No. 717,055. Patented Dec. 30, 1902.

G. S. THOMPSON.

LIQUID GAGE.

(Application filed May 6, 1901.)

(No Model.)

Fig.5.

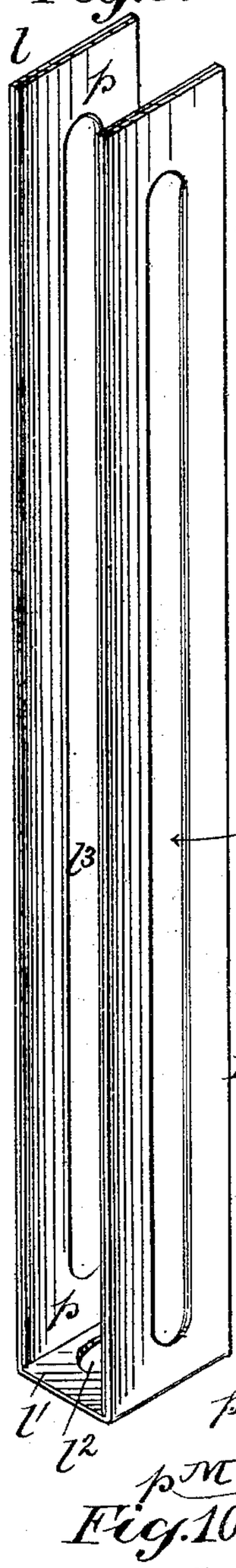


Fig.1.

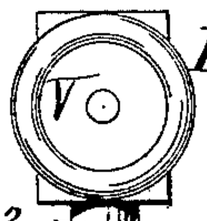


Fig.7.

Fig.2.

Fig.4.

Fig.3.

Fig.6.

