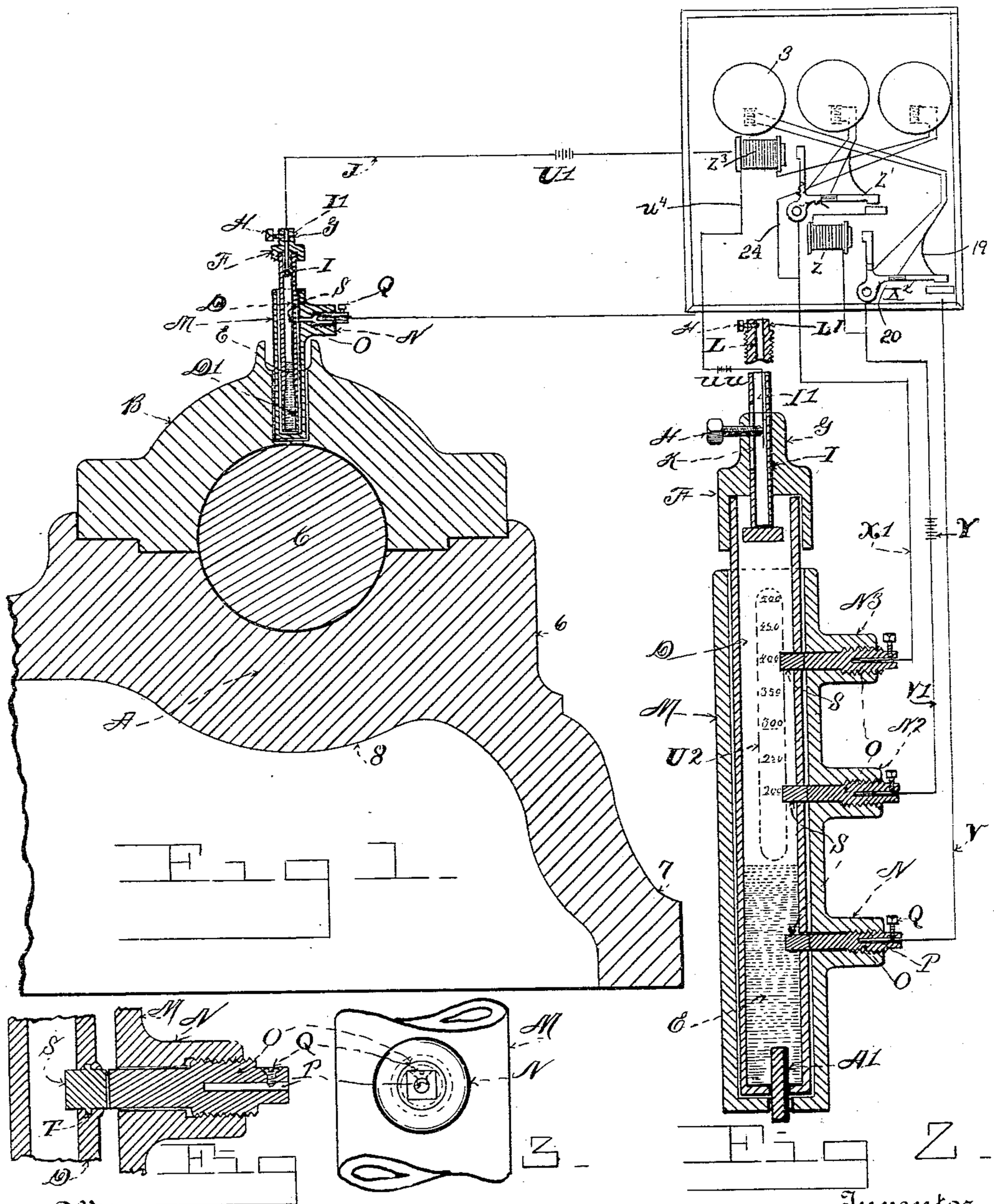
(No Model.) 2 Sheets—Sheet 1.

W. B. CHOCKLEY.

ELECTRIC INDICATOR FOR HOT JOURNAL BOXES.

