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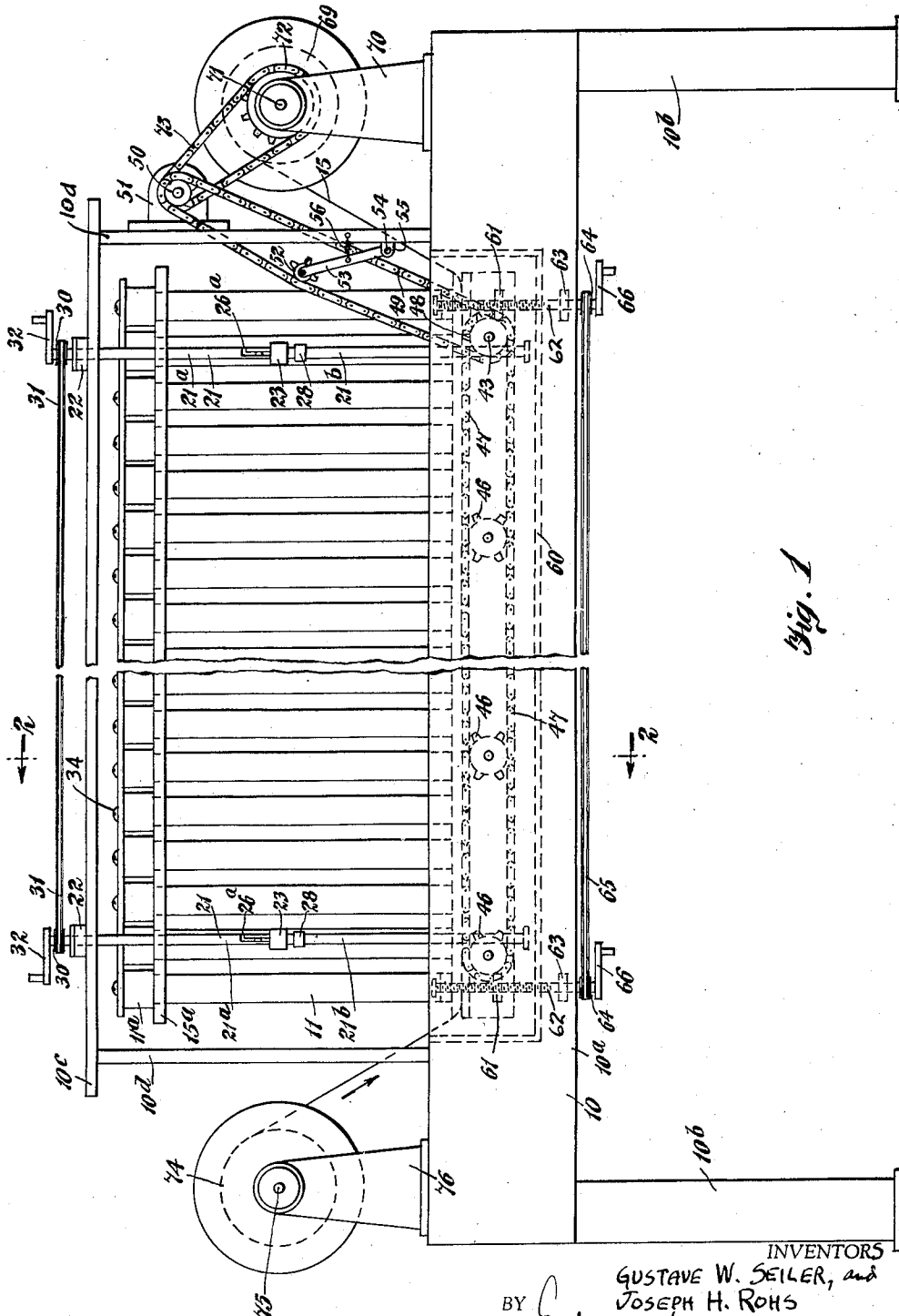
G. W. SEILER ET AL

