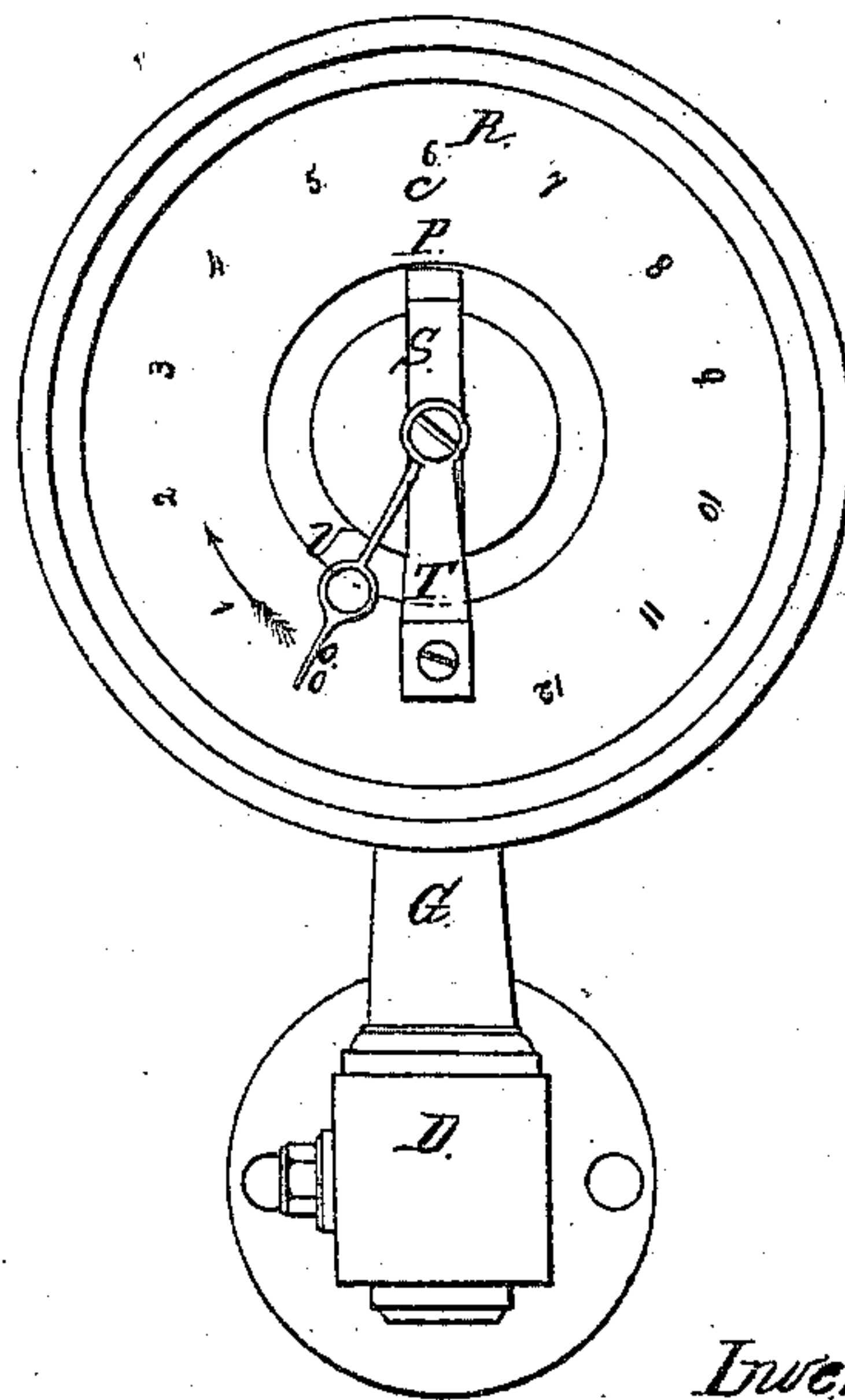