No. 557,650. Patented Apr. 7, 1896.



Witnesses
George A Parmall
Archie E Parmall

Inventor
William B. Chockley
By his Attorney
H S. Bailey

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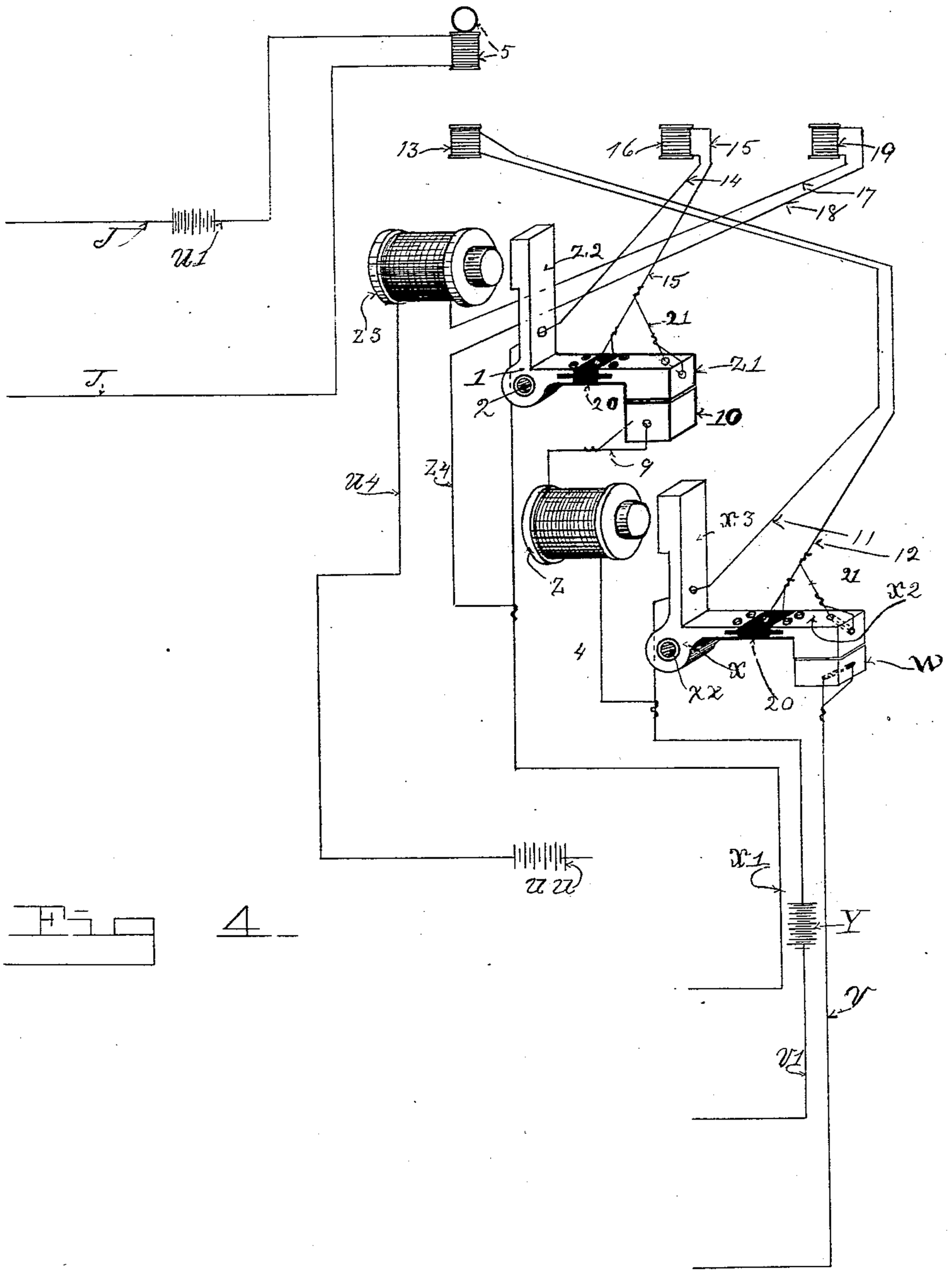

Fig. 4.