2,270,905

UNIVERSAL MERCURY CIRCUIT BREAKER

Filed Aug. 25, 1939

3 Sheets-Sheet 1



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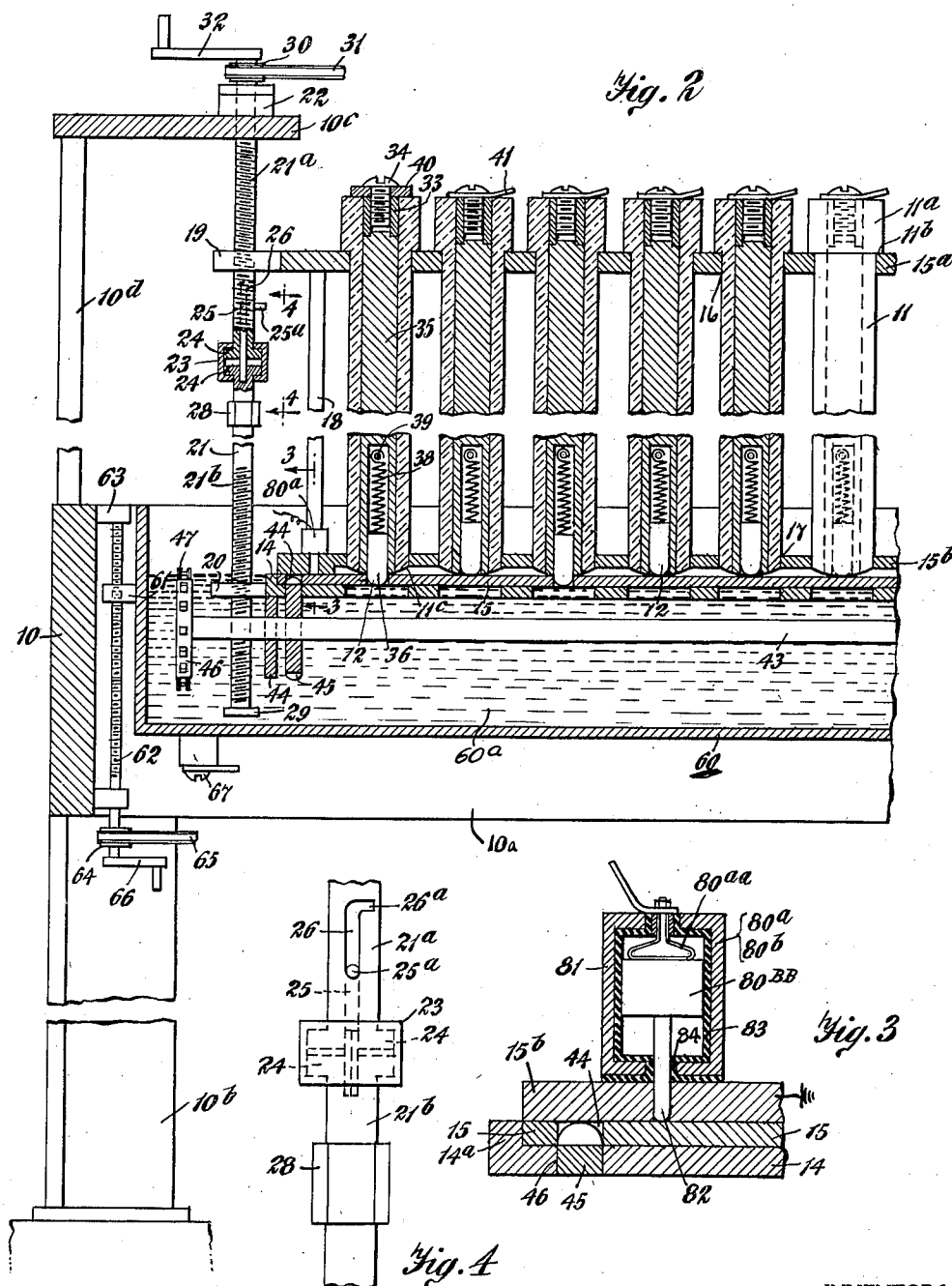
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UNIVERSAL MERCURY CIRCUIT BREAKER

