

No. 611,623.

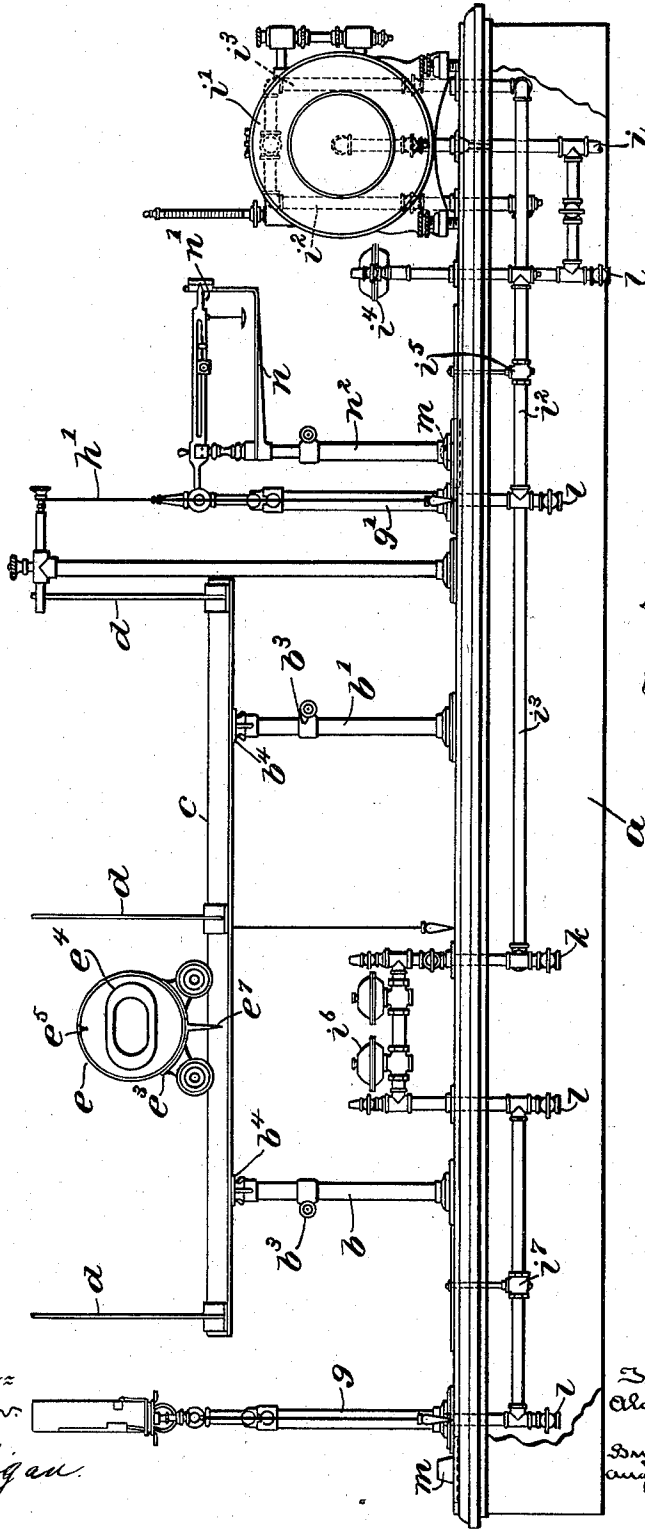
Patented Oct. 4, 1898.

A. GARTLEY.
PHOTOMETER.

(Application filed Nov. 16, 1897.)

(No Model.)

5 Sheets—Sheet 1.



Witnesses:
 W. Jackson
 K. H. Sullivan.

