(No Model.)

E. BROWN.

PYROMETER.

No. 550,479. Patented Nov. 26, 1895.

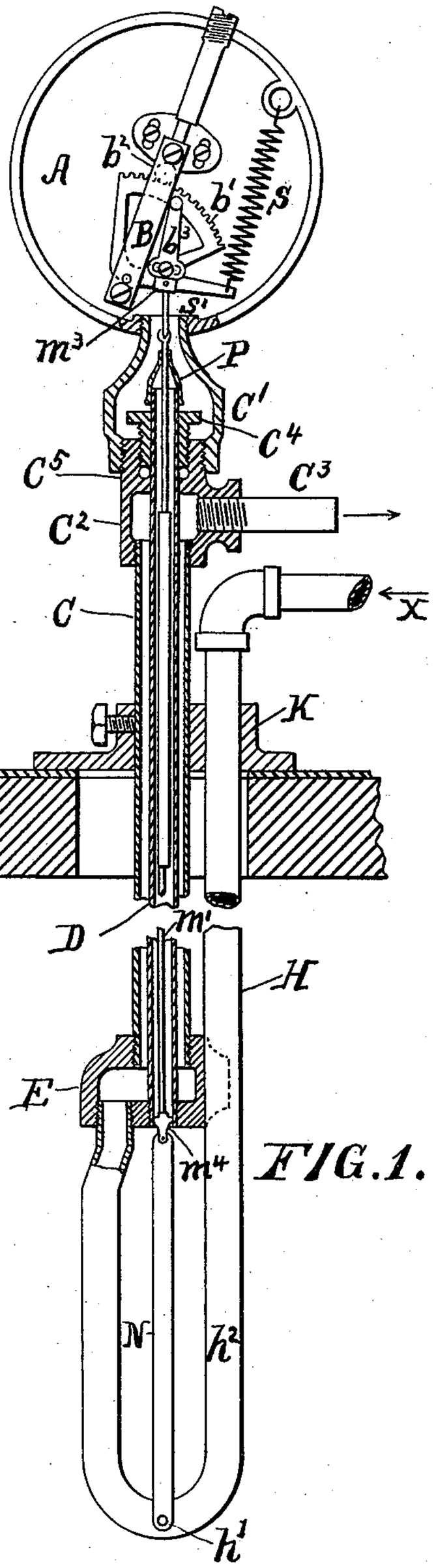

FIG. 1.

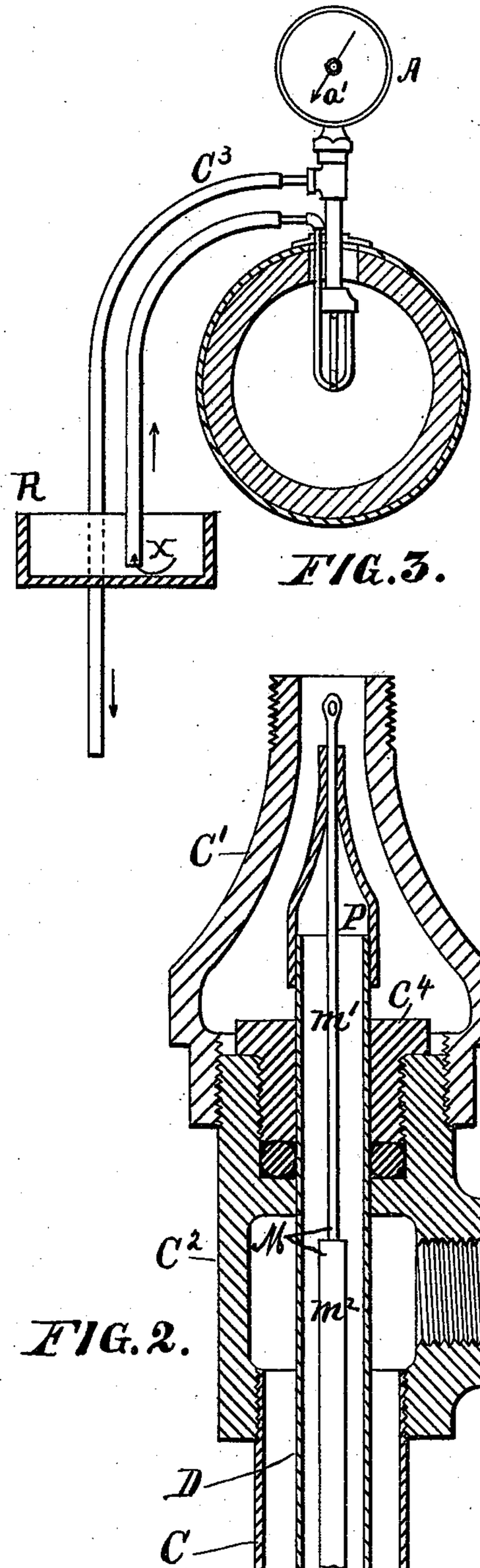

FIG. 3.

FIG. 2.

WITNESSES:

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PYROMETER.

