

June 10, 1930.

J. A. THOMMES

1,762,491

INDICATING CIRCUIT CONTROLLING APPARATUS

Filed March 5, 1926

3 Sheets-Sheet 1

Fig. 1.

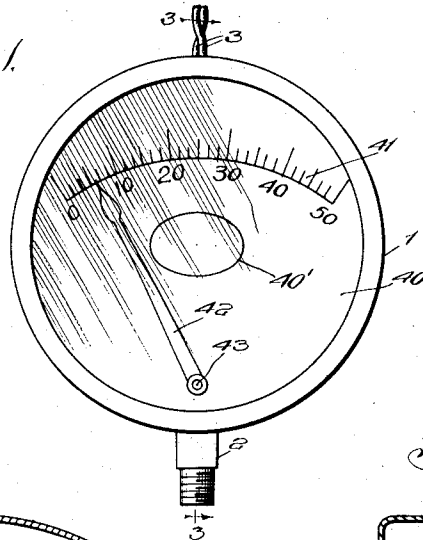


Fig. 2.

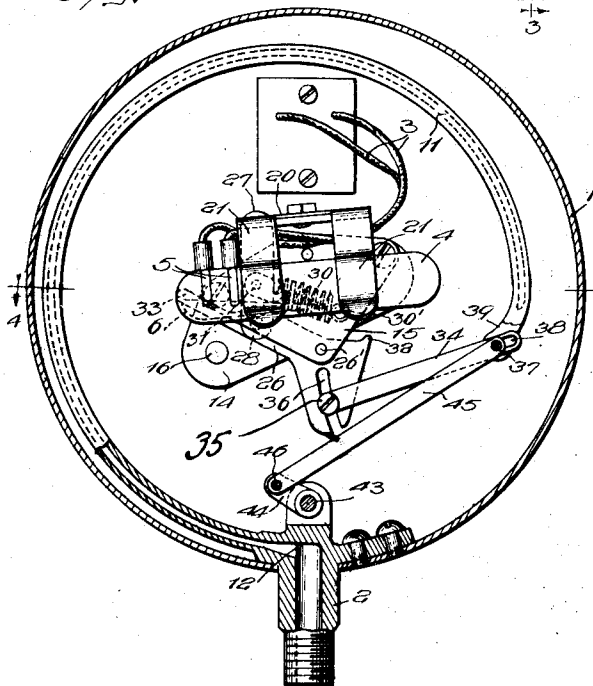
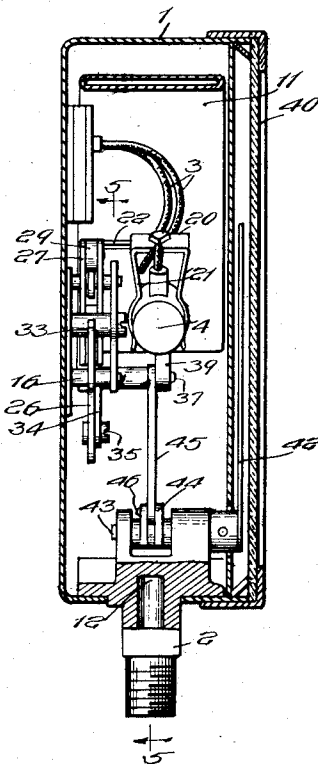


Fig. 3.



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Fig. 4.

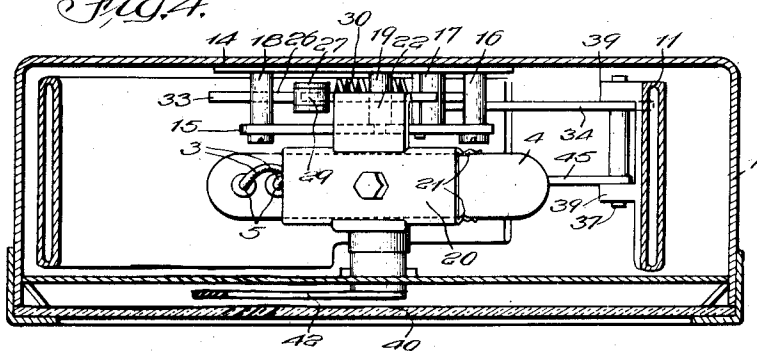


Fig. 5.