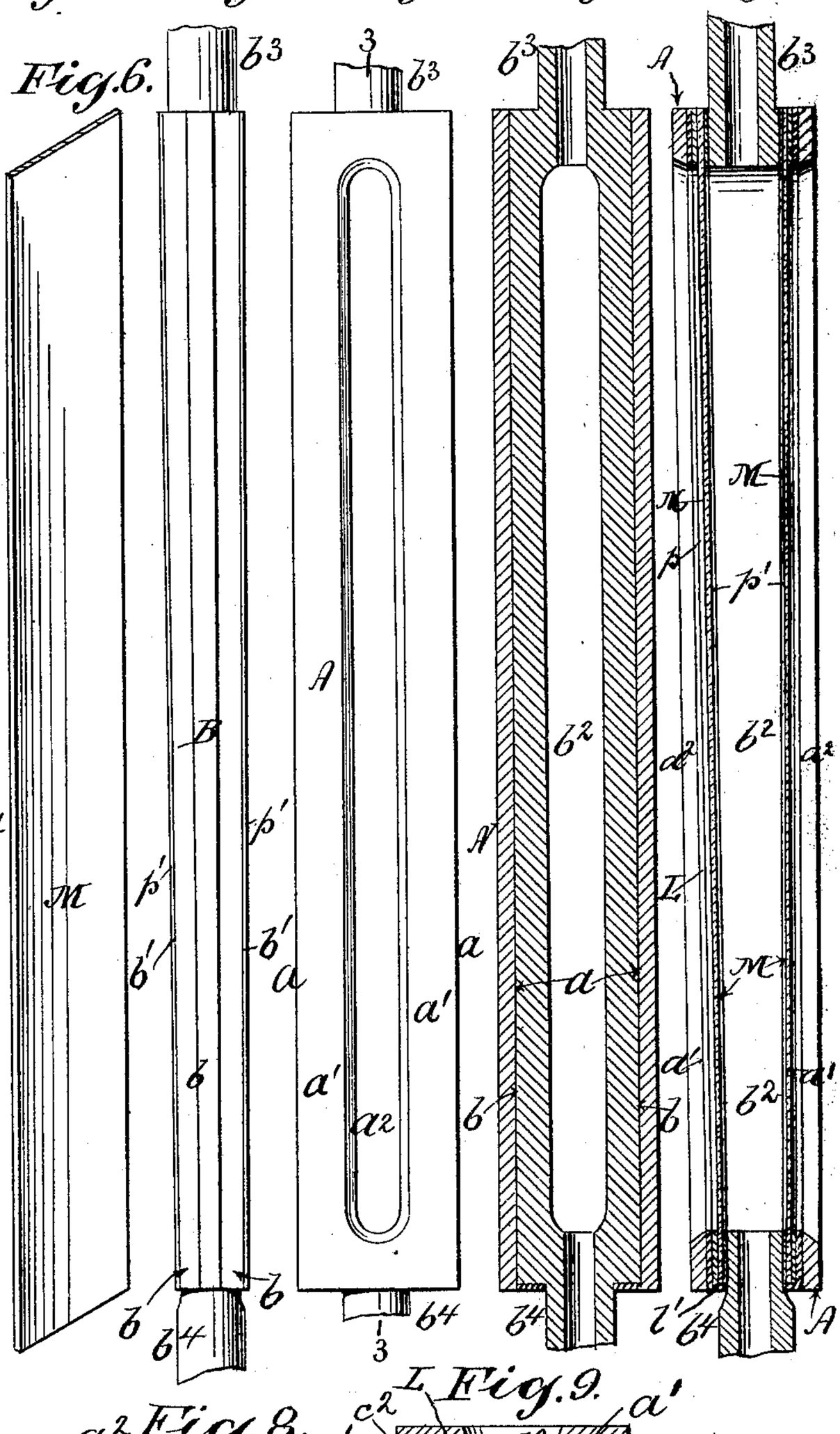


Fig.10.

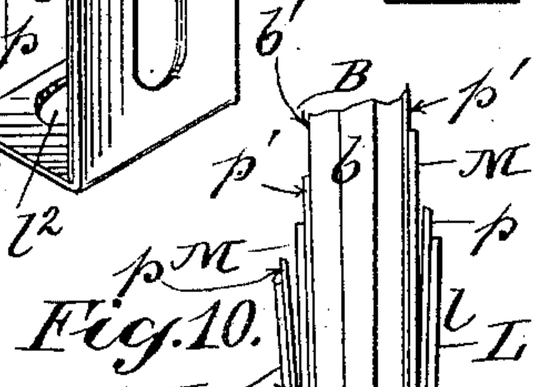


Fig.8.

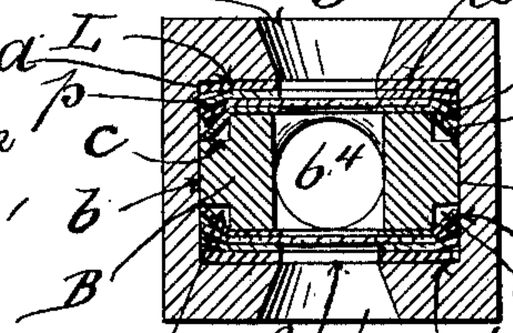
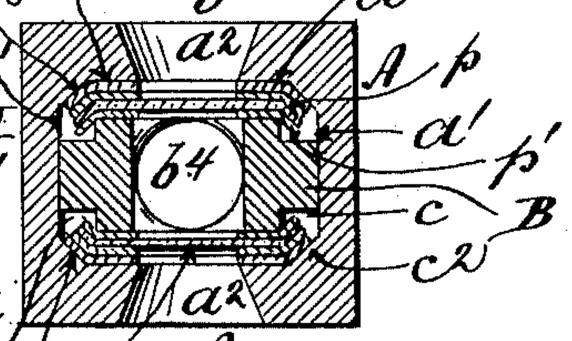


Fig.9.



Witnesses.
D. W. Gardner.
John Thorn

Inventor:
George S. Thompson
By his attorney
Leo. Pr. Miath

UNITED STATES PATENT OFFICE.

GEORGE S. THOMPSON, OF HOCKESSIN, DELAWARE.

LIQUID-GAGE.

SPECIFICATION forming part of Letters Patent No. 717,055, dated December 30, 1902.

Application filed May 6, 1901. Serial No. 58,853. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. THOMPSON, a citizen of the United States, residing at Hockessin, Newcastle county, and State of Delaware, have invented certain new and useful Improvements in Liquid-Gages, of which the following is a specification, sufficient to enable others skilled in the art to which the invention appertains to make and use the same.