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3 Sheets-Sheet 2



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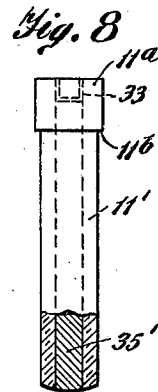
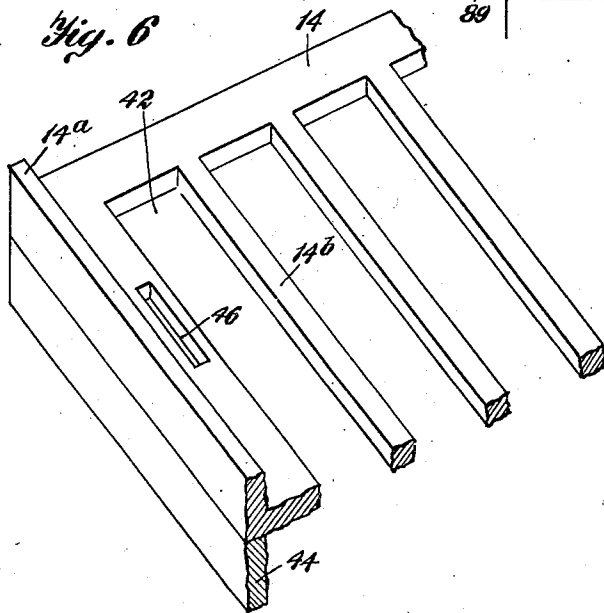
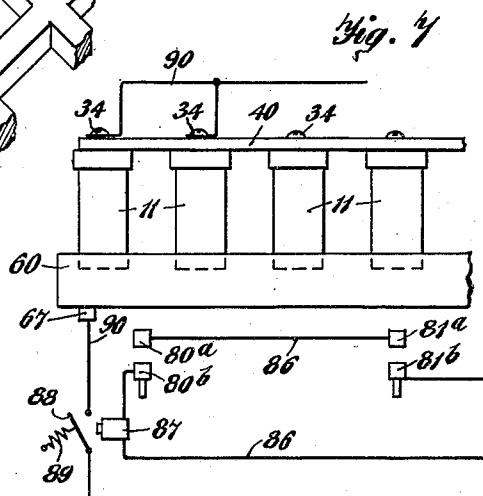
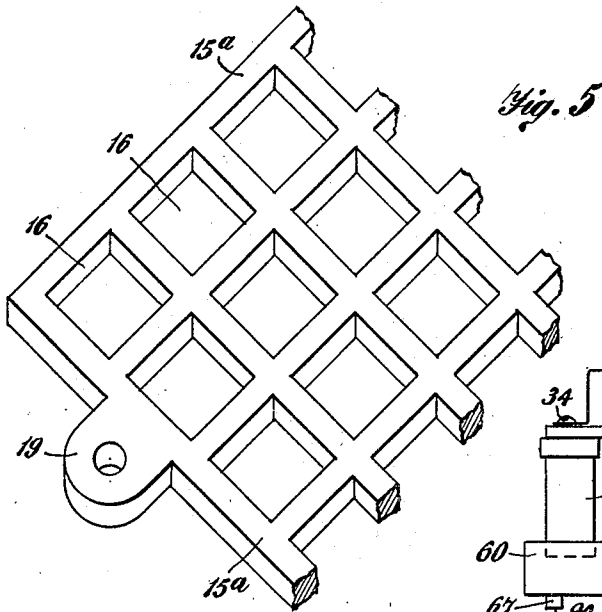
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UNIVERSAL MERCURY CIRCUIT BREAKER

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,270,905

UNIVERSAL MERCURY CIRCUIT BREAKER

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5 Claims. (Cl. 200—46)

This invention relates to new and useful improvements in a universal circuit breaker.

