(No Model.)

E. BROWN.

PYROMETER.

No. 520,875. Patented June 5, 1894.

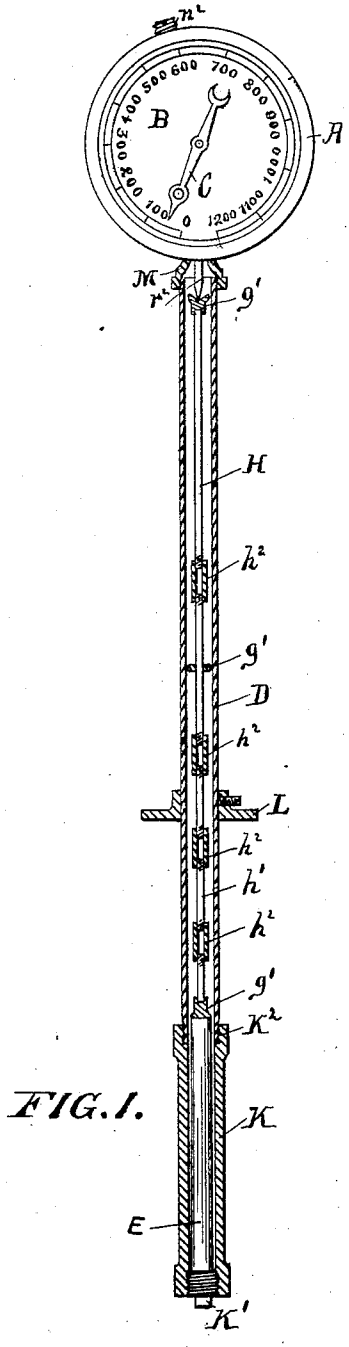

FIG. 1.

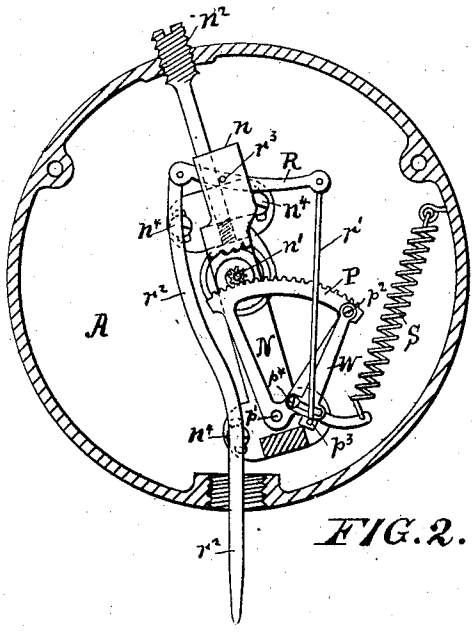

FIG. 2.

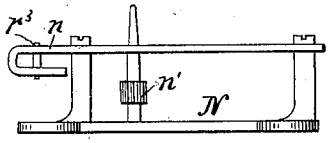

FIG. 3.

WITNESSES:

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PYROMETER.

SPECIFICATION forming part of Letters Patent No. 520,875, dated June 5, 1894.

Application filed September 6, 1893. Serial No. 484,923. (No model.) Patented in England March 29, 1893, No. 6,655.

To all whom it may concern:

Be it known that I, EDWARD BROWN, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Pyrometer, of which the following is a specification.

Claim 2 has been included in a patent in Great Britain, granted to me, No. 6,655, and dated March 29, 1893.

My invention relates to the construction of fixed or stationary pyrometers which have a long stem projecting into a medium, the temperature of which is to be indicated.

The object of my invention is to construct this stem so that it may be put through walls which vary in thickness, or it may be immersed in a heated fluid, such as melted tin which may vary in depth a foot or more; and may remain in the said varying medium constantly as a fixed or stationary pyrometer without changing the accuracy of the indication. This desirable feature has heretofore been approximated by me, by making the inside sliding rod, which connects the indicating portion of the stem with the mechanism in the head, of the same metal as the inclosing tube. The result of which is that the pointer indicates higher with a deeper immersion of the stem.

The invention herein described consists in the discovery, that as the ratio of expansion of the inside sliding rod is increased above that of the tube inclosing it, the pyrometer becomes more accurate until the excess reaches usually about twenty-five per cent., and in some pyrometer stems thirty per cent. After this point is ascertained a greater ratio of expansion only deteriorates it again, gradually, as the ratio is increased. Also in the construction of the multiplying gearing within the head of the pyrometer, by which I increase the movement of the pointer and preserve a very free and regular motion to the pointer.

