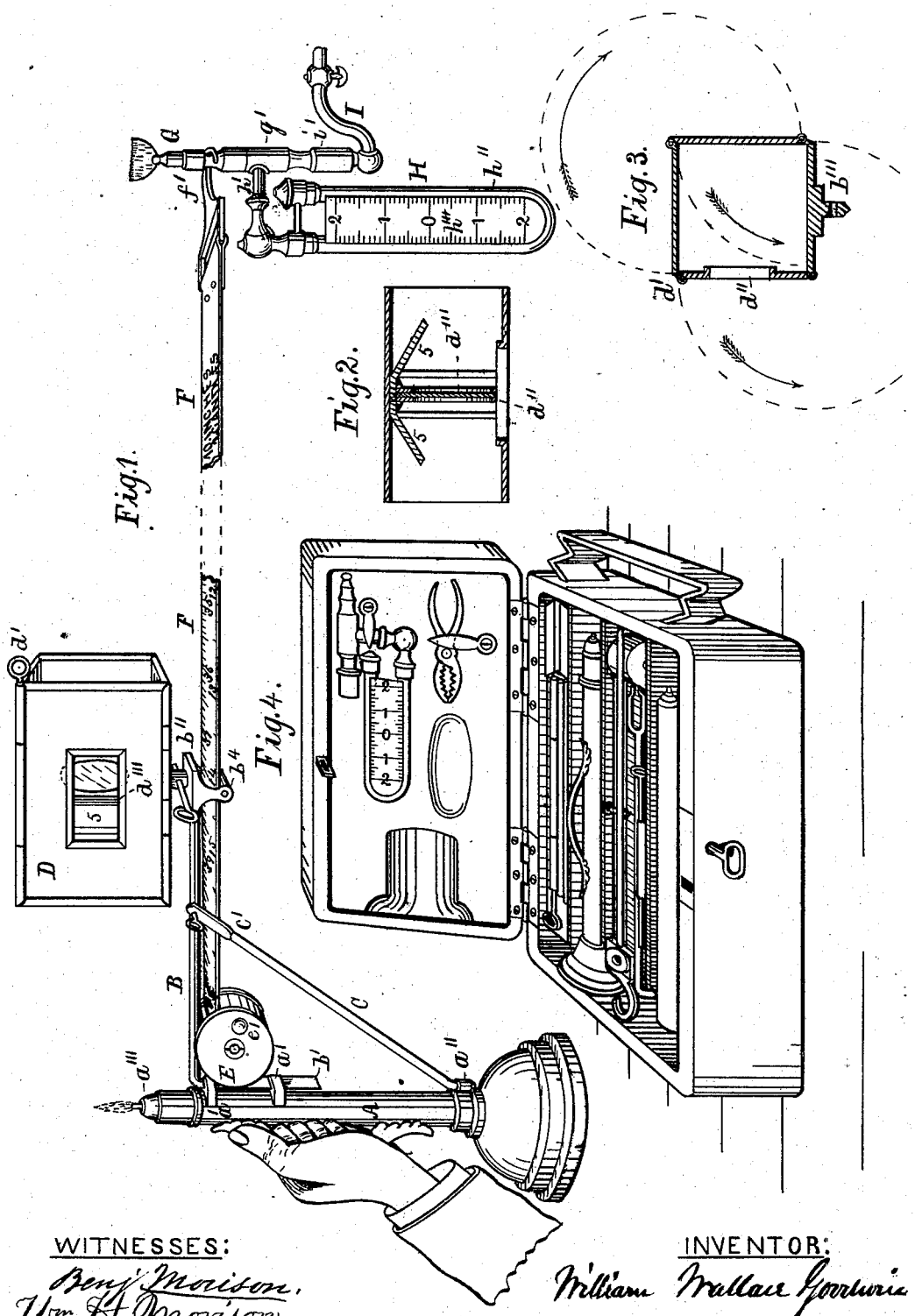
W. W. GOODWIN.

Portable or Hand-Photometer.

No. 164,728. Patented June 22, 1875.



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IMPROVEMENT IN PORTABLE OR HAND PHOTOMETERS.

Specification forming part of Letters Patent No. **164,728**, dated June 22, 1875; application filed May 12, 1875.

