

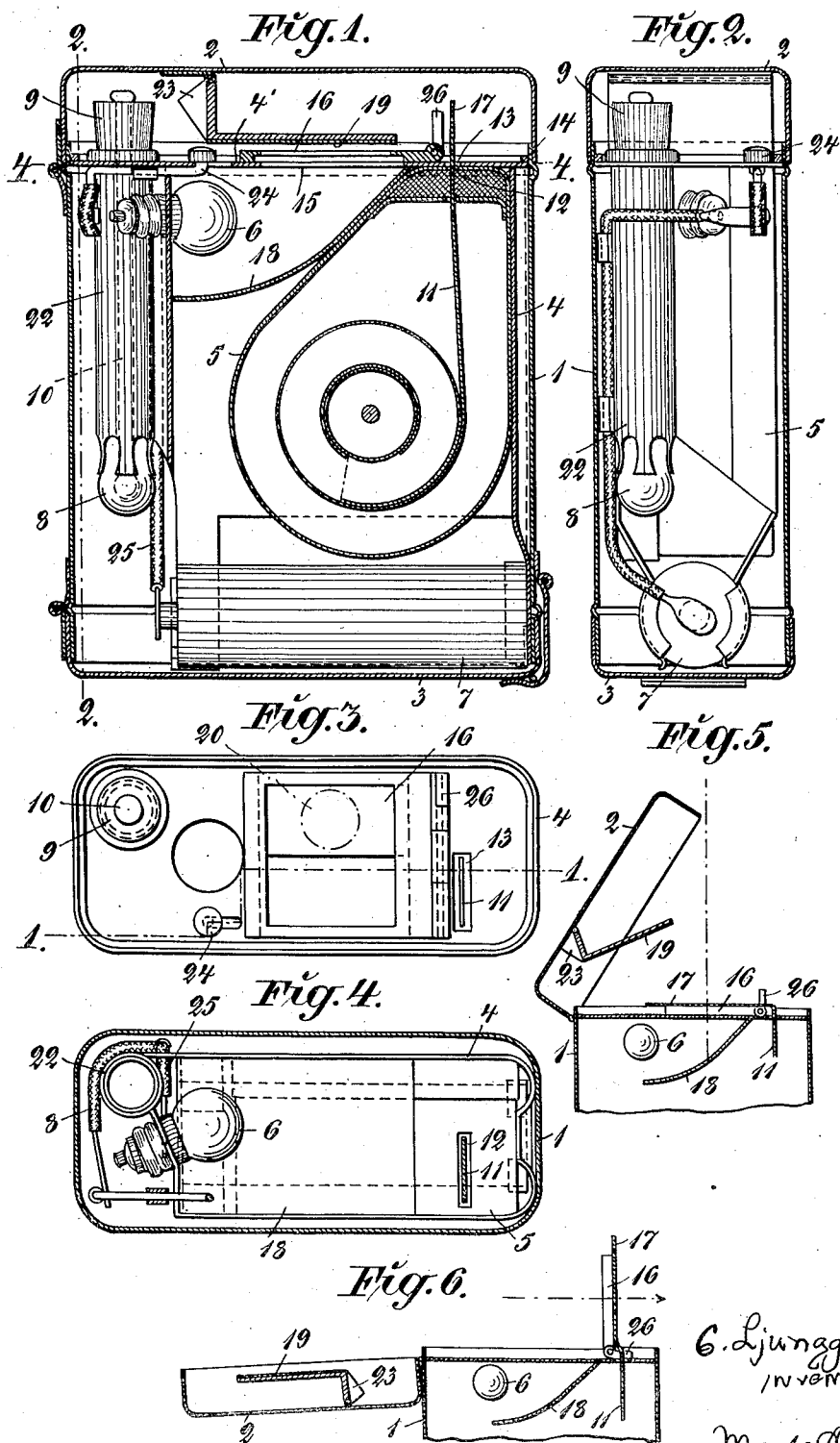
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APPARATUS FOR THE DETERMINATION OF CARBON MONOXIDE