My invention relates to gages for indicating liquid-levels, particularly water-gages for use in connection with steam-generators and the like, in which a relatively high degree of internal pressure is attained.

Heretofore the transparent parts of gages have been made of glass, which is subject to fracture both from external and internal pressure by reason of its lack of tensile strength. It is also easily broken by undue jar or vibration, as well as by sudden or extreme variations in temperature.

The main object of my invention is to overcome these and other known objections to the use of glass in a liquid-gage; and the leading feature of the invention consists in the employment of means whereby mica is adapted for use as the transparent medium through which the level of the liquid may be observed.

The invention also includes several special features in the construction and arrangement of parts hereinafter set forth.

In the accompanying drawings, Figure 1 is a front view of my improved gage ready for use. Fig. 2 is an elevation of the outer case; Fig. 3, a longitudinal section upon plane of of line 3 3, Fig. 2; Fig. 4, a longitudinal section taken at right angles to Fig. 3. Fig. 5 is an isometrical view of the metallic lining. Fig. 6 is an isometrical view of the mica plate. Fig. 7 is an edge view of the wedge-shaped plug. Fig. 8 is a transverse section upon an enlarged scale; Fig. 9, a view similar to Fig. 8, showing a modification of the casing; Fig. 10, a sectional view of the upper end of the casing, showing the method of inserting the plug, lining, mica, &c.

In adapting my invention to various uses and requirements it may be necessary to modify the form and arrangement of parts to some extent; but this can be done without departing from the spirit and intent of my invention, and I do not, therefore, confine myself strictly to the construction shown in the accompanying drawings, which merely illustrate the embodiment of the essential features of my invention in practical form.

As shown in the drawings, my gage is designed for use as a water-gage in which the parts are to be subjected to considerable internal pressure. The part A is an elongated rectangular box or casing open at both ends and formed with two internal side walls a a, which are parallel, and two a' a', which converge, preferably, from the upper end toward the lower end. One or each of the converging side walls a' a' is formed with a longitudinal slot a^2 to expose the interior of the gage.

Fitting into the casing is the wedge-shaped plug B, having the parallel sides b b and the tapering sides b' b', which latter engage with the converging internal side walls a' a' of the casing A, so that when the plug is forced into position a tight joint will be effected between the opposed inclined surfaces or between plates interposed between them.

The body of the plug B is formed with a central longitudinal liquid-chamber b^2, preferably, though not necessarily, coinciding with the slot a^2 in the converging sides a' a' of the casing A. Communication is had with this liquid-chamber through the conduits b^3 b^4, which in the construction shown form a part of the plug, although this is not an essential feature, since the ends of the plug may be made solid and communication with the liquid-chamber b^2 may be effected by any well-known mechanical expedient.

The conduits b^3 b^4 are in any case connected with valves V V, (two of which are shown symbolically in Fig. 1,) which are in turn connected by suitable pipes with the vessel upon which the gage is to be used.

It will be seen that the inclined internal side walls a' a' of the casing in reality consist of flanges flanking the longitudinal slots a^2, and this is also true of the inclining surfaces b' b' of the wedge-shaped plug B, which flank the liquid-chamber b^2. In order to close the latter, I interpose plates of mica M between the opposed inclined flange-surfaces of the plug and of the casing, respectively, the plug being wedged into the casing with sufficient force to create a liquid-tight joint between the surfaces in contact with the edges of the mica plates M.

In order to facilitate the attainment of a perfectly tight liquid-proof joint between the

mica and the casing A and the plug B, I interpose strips of packing $p\,p'$ between them in any desirable manner. A convenient means of attaining this result is to apply a layer p' of packing material to the flange-surfaces of the inclined sides of the plug and to employ a stiff lining L, to the inner side of which layers of packing p are also applied, the two leaves $l\,l$ of the lining being connected at the lower end by a ligature l', formed to fit over the lower end of the plug B, so that the mica may be placed in position on the inclined sides of the plug and the lining used to protect the mica in such position and relieve it from friction or derangement during the introduction of the plug and mica into the casing, as indicated in Fig. 10.

