

C. F. A. SCHULDT & F. H. NICHOLSON.

MERCURY CONTACT RELAY.

APPLICATION FILED OCT. 12, 1908.

937,098.

Patented Oct. 19, 1909.

2 SHEETS—SHEET 1.

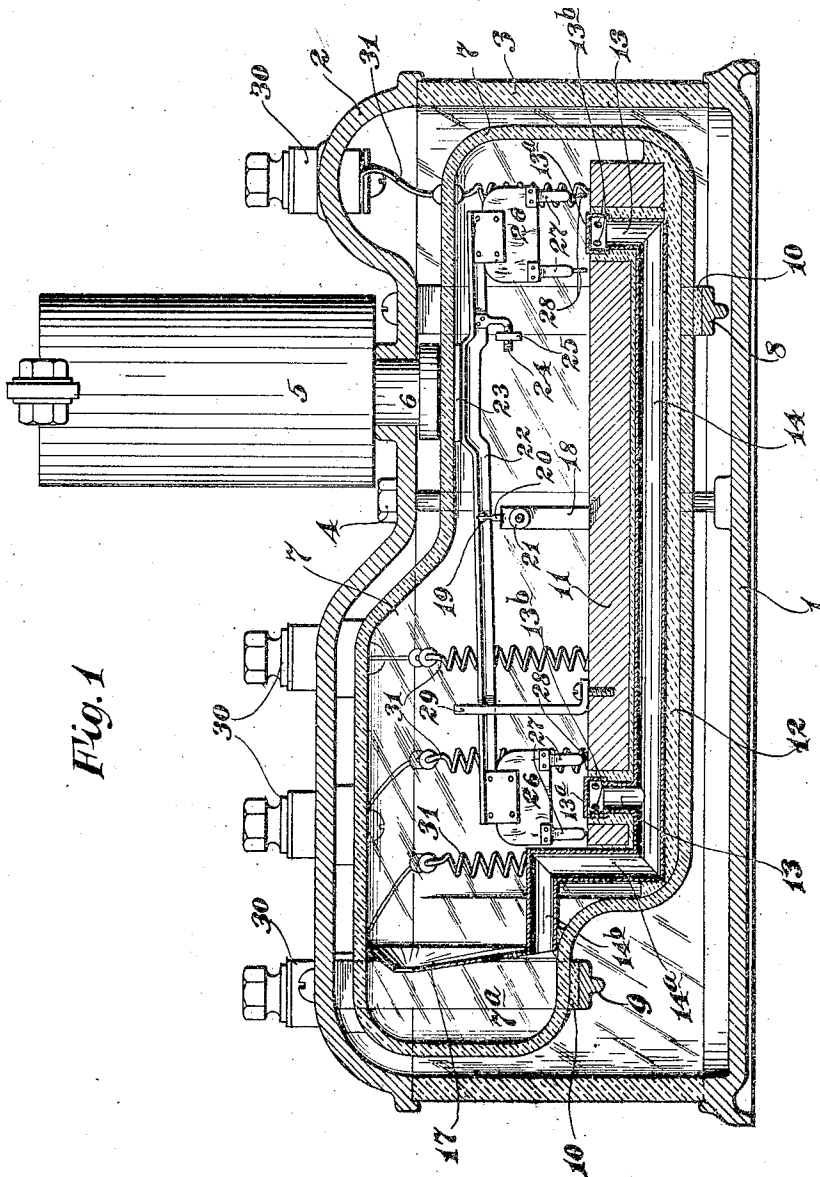


Fig. 1

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2 SHEETS—SHEET 2.