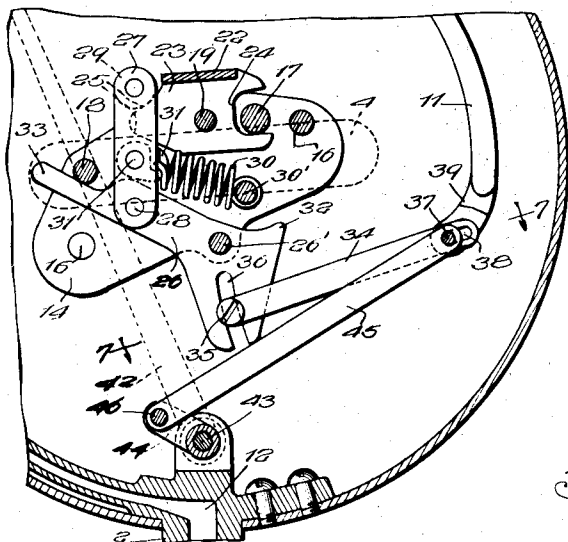


Fig. 7.

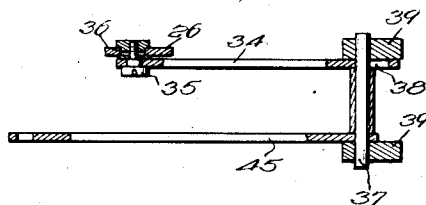
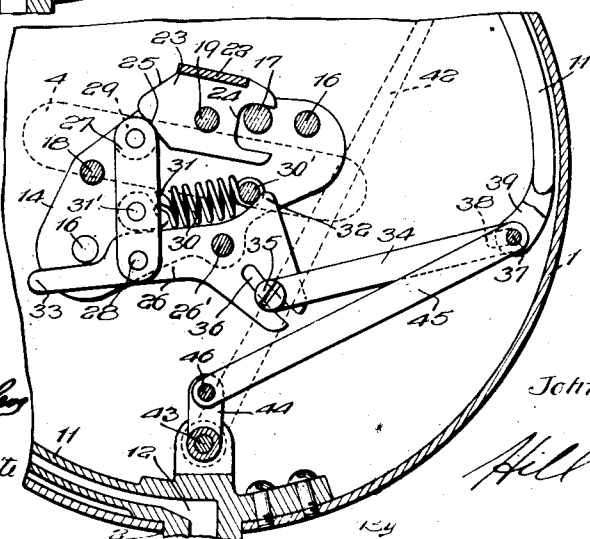


Fig. 6.



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Fig. 8.

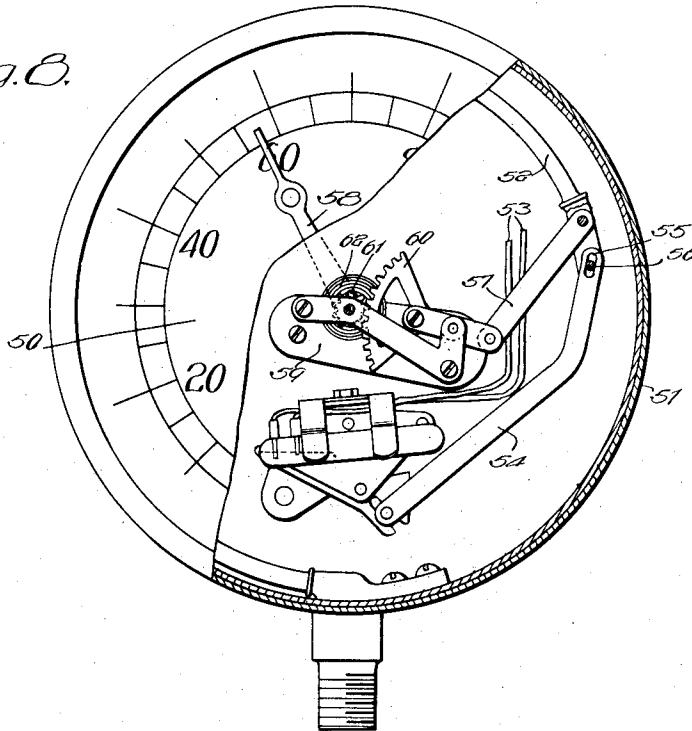
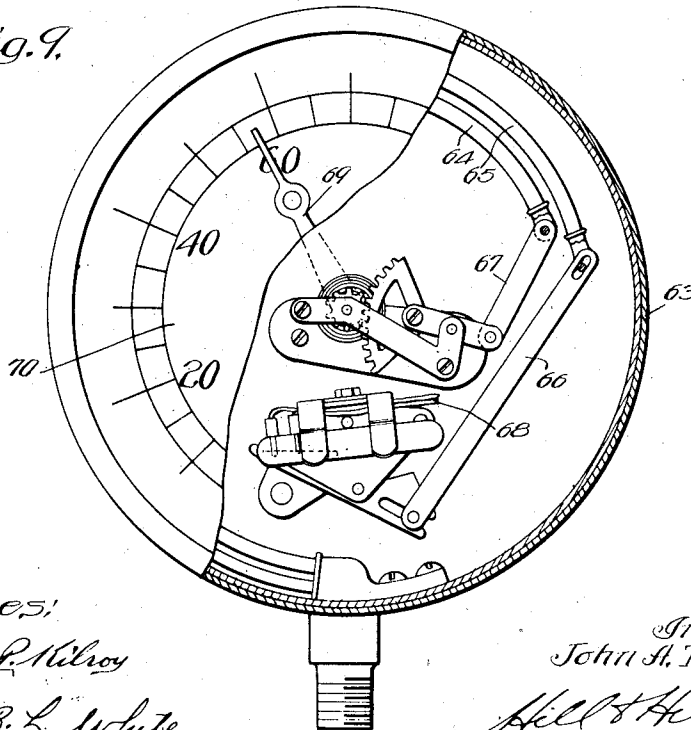