The invention has for an object the construction of a circuit breaker which is characterized by a guide rail adapted to support and guide 5 perforated tape or a plurality of perforated cards, and a plurality of insulation members with contacts and removably and replaceably mounted and cooperative with said perforated tape or said perforated cards in conjunction with a container 10 of mercury for controlling a plurality of circuits.

More particularly the invention proposes the provision of a frame for holding the various insulated contact members in a way so that the insulated contact members may be removed, or 15 if desired additional ones may be inserted, and control any number of circuits in a simple or complicated electrical device.

More particularly the invention proposes the construction of a mercury circuit breaker which is universal in the sense that this breaker is applicable to the smallest load or, in multiple to larger loads, without any readjusting.

Furthermore the invention proposes a mercury circuit breaker which is universal in the sense that the breaker functions by means of a perforated tape or perforated card which may be from "Cellophane," "Celluloid," or any substance in which it is possible to obtain clear cut perforations.

Still further the invention proposes the construction of a mercury circuit breaker which is universal in that its method of making and breaking electrical contacts can be utilized in straight switching methods as used in light and power work, also in making and breaking connections for traveling sign indications, news flashes, advertising apparatus and appliances, etc., also remote indications such as score boards, bulletin boards, accounting machines, signalling 40 devices, etc.

A further object of this invention resides in characterizing the mercury circuit breaker by the fact that it is possible to adjust the distance between the guide rails in the perforated tape 45 or cards, and the insulated contact members, so as to adapt the device to tape and cards of different thicknesses.

Still further an arrangement is proposed which will permit the adjustment of the guide rails and the insulated contact members mentioned in the previous paragraph to be adjusted as a unit in relation to the mercury container. This will permit the adjustment of the pressure of the mercury upon the contacts of the insulated contact members.

Still further the invention proposes a novel arrangement for vertically adjusting the mercury container in relation to the guide rails and the plurality of insulated contact members.

A further object of this invention resides in the provision of an arrangement by which there is pressure between the make and break contacts, so devised that the contacts are at all times clean due to the wiping action of the tape or card traveling against them.

Still further the invention proposes an arrangement of the mercury circuit breaker so that the contrivance is economical in that it may be built up even after the frame installation has been made, merely by the insertion or removal of the insulated contact members, as previously mentioned.

Still further the invention proposes to so arrange the circuit breaker that it has long life in that the contact carrying parts are much larger than is necessary, this feature is made possible in part by a molded material housing.

Still further the invention proposes an arrangement of the circuit breaker so that its operation is extremely flexible and so that it can be used in numerous ways and for such a variety of applications, from the single circuit breaker up to as many as required, as partially illustrated.

Still further the invention proposes to so arrange the circuit breaker that the space requirements are exceptionally small, and where space is a factor the contact carrying parts may be also molded in one solid block, or produced in a round member, as required.

Still further the invention proposes to characterize the circuit breaker in that it is positive and speedy in response to the adjustable pressure, yet in absolute control of the operator.

Still further the invention proposes to characterize the device by the fact that its safety factor is very high in that the apparatus lends itself to complete enclosure without any sacrifice of space.

Still further the invention proposes to so construct the circuit breaker that the maintenance factor is very low and that the action of the tape or cards tends to insure, by their wiping action, a clean bright contact at all times eliminating the constant cleaning and filing of contacts, which in turn always mean readjusting and aligning of contacts.

Still further the invention proposes to arrange the device so that the cost of operation is very low, in that the contacts are made momentarily and are not subject to and depending on associated coils, relays, springs, etc.

Still further it is proposed to so construct the device that the same pressure prevails on all of the contacts regardless of the number utilized, obviously much better than an equal amount of spring contacts.

