June 5, 1928. 1,672,229

R. C. PAIRMAN

PYROMETER

Filed Sept. 3, 1925

Fig. 1.

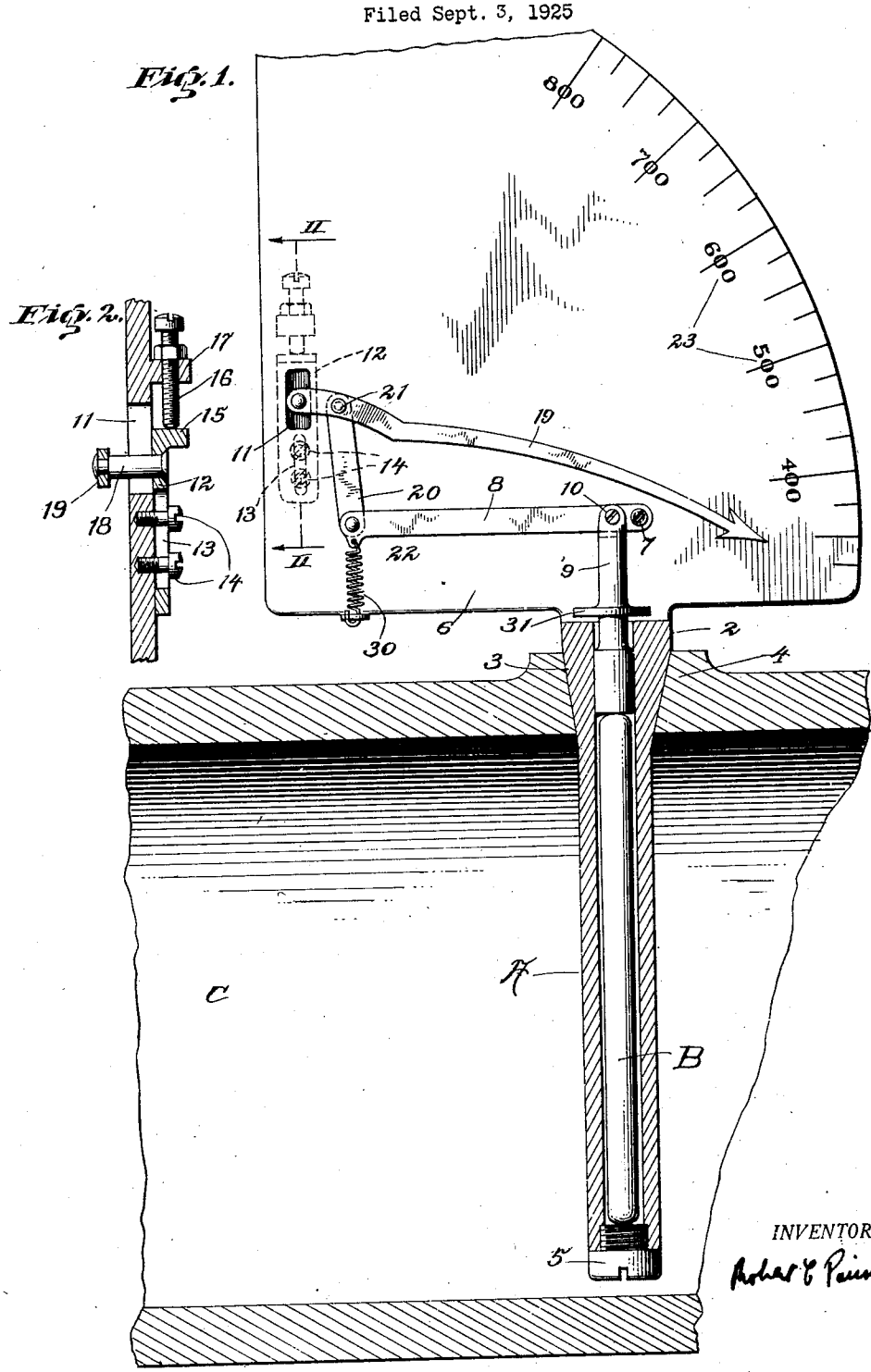


Fig. 2.

INVENTOR.

Robert C. Pairman

Patented June 5, 1928. 1,672,229

UNITED STATES PATENT OFFICE.