Witnesses
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Archie E Parmall

Inventor
William B Chockley
By his Attorney
H. S. Bailey

UNITED STATES PATENT OFFICE.

WILLIAM B. CHOCKLEY, OF DENVER, COLORADO.

ELECTRIC INDICATOR FOR HOT JOURNAL-BOXES.

SPECIFICATION forming part of Letters Patent No. 557,650, dated April 7, 1896.

Application filed March 15, 1895. Serial No. 541,907. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM B. CHOCKLEY, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Electric Indicators for Hot Journal-Boxes; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to an electric alarm-indicator for journal-boxes, and comprises a device for electrically indicating a hot box, and an annunciator comprising a bell-alarm and heat-indicator located at a distant point (office or engine-room) from the machinery.

My invention is applicable to all classes of high-speed machinery, such as dynamos, steam-engines, both land and marine, railway-train axle-boxes and wrist-pins, &c. I attain these objects by the mechanism illustrated and described in the accompanying drawings and specification, in which—

Figure 1 represents a sectional elevation through a journal-box and shaft and through that portion of my invention which is connected thereto, and also an outline of the circuit system. Fig. 2 represents a section through the indicating device, showing it arranged to register at the annunciator the degree of heat at the journal-box. Fig. 3 represents two views of details of construction of the contacting terminals. Fig. 4 represents an enlarged view of the circuit-breaking mechanism shown on a small scale in Fig. 3.

Similar letters and figures of reference refer to similar parts throughout the several views.

Referring to Fig. 1, A designates a shaft-bearing, which in this view forms part of the machine bed-plate. B designates a cap, and C the shaft. D designates a glass tube formed, preferably, with an enlarged portion or bulb D′ at the bottom. In this tube is confined a quantity of expansive fluid E, preferably mercury. The top of the tube is sealed by a cap F, which may be attached to it in any suitable manner. A reduced extension G on the top is provided with a threaded binding-screw H, which extends into a central perforation made in said cap, in which is adjustably fitted to move longitudinally in the cap a conducting contact-plug I. (See Fig. 2.)

I provide the plug with a central perforation I′, which extends some distance into it, and which is adapted to receive one end of a circuit-wire J. There are a number of ways in which the plug can be made adjustable in the cap. In Fig. 2 it is adapted to slide up and down through the cap, the binding-screw projecting into its center hole through a slot K cut through its shell. By keeping it well lubricated with oil it can be practically fitted tight and still be moved in the cap. Directly above the plug I show a fragment L of a similar plug, except that it is provided with an exterior thread. It has also a square end adapted to receive a wrench. The binding-screw H is threaded in this square instead of through the hub of the cap. If the plug is made in this manner, which is preferable, the hole through the cap will have to be internally threaded, in which case the plug would screw in and out of the cap.

M designates a socket. It is constructed of non-conductive material and is adapted to surround and protect the glass tube. It is also adapted and arranged to afford means of making one or several electric circuit connections with the mercury and the annunciator, as will be hereinafter explained.

In Fig. 2 I show a straight glass tube containing mercury, surrounded by the socket M. At different points in its height the socket is provided with several projections N. These projections have a hole through them of preferably two diameters, the largest of which is threaded, (see Fig. 3,) in which two views of this projection and the contact-terminals of the socket and tube are shown, one of which is a sectional fragment of the tube and socket and the other a fragment of a socket in elevation.

In Fig. 3 the plug O, which with the other parts is a duplicate of all the projections, is fitted to screw into and extend through the projection. Its outer end is squared for the reception of a wrench. A hole P is drilled into it to receive one end of a circuit-wire which is placed in it and secured by the bind-

ing-screw Q. In the walls of the glass tube are secured pole-pieces S. They are arranged in position to register with the plugs when the tube is in the socket. I preferably form the pole-pieces with an enlarged circular collar T, which enables it to be firmly secured in the glass. After the glass tube is inserted in the socket the plugs are adjusted to contact with them by screwing them through the projections.