Still further the invention proposes to arrange the device so that the breaker may be used both

with A. C. and D. C. current, with equal results, in that no arcing is possible on the contacts.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

Fig. 1 is a side elevational view of a universal mercury circuit breaker constructed in accordance with this invention.

Fig. 2 is a fragmentary enlarged vertical sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary enlarged vertical sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary enlarged elevational view looking in the direction of the line 4—4 of Fig. 2.

Fig. 5 is a fragmentary perspective view of a portion of the frame used to support the insulation members with the contacts.

Fig. 6 is a perspective view of another portion of the frame mentioned in Fig. 5.

Fig. 7 is a schematic wiring diagram of the device.

Fig. 8 is a side elevational view of a modified form of insulated contact member usable in the circuit breaker.

The universal mercury breaker in accordance with this invention includes a body 10 adapted to be rested upon a table, bench, the floor or other support. This body includes a rectangular shaped middle section 10a supported by several legs 10b, and a top section 10c which is supported by several vertical posts 10d mounted on the middle section 10a. A frame for supporting a plurality of insulated contact members 11 with contacts 12, is supported so as to be vertically adjustable relative to the body. A guide rail 14 for supporting and guiding a perforated tape 15 or a perforated card, is located beneath the said mentioned frame. The frame and the guide rail are arranged to be held in various relative positions, and this unit of parts is arranged to be adjustable relative to the body 10.

More particularly the frame mentioned in the previous paragraph includes a top frame section 15a formed with a plurality of openings 16 through which the insulated contact members 11 are mounted. A frame also includes a bottom frame section 15b formed with a plurality of openings 17 through which the lower ends of the insulated contact members 11 project. These frame sections 15a and 15b are held relatively fixed together as a unit by several posts 18 connected between these parts. At several points, the frame section 15a is formed with laterally projecting lugs 19. At points directly below these lugs 19 the guide rail 14 is provided with similarly formed lugs 20. A screw 21 is threadedly engaged through each superimposed pair of lugs 19 and 20.

Each screw 21 is formed from two screw sections. There is an upper section 21a and a lower section 21b. These sections have threads of different hands, and each threadedly engages the lugs 19 or 20. The upper section 21a is rotatively supported in a bearing 22 which is mounted on the frame portion 10c. The adjacent ends of the sections 21a and 21b are rotatively connected by a tubular bushing 23 which is connected upon head portions 24 formed on the adjacent ends of the screw sections. A bolt 25 is slidably

mounted on the section 21a and is non-circular in transverse cross section and engages a correspondingly shaped opening in the end of the other section for non-rotatively connecting the sections 21a and 21b together.

The bolt 25 has a head portion 25a by which it may be gripped and moved upwards to an inoperative position, in which the lower end disconnects from the opening in the section 21b, and then the sections 21a and 21b are relatively free and may be turned independently. The bolt 25 is slidable in a longitudinally extending slot 26 formed in the section 21a, and this slot at its upper end is formed with a branch portion 26a into which the head 25a of the bolt may be engaged when a bolt is raised so that the bolt is held in its raised inoperative position. The screw section 21b is provided with a hexagonal portion 28 by which it may easily be gripped and turned. At its lower end the section 21b is provided with a head 29 to prevent accidental disengagement of the lug 20 from the screw.

The various screws 21 are connected together to work in unison. This is accomplished by a sprocket wheel 30 mounted on each screw 21 preferably upon the top section 21a, and a chain 31 engaging over the sprocket wheels 30. Each section 21a is provided with a handle 32 by which it may be turned. This arrangement allows one of the screws to be manually turned, and the rotations will be transmitted to the other screws.