Inventor—
 George Swithey
 By
 Augustus Broughton
 Attorney

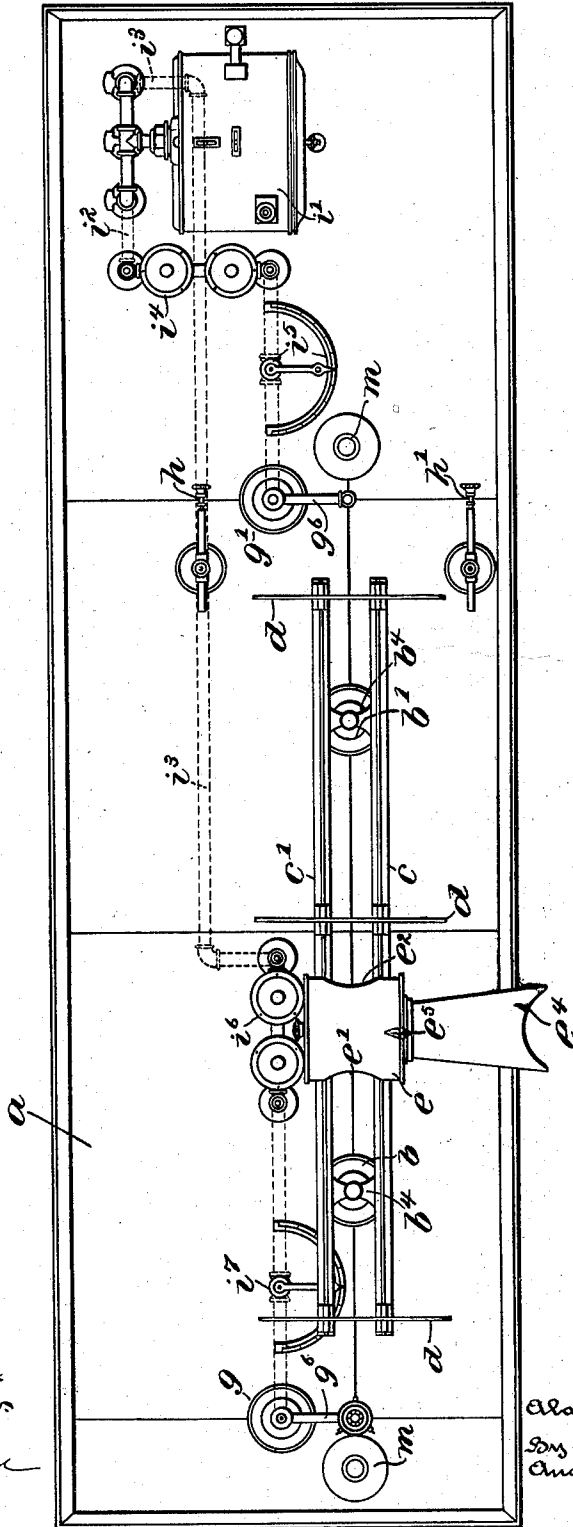
A. GARTLEY.
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(No Model.)

5 Sheets—Sheet 2.

Fig. 2



Witnesses:
 W. B. Jackson
 K. H. Kilgus

Inventor
 Alonzo Gartley
 By
 Augustus B. Stoughton
 Attorney.

No. 611,623.