To all whom it may concern:

Be it known that I, WILLIAM W. GOODWIN, of the city of Philadelphia, in the State of Pennsylvania, have invented an Improved Portable or Hand Photometer, of which the following is a specification:

The object of my invention is to afford a reliable photometer, which can be held in one's hand and operated with facility and accuracy when in connection with the burner of the ignited gas which the operator may desire to test, and also that can be readily separated into several distinct parts, and packed within a small box, which can be easily carried in hand, or placed in one's traveling-trunk for the purpose of transportation, ready for immediate readjustment and use, as occasion may require; and my invention consists in the peculiarity of construction and mode of uniting and separating the different parts of the photometer, as will hereinafter be fully and clearly described, with reference to the accompanying drawing, in which—

Figure 1 is a perspective view of the photometer in connection with an ignited test-burner having a pressure-gage attached. Fig. 2 is a horizontal section of the sight-box detached. Fig. 3 is a vertical transverse section of the sight-box without its partition and reflectors; and Fig. 4 represents a perspective view of the whole apparatus constituting the hand-photometer, as placed in a disjointed condition in a small hand-box for safety and convenience in transportation.

A is the candle-stand; B, a detachable horizontal arm of the candle-stand; C, a detachable brace-bar for giving additional strength and steadiness to the arm B; D, the sight-box, detachably supported on the projecting end of the arm B; E, a cylindrical case containing a coil-spring cylinder, which permits a flexible steel scale, F, to be drawn outward by the operator in carrying the photometer horizontally away from the gas-burner to which the outer end of F has been attached, as shown in Fig. 1, and also automatically winds inward the said flexible steel scale when the operator carries the photometer toward said burner. The case of the spring-cylinder E is soldered fast to the under side of the arm B. The arm B is bent downward at a right angle at its inner end b', so as to produce a vertical portion of triangular cross-section, which fits so as to be readily inserted and withdrawn at any time into a dovetail opening in each of the two projecting bosses a' a', which are permanently soldered to the side of the candle-stand A, and the brace-bar C has its lower end bent vertically downward, and detachably inserted in a corresponding vertical hole, a'', in the base of the stand A, and its upper end made bifurcate, and detachably secured to the arm by means of a draw-pin, c'. Fixed permanently at the outer end of the arm b is a small base, b'', having a short vertical socket at its upper side, over and into which a small corresponding stem, b''', (see Fig. 4,) is detachably inserted, the said stem being perpendicularly fixed to the under side of the sight-box D, for the purpose of detachably supporting the latter upon the arm B, as shown in Fig. 1. The under side of b'' is made bifurcate, and the two branches extend downward below the arm B, where they are connected by a small shaft, which carries a horizontal friction-roller, b^4, which leaves a roomy space above it, through which, as well as through the space left between the bifurcate end of the brace C, and the arm B above, the flexible steel scale will move freely as it is operated, as will hereinafter be explained. A small spring-catch, e', enables the operator to release the coil-spring in E, and thus permit it to retract the flexible steel scale F as the photometer is carried toward the gas-jet burner G. The outer end of the flat flexible steel scale F has attached permanently a hook, f', whereby the said scale can be readily applied around the said burner, (see Fig. 1,) and the eye-piece of said hook serves to stop the retraction of the flexible steel scale F the moment it comes into contact with b'. The distance from the vertical central line of the candle in A to the vertical central line of the sight-box D is exactly ten inches, and consequently to find the number of inches commence

to count inward from the number ten, and the number of candles from the same point marked one in the candle-scale.

In the drawing, Fig. 1, the portion between ten and thirty-three inches (of the two scales) is cut away for want of room to show a greater or the full length of the scale.