Each insulated contact member 11 comprises a body of insulation material having a head portion 11a, the bottom edge of which is formed on a shoulder portion 11b which is adapted to rest upon the material frame section 15a. The main portions of the insulated contact members 11 are adapted to extend downwards and extend into the openings 17 in the bottom frame section 15b. Each insulated contact member 11 is provided with a grommet 33, in its top end, into which a terminal screw 34 threadedly engages. Each grommet 33 connects with a contact rod 35 which extends longitudinally through the body of the insulation member. Each rod 35 at its bottom end is formed with a bore 36 into which a contact member 12 is slidably mounted. Within each bore 36 there is an expansion spring 38 acting to normally urge the contact 12 resiliently downwards. The inner end of each spring 38 is fixedly held by a pin 39 mounted through the material of the rod 35. At its outer end each spring 39 is connected with the contact 12 to support the same. The bottom ends of the insulated contact members 11 are formed with round areas 11c against which the perforated tape or perforated card engage.

For certain applications the insulated contact members may comprise an insulated contact member 11' which is used without the supplementary expansion spring arrangement for the top of the contact. In this case it is supplied with a solid contact rod 35', see Fig. 8.

The terminal screws 34 may be connected in groups by bus bars 40, or may be individually connected with cables 41. These groups of bus bars and cables may be connected in suitable circuits for controlling various apparatus, and devices as previously mentioned.

The guide rail 14 is provided with flanges 14a along its sides which are adapted to engage the edges of the tape 15 or cards to properly guide them through the device. The guide rails 14 are also provided with a plurality of longitudinally

extending strip portions 14b extending transversely thereof and adapted to engage beneath the perforated tape 15 or cards so as to support many areas thereof to prevent sagging and possible disconnection of the tape 15 or perforated cards from the bottom ends of the insulated contact members. Between the bars 14b there are spaces 42 through which the mercury may pass to engage the exposed contacts through the perforations of the tape or cards 15 as herewith more fully described.

A means is provided for advancing the perforated tape or card. This means includes a plurality of shafts 43 rotatively supported on side bars 44 attached along the sides of the guide rail 14. These shafts 43 support sprocket wheels 45 which extend upwards through openings 46 formed in guide rail 14. The top portions of the sprockets 45 are adapted to engage perforations formed along the edges of the perforated tape 15, or perforated cards, to assist in advancing same. On each shaft 43 there is another sprocket 46 which is engaged by an endless chain 47 connected with suitable drive means. This drive means may include an auxiliary gear 48 on one of the shafts 43 engaged by a chain 49 which connects with a drive pulley 50 of an electric motor 51, or other prime mover. The electric motor is shown supported on one of the posts 10d. A resiliently urged sprocket wheel 52 engages one of the sides of the chain 49 for maintaining the tension thereof. This sprocket wheel 52 is mounted on an arm 53 which is pivotally supported on a pintle 54 mounted on a bracket 55 also mounted on the post 10d. A spring 56 acts against the arm 53 for urging the arm in a direction to tension the sprocket wheel 52 against the chain 49.

A mercury container 60 is arranged beneath the insulated contact members 11 with the contacts 12, in a way so that the contacts 12 engage into the container. It is intended that the container 60 hold a suitable quantity of mercury 60a which extends upwards through the openings 42 of the guide rail 14 and extend upwards through the various perforations of the perforated tape 15, or perforated cards, to control the various circuits as operated by the perforated tape or cards. This mercury container 60 has several lugs 61 at its sides which are engaged by vertical screws 62 rotatively supported in bearings 63 mounted on the middle section 10a of the body of the device. Each of the screws 62 is provided with a sprocket 64 over which the endless chain 65 engages. Each screw 62 is provided with turning handle 66 by which it may be turned. The arrangement permits any one of the screws to be turned and the rotation will be transmitted to simultaneously rotate each of the screws 62. The mercury container 60 is provided with a terminal 67 which may be engaged in electrical circuits as previously explained.

