

July 3, 1928.

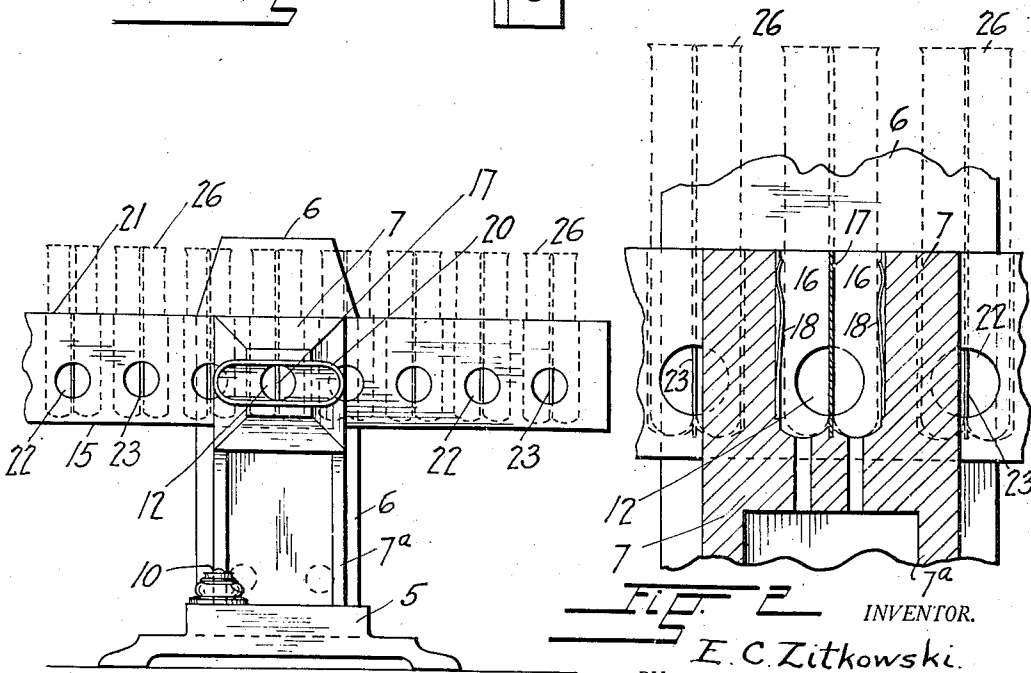
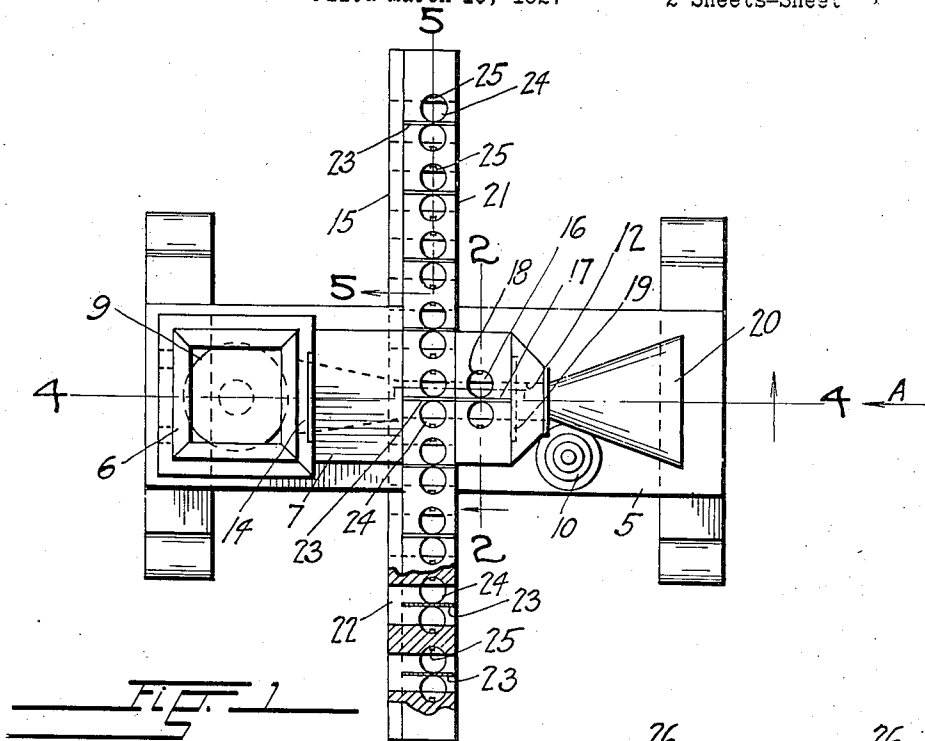
E. C. ZITKOWSKI

