E. BROWN.

Improvement in Pyrometers.

No. 130,894. Patented Aug. 27, 1872.

Fig: 1.

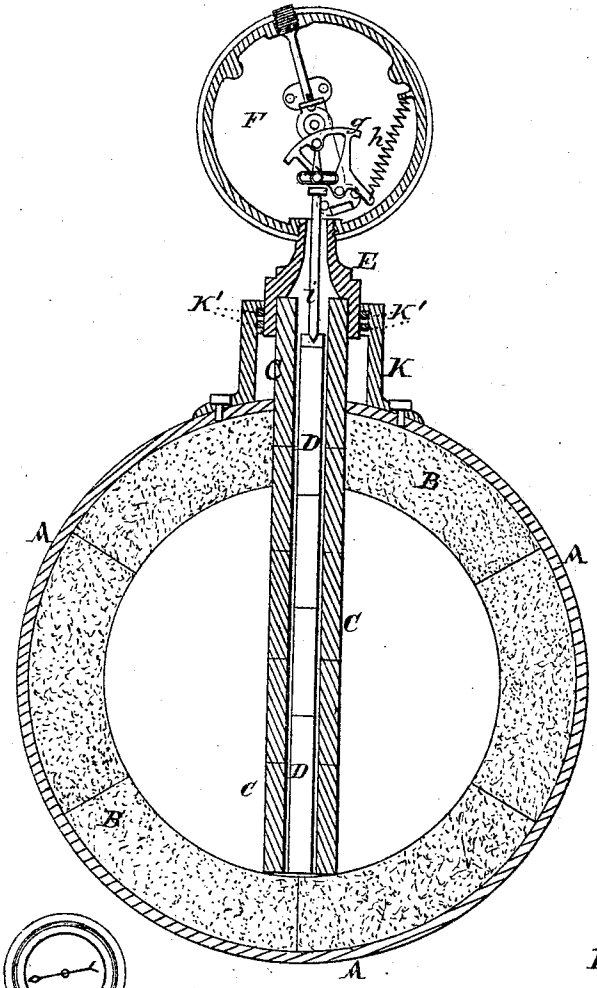


Fig: 2.

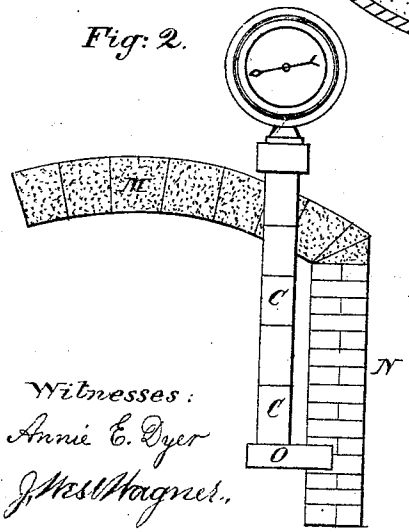
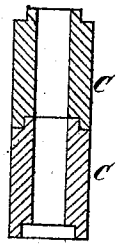


Fig: 3.



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UNITED STATES PATENT OFFICE.

EDWARD BROWN, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN PYROMETERS.

Specification forming part of Letters Patent No. **130,894**, dated August 27, 1872.

To all whom it may concern:

Be it known that I, EDWARD BROWN, of 311 Walnut street, Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Pyrometers, of which the following is a specification:

Hitherto pyrometer-stems practically in use in the arts have been constructed of a brass tube inclosing a rod of iron, or an iron tube inclosing a bar or bars of some highly refractory material, such as plumbago or fire-clay, as shown in my patent of May 3, 1870. This construction makes the instrument available only for indicating such degrees of heat as are below the softening point of the metal stem, which is about 1,200°, or red heat, thus rendering the instrument useless for the higher temperatures of white heats, for which it is most desirable to have a true indicator.

My invention is designed to overcome this difficulty, and to produce a pyrometer which will stand a white heat and indicate the temperature correctly, no fixed instrument of this character being in use at the present time. To this end I make the outside tube of rings of a highly refractory material, placed one upon another, and so arrange them, in combination with the inside bars, that the difference of expansion is multiplied, and communicated by suitable mechanism to a pointer.

In the accompanying drawing, Figure 1 represents a vertical section of a hot-blast pipe having my improved pyrometer applied thereto. Fig. 2 represents my improved pyrometer applied to an oven for annealing malleable iron. Fig. 3 represents a section of two of the outer sections of fire-clay, forming my improved pyrometer-stem.