In Fig. 1 but one projection is shown on the socket. This is placed high enough to allow the socket and tube to be inserted in a hole drilled in the oil-cup of the cap, or in a hole drilled in any other convenient place, which would bring the bottom of the tube close to the shaft. The opposite end of the terminal wire J is connected to the plug O in this projection by the binding-screw Q. This circuit leads to an annunciator U, which, with a battery U′, is also placed in the circuit. The device as represented in Fig. 1 is adapted to ring an alarm-bell 5 in the annunciator, but as arranged in Fig. 2 it will register at the journal-box and also at the annunciator upon suitable dials the degree of heat at the journal-box until it reaches the danger-point. I graduate the glass tube in a manner similar to that shown, cutting a slot U^2 in the socket to enable the graduations to be seen. I also graduate the face of the dials U^3, U^5, and U^6 at the annunciator to correspond to the graduations at the contact-points of the tube.

From the plugs O and S of the lower projection N of Fig. 2 I run a wire V to an electrode or stationary contact W in the annunciator. From the second projection N^2, I run a wire V′ to the rock-arm contact X, which is pivoted on a pivot XX. This rock-arm is also a conductor. In the wire V′, I place a battery Y.

Z designates a magnet arranged in operative relation to the rock-arm X. From this magnet Z, I run a shunt-wire 4 to the main wire V′ and also another wire 9 to the stationary terminal 10. The upper projection N^3 is connected by a wire X′ to a second rock-arm 1, which is also a conductor and is pivoted to a pin 2. The rock-arm is provided with two arms Z′ and Z^2. The horizontal arm Z′, which is constructed similar to the horizontal arm X^2 of arm X, is normally in contact with the terminal 10. I place a second magnet Z^3 in make-and-break relation to the vertical arm Z^2 of the rock-arm 1, and from it I run a shunt-wire Z^4 to the main wire X′, and a second wire U^4 from said magnet Z^3 to the cap-terminal contact-plug I. In the wire U^4, I place a battery UU. This completes the circuits and the make-and-break contacts by which they are cut in and out by the mercury rising in the tube.

I will now describe how the circuits are arranged, made, and broken, and will then describe how each circuit transmits a portion of its current to the dial, which is connected with it and which records the degree of heat in the tube at the journal-box; but it must be understood that the mechanism in the dials, by which the pointers are moved from point to point by the current, does not form any part of my present invention. I will now describe the first circuit made by the rise of the mercury in the tube. As the journal-box heats the mercury rises in the tube from its present position until it contacts with the plugs S and O of the second projection N^2. When this takes place, a circuit is formed by an electric current flowing from the battery Y through the wire V′ to the rock-arm X, to which it is connected. At the rock-arm I preferably divide the current and cause a portion of it to flow through the horizontal arm X^2 of the rock-arm to the terminal W and a portion to be shunted by wire 11 to the magnet 13, which connects the two. Although it is not essential to the working of the circuits to so divide the current, as I explain hereinafter, in order to divide the current at the rock-arm and prevent all of it from passing through the rock-arm to the terminal W, I place a resistance 20 in the rock-arm intermediate of the connecting-point of the wire V′ to it and the end of the horizontal arm X^2. This resistance consists of a material of lower conductivity than the material of which the rock-arm is made, which acts to retard or dam up its flow and to divide it, causing a portion of it to flow through the rock-arm and a portion to be shunted over wire 11 to the magnet 13. It is not necessary that the current be equally divided and it is immaterial which way the larger portion flows. Now if the part 20 of the horizontal arm X^2 were a perfect insulation between the wire V′ and the end of said rock-arm the current would go direct to the magnet 13 and return over wire 12 to the part 20 and be shunted over the shunt-wire 21 to the end of the horizontal arm of rock-arm. Consequently, as far as the circuits are concerned, the portion 20 of the arm X^2 may be either a resistance or an insulation; but the advantage to be derived from conveying a portion of the current through the rock-arm and shunting the balance to the magnet is that it makes the circuits between the tubes and rock-arms independent of the circuits between said rock-arms and the magnets which operate the indicating mechanism, and if the circuit between the rock-arm X and the magnet 13 is broken the circuit between the rock-arm and the tubes is still open, and if a box should heat it will, when the mercury rises to the second projection of the tube, excite and open the second circuit, which would immediately indicate to the engineer the degree of heat through its magnet and indicating mechanism of the box, providing the circuit between its rock-arm 1 and its magnet 15 were in working order. Consequently I preferably make the point 20 of the rock-arms a resistance. A portion of the current from wire V′ then flows through the horizontal arm X^2 to the terminal W and over the wire V to