1,675,967

COMPARATOR

Filed March 15, 1927

2 Sheets-Sheet 1



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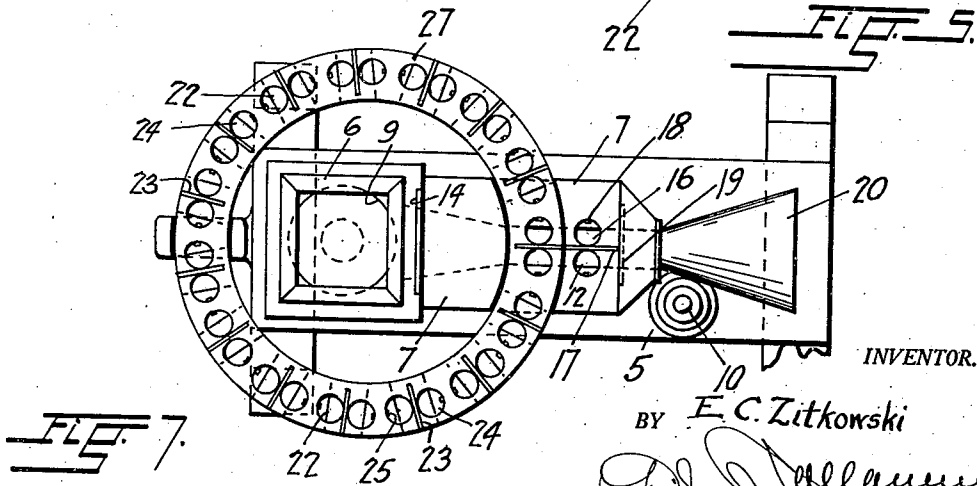
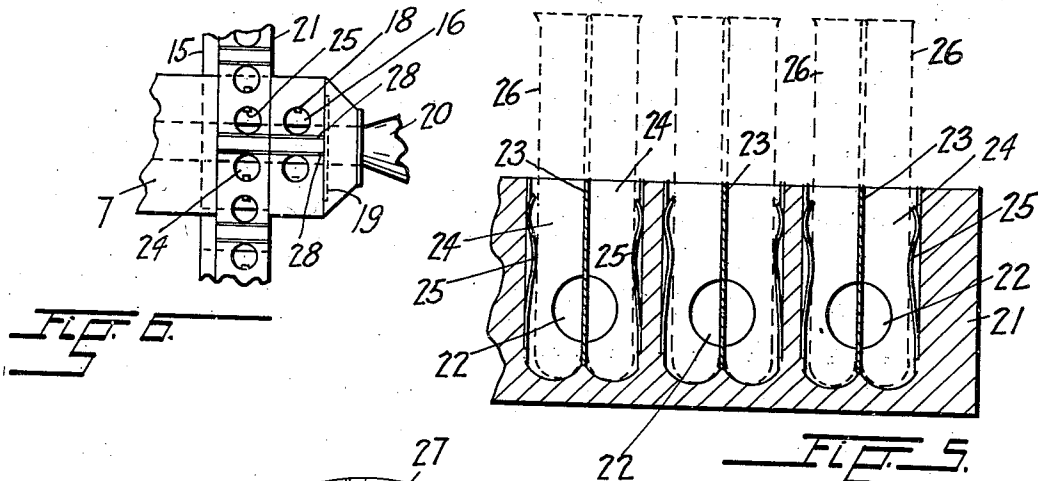
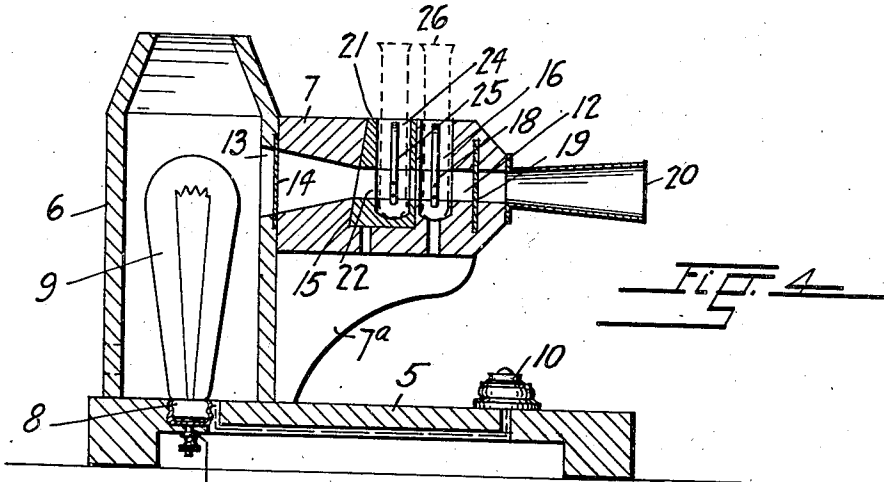
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