Fig. 9.



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UNITED STATES PATENT OFFICE

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INDICATING CIRCUIT-CONTROLLING APPARATUS

Application filed March 5, 1926. Serial No. 92,513.

My invention relates particularly to an indicating circuit controller particularly designed for use in connection with refrigerating apparatus, compressors and the like where it is desired to maintain a control of the fluid pressure, but it may be used wherever found applicable. The invention has among its objects the production of a device of the kind described that is simple, compact, efficient and satisfactory. It has particularly as an object the production of a safety device that will indicate the conditions under which the same is working, as well as control an electric circuit upon variation in conditions between desired limits. It has also among its objects the production of an instrument of the kind described in which the controller mechanism and the indicating mechanism are directly related, and whereby failure of either the indicating mechanism or circuit controlling mechanism to function will immediately be apparent. Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosures herein given.

To this end my invention consists in the novel construction, arrangement and combination of parts herein shown and described, and more particularly pointed out in the claims.

In the drawings, wherein I have illustrated the preferred embodiment of my invention:

Fig. 1 is a face view of one type of instrument embodying the invention;

Fig. 2 is an enlarged view of the same, with the dial and front face removed;

Fig. 3 is a sectional view taken substantially on line 3—3 of Fig. 1;

Fig. 4 is a sectional view taken substantially on line 4—4 of Fig. 2, with the dial and indicator in position;

Fig. 5 is an enlarged view of a portion of Fig. 2;

Fig. 6 is a similar view showing the parts in changed position;

Fig. 7 is a view taken substantially on line 7—7 of Fig. 5;

Fig. 8 is a face view of another embodiment of the invention with a portion of the

dial removed to show the inner mechanism; and

Fig. 9 is a similar view of another embodiment of the invention.

Referring to the drawings, 1 represents a shell or casing provided with tubular stem 2 for attachment to a fluid pressure system and with electrical conductors 3 extending to the desired electrical circuit in which the same is connected. Any type of circuit breaker may be employed, that shown consisting of a mercury tube 4 of glass or other suitable material, provided with contacts 5. When the tube 4 is in one position, the mercury bridges or electrically connects the contacts 5, while when the tube is in the other position the circuit is broken between the contacts 5. The conductors 3, as most clearly shown in Fig. 2, are connected to contacts 5 so that the circuit through conductors 3 is controlled by tilting or rocking the tube 4, as will be more fully explained in the operation of the device. In the instrument illustrated, the tilting of the tube is controlled by fluid pressure. A Bourdon spring 11 connected with the member 2 and open to the bore thereof, as indicated at 12, is arranged to actuate or control the movement of the tube 4. Variation in the pressure will cause a variation in the tube through the intermediate mechanism. Any suitable mechanism may be employed for transmitting the movement of the Bourdon tube to the switch tube 4, that shown being merely illustrative and representing a type already on the market with the exception of suitable connecting links arranged between the Bourdon tube and the operating mechanism for the switch 4 and between the Bourdon tube and the indicator hand.