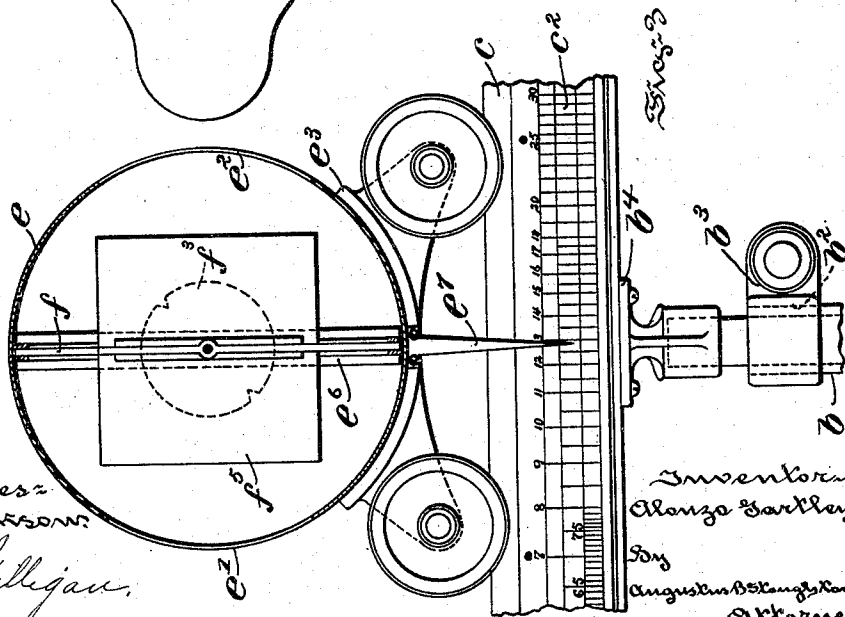
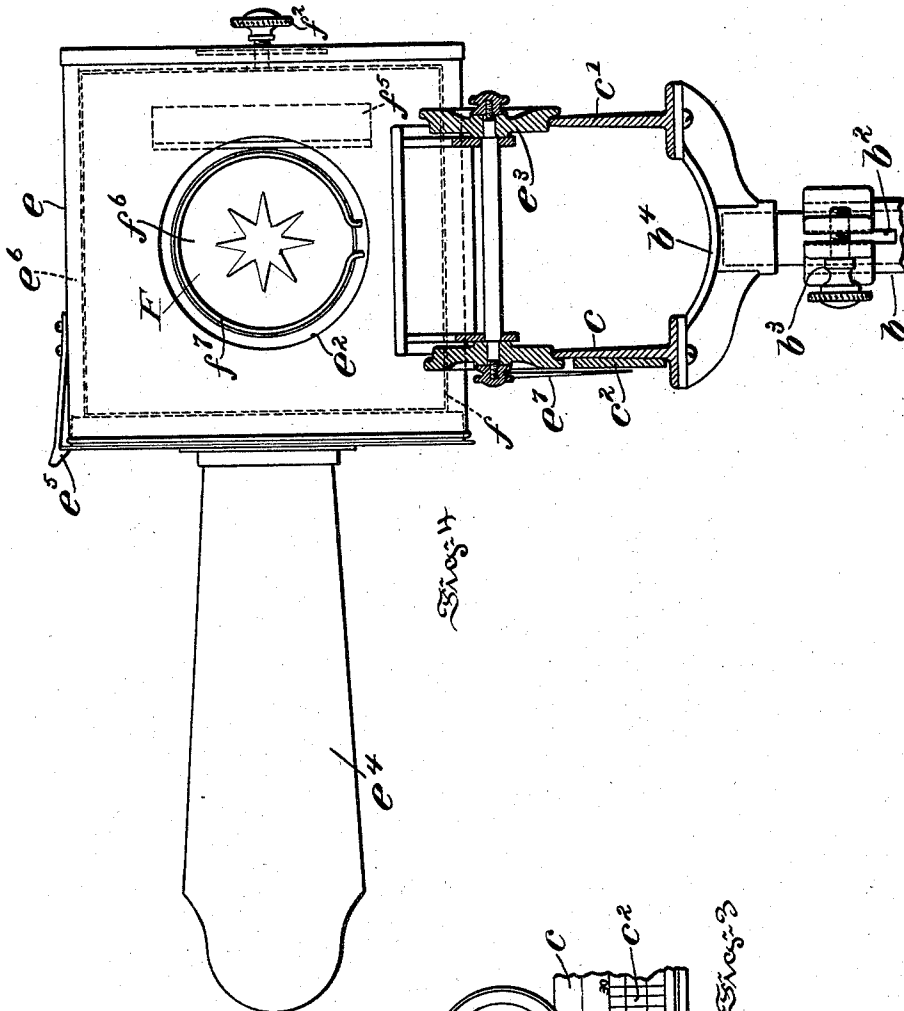
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Witnesses:
W. D. Jackson.

K. M. Sullivan.

Inventor
Alonzo Gartley
By
Augustus B. Langston
Attorney

No. 611,623.