When the conduits are formed in the ends of the plug, as shown in the drawings, the ligature l' of the stiff lining is formed with the perforation l^2 to receive the lower conduit b^4. The stiff lining L is preferably, although not necessarily, formed of one piece of sheet metal having the perforation l^2 and the longitudinal slots $l^3\,l^3$ stamped out of it and being then bent over into shape, as shown in Fig. 5, although this construction is not indispensible, since the lining may be made in separate pieces.

The parallel side walls $b\,b$ of the plug B are narrower than the opposed side walls $a\,a$ of the casing, so that when the parts are assembled in position spaces $c\,c$ are created in the casing, into which the extreme edges of the mica, stiff lining, and packing project, as illustrated in Fig. 8. As a result when the plug is driven forcibly into position within the holder the overlapping edges of the mica, stiff lining, and packing are naturally deflected more or less into these spaces $c\,c\,c\,c$ at an angle, since the resistance encountered by such edges is all on one side, and this warping of said edges around the sharp corner of the inclined sides of the wedge-plug B adds materially to the resistance afforded against displacement by reason of internal pressure exerted against the mica. In other words, the frictional contact between the mica and the surfaces with which it is in contact is supplemented by a lateral resistance exerted by the sharp edges of the plug against the bent edges of the mica, lining, and packing, so that the tendency of the mica to draw or creep toward the center under internal pressure is effectually counteracted, actual experience having demonstrated that under these conditions the internal pressure upon the mica may be increased until the mica is ruptured without affecting the joint between the mica and the surfaces with which it is in contact.

The crimping or turning over of the overlapping edges of the lining, mica, and packing may be effected by positive means, if desired, as by forming deflecting-surfaces $c^2\,c^2$ in the interior corners of the casing, as shown in Fig. 9, or by any other known mechanical expedient, as by the insertion of a fillet in each of said corners. This means of insuring the crimping of the edges of the mica, &c., may be resorted to where the gage is designed to withstand a high degree of internal pressure or where the mica used is of considerable thickness; but for lower pressures and ordinary use the natural deflection of the edges inward when the wedging-plug is driven home is found to be sufficient to prevent the creeping or slip of the mica.

As hereinbefore intimated, only one side of the casing may be slotted longitudinally to give visual access to the contents of the liquid-chamber b^2. In this connection a float F may be used in said liquid-chamber to aid in determining the height of the liquid contained therein.

When one side of the gage is formed to reveal the chamber b^2, the plug B need not necessarily be tapered or wedge-shaped, provided the converging internal walls of the casing are retained, since a wedge-shaped fillet or plate inserted behind the plug B and between it and the rear wall of the casing can be used to lock the parts in position with like result; but this simply amounts to making the wedge-shaped plug in two pieces and is a mere modification of the structure shown.

In the accompanying drawings I have shown the openings which are closed by the mica in the form of longitudinal slots; but it is obvious that a series of holes or any other form of opening for the purpose of revealing the interior of the gage may be substituted, if preferred.

There are many practical advantages attained by the use of mica as a transparent medium through which the level of the liquid in the gage may be observed. It is practically indestructible as compared with glass, will stand a much higher temperature, is not affected by extremes of temperature, and by the use of plates of suitable thickness may be relied upon to resist any desired pressure within the limits of practical use. One of the objections to glass in gages where high pressure or high temperatures are to be met or where dangerous fluids are to be gaged is its liability to fracture under sudden jar or concussion or from contact with extraneous objects—objections which are overcome by my use of mica as a visual medium, since the great tensile strength of mica enables it to withstand high pressures, whether sudden or uniform. Furthermore, by my construction and arrangement of the parts the mica is protected against accidental contact with external objects, while all danger from fracture by expansion or contraction is avoided.

My improved gage can safely be used where glass gages are impractical, as in connection with marine and other forms of boilers in which high pressures are attained, thus dispensing with the trouble and inconvenience attendant upon the use of the pet or try cocks at present in use. It is further especially

adapted for use in the navy, since it will withstand any degree of concussion.

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

1. In a liquid-gage, the combination of an outer casing having two inner converging side walls, one of which is formed to expose the interior of the case, a plate of mica resting against the inner surface of said open side wall, a liquid-chamber in said outer casing, and a wedge-shaped plug for forcing the edges of the said plate of mica against the inner surface of said open side walls for the purpose of securing said mica in place as a transparent medium for exposing the interior of the liquid-chamber, substantially as set forth.