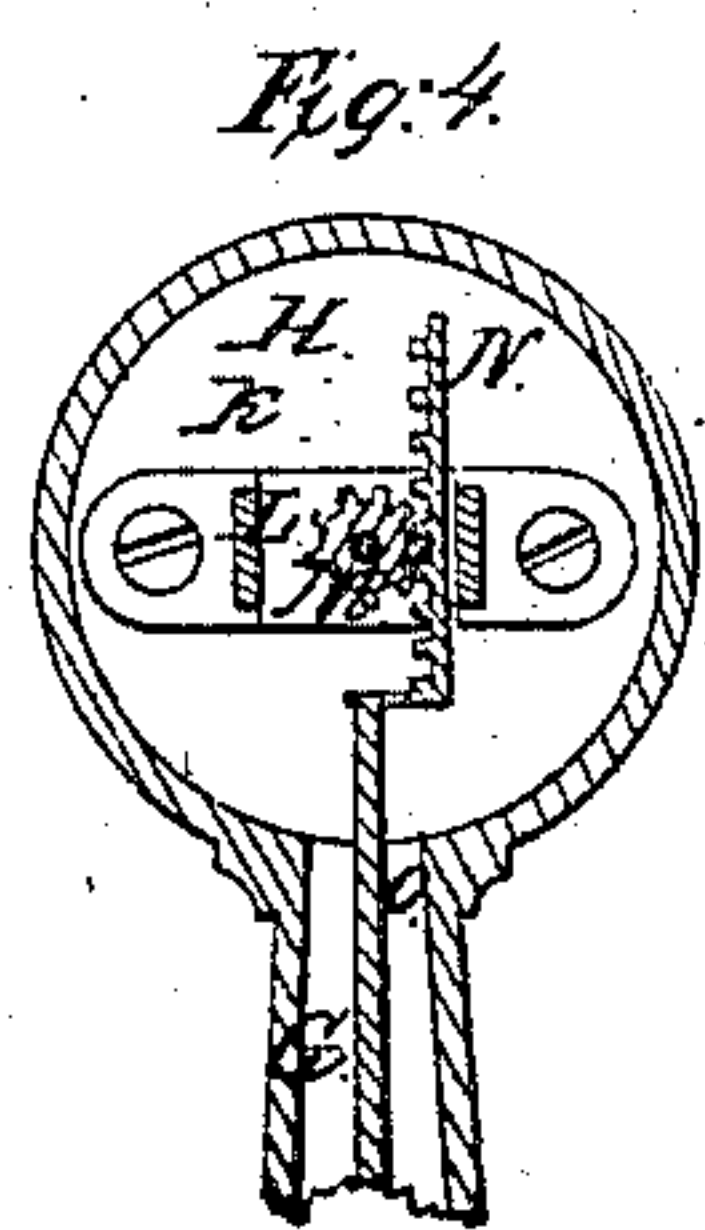
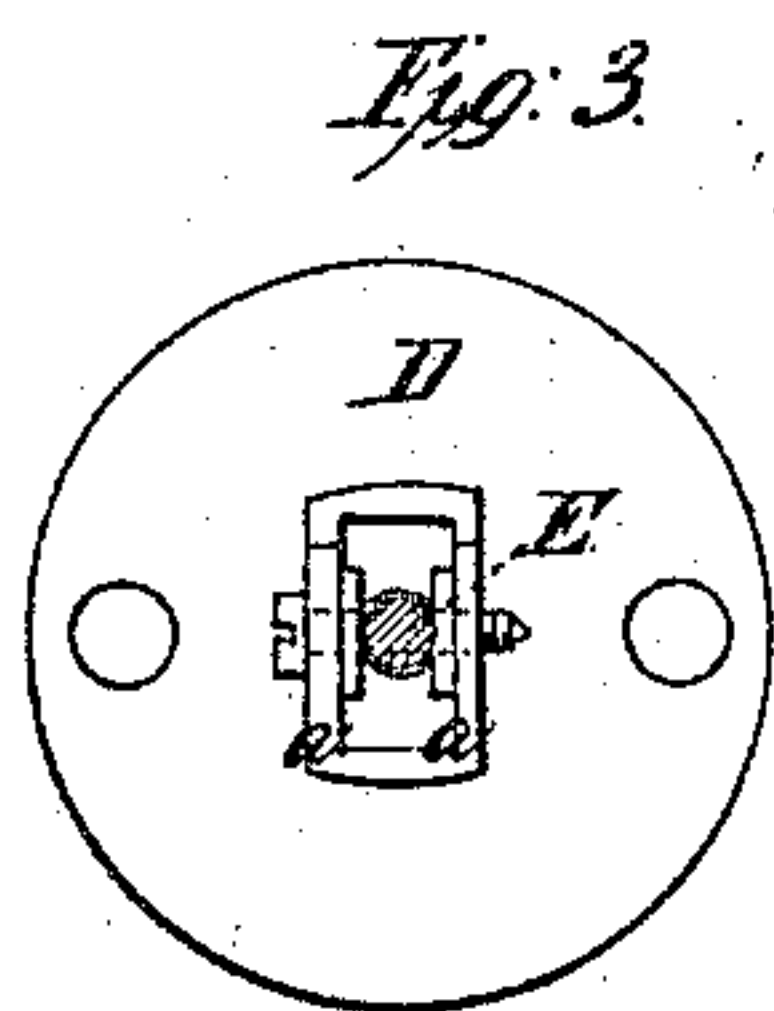