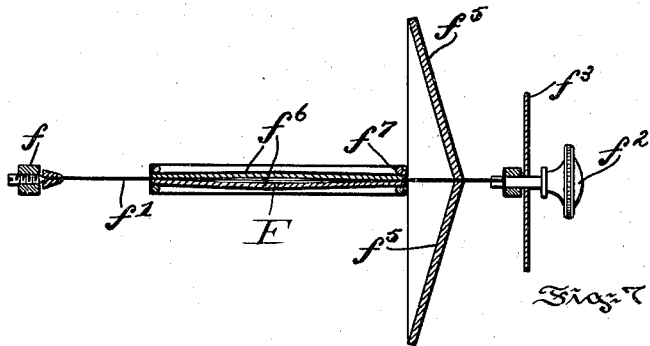
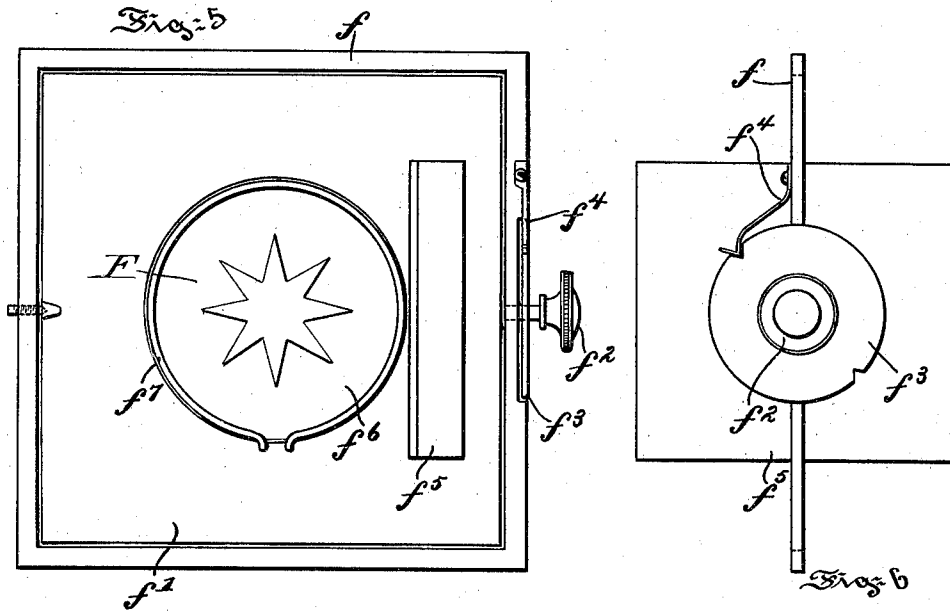
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A. GARTLEY.
PHOTOMETER.

(Application filed Nov. 18, 1897.)

(No Model.)

5 Sheets—Sheet 4.



Witnesses:
W. B. Jackson
K. A. Killigan

Inventor:
Alanzo Gartley
By
Augustus S. Stangor
Attorney

No. 611,623.

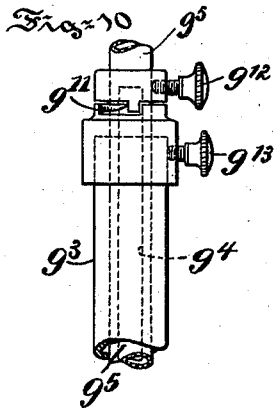
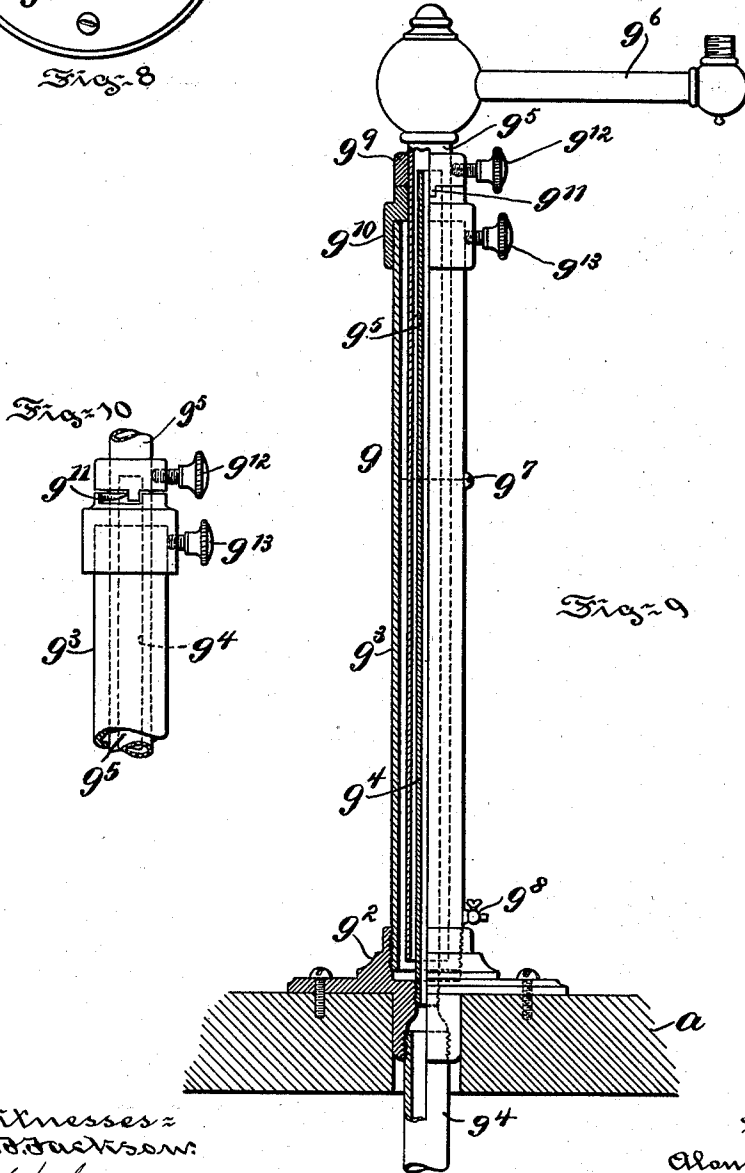
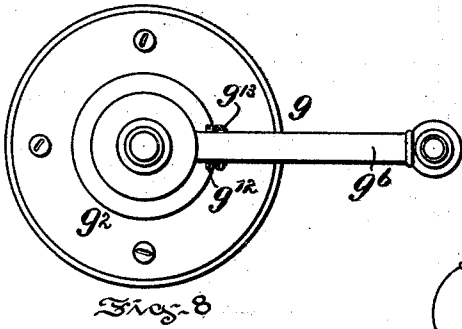
Patented Oct. 4, 1898.