In the event that the circuit breaker is operated by perforated tape, the arrangement may be provided for supplying this tape in long strips. For this purpose there is a roll of tape 69 supported on a suitable standard 70. The roll 69 is provided with a shaft 71 which has a sprocket wheel 72 by which the chain 73 connected with a section of the sprocket wheel 50 of the motor 51. The arrangement is such that the rotations from the motor 51 will serve to rotate the roll 69 and wind and draw the tape so as to provide satisfactory tension of the tape. A supply roll 74 may be provided on the opposite side of the de-

vice from which the tape may be drawn. This supply roll is shown supported on a shaft 75 supported on standards 76. In the event that perforated cards are fed to the machine it is intended that these cards be fed manually or if so desired a suitable feeding mechanism may be used which is not defined in the present application and forms no part thereof.

An arrangement is provided to open the electric circuit through the device during the period that a new card is being moved into or from its position in the device, to prevent short circuiting of the various contacts 12.

The means mentioned in the previous paragraph includes a pair of switches 80a, 80b, and 81a, 81b. Each of these switches is located upon opposite ends of the frame section 15b. These switches are so arranged that when there is card material or tape material in proper position the switches will be closed and the device is ready to function. When one or both of these switches are not held open by a perforated tape or card, they will automatically open and break the circuit. Each switch includes a body 81 in which a plunger 80bb is slidably mounted. This plunger has a stem 82 which extends downwards through the material of the frame section 15b and bears against a portion of the perforated tape or card 15 when such parts are in position beneath the stem. A stationary contact 80aa is mounted upon the top of the cylinder 81 and in the raised position of the stem 82, the bottom contact 80bb is raised engaging the top contact and closing the circuit. The cylinder 81 is lined with suitable insulation material 83, and an insulation bushing 84 surrounds the stem 82. The arrangement is such to prevent short circuiting of the switches.

In Fig. 7 a schematic diagram of the device has been illustrated. The switches 80a and 80b, 81a and 81b are connected in series in a circuit 86. This circuit includes an electro-magnet 87 capable of closing a main switch 88. The main switch is urged open by a spring 89. This main switch controls a circuit 90 which includes the mercury container and the various contacts 12 of the insulated contact members 11. From examining Fig. 7 it will be recognized that it is necessary for the switches 80a, 80b, and 81a, 81b to be both closed before the main circuit through the circuit breaker is in condition to function. Consequently during that period when a perforated card is not in its proper position within the device, the main circuit will be opened and prevent any possible short circuiting thereof.

The operation of the device is as follows:

The screws 21 may be turned, by turning one of the handles 32 so as to cause the frame 15a, 15b and the guide rail 14 to move relatively to each other. This is so in that as the screws turn the right and left hand threads of the sections 21a and 21b will function to move the parts together or separate them. In this way the guide rail 14 may be properly located with respect to the frame section 15b to accommodate perforated cards or perforated tape of different thicknesses so as to properly hold the tape in position in the device and against the stems 82 of the switches, as illustrated in Fig. 3.

When desired the handles 25a of the bolts 25 may be moved upwards to disengage the upper sections 21a from the lower sections 21b of the screws 21. Then the upper sections 21a may be rotated, for example, to raise the frame 15a, 15b. Or the lower sections 21b may be rotated to low-

er the guide rail 14. After such an adjustment of the other parts must be brought into approximate relationship with the former part. Then the screw sections 21a and 21b may be again connected by the bolts 25, and then the screws may be operated to bring the guide rail 14 into proper relationship with frame section 15b. However in the new positions, the unit comprising the frame 15a and 15b, and the guide rail will be in a raised or lowered position relative to the body 10 of the device, and also relative to the mercury container 60. Furthermore the mercury container may be adjusted by controlling the screws 62 to raise or lower the same.

During the operation of the device the contacts 12 will be continuously resiliently urged against the perforated tape, or card, and as the tape or cards, move, the contacts will be continuously wiped and kept clean to insure proper electrical connection thereof.

While we have illustrated and described the preferred embodiments of our invention, it is to be understood that we do not limit ourselves to the precise constructions herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claims.