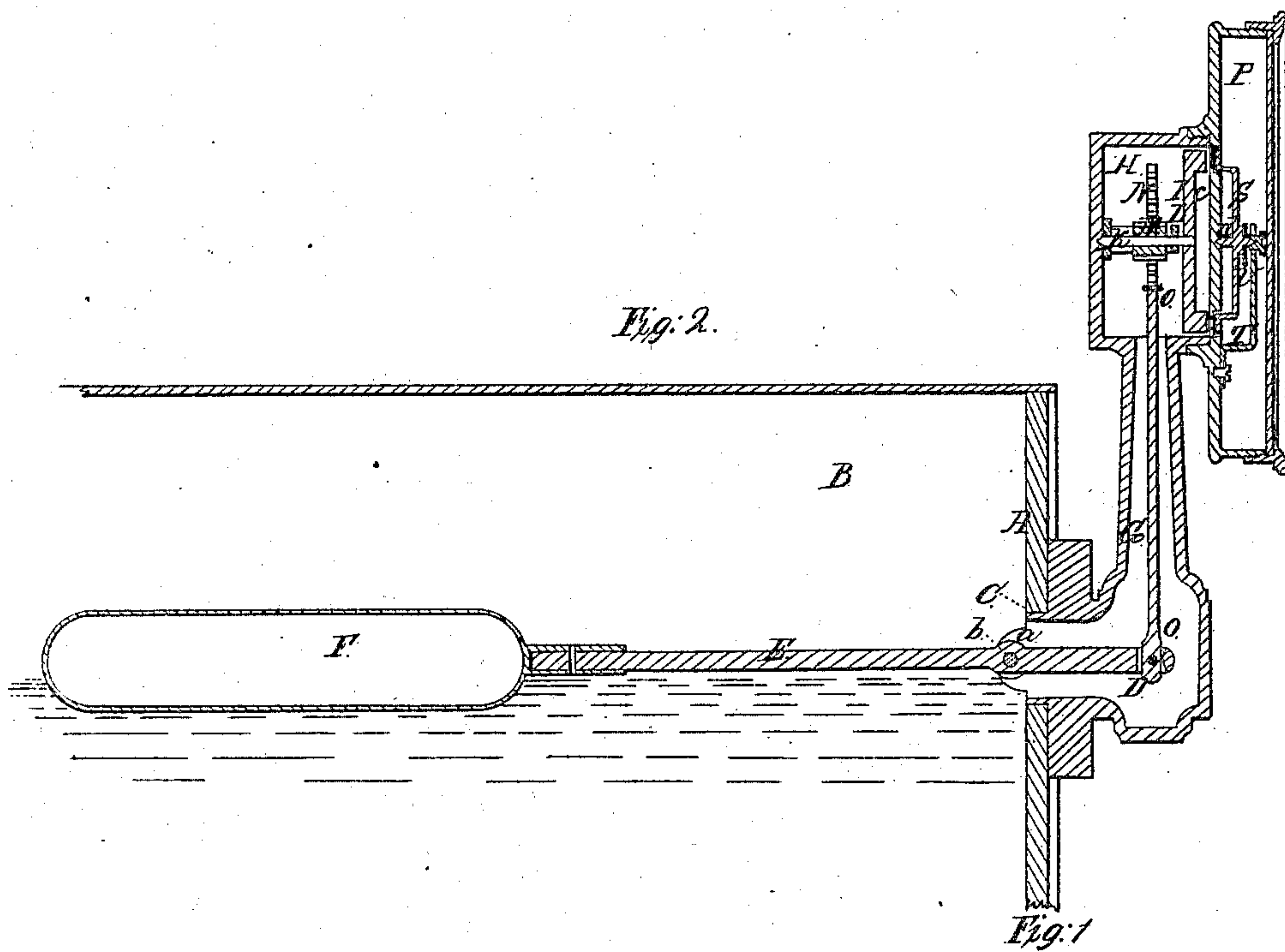


