper disk or terminal 43 against the outer face of the disk and a copper stud or post 43ª fixed thereto extends through the disk 38 and is securely connected to the lead 8 of the measuring set. An indicating disk

44 and a pointer 45 are mounted upon reduced portions of the post 39 and are held in place thereon by a thumb screw 46, the shank of which is threaded into the outer end of the post as most clearly shown in Fig. 4. An eccentric pin 46' holds the indicating pointer against movement but the disk 44 is rotatable and carries a brush arm for separately connecting the switch terminal or contact disk 42 to any one of the individual contacts 37. The disk 44 and the pointer 45 are preferably formed of hard rubber or like insulating material and the head of the screw 46 is covered with similar insulating material.

The switch brush comprises an annular copper disk 47 which encircles but does not contact with the post and which is secured to the inner face of the disk 44 by screws 48 located at diametrically opposite points. The portions of the disk 47 intermediate the screws are bent inwardly toward the face of the fixed disk 38 and one portion of the copper disk or arm 47 is provided with an inwardly projecting extension or brush 49 which engages the contact ring or terminal 42. The opposite portion of the plate 47 is provided with a projection 50 having a copper shoe 51 thereon which is preferably radially notched and adapted to engage with any one of the radial contact strips 37. The copper plate or arm 47 has sufficient resiliency to snugly hold the brush 49 and the brush or shoe 51 in snug engagement respectively with the contact ring 42 and with one of the contact wires 37. The engagement of the radial notch of the shoe 51 with one of the contacts holds the rotatable switch member against accidental displacement from adjusted position.

When it is desired to determine the temperatures at different points in any one of the grain tanks or bins, the common coupling member and switch are engaged with the proper coupling plug to thereby connect the group of thermo-electric circuits and junctions of the particular tank or bin to the measuring set, the common German silver lead of one polarity being connected to the lead 7 of like polarity of the measuring set and the individual copper leads of opposite polarity being separately connected by rotating the switch arm 47 to the lead 8 of corresponding polarity of the measuring set. In this way, the dissimilar metal leads of opposite polarity of any unknown temperature junction are properly connected to the leads of corresponding polarity of the common comparison device or thermo-electric junction 6 so that the electro-motive force of the unknown temperature junction acts against or is opposed to that of a common comparison device or junction of the measuring set. As well known, the current flowing in such a completed circuit is proportional to the difference in temperature of the two opposed junctions. In the position of the switch shown in Fig. 1, such a circuit is completed through the upper junction 2 of the tank diagrammatically shown in the upper left-hand portion of the figure and, since the temperature of the common junction 6 can be ascertained by the thermometer 9, the temperature of the distant junction can be determined from the reading of the galvanometer 11. For convenience the German silver leads of one polarity are indicated in heavy lines in Fig. 1 and the copper leads of opposite polarity by light lines.

By means of the improved connections and switch mechanism, a very large number of groups of circuits can be quickly connected to a measuring instrument. The groups of leads or cables 5 from a number of grain bins or tanks, instead of being extended to the measuring instrument, terminate at the multi-contact coupling plugs, on the wall plate 16 which can be mounted in any convenient location. The separate coupling plugs are numbered to correspond with the different bins and any one of them can be readily connected, as described, to the leads or terminals of the measuring instrument by means of the common coupling member and switch. The rotating disk or dial 44 of the switch is marked as shown in Fig. 2, and cooperates with the pointer 45 to indicate the depth or level of the junction and which, in any given position of the switch, is connected to the measuring instrument. The contacts of the switch and coupling members can be readily cleaned and maintained in good order and the arrangement is such that the contacts and leads of each group of circuits is separated or insulated from those of the other groups.

The socket member or switch is preferably provided with a casing comprising a cylindrical metal shell 52, the outer end of which fits upon the disk 38 and its inner end upon a projecting flange 53 formed upon the inner end of the insulating block or body 26. The inner end of the shell is thickened to form an inwardly projecting rib 54 which seats within a rabbet formed in the flange 53 and screws 55 secure the outer portion of the casing to the disk 38. Preferably, as shown, the rotating switch disk 44 is shouldered or rabbeted to loosely fit within the outer end of the cylindrical shell or casing 52. A short sleeve 56 is fixed to the casing by the screws 55 over an opening therein and the conductors or leads 7 and 8 from the measuring set extend therethrough.