In pyrometer-stems as heretofore made the interior bars of fire-clay or plumbago-ware are held in contact by an exterior metal tube, which also answers the purpose of the expansion-bar, giving motion to the pointer. But the use of this protecting-tube, which forms the stem, prevents the pyrometer from being used in temperatures which exceed the melting or softening point of the metal used; consequently no fixed pyrometer is at present in practical use indicating temperature over red heat.

I obviate this difficulty by combining the surrounding tube C of fire-clay brick with solid interior bar or bars D of plumbago, both being highly refractory materials, but the latter having a different rate of expansion from the fire-brick clay, which combination produces an important and much-desired improvement in instruments to test high temperatures and stand white heat. To successfully use fire-brick clay, however, and guard against its cracking, I construct it in sections with overlapping joints, so that the one shall fit upon and form a closed bracing joint with the other to exclude the gases from the interior and prevent lateral displacement of the sections, the lowest section and the plumbago-bar resting alike upon the bottom of the hot-blast pipe A, formed, by the usual lining B, of fire-brick, while the other sections are held in place by gravity and the pressure of the head containing the indicating mechanism. In the employment of fire-brick clay the expansion is much less per degree of heat, and I prefer to add several lengths together in order to obtain the requisite amount of expansion without multiplying the motion too much by the mechanism in the head. In this arrangement the interior wall of the hot-blast pipe forms the fulcrum for the stem, and the pressure of the head, either by its weight or a spring, is sufficient to hold the sections in contact whether in a perpendicular or horizontal position. The top section is capped by the brass socket E, on which the head F is screwed, which contains the mechanism to operate the indicating-hand, which consists of a center pinion, a rack, *g*, spring *h*, and pin *i*, connected to the rack *g*, and bearing upon the top section of the stem, while the metallic connecting-pin *i* extends directly from the indicating mechanism to the top of the plumbago-bar, and thus, with the latter and the outer tube of fire-brick clay, forms a new combination and relation with a beneficial result, viz., a durable pyrometer for the indication of white heat. To prevent the escape of the blast and to steady the top of the stem, and at the same time to permit of a motion up and down, the brass socket E is held in a stuffing-box, K, bolted to the blast-pipe, and packed with asbestus, as shown at K′. It is essential that the weight of the head F and socket E shall be sufficient to overcome the friction of the stuffing-box and the upward tendency of the

spring *h*, thereby keeping all the parts of the stem and head in close contact with each other. These sections, for better security, may have rabbet-joints, as shown in Fig. 3, which joints also serve to keep them in perfect line, and prevent the oxidation of the plumbago-bars D by shutting off deleterious gases. If the instrument is used horizontally a spring will be required to keep the head F and sections C in contact. The two sections C D of fire-clay and plumbago are highly refractory and of different expansive qualities, this difference of expansion under heat being communicated to the indicator-hand through the pin *i* and gearing in the head F.

By this arrangement of highly refractory materials I can dispense with the surrounding metal tube, which is of the utmost importance, as it enables me to use the highly refractory substances of the sections C and D in degrees of heat far beyond the softening point of the metal stem.

In Fig. 2 I have shown my improved pyrometer applied to the oven of an annealing-furnace, the lower sections C D resting on a fire-brick, O, projecting from the side wall N, and the pyrometer-stem built up in sections, as above described, extending through the roof M of the oven, and carrying the head F. No stuffing-box need be used here, as there is no presence of air.

I claim—

1. A pyrometer-stem of fire-brick clay, or similar material, having its surrounding tube made in independent sections, constructed substantially in the manner and for the purpose herein described.

2. A pyrometer-stem constructed of a series of sections, C, of fire-brick clay, or equivalent material of a highly refractory nature, inclosing a bar or bars, D, also of a highly refractory material, but of a different rate of expansion, the said rings and bars being supported and retained in contact with each other and the indicating mechanism, substantially as herein described.

3. In a pyrometer, the combination of the outside tube C of fire-brick clay with the inside bar D of plumbago or its equivalent, whether constructed in sections or not.

4. In a pyrometer, the combination of the outside tube C of fire-brick clay and the inside bar of plumbago or its equivalent with the metallic connecting-pin *i* and the indicating mechanism designed to be operated thereby, as described.

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