F. A. HOYT.  
MAGNETIC GAGE.

No. 27,498.

Patented Mar. 13, 1860.



Witnesses;  
R. H. Cooley  
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# UNITED STATES PATENT OFFICE.

FRANCIS A. HOYT, OF BOSTON, MASSACHUSETTS.

## IMPROVED MAGNETIC GAGE FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. 27,498, dated March 13, 1860.

*To all whom it may concern:*

Be it known that I, FRANCIS A. HOYT, of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improved Magnetic Gage for Determining the Height of Water in a Steam-Boiler; and I do hereby declare that the same is fully described and represented in the following specification and the accompanying drawings, of which—

Figure 1 denotes a front elevation, and Fig. 2 a longitudinal section, of my improved magnetic gage as applied to the head of a steam-boiler. Fig. 3 is a rear view of the box for carrying the front arm of the float-lever and the bearings of the fulcrum of such arm. Fig. 4 is a longitudinal section of the armature-chamber, it being taken through the pinion thereof.

The nature of my invention consists in the arrangement of the lever-arm box or chamber, the indicator, steam-column, and case, or the latter and the float-lever together, and relatively to the boiler head or end; also, in the application of the bearings of the float-lever-fulcrum supports to the lever-arm box, so as to be supported thereby independently of the boiler-head; also, in an improved arrangement of the magnet and its armature with reference to the steam-space of the boiler; also, in the combination of a separate indicator or index-pointer with the magnet in such manner as to extend beyond the latter.

In constructing magnetic gages for indicating the altitude of water in a boiler it has been customary to place the magnet either within the steam-space of the boiler or in a chamber so connected therewith that the steam from such space could have free access thereto. A stuffing-box between the steam-space and magnet-chamber, and to encompass the shaft of the magnet, is seriously objectionable, on account of the great friction that it produces on the shaft of the magnet. It will be seen that under the said arrangement of the magnet the steam has had free access to it. When so in contact with the steam the magnet is liable to become oxidated and demagnetized, or to lose its power, and, besides, it is so inclosed as to render it very difficult or inconvenient to remagnetize it.

In carrying out my invention I not only apply an armature within the steam-space of the boiler, or in a separate chamber communi-

cating freely with such steam-space, but I place the magnet in another chamber, entirely separate from the first chamber or the steam-space of the boiler, and I apply the armature and the magnet to separate shafts or spindles. The armature-shaft I so apply to the float within the boiler that the rise and fall of the water may by its movements of the float produce a rotary movement of the armature-shaft and armature. Furthermore, I arrange the armature and the magnet in such close proximity on opposite sides of the unperforated partition separating the magnet and armature chambers that the attraction of the magnet for the armature may cause the magnet to be rotated within its chamber in correspondence with any rotary movement of the armature.