ROBERT C. FAIRMAN, OF OAKLAND, CALIFORNIA.

PYROMETER.

Application filed September 3, 1925. Serial No. 54,262.

This invention relates to a pyrometer and especially that type in which the co-efficient of expansion of two metals is employed to actuate the temperature indicator.

The pyrometer forming the subject matter of the present application consists of a substantially non-expanding element in the form of a tube which is adapted to be exposed to hot gases or another medium, the temperature of which it is desired to determine. This tube contains an expansible element in the form of a rod and the object of the invention is to permit free expansion or contraction of the rod with changes of temperature without danger of binding or in any manner stressing either element, to provide means whereby the expanding action of the rod may be transmitted to move a temperature indicating arm or pointer over a graduated scale, to provide a structure which is exceedingly simple and rugged and in which lost motion and wear is automatically taken up by gravity and spring action, to provide means whereby lost motion, wear, etc., may be readily compensated for, and further to provide a structure which may be easily taken apart for inspection, repair, cleaning, etc.

One form which my invention may assume is exemplified in the following description and illustrated in the accompanying drawings, in which—

Fig. 1 is a side elevation of the pyrometer partially in section.

Fig. 2 is a cross section on line 2—2, Fig. 1.

Referring to the drawings in detail and particularly to Fig. 1, it will be noted that the pyrometer consists of a tube A which is adapted to be exposed to the hot gases or another medium the temperature of which it is desired to determine. The tube is provided with a head member 2 the exterior surface of which is tapered as at 3 to form a fairly tight joint with relation to a seat member 4. The opposite end of the tube is provided with a screw plug 5 which forms a closure for the lower end and which also serves the function of permitting removal of an end rod generally indicated at B. This rod is constructed of an expansible material such as brass or the like, while the tube A is preferably constructed of a substantially non-expansible metal such as invar metal or the like. Secured to the head member 2 in any suitable manner is a plate 6 and pivotally mounted as at 7 on the plate is a primary actuating lever 8. Interposed between the rod B and the lever 8 is an intermediate rod 9. The lower end of this rod rests by gravity on top of the expanding rod B and the upper end of the intermediate rod is pivotally connected to the lever 8 as at 10. Formed in a plate 6 near one edge thereof is a slot 11. Disposed on the rear side of the plate is an adjustable bracket 12 (see particularly Fig. 2). This bracket is slotted as indicated at 13 and a pair of clamping screws 14 pass through the slotted bracket and enter the plate 6. The bracket is provided with a head member 15 on its upper end and this is engaged by an adjusting screw 16 which is carried by a lug 17 on the rear side of the plate 6. The bracket plate 12 carries a pin 18 which projects through the slot 11 in plate 6 and this pin serves as a pivotal support for a pointer or indicator arm 19 which is actuated by the primary lever 8 through means of a link 20, this link being pivotally attached to the respective levers as indicated at 21 and 22. The outer edge of the plate 6 is graduated as shown at 23 to indicate temperature readings and the pointer 19 moves over the graduated scale when the pyrometer is in actual operation.

For the purpose of illustrating one of the uses to which the pyrometer may be put, the elbow C which forms a connection between the head and the exhaust manifold of an internal combustion motor, for instance a Diesel motor, is illustrated. This elbow is provided with the seat 4 for the reception of the head portion of the pyrometer and if it is desired to determine the temperature of the exhaust gases before they enter the manifold, it is merely necessary to insert the pyrometer as shown in Fig. 1. The heated gases will rapidly raise the temperature of the exterior expanding tube A to that of the gases. This will in turn by radiation and combustion heat the rod B interior thereof, which will freely expand. Its length will accordingly be increased in proportion to the temperature and the movement of expansion be transmitted to the intermediate rod 9 thru the primary actuating lever 8 as

the intermediate rod is pivotally connected to the operating lever at a point closely adjacent the lever pivot 7. The opposite end of the lever will move upwadly and this movement is transmitted through the link 20 to move the pointer 19 over the graduated scale 23. In actual practice, the average temperature of the exhaust gases should range somewhere around 600° F. and if the proper amount of fuel is being fed to the engine and the exhaust valves are tight, the pointer will assume a position where it indicates 600° temperature. If, for any reason, too much fuel is being fed to the cylinders, the exhaust valves are leaking, or the fuel fed is too much retarded, it is immediately indicated by the pointer 19 as the pointer will show higher temperature; for instance, 700° or 800°, or whatever the case may be. This reading is immediately a warning to the operator who will then investigate to determine the cause thereof.