When the coupling members are disengaged, the contacting portions of the series of terminals 17 and 18 are exposed respectively upon the external surface of the plug member and upon the internal surface of the socket member and can be readily

cleaned to remove any dust or moisture.. The cleaning of the plug contacts is facilitated by the fact that they are substantially flush with the surface thereof. Moreover, the proper engagement of the spring pressed terminal contacts 28 with the contacts 17 as the coupling members are engaged serves to maintain the contact faces clean and bright. When the socket member 26 is disengaged, the wall of the recess 27 thereof supports and positions the spring pressed terminals 28 so that they cannot be readily disarranged or injured in cleaning the same or when the socket member is engaged with the plug member. It should also be noted that the openings in the wall of the recess 27 act as guides to hold the free ends of the spring pressed terminals in position and prevent the formation of short circuits between the adjacent terminals. These guiding openings also cooperate with the aligning pins 33 and 34 to insure the proper engagement of the plug and socket terminals. The axial and eccentric aligning pins, as stated, prevent the engagement of the coupling members except in one relative angular position and compel the engagement of the members with the pairs of contacting terminals of like metal and polarity in alignment. The aligning pins also serve to properly position the multi-contact selecting switch and the indicator therefor. The longitudinal extension of the contact faces of the terminals 17 upon the periphery of the plug insure the engagement of the socket terminals 28 therewith, even though the socket member is not pushed on to the plug as far as it can go. The improved construction is extremely simple, compact and durable and is such that a very large number of terminal electric circuits can be quickly connected to a temperative measuring device.

Changes may be made in the details set forth without departure from the essentials of the invention as defined in the claims.

I claim as my invention:—

1. A coupling for a plurality of electric circuits comprising a double pole multi-contact coupling member, a co-operating double pole switch detachably engaging said coupling member and adjustable to selectively connect with the contacts of the coupling member, means for indicating the various contact positions of the switch, and inter-engaging parts on the coupling and the switch for compelling engagement of the latter with the former so that the indicating means always bears the same relation to the contacts of the coupling member.

2. A coupling for a plurality of electric circuits comprising a double pole coupling member having a circular series of individual terminal contacts of one polarity and a common terminal contact of opposite polarity, a co-operating double pole switch, a supporting casing therfor adapted to removably engage said coupling member, said switch having a common terminal contact of one polarity and a rotatable contact arm for selectively connecting its opposite terminal to any one of the individual terminal contacts of said coupling member, an indicating dial and pointer connected respectively to said switch support and said rotatable contact arm, said switch support and coupling member having means for compelling the engagement thereof in definite angular relation and for holding same, when engaged, against relative angular movement with said common terminal contacts in engagement and so that the indicating dial and the pointer represent corresponding relative positions of the rotatable contact arm and the said series of individual terminal contacts.

3. The combination with a plurality of thermo-electric generating elements of a double-pole multi-contact coupling member having circuit wires from said elements independently connected with the contacts thereof, a double-pole switch adapted to removably engage said coupling member, the conducting parts of said member and said switch of one polarity being formed of one metal and those of the opposite polarity of another metal, said coupling member having a circular series of individual contacts of one polarity and a common terminal contact of opposite polarity, said switch having a common terminal contact and a rotatable contact arm for separately connecting its opposite terminal to any one of said individual contacts, means for compelling the engagement of said switch and coupling member in definite angular relation and for holding the same, when engaged, in such relation with said like metal common terminal contacts in engagement and a temperature measuring instrument having a pair of circuit wires connected respectively to the common terminal contact of the switch and the contact arm thereof.

4. The combination with a plurality of thermo-electric generating elements having separate circuit wires leading therefrom, and a measuring instrument having a pair of circuit wires leading therefrom, of means for selectively connecting the latter with the former comprising a multi-contact double-pole coupling member having the circuit wires from the aforesaid generating elements connected therewith, a switch member adapted to be detachably mounted on said coupling member, and having a switch arm movable to selectively connect with the contacts of the coupling member, means for indicating the position of the switch arm, and inter-engaging parts on the switch and the coupling member for compelling engagement of the fromer with the latter so that the various positions of the indicating means

always indicate the corresponding connections of the switch arm with the contacts of the coupling member.

5. In a device of the class described, the combination of a pair of separable connectors, each having a pularity of independent contacts adapted to register with and engage corresponding contacts of the other member, a switch for selectively connecting the inter-engaged contact in an electrical circuit, and means acting in advance of the engagement of the contacts to align and compel subsequent engagement of the latter in a predetermined relative position.

6. A coupling for a plurality of electric circuits comprising double pole, separate coupling members having a number of pairs, more than two, of co-operating terminal contacts, some of one polarity and the others of the opposite polarity, said coupling members having means for compelling the engagement thereof in definite angular relation and for holding the same, when engaged, against relative angular movement with the contacts of like polarity in engagement, one of said members forming a switch casing and a movable switch arm therein adapted to separately select any individual one of the pairs of contacts of one polarity.