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APPARATUS FOR THE DETERMINATION OF
CARBON MONOXIDE

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The present invention relates to apparatus for the detection, indication and determination of the percentage in air of carbon monoxide or of other admixtures not normally present, using the methods in which a test-paper impregnated with a suitable substance, such as palladi-
ous chloride, is used as an indicating means, the test paper being moistened with water or other suitable liquid at the moment of examination, and subjected to the action of the air in the locality to be examined. More particularly the invention refers to apparatus using the method of detecting the presence of carbon monoxide described in the specification of British patent application No. 1,942/1930 in which a test-paper is used impregnated with palladi-
ous chloride and a so-called buffer substance, i. e. a substance able to control the hydrogen ion concentration and to maintain the same at a fixed value. When carrying out tests in accordance with the said method the test-paper is moistened with a drop of water whereupon a dark colouring will appear around the moistened spot if carbon monoxide is present. The approximate carbon monoxide concentration and the extent of danger therefrom is then determined from the time required for the dark-coloured ring to become clearly visible.

This method, which, in spite of its simplicity gives comparatively exact results, is, however, not quite free from errors and its practical application has proved to be attended by certain difficulties. It has been found that the degree of accuracy depends to a large extent upon the manner of illuminating the moistened spot on the test-paper. In diffused daylight the dark colouring on the test paper may be easily observed if the paper is held up against the light and looked at by transmitted light. The carrying out of tests in dark localities, which type of test is, of course, most common in occurrence, is however, attended by difficulties. Even when artificial light is used the dark-coloured ring is best observed by transmitted light. In such a case the opposite side should, however, also be illuminated to a certain extent. Considerably increased accuracy in the test results may also be obtained by rendering possible a comparison between the dark colouring formed at the test-paper and a suitable standard-colour.

For the practical application of the method it has also been found particularly advantageous to combine in a single apparatus all the means required for the carrying out of the test, namely a supply of test-paper, a suitable light source, means for applying the paper at the test in a

suitable position in relation to the light source, and means for conveniently applying the required moisture to the test paper.

The store of sensitive test-paper should be disposed in such a way that it is well protected against the action of light and air and not subjected to the surrounding air even when the quantity of paper required for a test is taken out.

The present invention has for its object to provide an apparatus which meets the above mentioned requirements and which facilitates the practical carrying out of indicating methods of the kind referred to. The invention will now be more closely described with reference to the accompanying drawing, illustrating a preferred form of apparatus according to the invention, which is particularly adapted to be used for the carrying out of the method according to the patent referred to above. In the drawing:—

Figure 1 is a vertical section through the apparatus on the line 1—1 in Figure 3;

Figure 2 is a side view with the external cover broken away;

Figure 3 is a plan view with the lid removed;

Figure 4 is a horizontal section on the line 4—4 in Figure 1;

Figure 5 is a view of the upper portion with the parts in testing position when using artificial light; and

Figure 6 is a view of the upper portion with the parts in testing position when using daylight.

The different parts of the apparatus are enclosed in a box 1 which is provided at its top with a hinged lid 2 and the bottom 3 of which may be opened and closed in a similar manner. In said box the test assembly may be inserted from below. The assembly aggregate is held together by a frame 4 enclosing a metal container 5 for the test-paper and supporting a small electric bulb 6 with corresponding dry battery 7 as well as a liquid container 8 of glass, provided with a rubber cork 9, and a glass rod 10 fixed thereto. Said container 8 is disposed in a holder 22.