A pyrometer of this character is accordingly well adapted for use in connection with Diesel motors and the like as no delicate adjustments or construction is required. The tube A may be heavy and substantial to prevent warping and bending, and so may the expanding rod B. This is also true of the intermediate rod and the levers 8 and 19 actuated thereby. Wear will, however, take place at the pivotal connections such as shown at 7, 10, 18, 21, and 22, and such wear creates loose position and play. This must be compensated for, and it is for this reason that an adjustable support is provided for the pointer or lever 19. The bracket 12 is vertically adjustable on the rear side of the plate and may be moved in a downward direction by loosening the screw 14 and tightening up on the adjusting screw 16. This forces the pivot 18 in a downward direction and will thus compensate for any wear that may have taken place. Loose position is taken up by the weight of the lever and also by the spring indicated at 30, this spring being secured to the lower end of the plate and the outer end of the lever 8. This spring is of further importance as it permits the pyrometer to be placed in any position desired, whether it be vertical, horizontal, on an angle, or otherwise.

The upper end of the tube A is open, and dust, grease, or other foreign particles might thus enter between the tube and the rod B and cause sticking of the same. This is obviated in the present instance by placing a collar 31 on the intermediate rod. This serves as a cover for the opening and prevents foreign particles from dropping in or otherwise entering. Under extreme temperature conditions, it has been found that the brass rod B has a slight tendency to scale. Such scales when formed will cause the rod to stick, and it is therefore necessary to permit ready removal for the purpose of cleaning off the scales. This is accomplished by removing the pyrometer as a whole and unscrewing the plug 5, which permits the rod 8 to be taken out and cleaned by means of a piece of sandpaper, emery cloth, or the like, and similarly permits smoothing off of the interior surface of the tube. Considerable play may be permitted between the rod and the tube, and this is also important at it obviates sticking and stressing of either of the elements; to wit, the tube A and the rod B, when in operation.

While certain features of the present invention are more or less specifically illustrated, I wish it understood that various changes in form and proportion may be resorted to within the scope of the appended claims. I similarly wish it understood that the materials and finish of the several parts employed may be such as the experience and judgment of the manufacturer may dictate or various uses may demand.

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

1. A device of the character described comprising an elongated tube construction of a substantially non-expandible metal, a plug forming a closure for one end of the tube, the opposite end of the tube being open, a rod insertible in the tube and resting on the plug, said rod being constructed of an expansible metal and being freely expandible within the tube, a plunger member insertible in the open end of the tube and resting on the expandible rod, said plunger member having a collar formed thereon and disposed below the open end of the tube to form a cover therefor to prevent admission of dust, a flat substantially triangular plate supported by the tube and having a graduated scale thereon, an indicator arm pivotally mounted on the plate and movable with relation to the graduated scale on the plate, and means for transmitting movement from the plunger to said indicator arm.

2. A device of the character described comprising an elongated tube constructed of a substantially non-expandible metal; a plug forming a closure for one end of the tube, the opposite end of the tube being open, a rod insertible in the tube and resting on the plug, said rod being constructed of an expansible metal and being freely expandible within the tube, a plunger member insertible in the open end of the tube and resting on the expandible rod, said plunger member having a collar formed thereon and disposed below the open end of the tube to form a cover therefor to prevent admission of dust, a flat substantially triangular plate supported by the upper end of the tube and having a graduated scale thereon, an indicator arm piv-

otally mounted on the plate and movable with relation to the graduated scale on the plate, a horizontally disposed lever pivotally mounted on one face of the plate, an indicating arm normally disposed and substantially parallel therewith and also pivotally attached to the plate, a pivotal connection between the plunger and the first-named lever, a link forming a connection between the outer end of said lever and the inner end of the indicating arm, and a spring attached to the outer end of the first-named lever and to the plate.

ROBERT C. PAIRMAN.