Fig. 2

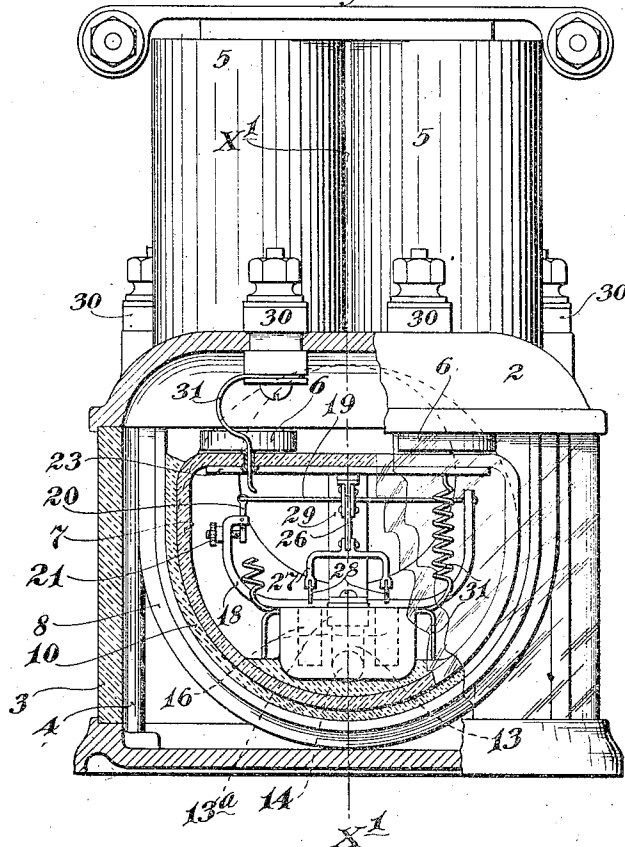


Fig. 3

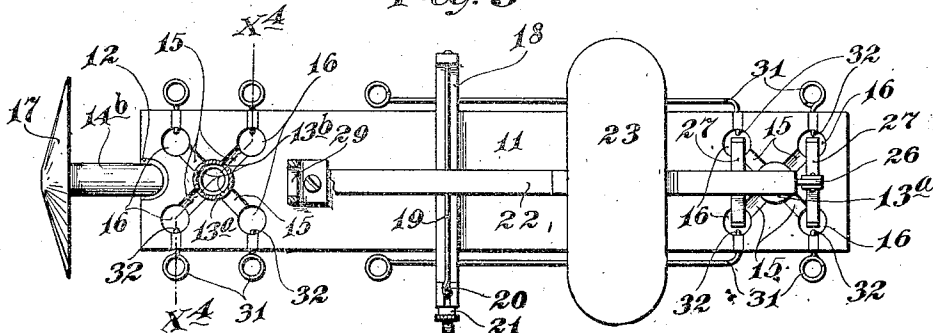
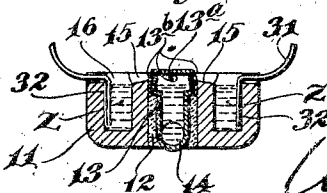


Fig. 4



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UNITED STATES PATENT OFFICE.

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MERCURY-CONTACT RELAY.

937,098.

Specification of Letters Patent.

Patented Oct. 19, 1909.

Application filed October 12, 1908. Serial No. 457,298.

To all whom it may concern:

Be it known that we, CHARLES F. A. SCHULTZ and FRANK H. NICHOLSON, citizens of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Mercury-Contact Relays; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention has for its object to provide an improved mercury contact relay, and to this end the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

The improved relay was especially designed for use in connection with railway signaling systems, but is, nevertheless, capable of general use wherever a relay of this general character may be found serviceable.

In the accompanying drawings which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings: Figure 1 is a vertical section taken through the improved relay, approximately on the line x^1 of Fig. 2; Fig. 2 shows the improved relay in end elevation, some parts being broken away and some parts being sectioned; Fig. 3 is a plan view showing the internal mechanism of the relay removed from working position; and Fig. 4 is a section taken on the irregular line x^2 of Fig. 3.

The outer shell, or keys proper of the relay, is shown as made up of a base plate 1, a curved top plate 2, and a heavy glass wall 3, the said parts being rigidly but detachably connected by bolts 4. To the top plate 2, a pair of magnets 5 are secured, the same as shown, having depending headed cores 6 that project downward through suitable seats in the said plate 2.

The working parts of the relay are contained within an air-tight inner shell in the form of a glass envelop 7, which as shown, is supported from the top plate 2 of the case by a pair of stirrups 8 and 9. As shown, thin layers of cement 10 are interposed between the stirrups 8 and 9 and the glass envelop 7, so that the latter is firmly secured in position by the two stirrups, and spaced apart from the outer casing.

A base bar 11 of insulating material, such

as porcelain, wood fiber or vulcanized rubber, is secured within, and to the bottom of the glass envelop 7, by a body of cement 12. Near its ends, the bar 11 has vertical perforations that receive portions of the cement 12, and contain the up-turned necks 13 of a mercury tube 14, which latter is seated in the body of cement 12, and at one end, is up-turned at 14^a, and then is extended horizontally at 14^b. The upper ends of the necks 13 terminate in heads 13^a, each of which, as shown, has four radial perforations 13^b. The perforations 13^b open into grooves 15, which in turn lead to small mercury wells 16, formed in the end portions of the bar 11. By reference to Figs. 1 and 4, it will be noted that the perforations 13^b lie in a plane slightly below the upper portion of the wells 16, this being done for an important purpose which will hereinafter appear.