SPECIFICATION forming part of Letters Patent No. 550,479, dated November 26, 1895.

Application filed August 3, 1895. Serial No. 558,076. (No model.)

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.

My invention relates to pyrometers in which the indicating motion is derived from an expansion-stem which projects into the medium to be indicated. This stem is usually made of two materials which have a considerable difference in their ratio of expansion per degree of heat. The amount of this variation is communicated by means of multiplying mechanism to an indicating-pointer. For temperatures over red and especially when approximating to white heat there is great difficulty in combining two materials which have the requisite qualifications as regards ratio of expansion and which are both equally durable.

In this new pyrometer the stem consists of a water-cooled tube to which is secured a refractory expansion-bar, such as platinum or cast-iron. This water-cooled tube remains comparatively cool under all temperatures, and consequently all the expansion of the refractory expansion-bar may be utilized in giving motion to the pointer, and greater accuracy and durability at a white heat are secured. This form of pyrometer will be nearly accurate so long as the speed of the water current remains constant. Should the flow be diminished, the tube becomes hotter and the indication for the same heat will be lower—that is, the pointer will fall. To overcome this error a compensating connecting-rod is applied, which can better be described by reference to the accompanying drawings, in which—

Figure 1 is an elevation of the pyrometer stem and head, partly in section. Fig. 2 shows a full-size section through a portion of the stem. Fig. 3 is a sketch showing the pyrometer in place and connected to the water-supply.

A is the cast-iron head containing the multiplying mechanism which moves the pointer a' over a graduated dial. B is an adjustable frame carrying the toothed quadrant b' and pinion b^2. Upon the quadrant is the adjustable radius-arm b^3. This has frequently been described by me in former patents.

To the head A is secured the water-circulating stem, which may be briefly described as a water-tube bent into a loop, within which is hung the expansion-bar.

The water-tube C, which forms part of the stem, is secured to the head A by means of the coupling C′ and the branch pipe C^2, carrying an outlet-pipe C^3. Within the tube C is an inside iron tube D. The lower ends of the tubes C and D are screwed into the hollow casting E, as shown. There is also screwed into this casting an inlet water-pipe H, bent into a long loop or frame h^2, eight inches or more long. The upper end of this pipe passes through the sliding flange K, which flange is also screwed upon the stem to carry the instrument when in position and to cover the opening made for the introduction of the stem into the furnace. The upper end of the tube D passes through a stuffing-box C^5 upon the branch pipe C^2.

C^4 is the gland of the stuffing-box.

Within the tube D is a light connecting-rod M, made up of two materials—an iron rod m' and a brass part m^2. The top of this rod is linked to the pin m^3 upon the radius-arm. To the bottom of this rod M is a plug or piston with an eye m^4. The refractory expansion-bar N is attached to this eye and to a pin h' upon the loop h^2.

The operation of the instrument is in this way: A current of water is admitted to the stem at X. It flows into the casting E and between the tubes C and D and out at C^3, thus keeping the stem cool and durable under intense white heat. Almost all the expansion of the bar N is utilized to move the pointer. In ordinary practice the current of water will vary in temperature and in velocity, whatever automatic apparatus may be attached to regulate it, causing a change and error of the pointer. This is obviated by the compensated rod M, which, passing in close proximity to the heated water current, expands or contracts sufficiently more than the stem C to equalize the combined expansion of the stem and that of the loop h^2. The spring S, acting upon the arm attached to the toothed quad-

rant, causes a tension upon the compensating rod M and keeps all the joint-pins tight. When a heavy or strong expansion-bar N is used, a stronger spring may be employed and the tube D be dispensed with. The compensating rod then will pass through and in contact with the water by means of a stuffing-box at the top and one in the bottom casting E. An india-rubber diaphragm P is stretched over the tube D and the rod m' to prevent the exit of heated gases. This diaphragm is unnecessary when the compensating rod passes through stuffing-boxes, as above described.

To obviate any danger from the escape of water into the furnace, I pass the water by suction instead of pressure.

R is a water-tank below the level of the furnace. The current having been started by suction in the outlet-pipe C^3, it will continue to flow from the outlet C^3 at a lower level.

What I claim as my invention is—

1. The combination in a pyrometer of a stem cooled by a water current, an expansion bar secured to the said stem and a connecting rod to convey the motion of the expansion bar to indicating mechanism.

2. The combination in a pyrometer of a stem cooled by a water current an expansion bar secured to the said stem, a compensating connecting rod influenced in its expansion by close proximity to the water current, and indicating mechanism moved by the said connecting rod.

3. The combination in a pyrometer stem of the water cooled loop h^2, the expansion bar N, the water cooled tube C, the compensating connecting rod M in close proximity to the water current, and indicating mechanism, operated by the said connecting rod.

4. The combination in a pyrometer stem of the water cooled loop h^2, the expansion bar N, the outside and inside water cooled tubes C and D, the compensating connecting rod M, in close proximity to the water current, and indicating mechanism operated by the said connecting rod.

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Witnesses:
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