EMIL C. ZITKOWSKI, OF SAN FERNANDO, PHILIPPINE ISLANDS.

COMPARATOR.

Application filed March 15, 1927. Serial No. 175,603.

My invention relates to comparators of the type used in determining certain qualities of liquids by color-comparisons. My invention is particularly adapted for use in determining the degree of acidity or alkalinity in sucrose solutions obtained in the manufacture of sugar, by measuring the hydrogen ion concentration thereof.

In instruments of the type to which my invention appertains this method of ascertaining the hydrogen ion concentration of sugar solutions is based on the knowledge that certain substances are indicative of the degree of acidity or alkalinity of sugar solutions to which they are added by changes in color.

By providing a series of solutions of the indicator, of different color-strengths and comparing them as standards, separately with the unknown solution, the degree of acidity or alkalinity of the latter is readily ascertained.

Various appliances devised to facilitate the work of making the comparisons, require careful study on the part of the observer to correctly ascertain the identity of colors between the standards and the unknown solution, and it is an object of the present invention to provide an instrument so constructed that the two colors subject to comparison can be seen at the same time without shifting the eyes from one to another.

Another object is to provide an instrument of the above described character in which the several standards are readily moved into the line of vision for selective comparison with the solution under examination and still further objects of the invention reside in details of construction and a novel arrangement of parts as will be fully brought out in the course of the following description.

An embodiment of the invention has been illustrated in the accompanying drawings in the several views of which like parts are similarly designated and in which:

Figure 1 represents a plan view of the improved comparator,

Figure 2, a fragmentary transverse section along the line 2—2 Figure 1, drawn to an enlarged scale,

Figure 3, a front-elevation of the instrument looking in the direction of the arrow A in Figure 1, part of the standards-magazine having been omitted for lack of space,

Figure 4, a longitudinal section of the in-

strument in a vertical plane indicated by the line 4—4 in Figure 1,

Figure 5, an enlarged section through a portion of the standards-magazine, as on the line 5—5 Figure 1.

Figure 6, a fragmentary plan view of the sight-tube of the instrument, showing a modification in the construction thereof, and

Figure 7, a plan view of the instrument, illustrating a modified construction of the standards-magazine.

Referring further to the drawings, the instrument comprises a base 5, a lamp-housing 6 supported thereon, and an observation or sight box 7 projecting forwardly from the housing. Additional support for the box is provided by a bracket 7^a.

A socket 8 in the bottom of the housing connects an incandescent lamp 9 in an electric lighting circuit, the current-flow through which is controlled by a push-button switch 10 mounted at the forward end of the base.

The observation-box consists of a body having a cylindrical bore 12 flaring at its rear end to an opening 13 of larger diameter in the front of the lamp-housing, which may be covered by a pane of opal glass 14.