While I make no claim to the specific mechanism shown, the same may be described in order that the operation of the instrument may be understood. As shown, 14 and 15 represent a frame secured to the casing by screws 16 or equivalent. The two frame bars 14 and 15 are maintained in spaced relation by the spacers 17 and 18. The frame is provided with pins 19 and 26'. The mercury-containing tube 4 is mounted in or carried by a plate member 20 having depending arms

21 which firmly grip the tube 4. The carrier 20 is mounted on a plate 22 which is provided with the flange portion 23 pivotally mounted on a pin 19. As shown, the one end of 23 is bifurcated as at 24 and is adapted to cooperate with the spacer pin 17 which limits its pivotal movement. The opposite end is formed with cam faces 25. Mounted on the pin 26' is an arm 26 which carries a pair of links 27, the lower end of which are pivotally secured to 26 as indicated at 28. At the opposite end of links 27 is arranged a cam roller 29 arranged to cooperate with the faces 25. A spring 30 secured at one end to the pin 30' on the frame engages the hook 31 at the opposite end which is shown pivotally secured to the links at 31'. The movement of member 26 is limited by the engagement of the end 32 with the pin 30' in one direction and by the engagement of the portion 23 with the pin 18 at the opposite side. Member 26 is connected with the Bourdon spring 11 by a link 34 which is secured at the one end by a screw or bolt 35 to the member 26 which is formed with a slot 36 to permit adjustment. At the opposite end the same is connected to the Bourdon spring ears 39 by a pin 37 extending through the slot 38. Obviously the slot 38 may be formed in the other end of the link 34 if it is so desired.

It will be particularly noted that the slot 38 and the link 34 permits an initial movement of the Bourdon spring without tripping the mechanism. The importance of this will be obvious from the description given, and in so far as I know this movement is new in apparatus of the kind described where as I am aware, the connection has been rigid, thereby requiring a much more powerful or rigid Bourdon spring to be employed. It will be obvious that the mechanism just described may be used alone without the indicating mechanism. Examination of the instrument in itself did not disclose whether or not the switch was about to be tripped in one direction or the other. I provide an indicator so that an engineer or attendant may at all times have a knowledge of the operative pressure in the system and whether the instrument is about to be tripped either way.

As shown, 40 represents a dial provided with scale 41 thereon. Movable over the scale is an indicator 42 mounted on a rock shaft or pin 43. Secured to 43 is an arm 44 connected by a link 45 with the Bourdon spring 11, the link being pivotally connected at its ends to the pin 46 on the arm and to the pin 37 previously described on the Bourdon spring. Obviously, as the Bourdon spring is actuated by the variation of pressure in the system or by vacuum in the vacuum system, this movement will be transmitted to the indicator, which will indicate on the scale the conditions under which the Bourdon spring is

operating. The extent of movement of the spring, as well as the particular readings on the scale, will, of course, depend on the particular instrument, this being made to suit the conditions under which the instrument is to be employed.

With the preceding description in mind, the operation of the device may be briefly explained as follows:

Movement of the Bourdon spring will be indicated by movement of the indicator, the spring being designed for the particular pressure or fluid condition, and operation with the spring is apparent by referring to the face of the instrument. Movement of the spring is also transmitted through the link 34 to the circuit controller mechanism. Inasmuch as it is desired to control the circuit controller between certain limits and not continuously, the link is slotted as previously described so that at certain points in the expansion or contraction of the spring the member 26 is rocked on its pivot 20.

Assuming that the parts are as shown in Fig. 5, it will be noted that the cam roller 29 is raised against one of the cam faces 25 and maintaining the mercury tube 4 as shown in Fig. 2 so that the mercury is at the contact end of the tube and the contacts 5 are immersed therein, forming a circuit. If the Bourdon tube 11 expands or tends to straighten out as indicated in Fig. 6, after an initial movement the same will move the link 34 and member 26, drawing down upon the links 27 and cam roller 29. This, however, has no effect on the tube carrier member 23, the movement of which is limited by the pin 17 engaging one side of the bifurcated end of the member. Spring 30 maintains the roller 29 in contact with the cam face. After the roller passes the high spot of the cam and over to the other side, it tends to raise the end of 23, the spring moving the links 27 about the pivot 28. This causes the mercury tube 4 to be snapped or flipped into the position shown in Fig. 6, throwing the mercury to the opposite end of the tube and away from the contacts 5, thereby breaking the circuit. If desired, manual means may also be employed to control the circuit controller. It will be noticed that if the mercury tube 4 is reversed in its holder the operation will be just the reverse of that described. The engineer, looking at the face of the instrument, can tell by the indicator just what the working conditions are in the system and whether the circuit controller is about to be tripped or has just been tripped, etc. If desired, a portion of the dial may be cut away, for illustration, as indicated at 40', so that the circuit controller itself may be observed, although with the indicating mechanism this is optional. The instrument itself, without some indicating mechanism, will of course, disclose whether the circuit is open or closed,

