

(No Model.)

R. KLINGER.  
WATER GAGE.

No. 470,858.

Patented Mar. 15, 1892.

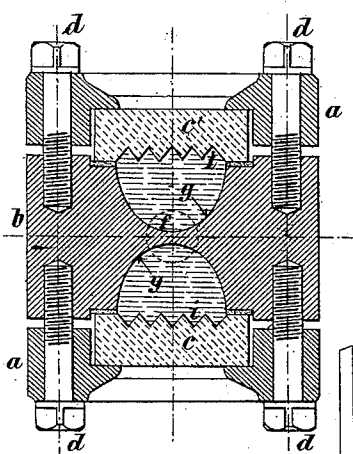


Fig. 4.

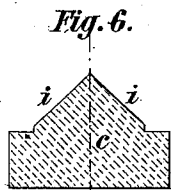


Fig. 6.

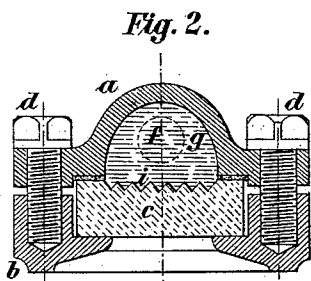


Fig. 2.

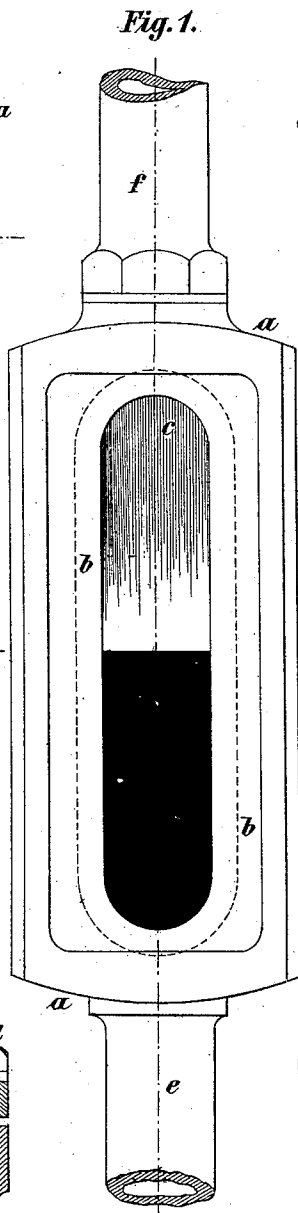


Fig. 1.

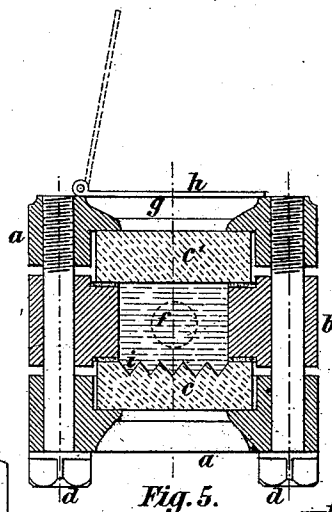


Fig. 5.

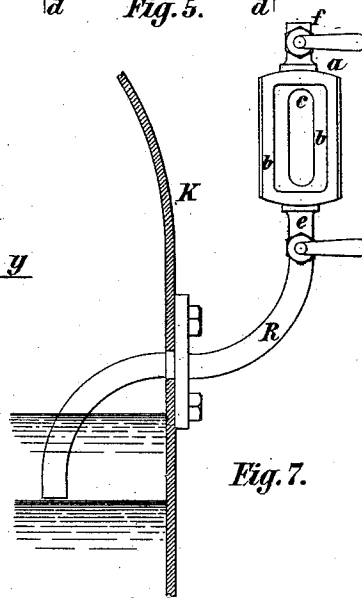


Fig. 7.

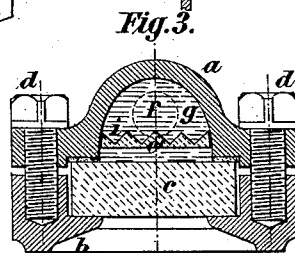


Fig. 3.

Witnesses:  
Gustav Kichmianov  
Anna Beresch.

Inventor.  
Richard Klinger  
per Robert B. Jentzsch  
Attorney

# UNITED STATES PATENT OFFICE.

RICHARD KLINGER, OF VIENNA, AUSTRIA-HUNGARY.

## WATER-GAGE.

**SPECIFICATION** forming part of Letters Patent No. 470,858, dated March 15, 1892.

Application filed November 13, 1891. Serial No. 411,825. (No model.) Patented in Germany October 28, 1890, No. 57,753; in France November 8, 1890, No. 209,381; in Belgium November 10, 1890, No. 92,664; in England November 13, 1890, No. 18,273; in Switzerland December 22, 1890, No. 3,273, and in Austria-Hungary January 8, 1891, No. 41,874 and No. 69,029.

*To all whom it may concern:*

Be it known that I, RICHARD KLINGER, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Empire of Austria-Hungary, have invented new and useful improvements in Water-Gages, (for which I have obtained a patent in Austria-Hungary on January 8, 1891, No. 41,874 and No. 69,029; in Germany on October 28, 1890, No. 57,753; in Belgium on November 10, 1890, No. 92,664; in France on November 8, 1890, No. 209,381; in England on November 13, 1890, No. 18,273, and in Switzerland on December 22, 1890, No. 3,273,) of which the following is a specification.