In the container 5 the test paper is stored in the shape of a ribbon 11 wound to form a roll, the free end of which ribbon extends through openings 12, 13 in the container 5 and in the top portion 4' of the frame 4 respectively. In order to protect the store of test-paper the opening 12 in the container 5 is sealed by means of a block 14 of rubber in unhardened condition, which block is provided with a narrow slot through which the paper ribbon may be pulled out under comparatively great friction. By this means the test-paper is thus rendered easily accessible while at

the same time the wound-up store in the container is completely protected against the action of the surrounding air even when stored for a considerable period of time.

5 In the top side 4' of the frame 4 is provided a light opening 15, which is covered by a window 16 secured in a holder adapted to be erected in a vertical position. When the pulled out portion 17 of the paper ribbon 11 is bent down
10 against the top side of the frame as shown on the drawing said portion will lie on the closed window 16 and thus extend across the light opening, in which position it may be illuminated from below by light from the bulb 6, which light is
15 reflected in an upward direction through the light opening 15 and the window 16 by means of a suitable reflector 18, the ribbon being thus illuminated by transmitted light. At the same time the ribbon may also be illuminated from
20 above by rays of light from the lamp, which rays are reflected by a mirror 19 pivotally mounted inside the lid 2 and provided with a stop 23 intended to abut against the lid and keep the mirror in a suitable position in relation to the light
25 source and the paper ribbon when the lid is kept open in the position shown on the drawing.

In order to render possible, in the manner mentioned above, a close comparison between the dark colouring of the test-paper and a certain
30 standard colouring, one half of the light opening 15 is covered by a matching paper 20 disposed under the glass, which paper is thus illuminated from below and from above in the same manner as the portion of test-paper dis-
35 posed laterally of the former. The matching paper is provided with a transparent spot, by way of example a grease spot, the edge of which has been given a dark colour. Said dark-coloured ring represents the standard colouring with which
40 the colouring of the test-paper is compared at the test.

The test is carried out in the following manner:—

45 The lid 2 is opened, the bulb 6 is lit by means of a suitable contact device comprising a slidable handle 24 suitably insulated from the frame and a conductor 25 also insulated in a suitable manner. A fresh length 17 of the ribbon is pulled
50 out and placed as shown on the drawing on top of the window 16 laterally of the matching paper, whereupon a drop of water from the container 8 is applied by means of the glass rod 10 on the test-paper exactly above the light opening 15.

The lid 2 is set in such a position that the desired illumination of the moistened spot is obtained in which position the lid screens off direct light from the bulb in relation to the person carrying out the test, who is observing the two colourings from above. See Figure 5. The time required until the ring shaped colouring appearing around the moistened spot stands out with the same power as the colouring on the matching paper is now observed.

If clear daylight is available when the test is carried out it is usually advantageous to use this in place of the artificial light source in the apparatus. The window 16 together with the matching paper secured thereon is then opened to a vertical position in which a stop 26 bears against the top portion 4' of the frame, as shown on the drawing in Figure 6, the pulled out fresh length 17 of the test paper is then held against the window laterally of the matching paper and is moistened in the manner described above, whereupon the lid 2 of the apparatus is completely opened and the apparatus held in such a position that the daylight enters the window in the direction of the arrow 21.

I claim:—

1. An apparatus for determination of the contents of dangerous gases in the air comprising in combination a receptacle for prepared test paper and provided with an opening, sealing means for said opening permitting withdrawal of test paper from the receptacle, a transparent plate associated with the receptacle adapted to support a withdrawn piece of test paper in testing position adjacent said sealing means, a standard sheet arranged on said plate adjacent the testing position of the test paper, a source of light arranged in fixed relation to the receptacle and said plate, means directing light from said source of light through said plate onto the piece of test paper in testing position and onto the standard sheet, and an outer casing compactly enclosing all of said elements so as to form a testing unit.

2. Apparatus as described in claim 1, in which said sealing means consists of a block of rubber-like material, said block being provided with a narrow slit adapted to permit the withdrawal from the receptacle of the test paper in the shape of a ribbon and the edges of the slit being adapted to bear against the ribbon.

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