Extending transversely through the sight-box is a slide-way 15 of trapezoidal section for the standards-carrier hereinafter to be described, and forward of the slide-way are two pockets 16 which extend vertically through the bore of the body at opposite sides of the vertical plane of the axis thereof. The two pockets are divided from each other by a thin partition 17 extending in the vertical axial plane above referred to and they are each provided with a leaf spring 18 for the purpose of pressing test-tubes inserted in the pockets tightly against the partition.

Forward of the pockets, the bore 12 is closed by a pane of opal glass 19 inserted in a groove of the body of the box and at the front end of the box and in connection with the forward end of the bore thereof is a flaring eye-piece 20 of sufficient width to accommodate both eyes of the observer.

The standards-carrier, hereinbefore referred to provides a magazine for a plurality of test-tubes arranged in pairs for comparison with the test-tubes in the pockets of the relatively stationary element of the instrument. The carrier is composed of a bar of wood or other suitable material provided with a number of equidistantly spaced trans-

verse bores 22 adapted to separately register with the bore of the box 7.

Thin partitions 23 bisecting the bores of the carrier are adapted to register with the partition 17 of the box, pockets 24 for test-tubes are formed at opposite sides of the partitions 23, and springs 25 in the pockets 24 press the test-tubes against the partitions for light-proof contact therewith.

The bar 21 fits in the slide-way of the box so that it may be moved longitudinally to place any one of its transverse bores in alignment with the bore of the box.

In order to facilitate insertion of the partitions 17, and the opal glass 19, the box 7 may be made in sections as indicated in the drawings.

Having thus described the preferred construction of the comparator its operation is as follows:—

Test-tubes 26 which in the drawings have been indicated in broken lines, are placed in the pockets of the magazine and the observation box and are by means of the springs pressed tightly against the respective partitions between the pockets to prevent the passage of light outside the tubes. One of the test-tubes in the stationary element is supplied with a quantity of the unknown solution and the other with a mixture of the solution and the indicative or coloring agent. Of the several pairs of test-tubes in the sliding carrier, one tube in each pair is filled with distilled water and the other with a solution of the indicator in water, the quantity of the indicator used in the solution being varied in the different pairs so as to provide a graded scale of color-variations.

By looking into the eye-piece of the instrument after the lamp has been lighted, the observer sees in the circular field of the bore 12 both colors divided in the center of the field by a black line produced by the aligned partitions 17 and 23. Both colors are thus seen at the same time in the field of the bore, and the half-shade effect produced by the opal glass 19 permits of comparing the colors at opposite sides of the line accurately and without effort on the part of the observer.

The standard-carrier is moved lengthwise through the slide-way to bring its pairs of test-tubes consecutively into register with the test-tubes of the box 7 until the colors at opposite sides of the division line are seen to be identical.

The known proportion of the indicator in the test-tubes of the magazine provides the means to ascertain the hydrogen ion concentration of the sugar solution in the test-tubes of the stationary element of the instrument.

When the colors in the test-tubes are difficult to distinguish as for example when thymol blue is used as an indicator, the test-

tubes in the sight-box 7 and the sliding carrier may be further separated from each other by the use of two spaced partitions 28 as illustrated in Figure 6. The operator looking into the eye-piece of the instrument will see a white zone between two colors in the field of vision, which enables him to compare each color with the white zone and thereby distinguish between the colors with greater accuracy than if they were placed adjoining as in the first described form of the invention.

In the modified construction shown in Figure 7, the carrier 27 is of annular form and moves in a circular path through the slide-way of the sight-box. This form of the comparator is particularly useful where it is required to employ a larger number of standards than could be assembled on a straight carrier without impracticable increase in the length thereof.

Other variations in the construction of the instrument may be resorted to within the scope of the invention and it is to be understood that while the instrument is especially adapted for use as a comparator to determine hydrogen ion concentration in sucrose solutions, it may be effectively employed as a colorimeter in other industries.

Round test-tubes as shown in the drawings are preferable by reason of their low cost and easy manipulation but it is evident that square test-tubes or test-tubes of other different forms may be used if so desired.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. In an instrument of the character described, a sight-box having a light passage and pockets for test-tubes, divided by a partition dividing the field of the passage, and a carrier movable across the passage and having pockets for test-tubes, divided by partitions, the partitions being so disposed in the carrier that they register respectively with that of the sight box in the travel of the carrier across the passage.