My invention is based upon the optical law of the total reflection of the light when passing from a medium of greater refracting power into a medium of less refracting power, as explained in the following: When a ray of light passes from a medium of greater refracting power into one of less refracting power, the angle which said ray forms with the perpendicular is enlarged. There must therefore exist a limit for the angle of incidence in the medium of greater refracting power outside of which limit the law of refraction cannot be corresponded to any more. This limit lies, for instance, for the passage of light from glass into air between forty-one and forty-nine degrees. Therefore if a ray of light forms in glass, for instance, an angle with the perpendicular even but very little larger than the critical angle, this ray cannot leave the glass any more, but is reflected inwardly upon the surface of the glass after the general law of reflection. If there is, for instance, water behind the glass, such a ray is not totally reflected, but continues its passage through the water in a refracted state.

The object of my invention is in making use of the optical law and the circumstances just referred to to apply suitable facets or reflecting-surfaces to the observation-glasses of gages for indicating the level of water or other liquids in such manner that the part of these glasses which is covered by the liquid will permit the passage of the light, while from that part of these glasses covered by the gas-

eous body—such as steam or air, for instance—the light will be reflected from said facets, so that a sharp and clear demarkation is produced between the two bodies, which will permit to discern plainly, even from a distance, the level of the liquid in the gage.

In the accompanying drawings, which illustrates my invention, Figure 1 shows in elevation a water-gage provided with my improvements. Fig. 2 is a cross-section through the same after line  $xy$  of Fig. 1. Fig. 3 shows a similar cross-section of a modified gage. Figs. 4 and 5 show in similar cross-sections two further modifications. Fig. 6 shows a single faceted glass, and Fig. 7 shows my gage as employed as an automatic indicator of the lowest water-level in steam-boilers.

In all figures similar letters of reference indicate like parts.

$a$  is the casing of a gage, provided with the usual connecting-tubes  $e$  and  $f$ , to which casing a frame  $b$  is attached by means of screws  $d$ , or in any other suitable manner. Between frame  $b$  and casing  $a$  the observation-glass  $c$  is inclosed and tightened to hold the contents of the gage. Glass  $c$  is provided with the facets or reflecting-surfaces  $i$ , which may either be ground, pressed, cast, or formed in any other manner upon the same, as shown in Fig. 2, or the observation-glass may, as shown in Fig. 3, be plain on both sides, and a separate facet-glass may be placed inside of the casing. The part of the casing situated opposite the facet-glass forms or carries the background  $g$ , which I make black by preference, but which may be of any other color.

When the gage contains a liquid of any kind, the light falling upon the observation-glass will, according to the before-mentioned principle, pass through the facets and the liquid, making the background visible, while upon all those parts not covered with the liquid the light will be reflected from the facets, and the steam, air, &c., contained in that part of the gage will appear opaque. The effect of this in a water-gage, for instance, provided with a black background is that the water will appear perfectly black, while that part of the gage containing the steam will shine

with a silvery brightness. This arrangement offers over the existing water-gages the great advantage that the height of the water can be clearly and unmistakably seen even in the 5 often dim light of a boiler-room and from a distance.

Gages after my system may also be made with two or more observation-faces, as shown in Fig. 4 of the drawings, where two of the 10 apparatuses above described are joined back to back.

The kind, number, form, and direction of the facets may be chosen at will, and, as shown in Fig. 6, a glass with but two facets or re- 15 fracting-surfaces may be employed.

For certain purposes—as, for instance, in vacuum-pans for boiling sugar, glue, &c., where it becomes necessary to observe from time to time also the color of the liquid or its 20 consistency—a gage after my system may be employed with a removable background, as shown in Fig. 5 of the drawings. Here the rear of the gage is provided with a plain transparent glass *c'*, behind which the background *g* is 25 placed upon or formed by a hinged or sliding plate *h*, which can at will be removed in order to make the liquid visible in its natural color. Otherwise the gage may be constructed as above described.

30 Instead of using a background, my faceted gage-glasses may also be employed in such manner that they are arranged upon either side of the column of water and steam in the apparatus—that is, in the front and in the rear 35 thereof. If a gage of this kind is lighted from behind, the part containing the water will show bright and that containing the steam opaque, the water permitting the passage of the light, while from the steam part it is re- 40 flected.

In Fig. 7 I have shown an application of my gage as an automatic indicator of the lowest water-level in steam-boilers. The apparatus is mounted upon a pipe *R*, reaching with its 45 other end into the steam-boiler *K*, down to the

lowest admissible water-level. As long as the water in the boiler stands above the lowest level it covers the mouth of pipe *R* and the gage will remain filled with water, which in the glass, when a black background is used, 50 for instance, will appear perfectly black. In the moment, however, when the water sinks below its lowest level the water from the gage will flow back and the latter will be filled with steam, appearing in the glass bright and 55 shining, and thus indicating that the water has sunk below its proper level.

Instead of employing a separate pipe, the gage might be connected with the lowest gage-cock of the boiler for the same purpose. 60

What I claim as my invention, and desire to secure by Letters Patent, is—

1. Glasses for liquid-gages, provided with facets or reflecting-surfaces in such manner that they will permit the passage of the light 65 where covered by the liquid and entirely or partially reflect the light where not covered by the liquid, substantially as and for the purpose described.

2. The combination of glasses provided with 70 facets or reflecting-surfaces with the frame or casing of a liquid-gage, substantially as described.

3. In liquid-gages, the combination, with a suitable frame or casing, of glasses provided 75 with facets or reflecting-surfaces and a colored background, substantially as described.

4. In liquid-gages, the combination, with a suitable frame or casing, of glasses provided with facets or reflecting-surfaces, a plain glass 80 plate *c* in the rear part of the gage, and a removable background, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name in presence 85 of two subscribing witnesses.

RICH. KLINGER.

Witnesses:

A. SCHLESSING,  
ROBT. P. JENTZSCH.