the projection N, through the mercury to the projection N^2 and up the wire V′ to the battery Y, thus completing the first circuit, while the remainder of the current is shunted to the magnet 13 over wire 11 and returns by wire 12 to the resistance 20 and is shunted by wire 21 to the end of the arm X^2 and unites with the current that flows through the rock-arm back to the battery Y. Should the mercury drop below the projection N^2, owing to the cooling of the journal-box, this circuit would be broken; but assuming that the journal continues to heat, then the mercury will continue to rise in the tube, and when it reaches the third projection N^3 and contacts with its plug S another circuit is made, and for about a second there are two circuits, but in a second the first circuit is broken.

I will now describe the manner in which the second circuit is made and the first broken. The instant the mercury touches the plug S of the projection N^3 a mild current is shunted from the battery Y and wire V′ through the shunt-wire 4 into the magnet Z. It flows from the magnet through the wire 9 to the terminal 10 and from it to the horizontal arm Z′ of the rock-arm 1, and through the rock-arm to and through the wire X′ to the projection N^3 and through the mercury to the projection N^2 and up the wire V′ to the battery Y. Consequently whatever current flows through this second circuit at the first second of its existence is shunted from the battery and wire V′ from the current of the first circuit, which is not yet broken, and the wire V′, the battery Y, and the projection N^2 is used momentary for both circuits. This state of affairs does not last, however, but for a second, because the shunted current from wire V′ to the magnet Z excites the magnet and it attracts the vertical arm X^3 of the rock-arm X to it, which raises its horizontal arm X^2 from the terminal W and thereby breaks the current which has been flowing from the battery Y through this arm and wire V to the projection N, and consequently breaks the first circuit. All the current of the battery Y now flows through the second circuit, which comprises the projections N^3 and N^2 and their wires V′ and X′, the magnet Z, the wire 9, the terminal 10, and the arm Z′, the lower projection and its wire V being completely cut out. If the mercury continues to rise in the tube until it reaches the cap-terminal I, then a third circuit is made through the mercury between the cap-terminal I and the projection N^3 and the second circuit is broken.