2. In a liquid-gage, the combination of an outer casing having two inner converging side walls, one of which is formed to expose the interior of the case, a plate of mica resting against the inner surface of said open side wall, and an internal wedge-shaped plug for forcing the edges of said plate of mica against the inner surface of said open side wall, said plug being formed with a liquid-chamber of which the said plate of mica constitutes a transparent side, substantially as set forth.

3. In a liquid-gage, the combination of an outer casing having two inwardly-converging side walls, each formed to expose the interior of the case, plates of mica resting against the inner surfaces of said converging open side walls, and an internal wedge-shaped plug for forcing the edges of said plates of mica against the inner surfaces of said open side walls, said plug being formed with a liquid-chamber of which the said plates of mica constitute transparent side walls, as set forth.

4. In a liquid-gage the combination of a case formed with two inwardly-converging side walls one of which is formed to expose the interior of the case, a stiff lining resting against the inner surface of said wall, a plate of mica resting against said lining, and a wedge-shaped plug for forcing the stiff lining and the edges of the plate of mica against the inner surface of said open side wall, said plug being formed with a liquid-chamber of which the plate of mica constitutes a transparent side wall, substantially as set forth.

5. In a liquid-gage, the combination of a case having two inwardly-converging side walls each formed to expose the interior of the case, a stiff lining resting against the inner surfaces of each of said walls, two plates of mica resting against the stiff lining, and a wedge-shaped plug for forcing the stiff lining and the edges of the plates of mica against the inner sides of said converging side walls, said plug being formed with a liquid-chamber of which the plates of mica constitute transparent side walls, substantially as set forth.

6. In a liquid-gage, the combination of a case having two inwardly-converging side walls, one of which is formed to expose the interior of the case, a stiff lining resting against the inner side of said wall, a plate of mica resting against the stiff lining, a wedge-shaped plug for forcing the edges of the plate of mica and the edges of the stiff lining against the inner surface of the said wall, said plug being formed with a liquid-chamber of which the mica plate constitutes a transparent side wall, and sheets of packing interposed between the opposed surfaces of the plug, the mica, and of the stiff lining, substantially as and for the purpose set forth.

7. In a liquid-gage the combination of a case having two inwardly-converging side walls each formed to expose the interior of the case, a stiff lining resting against the inner surfaces of said side walls, plates of mica resting against the stiff lining, a wedge-shaped plug for forcing the stiff lining and the edges of the plates of mica against the inner surfaces of said converging side walls, said plug being formed with liquid-conduits at either extremity, and with a liquid-chamber of which the mica plates constitute transparent side walls, and sheets of packing interposed between the opposed surfaces of the plug, the mica, and the stiff lining, substantially as set forth.

8. In a liquid-gage, the combination with the casing having two converging side walls formed to expose the interior of the case, with the plates of mica, and with the wedge-shaped plug formed with a liquid-chamber of which the plates of mica constitute transparent side walls, of a stiff lining formed to straddle the lower end of the wedge-shaped plug and the ends of the mica plates, and perforated to conform to the open sides of the case, substantially as set forth.

9. In a liquid-gage, the combination with the casing having one or more converging side walls formed to expose the interior of the case, with the stiff lining, and with the mica, of the wedge-shaped plug formed with the liquid-chamber, said plug being formed with bearing-surfaces of less width than the mica plates and stiff lining, whereby the edges of the mica and stiff lining are deflected at an angle when the plug is driven into the case, thereby reinforcing the mica against the internal strain to which its inner exposed surface is subjected in use, substantially as set forth.

10. In a liquid-gage, the combination with the casing having two or more converging side walls formed to expose the interior of the case, with the stiff lining, with the mica, and with the wedge-shaped plug formed with bearing-surfaces of less width than the mica and stiff lining, of means for positively crimping the overlapping ends of the mica on lining for the purpose of reinforcing the mica against the internal strain to which its inner exposed surface is subjected in use, substantially as set forth.

GEORGE S. THOMPSON.

Witnesses:
D. W. GARDNER,
JOHN KIRN.