In the drawings, A exhibits the head of a steam-boiler or steam-generator, B, such head being supposed to be arranged in a vertical plane, and the boiler to extend horizontally therefrom. Through the said head I make an aperture, C, for the introduction of the float into the boiler and the reception of the projecting posts *a a* of a cap-box, D, such parts *a a* serving as bearings for the support of the fulcrum *b* of a float-lever, E, furnished with an elongated float, F. This float-lever is to project from the boiler-head horizontally, or thereabout, the float being made small in diameter and quite long, as shown in the drawings, in order that it may be passed through a small hole made in the boiler-head, as my invention is intended particularly for the boilers of railway-locomotive engines, in which the usual arrangement of the stays and the application of other parts will seldom admit a float of a large diameter to be used or a large hole to be made in the boiler-head.

The front arm of the float-lever projects into the cap-box D, which is to be fastened to the end of the boiler when such boiler is of the horizontal kind. From this box a hollow column, G, or its equivalent, extends upward, opens into, and is surmounted by a close armature-chamber, H, having a cylindrical or other proper form. Within this chamber the armature I is placed and fixed on one end of a horizontal shaft, K, duly supported by a bracket, L, and carrying a pinion, M. The said pinion engages with a toothed rack, N, carried by a rod, O, whose lower end is jointed to the



front end of the shorter arm of the float-lever. In front of the armature-chamber, and separated from it by an unperforated partition, *c*, is another index and magnet chamber, *P*, carrying a divided arc or index, *R*, and a magnet, *S*, the axle or shaft *d* of the magnet being arranged in line with that of the armature-shaft and supported by a bracket, *T*. From this magnet an indicator or index-pointer, *U*, may project laterally, if made of iron or steel; but should it be constructed of brass or a metal not magnetizable, it may project longitudinally from the magnet.

It will readily be seen that should the index-pointer be made of steel, and extended longitudinally from the magnet, it would become magnetized, and so form part of the magnet as to carry one pole too far beyond the armature to be moved by it by the attractive power of the magnetic force.

In my construction of the gage the indicator-arc and magnet-chamber can be made of a diameter much larger than that of the armature-chamber, and thus afford the advantage of a large arc of divisions with a small armature-chamber, thus materially decreasing the weight of the apparatus to what it would be were we to make the armature-chamber of a diameter equal to or about equal to that of the magnet and index chamber. This is a matter of importance when the invention is applied to a locomotive-engine. To insure correct operation of the magnet, all the parts of the apparatus, except the magnet and its armature, may be made of some metal or metals or material or materials not magnetizable or attractive to the magnet.

Any movement of the float in a vertical plane will cause the shaft of the armature, and the armature, of course, to rotate more or less, and as the poles of the magnet are arranged directly opposite the extremity of the armature, the said movement of the armature will produce through the attraction of the magnet a corresponding rotary movement of the mag-

net and its index-pointer, whereby the latter will be made to measure or point out on its arc of divisions the degree or amount of movement of the float, and so as to indicate the height of water in the boiler.

I lay no claim to the arrangement constituting the invention covered by Letters Patent of the United States numbered 4,288.

In my arrangement of the magnet it is always in sight and out of the demagnetizing and oxidizing influence of the steam of the boiler; and, furthermore, it is so situated as to be capable of being easily touched with a magnet or remagnetized in case its attractive power at any time or from any cause may be diminished.

What I claim as my invention is—

1. The arrangement of the lever-arm box *D*, the indicator, steam column and case, and the float-lever and float, together and relatively to the boiler-head, substantially as described.
2. The application of the fulcrum-bearings to the lever-arm box, and so as to be movable therewith and separate from the boiler-head.
3. My improved arrangement of the magnet and its armature with reference to the interior or steam space of the boiler, the said arrangement consisting not only in placing the magnet in an indicating or other proper chamber entirely insulated from or having no connection with the said steam-space or the armature-chamber, so that no steam can pass therefrom into the magnet-chamber, but in arranging the armature with respect to the magnet and applying the float to the armature so as to operate it, substantially in manner as described.
4. Combining a separate index-pointer with the magnet so as to extend therefrom, as specified.

FRANCIS A. HOYT.

Witnesses:

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