The sight-box D is made of sheet metal, in the form of an oblong square box entirely open at both ends, the four sides thereof being hinged together, so that the same can be readily lapped together into a flat condition by turning them on their hinges, as indicated by the dotted curve lines in Fig. 3, and also so that the same may be readily turned up at right angles, and the two meeting ends of the series connected together as a hinge, and so secured by a detachable wire pintle, d', as indicated in Figs. 1 and 3. The front side of the sight-box has an oblong square opening, d'', which is divided vertically by a detachable transverse partition, d''', into two equal parts, which partition has a large central opening, closed by a semi-transparent disk in the usual manner, the light striking upon this disk from the candle and the gas during ignition being reflected to the eyes of the observer in testing the quality of the gas being consumed by the burner G in the usual well-known manner. The partition d'' is a rectangular plate of sheet metal, with fixed bracing-strips at its upper and lower edges, that keep it vertical across the top and bottom of the box D, while the reflecting-plates 5 5 are held detachably in position at the rear side of the interior of the sight-box by a vertical groove, in which the partition slides up and down when opening and closing the said box.

In using this portable or hand photometer, the operator lights the test-candle, which, being constantly pressed upward by a spring in the tube, in which the candle is held down by a thimble, a''', in the usual manner, always keeps the center of the flame at the same height, and in the same horizontal line with the center of the open ends of the sight-box and its semi-transparent disk d''. When the photometer is held by his one hand, in the position shown in Fig. 1, he walks up to the ignited gas-burner G, and hooks the free end of the scale F around said burner; then, walking or moving toward the test-candle, and keeping the candle-flame, the open ends of the sight-box, and the gas-flame in alignment with each other, until he brings the two reflecting-disks into perfect unison as to their respective lights, in the usual well-known manner. He then observes the candle-power of the gas being tested by observing the number indicated by b'' on the scale, and also the inches of pressure.

The test being now finished, he detaches the hook f' from the burner G, and, inserting his finger through the hook for the purpose of preventing from being retracted too violently against the stop b'', he moves back the detent or spring-catch e', and allows the scale to be retracted at moderate or safe speed. He then blows out the flame of the candle, and proceeds to pack the various disjoined parts into a corresponding box, (see Fig. 4,) which need not exceed eleven inches in length and four inches in height and width.

The figure shows the open box, with all the parts of the photometer safely packed therein, ready for closing.

As there is considerable variation in the capacity of ordinary burners of the same class, it is important, in testing the quality of gas, that a test-burner be used, and also a pressure-gage, in order that the nearest approximation to an absolutely correct test be obtained, and, therefore, a test-burner and a small pressure-gage accompany the photometer, and shown applied in Fig. 1, G being the said test-burner, and H the pressure-gage.

The ordinary burner is first detached from the bracket I, then a short thimble, i', screwed on in place thereof, and the tapering lower end of g' inserted into a correspondingly-tapered hole in i', forming together a ground or gas-tight joint thereat.

The test-burner G is permanently screwed into the upper end of g', and the horizontal portion h' of the presser-gage H permanently inserted into the side of g', the pressure-gage being permanently secured to the under side of h', all substantially as represented in the drawing.

The gage H consists of a U-shaped glass tube, h'', containing a portion of water, and permanently secured to a scale, h''', the said tube being closed at one end, while the opposite end communicates with the bracket I and test-burner G, and consequently the variable pressure of the gas will be shown by the height of the variable column of water in line with the division on the scale.

It will be seen and clearly understood, without any further description and explanation, that the objects sought to be accomplished—*i. e.*, "to afford a reliable photometer, which can be held in one's hand and operated with facility and accuracy when in connection with the burner of the ignited gas which the operator may desire to test, and also that can be readily separated into several distinct parts, and packed within a small box, which can easily be carried in hand, or placed in one's traveling-trunk for the purpose of transportation, ready for immediate readjustment and use, as occasion may require"—have been attained.

I do not desire to claim the use of the test-burner and pressure-gage; but, at the same time, it is intended that they accompany the photometer in the box, to be used where a

more accurate test of the gas may be desirable than can be obtained by the use of an ordinary burner without a pressure-gage attached; but

Having fully and clearly described my invention, I claim—

In a portable or hand photometer, substantially as described, the flexible steel scale F, the take-up spring-cylinder E, and the sight-box supporter b'' and friction-roller b^4, permanently secured together, as described, in combination with the detachable candle-stand A, arm B, supporting-brace C, and sight-box D, the said fixed and detachable parts being constructed and arranged to be carried and operated in hand, in connection with a gas-burner, for the purpose set forth.

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Witnesses:
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