but this does not disclose the immediate condition of the system as is the case with my improved instrument. In some instances I may prefer to form the dial from transparent material so that the circuit controller may be readily observed.

It may be mentioned that the slotted connection of the link 34 is a very desirable feature inasmuch as a more sensitive Bourdon tube may be employed and there is no continual strain on the tube inasmuch as the tripping is only after movement of the spring between its tripping positions.

Another embodiment of the instrument is shown in Fig. 8, in which a circuit controller similar to that described is employed, but in this case the instrument is provided with an indicating mechanism which permits a wider range of travel of the indicator. As shown, 51 represents the casing and 52 the Bourdon spring, 53 the conductors forming a part of the circuit. In this case the spring is connected by the link 54 with the controller mechanism, the link being slotted as shown at 55 to allow movement of the pin 56 in the slot except at the limits of travel desired. I have shown a well-known type of movement in this figure, consisting of the frame 59 carrying a sector 60 which is connected by link 57 with the Bourdon spring. Movement of the sector 60 is transmitted through the pinion 61 to the pinion shaft, carrying the indicator 58 which is movable over the dial plate 50. In this case, 62 represents the usual hair spring employed in devices of this kind.

In the embodiment shown in Fig. 9, 63 represents the casing within which are arranged a pair of Bourdon tubes 64 and 65. One tube, as shown 65, is connected through link 66 with the circuit controller from which extends the conductor 68, while the spring 64 is shown connected with link 67 to the indicator mechanism arranged to actuate the indicator 69 and move the same over the dial plate 70. In both of the constructions shown in Figs. 8 and 9, it is preferred to slot the links 54 and 66 as indicated. This, however, is not quite so essential in the instrument shown in Fig. 9, in which two Bourdon springs are employed, but it is nevertheless preferred.

The device is particularly simple and convenient, and has many uses. It is particularly convenient for controlling compressors, pumps, etc., and may be installed proximate to the machine to be controlled or remote therefrom. When installed at a remote point, the desirability of having the indicating mechanism is apparent. It will be apparent from the preceding that the application of the indicating mechanism is not limited to the specific circuit controller shown, but it is most desirable in connection with that particular type of circuit controller.

Having thus described my invention, it is

obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence I do not wish to be understood as limiting myself to the exact form, construction, arrangement and combination of parts herein shown and described or uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

1. In a device of the class described including a fluid pressure operable element and in combination, a circuit breaker and indicating mechanism connected for operation by said element, links forming a connection between said circuit breaker, indicating means and element, one end of each of said links being respectively connected with the indicator and circuit breaker and one of said links having means affording movement of said indicating means with respect to said circuit breaker.

2. In a device of the class described including a fluid pressure operable element and in combination, a circuit breaker and indicating mechanism connected for operation by said element, links forming a connection between said circuit breaker, indicating means and element, one end of each of said links being respectively connected with the indicator and circuit breaker and one of said links having means affording movement of said indicating means with respect to said circuit breaker and permitting movement of said circuit breaker relatively to said indicator.

3. In a device of the class described including a fluid pressure operable element and in combination, a circuit breaker and indicating mechanism connected for operation by said element, links forming a connection between said circuit breaker, indicating means and element, one end of each of said links being respectively connected with the indicator and circuit breaker and one of said links having means affording movement of said circuit breaker relatively to the indicator.

4. In a device of the class described having a fluid pressure operable element in combination, a circuit breaker, indicating mechanism and links forming a connection for actuating said indicating means and circuit breaker, one of said links having the opposite ends respectively secured against movement relatively to the indicator and the fluid operable element, the other link having one end secured to the circuit breaker, and the opposite end thereof secured for movement with respect to said first mentioned link and its connection with said fluid operable element.

In testimony whereof, I have hereunto signed my name.

JOHN A. THOMMES.