An approximately vertical funnel plate 17 is secured to the end of the section 14^b of the mercury tube 14, and extends entirely across, and from top to bottom of the raised end portion of the envelop or inner casing 7, so as to cut off a small compartment 7^a from the main body portion of the said envelop. Also by reference to Fig. 1, it will be noted that the tube section 14^b leads from the extreme lower portion or bottom of this compartment 7^a.

A transversely extended approximate U shaped or forked bearing 18, is secured to the intermediate portion of the bar 11, and a wire 19 is attached at one end to one of the prongs of this bearing. The other end of the wire 19 is attached to a small lever 20 that is pivoted to the other prong of the said bearing 18, and is subject to an adjusting screw 21, by means of which, the tension on the said wire 19 may be varied.

A contact supporting lever 22 is immediately connected to the intermediate portion of the wire 19, so that the said wire affords a fulcrum for the said lever. At one side of its fulcrum, the lever 22 is provided with a transversely extended armature plate 23, that underlies the cores 6, and hence, is subject to the said magnets or magnetic coils 5. At a point near its armature, the lever 22, as shown, is provided with a small threaded finger 24, on which is an adjustable weight 25, by adjustments of which latter, the counterpoise of the lever may be varied.

To each end of the lever 22 is secured a

contact holder preferably in the form of a sheet of mica 26, but which may be of other insulating material. Each contact holder 26 carries two pairs of inverted U shaped contacts 27, having depending contact points 28 preferably of platinum, that are arranged to engage each in the mercury Z, contained in mercury cups 16. One end of the lever 22 is shown as guided by a split post 29 secured on bar 11.

There is nothing novel in the manner in which the relay herein disclosed is wired, and hence, for the purposes of this case, it will be sufficient to note that binding posts 30 on the top plate 2 of the case, are connected by wires 31, that extend through sealed passages in the envelop 7, to contact points 32 located one in each mercury containing well 16.

Before the inner casing or transparent envelop 7 is hermetically sealed, all of the parts contained therein, must, of course, be properly adjusted. Also the required amount of mercury must be introduced into the said envelop. The amount of mercury introduced into the envelop should be sufficient to fill the tube 14, its necks 13 and heads 13^a, up to the altitude of the perforations 13^b, so that this mercury will run into and fill the wells 16 without overflowing the latter. In shipment the mercury may run where it will, and when desired, it may be properly collected, first by standing the entire device on its left hand end, directions being taken in respect to Fig. 1. This will cause all the loose mercury to be collected on the funnel plate 17, hence directed into the compartment 7^a. Then, when the device is properly arighted, or set, as shown by Fig. 1, the mercury will run down through the tube section 14^b and 14^a into the tube 14, and from thence through the necks 13 and perforations 13^b into the mercury wells 16.

The relay as is evident, is thoroughly protected from the elements, such as rain, snow and dirt, and furthermore, the delicate parts thereof, are protected so they cannot possibly be tampered with. This latter feature itself, is of the very greatest importance, especially in railway signaling apparatus, wherein reliability under all conditions, is the first requirement. The transparent envelop enables inspection at all times of the internal mechanism of the relay, and this feature, as is obvious, is highly important.

Preferably, the air-tight envelop afforded by the inner glass casing 7 before it is sealed, has the air pumped therefrom, so that the operative parts of the relay are not closed or contained in a vacuum. This prevents oxidation of the contact points of the relay.

What we claim is:

1. In an electrical relay, the combination with a glass envelop and magnetically actuated contacts therein, including a lever, and a magnet entirely outside of said envelop operative on said contact lever.

2. In an electrical relay, the combination with a glass envelop and magnetically actuated contacts therein, including a lever, of a shell inclosing said envelop and a magnet supported by said shell with its core entirely outside of said envelop, and which magnet is operative on said contact lever, substantially as described.

3. In an electrical relay an air-tight envelop, mercury wells contained therein, movable contacts cooperating with said wells, and means for collecting mercury contained within said envelop and for directing the same into said wells, substantially as described.

4. In an electrical relay, the combination with an air-tight envelop, of a funnel plate and a mercury tube within said envelop, said tube having passages leading to and terminating in open mercury containing wells, movable contacts within said envelop cooperating with said wells, and a magnet for actuating said contacts, the said funnel plate and mercury tube being arranged to collect all the mercury contained in said envelop, when the latter is turned on one end, and to direct the mercury into said wells when the said envelop is subsequently arighted or set in normal position.

5. In an electrical relay, the combination with a wire and a support for the ends thereof, of a contact lever secured to the intermediate portion of the said wire, the said wire serving as a yielding fulcrum for the said lever.

In testimony whereof we affix our signatures in presence of two witnesses.

CHARLES F. A. SCHULDT.
FRANK H. NICHOLSON.

Witnesses:

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