I arrange the third circuit similar to the second, except that I place a battery UU in the wire U^4, as the battery Y and its wire V′ will be cut out when the second is broken. The instant the mercury touches the cap-terminal I a new or third circuit is formed by a current flowing from either one or both batteries Y or UU through the shunt-wire Z^4, the magnet Z^3, the wire U^4, the cap-terminal I, the mercury, the projection N^3, and the wire X′. Probably all or nearly all of the current would flow from the battery UU in wire U^4, as it is much nearer to the magnet Z^3. The magnet is excited by this battery, which attracts the vertical arm Z^2 of the rock-arm 1, which operates to raise the horizontal arm Z′ from the terminal 10, and thereby cuts out the battery Y and wire V′ and also the projection N^2, thus breaking the second circuit. There are consequently two circuits over the wire X′ for an instant when the mercury first contacts with the cap-terminal I. When the bearing cools, the mercury falls and leaves the cap-terminal, thereby breaking the third circuit, and the second circuit is reëstablished by the arm Z′ falling back on the terminal 10, which it does the minute the third circuit is broken, as the magnet loses its power to hold the vertical arm z^2 of the rock-arm 1, and if the mercury falls below the third projection N^3 the second circuit is broken in a similar manner. The object of these circuits is to register on suitable dials in the annunciator the degree of heat of the journal-box as each circuit is made by the rise of the mercury in the tube. To accomplish this, I connect each circuit to the mechanism and pointers 3 of the dial in such a manner that each circuit will move the pointer of its dial to the graduations on the dial corresponding to the graduations on the tube at the height of the mercury at and above the second projection N^2. To accomplish this, I run two wires 11 and 12 from the rock-arm X to a magnet 13 in the dial U^3, and when the mercury rises to the projection N^2 and makes the first circuit a small portion of the current of this circuit is shunted or runs direct on wire 11 from the rock-arm to the magnet 13. The current returns from the magnet 13 on line 12, which terminates in a resistance 20 in the lever X, which is adapted to cause the current to flow more readily over wire 11 to the magnet 13 than directly through the rock-arm. A shunt-wire 21 then conveys the current from wire 12 to the contact terminal end of the arm X, from which it flows through contact W and wire V. The magnet 13 draws through the medium of suitable mechanism the pointer 3 of the dial to the "200" point on the dial and holds it there as long as the circuit is unbroken, indicating to the engineer in charge that the journal-box has heated to that degree of heat. This "200" mark on the dial corresponds to the "200" mark on the tube at projection N^2, which is the point where the mercury makes and breaks the first circuit.

The second circuit is made and the first is broken, as above described, as the mercury rises in the tube and a portion of the current from the second circuit is shunted or flows direct from the rock-arm 1, which is arranged similar to rock-arm X, through the wires 14 and 15 to the magnet 16 from the dial U^5, and it is arranged to draw its pointer 3 to the "400" point of its dial, which corresponds to the degree marked on the glass tube at projection N^3. When the mercury reaches the cap-ter-

minal I, a direct circuit is established from magnet Z^3 by wires 17 and 18, which may be a continuation of wire U^4 from the magnet Z^3 to the magnet 19 of the dial 6, and from it to wire Z^4 or a direct circuit around both magnets from wires U^4 and the shunt-wire Z^4. This magnet 19 is adapted to move the pointer 3 of this dial U^6 to the "500" mark upon it and may also ring an alarm-bell as a signal of danger. When the first circuit is broken by the making of the second, the pointer of the first dial, which is connected to it, falls back to its starting-point, and so also does the second pointer when the second circuit is broken by the making of the third; but, as before stated, the mechanism through which the electric current acts to move the pointers is common in annunciators in use and the particular mechanism I prefer to use for this purpose will form the subject of a future application, and consequently does not form a part of my present invention.

In the bottom of Fig. 2 I show an electrode A′, which extends from the mercury through the socket. In some cases where an alarm only is desired I use this method to make a circuit through the mercury and the contacting terminal in the cap and dispense with the side connections in the projections of the socket, in which case, supposing the divide in Fig. 1 to be equipped with this bottom electrode instead of the side connection, the wire J of the circuit could be connected at any point of the bed-plate, as at 6, 7 or 8, and the circuit would be complete through it to the bottom electrode. A copper electrode at this point is also a good conductor of heat and would make the mercury slightly more sensitive. It is obvious that any number of journals or machines could be connected to the annunciator.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An electric alarm-indicator for hot journals comprising a suitable glass tube containing a heat expanding and conducting fluid, a cap sealed to the top of said tube, a contact-terminal adjustable longitudinally in the tube through said cap, a non-conductive socket inclosing the lower portion of said tube, an electrode in the bottom of said tube extending through said socket and in contact with the expanding fluid, a circuit-wire connected with said cap contact-terminal, means for connecting the tube and socket to a journal-box or cap and annunciator apparatus and battery in the circuit-wire, and means for connecting the opposite end of the circuit-wire with the box or cap or machine-frame, as set forth.