2. In an instrument of the character described, a sight-box having a light passage and pockets for test-tubes, divided by a partition dividing the field of the passage, an eye piece at an end of the passage, an opal glass closure for the passage between the eye-piece and the pocket, and a carrier movable across the passage and having pockets for test-tubes divided by partitions adapted to register with that of the sight-box.

3. In an instrument of the character described, a sight-box having a light passage and pockets for test-tubes, divided by a partition dividing the field of the passage, a carrier movable across the passage and having pockets for test-tubes, divided by partitions adapted to register with that of the sight-box, and springs in the pockets of the

sight-box and the carrier to press test-tubes in the pockets against the respective partitions.

4. In an instrument of the character described, a sight-box having a light passage, a partition dividing the field of the passage, test-tubes at opposite sides of the partition, a movable carrier having light passages adapted to separately register with the passage of the sight box, partitions in the light passages of the carrier adapted to aline with the partition of the sight-box, and test-tubes on the carrier at opposite sides of the partitions.

5. In an instrument of the character described, a sight-box having a light passage, a partition dividing the field of the passage, test-tubes at opposite sides of the partition, a movable carrier having light passages adapted to separately register with the passage of the sight-box, partitions in the light passages of the carrier adapted to aline with the partition of the sight-box, test-tubes on the carrier at opposite sides of the partitions, and means for the light-proof contact of the test-tubes with the partitions.

6. In an instrument of the character described, a sight-box having a light passage, a partition dividing the field thereof, test-tubes at opposite sides of the partition, a movable carrier having light passages adapted to separately register with the light passage of the sight-box, and test-tubes in the passages of the carrier, adapted to register with the test-tubes on the sight-box.

7. In an instrument of the character described a sight-box having a light passage, a partition dividing the field of the light passage and composed of spaced members, a movable carrier having light-passages adapted to separately register with the light passage of the sight-box, and partitions in the passages of the carrier each composed of two members adapted for alinement with those of the sight-box, the sight-box and the carrier having pockets for test-tubes at opposite sides of their partitions.

8. In an instrument of the character described, a sight-box having a light passage, a partition dividing the field of the light passage and composed of spaced members, and a movable carrier having light passages adapted to separately register with the light passage of the sight-box, the sight-box and the carrier having pockets for test-tubes at opposite sides of their partitions.

9. In an instrument of the character de-

scribed, a sight-box having a light passage an eye-piece at an end of the passage, a partition dividing the field of the passage, an opal glass closure for the passage between the eye-piece and the partition, and test-tubes at opposite sides of the partition, a movable carrier having light passages adapted to register with the passage of the sight-box, and test-tubes in the passages of the carrier adapted to register with the test-tubes of the sight-box.

10. In an instrument of the character described, a sight-box having a light passage, pockets for test-tubes divided by a partition dividing the field of the passage, and a slide-way transverse of the passage, a carrier in the slide-way having pockets for test-tubes divided by partitions adapted to aline with the partition of the sight-box and test-tubes in the pockets.

11. An instrument of the character described, comprising a lamp-housing having an opening, a sight-box having a light passage alined with the opening and a slide-way transverse of the passage, a partition dividing the field of the light passage, an opal glass closure for the light passage between the forward end of the passage and the partition, a carrier in the slide-way having light passages adapted to register with that of the sight-box, and partitions in the light passages of the carrier adapted for alinement with the partition of the sight-box, the sight-box and the carrier having pockets for the test-tubes at opposite sides of their partitions.

12. An instrument of the character described comprising a lamp-housing having an opening, an opal glass closure for the opening, a sight-box having a light passage alined with the opening and a slide-way transverse of the passage, a partition dividing the field of the light-passage, an opal glass closure for the light passage, between the forward end of the passage and the partition, a carrier in the slide-way having light passages adapted to register with that of the sight-box, and partitions in the light passages of the carrier adapted for alinement with the partition of the sight-box, the sight-box and the carrier having pockets for test-tubes at opposite sides of their partitions.

In testimony whereof I have affixed my signature.

EMIL C. ZITKOWSKI.