In the accompanying drawings Figure 1 is a vertical section through the pyrometer stem. Fig. 2 is an elevation showing the mechanism in the head of the pyrometer. Fig. 3 shows the top plate of the frame which carries the multiplying lever.

Similar letters refer to similar parts.

In Fig. 1 is shown the stem. This stem has an exterior tube D of iron or other metal, closed at the bottom, upon which rests a bar of plumbago-ware E or some other material which expands less per degree of heat than the tube D. Upon this bar E rests a composite rod H consisting of iron pieces h' and intermediate pieces of brass or copper h^2 screwed to or driven hard upon the iron pieces. The rod H is steadied centrally within the tube by buttons g' driven or screwed upon it. To facilitate the repair of the stem, when the end is burned off by great heat, I make the end of thick cast iron and screw it by an inside screw at K^2 to the tube D. A plug K′ is screwed into the end of the tube D. By this improvement the part of the stem subjected to the destructive action of heat is easily renewed without the loss of the remaining portion.

L is a sliding collar upon the stem.

A is a cast iron box forming the pyrometer head. This head is screwed to the stem by the coupling M.

C is the pointer, B the dial.

In the case or head A is seen the multiplying mechanism which actuates the pointer C. This consists of a frame, N, secured by screws n^4 to the case.

n^2 is a differential adjusting screw. One end of it passes through the case, the other through the frame N. The screws n^4 pass through elongated slots in the frame N, and by turning the screw n^2 a small vertical movement is given to the frame N. Within the frame N is mounted the toothed quadrant P on a pivot, p'. The spring S is hooked to an arm of the quadrant P at one end, and to the case A at the other end. A small pinion n', which carries the pointer C, gears into the quadrant. At one end of the quadrant P is hinged the adjusting-arm W by means of the screw-pin p^2. The other end carries a pin, p^3 by which it is jointed to the connecting-link r'. The arm W is also slotted near to the pin p^3, and a set-screw, p^4, passes through the said slot into the quadrant P and serves to fasten the arm W rigidly to the quadrant when the pin p^3 is at the exact radius required for each particular pyrometer. The arm W. is so adjusted that the pyrometer indicates correctly when all the parts of the stem are evenly heated, as consequent upon its permanent immersion in the medium to be indicated. The other end

of this link r' is hinged to the lever R. The top plate n of the frame N is bent over as shown, Fig. 3 and carries the lever R upon a fulcrum or pivot r^3. The link r^2 connects the lever with the top of the rod H, and thereby the movement of the rod H is communicated through the aforesaid mechanism to the pointer. The spring S acting upon the quadrant P is sufficient to force the link, the rod H and bar E all in close contact with the bottom of the tube K'.

A pyrometer stem is subject to a variety of uses. Suppose it to be used in melted tin up to the point K^2 and it is tested and adjusted accurate for that immersion, it will, as ordinarily constructed, with the rod H and tube D of the same material, indicate somewhat higher when immersed up to the collar L. By making the inside rod H of a metal which expands about twenty-five per cent. more per degree of heat than the tube D, the said proportion varying slightly more or less with the diameter of the rod and tube, I overcome this error. This proportion may be adjusted more accurately by changing the length of the expanding pieces h^2, until the pointer gives an accurate indication, whatever may be the depth of immersion of the stem.

I claim—

1. In a pyrometer the combination of mechanism in the head, which is adjusted to indicate accurately when the stem of the pyrometer is permanently fixed in the heated medium, with an outside expansion tube, an inside bar E., and a sliding rod H., which rod is proportioned in its expansion per degree of heat in excess of that of the tube inclosing it, up to the vicinity of twenty-five per cent. greater; to maintain accuracy of indication under varying depths of immersion as herein described.

2. In a pyrometer stem, the combination of the expansion tube D and the rod H made of pieces h', and more expanding pieces h^2, by which the total expansion of the rod H is adjusted as and for the purpose herein described.

3. In a pyrometer stem, the combination of the outside tube D, the separable thick expansion tube K, screw threaded to the tube D, the interior bar E, the composite sliding rod H as herein described.

4. In a pyrometer or gage head, mechanism in combination as follows:—the frame N, pinion n', quadrant P, adjusting arm W, link r' lever R, connecting link r^2, substantially as described for multiplying the motion of the link r^2 upon the pointer C.

5. In a pyrometer or gage head the following combination of parts: the frame N the top plate n bent over as shown to form a support for pivot for the lever R, pinion n', quadrant P, adjusting arm W, link r', connecting link r^2, for communicating the motion of the stem to the pointer.

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