Having thus described our invention, what we claim as new and desire to secure by United States Letters Patent is:

1. A universal mercury circuit breaker, comprising a body, a frame having a plurality of openings releasably holding a plurality of insulated contact members with contacts, a guide rail for perforated tape or cards and located beneath said frame, means for advancing said tape or cards, a mercury container beneath said insulated contact members with contacts with the later parts engaging therein, means for vertically adjustably supporting said container on said body, and means for holding said frame and guide rail in various fixed spaced positions and for supporting this unit in fixed vertical adjusted positions on said body and each of said insulated contact members with contacts comprising an insulated body, a conductor rod extending through said body, and a resiliently mounted contact on the bottom of said conductor rod.

2. A universal mercury circuit breaker, comprising a body, a frame having a plurality of openings releasably holding a plurality of insulated contact members with contacts, a guide rail for perforated tape or cards and located beneath said frame, means for advancing said tape or cards, a mercury container beneath said insulated contact members with contacts with the later parts engaging therein, means for vertically adjustably supporting said container on said body, and means for holding said frame and guide rail in various fixed spaced positions and for supporting this unit in fixed vertical adjusted positions on said body, each of said insulated contact members including an insulation body with a head portion forming a shoulder adapted to rest upon the material adjacent said openings, a conductor rod extending through said insulation body and having an opening in its bottom end, and a contact resiliently mounted and projecting from said bottom end.

3. A universal mercury circuit breaker, comprising a body, a frame having a plurality of openings releasably holding a plurality of insulated contact members with contacts, a guide rail for perforated tape or cards and located beneath said frame, means for advancing said tape

or cards, a mercury container beneath said insulated contact members with contacts with the later parts engaging therein, means for vertically adjustably supporting said container on said body, and means for holding said frame and guide rail in various fixed spaced positions and for supporting this unit in fixed vertical adjusted positions on said body, each of said insulated contact members with the contacts, comprising an insulation body having a threaded grommet in its top, a terminal screw threadedly engaged with each grommet, and a conductor rod extending from each grommet through the insulation body to the bottom thereof, and a resiliently mounted contact connected with the bottom of each conductor rod.

4. A universal mercury circuit breaker, comprising a body, a frame having a plurality of openings releasably holding a plurality of insulated contact members with contacts a guide rail for perforated tape or cards and located beneath said frame, means for advancing said tape or cards, a mercury container beneath said insulated contact members with contacts with the later parts engaging therein, means for vertically adjustably supporting said container on said body, and means for holding said frame and guide rail in various fixed spaced positions and for supporting this unit in fixed vertical adjusted positions on said body, including rotatively mounted screws supported upon said body and having separate top and bottom screw sections of different hands and screw sections selectively threadedly engaging lug portions formed on said frame and on said guide rail, and means for rotatively connecting said screw sections together, and a bolt for each pair of screw sections adapted to non-rotatively engage these sections together when required, each bolt being slidably mounted in one of the sections and being of non-circular cross sectional shape and engaging in correspondingly shaped openings in the adjacent section.

5. A universal mercury circuit breaker, comprising a body, a frame having a plurality of openings releasably holding a plurality of insulated contact members with contacts, a guide rail for perforated tape or cards and located beneath said frame, means for advancing said tape or cards, a mercury container beneath said insulated contact members with contacts with the later parts engaging therein, means for vertically adjustably supporting said container on said body, and means for holding said frame and guide rail in various fixed spaced positions and for supporting this unit in fixed vertical adjusted positions on said body, including rotatively mounted screws supported upon said body and having separate top and bottom screw sections of different hands and screw sections selectively threadedly engaging lug portions formed on said frame and on said guide rail, and means for rotatively connecting said screw sections together, and a bolt for each pair of screw sections adapted to non-rotatively engage these sections together when required, each bolt being slidably mounted on one of the sections and being of non-circular cross sectional shape and engaging in correspondingly shaped openings in the adjacent section, each of said bolts having a handle portion working in longitudinal slot having an offset branch portion adapted to hold the bolt in a raised inoperative position.

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