2. An electric alarm-indicator for hot journals comprising a suitable glass tube containing a heat-expanding conductive fluid, a cap sealed to the top of said tube, an adjustable contact-terminal in said cap extending into said tube, a circuit-binding connection on said contact-terminal, a socket partially inclosing said tube, a projection on said socket having a threaded perforation therethrough, a threaded plug fitting said threaded projection and extending into the socket, means for connecting a circuit-wire to said plug, contact pole-pieces secured in said tube in the path of the expanding fluid, and arranged to register with said plugs, a circuit-wire connected to said contact-terminals, a battery in said circuit, and an annunciator apparatus in operative engagement therewith, as set forth.

3. The combination with a glass tube arranged and adapted to hold a heat-expanding, conductive fluid, preferably mercury, a cap sealed to the top of said tube, a contact-terminal adjustable longitudinally in said cap, a central perforation in the end of said contact-terminal, a slot through the terminal piece into the said perforation, and a binding-screw threaded in the cap to extend through the said slot into the perforation, as set forth.

4. The combination with the journal-box and shaft of a tube having a bulb or enlarged portion at its lower end mercury in said tube, a cap secured to its upper outlet, a conducting-stem threaded to screw through said cap, a square end on the outer end of said stem, a hole extending into said stem a binding-screw threaded through said end into said hole, a non-conducting socket inclosing a portion of said tube, a projection on said socket, a contact-terminal substantially as shown, through said projection and tube in the path of the mercury, a battery-circuit wire connected to said terminals an annunciator apparatus also in said circuit and a perforation through said journal cap or box to the shaft or similar means for securing the socket and tube in juxtaposition to the shaft, as set forth.

5. The combination with the tube and the mercury therein having the cap and the adjustable contact-terminal, of a non-conducting socket inclosing a portion of said tube, one or more projections on said socket, perforations through said projections of two different diameters, an internal thread in the larger diameter, a plug adjustably adapted to said perforations to extend through it, a square end on the outer portion of said plug adapted to receive a wrench, a hole in said end, a binding-screw threaded through said end into said hole, conductive pole-pieces in said tube in the path of the mercury and arranged to register and contact with said plugs, and a battery-circuit and annunciator apparatus in electric contact with said terminals, as set forth.

6. The combination of the tube having the conductive, expansive fluid therein, a cap secured to said tube having an adjustable contact-terminal secured thereto, a non-conductive socket partially inclosing said tube, a plurality of projections on said socket, contact-plugs threaded in said projections, contact-

pole terminals through the walls of said tube arranged in the path of said fluid and to contact with said plugs, and annunciator apparatus, a stationary contact in said annunciator, a line-wire from the lowest projection to said stationary contact, a magnet adjacent to said stationary contact, a rock-arm make-and-break contact arranged in operative relation to said magnet and stationary contact terminal a second wire containing a battery connecting the next lowest projection of said socket to the said rock-arm, thereby making a line-circuit, a second rock-arm in contact with a second magnet, a shunt from said magnet to the second-named line-wire, a third line-wire from the third lowest projection to the second-named rock-arm, whereby when said fluid contacts with the last or third named tube terminal contact, the first circuit is broken and a second is made through the last two named, a second magnet arranged in operative relation to said second rock-arm, a line-wire from said cap contact-terminal to said magnet a battery in said line-wire, a shunt from said third-named line-wire to said second-named magnet, electric connection between said rock-arms or circuits and the annunciator-pointer, a graduated dial, means for moving the pointer a predetermined distance over the dial, graduations on said tube at the contact-terminal points corresponding with those on said dial, and a slot in said socket registering with said tube graduation, substantially as herein set forth.

7. The combination of the tube, having the pole-pieces and graduations, the cap having an adjustable contact-terminal, the mercury, the sockets having a plurality of terminal contacts arranged at successive elevations, an annunciator apparatus, a plurality of line-wires from said tube and socket thereto arranged to form a plurality of circuits, means for making and breaking successively the circuits as the said fluid rises in the tube, and closes each successive circuit, a graduated dial in the annunciator apparatus, a pointer pivoted to rotate on said dial, and arranged to register the degree of heat indicated at the contact-terminals of the said tube, as herein set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM B. CHOCKLEY.

Witnesses:

GEORGE A. PARNALL,

ARCHIE E. PARNALL.