7. A coupling for a plurality of electric circuits comprising double pole plug and socket members having a pair of co-operating common terminal contacts of one polarity and numbers of pairs of co-operating individual contacts of the opposite polarity, all of the contacts of each member being arranged in a circular series co-axial therewith and a rotatable switch arm co-axially mounted on one of said members and adapted to separately select any one of the individual contacts thereof, said plug and socket members having means for compelling the engagement thereof in definite angular relation and for holding the same against relative angular movement with the terminal contacts of like polarity in engagement.

8. A coupling for a plurality of thermo-electric circuits comprising double-pole plug and socket members having cylindrical portions adapted to fit one within the other and a number of pairs of co-operating terminal contacts, more than two, some of said pairs of contacts being of one polarity and the others of the opposite polarity and said contacts being arranged in circular series upon the cylindrical portions of said members, the conducting portions of one polarity of said members being formed of one metal and those of the opposite polarity of another metal, and means for compelling the engagement of said members in definite angular relation with the like metal terminal contacts in engagement.

9. A coupling for a plurality of electric circuits comprising plug and socket members having cylindrical portions, and a number of pairs of cooperating contacts arranged in circular series, one of said members having a projecting axial pin and a shorter eccentric pin and the other corresponding seats for said pins to compel the engagement of said members in definite angular relation.

10. A coupling for a plurality of electric circuits comprising plug and socket members having cylindrical portions adapted to fit one within the other and a number of pairs of co-operating terminal contacts, more than two, and arranged in circular series upon the interfitting cylindrical portions of said members, one series of contacts being radially spring-pressed and movable through openings of the cylindrical portion whereon they are mounted and said members having means compelling the engagement thereof in definite angular relation.

11. A coupling for a plurality of electric circuits comprising a cylindrical plug member having a series of fixed contacts on its periphery and a cooperating socket member having a cylindrical bore for receiving said plug member and a circular series of radial openings in the wall of said bore and a series of inwardly spring-pressed contact strips mounted on said socket member and having parts at their free ends extending through said openings into said bore and adapted to engage said plug contacts, said members having means compelling the engagement thereof in definite angular relation.

12. A coupling for a plurality of electric circuits comprising a plug member, a socket member having a bore within which said plug member fits, pairs of cooperating terminals, more than two, having their contacting portions arranged respectively in transversely extending series upon the interfitting external and internal walls of said plug and socket members, the terminals of said socket member being laterally spring-pressed and movable to a limited extent through openings in the wall thereof and adapted to effect rubbing contact with the terminals of said plug member as said socket member is engaged therewith, said members having means for compelling their engagement in definite relation with the contacting portions of each pair of terminals in alignment and said socket member having an enclosing casing.

13. A coupling for a plurality of electric circuits comprising a plug member having a series of contacts, a socket member having a recess for receiving said plug member and a series of openings in the wall of said recess, and a series of contact strips arranged upon the outer face of the wall of said recess and having inward spring-pressed free ends provided with contact portions extending

through said openings and adapted to engage said plug contacts.

14. A coupling for a plurality of electric circuits comprising a cylindrical plug member having a series of longitudinally extending contact terminals on its periphery, a socket member having a cylindrical bore within which said plug member fits and provided with a corresponding series of longitudinally extending contact strips fixed at one end thereto and having inwardly spring-pressed free ends adapted to effect rubbing contact with said plug terminals, said socket member having means for supporting and guiding the spring-pressed free ends of said contact strips, and said coupling members having means independent of said spring-pressed contacts for compelling their engagement in definite relation with the series of contacts thereof in alignment.

15. A coupling for a plurality of electric circuits comprising plug and socket members having cylindrical portions adapted to fit one within the other and a number of pairs of co-operating terminal contacts, more than two, arranged in circular series upon the cylindrical portions respectively of said members, and said members having means for compelling the engagement thereof in definite angular relation with the contact terminals of each pair in engagement.

16. A coupling for a plurality of electric circuits comprising plug and socket members formed of insulating material and having cylindrical portions adapted to fit one within the other and a number of pairs of co-operating terminal contacts, more than two, arranged in circular series upon the interfitting cylindrical portions of said members, the latter having means for compelling the engagement thereof in definite angular relation, the contact terminals of said plug member being formed by pins extending longitudinally therethrough, and having longitudinally extending contact surfaces upon the cylindrical portion thereof, and the contact terminals of said socket member being laterally spring-pressed through openings in its cylindrical portion.

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