A. GARTLEY.
PHOTOMETER.

(Application filed Nov. 16, 1897.)

(No Model.)

5 Sheets—Sheet 5.



Witnesses:
W. B. Jackson
K. B. Sullivan

Inventor:
Alonzo Gartley
By
Augustus S. Stoughton
Attorney.

UNITED STATES PATENT OFFICE.

ALONZO GARTLEY, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE UNITED GAS IMPROVEMENT COMPANY, OF SAME PLACE.

PHOTOMETER.

SPECIFICATION forming part of Letters Patent No. 611,623, dated October 4, 1898.

Application filed November 16, 1897. Serial No. 658,686. (No model.)

To all whom it may concern:

Be it known that I, ALONZO GARTLEY, a citizen of the United States, residing in the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Photometers, of which the following is a specification.

Objects of my invention are to provide a simple, durable, and accurate photometer which may be readily manipulated and conveniently operated, and to so construct, combine, and arrange the various parts of the instrument as that the same do not require frequent, difficult, or laborious adjustment.

My invention consists in the improvements hereinafter described and claimed.

The nature, characteristic features, and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, and in which—

Figure 1 is an elevational view of the complete instrument. Fig. 2 is a top or plan view of the same. Fig. 3 is a side view of the sight-box, showing part of the bar on which it travels. Fig. 4 is an end view of the same, showing a sectional view of the bar. Figs. 5, 6, and 7 are respectively face, edge, and sectional views of the mirror-carrier and its accessories. Figs. 8 and 9 are respectively a plan and a part sectional and part elevational view of the adjustable gas standard and seal, and Fig. 10 is a view illustrating details of construction of the upper portion of the gas-standard shown in Fig. 9.

In the drawings, a is a table or other suitable base or support. Upon this table are standards or uprights b and b' . As shown, the lower part of each of these standards comprises a tubular socket split near its top, as shown at b^2 , Fig. 4, and provided with a strap and binding-screw b^3 , and the upper part of these standards comprises a post movably fitted to the described socket and provided with arms, as b^4 . In consequence of this construction it follows that the standards are adjustable as to height and may be clamped after adjustment by means of the binding-screws b^3 . The arms b^4 carry paral-

lel rails $c c'$, which may be angle-irons and which are attached to the arms, for example, by means of screws. These rails are provided with a suitable scale, as c^2 , and constitute the bar of the photometer. The use of the rails and their supporting-arms is advantageous, because these parts present comparatively little surface from which light can be reflected, and, as is well known, the reflection of light from surrounding objects would detract from the accuracy of the instrument.

d are screens provided with suitable openings and adapted to the rails $c c'$.

e is a sight-box, shown as cylindrical in form. It is provided with openings e' and e^2 in its curved walls for the admission of the light from the sources which are to be compared. This sight-box is mounted on a carriage e^3 , that is provided with wheels adapted to the rails c and c' . The cylindrical form of the sight-box not only makes it very compact, but also enables its center of gravity to be brought comparatively near its wheel-base, so that it is not likely to be upset or derailed. One side of the sight-box is provided with a sight-tube or eyepiece e^4 and is detachably held to place, as by a clip e^5 . The interior of the sight-box is provided with guides e^6 , which detachably hold a frame f , Fig. 5, so that the frame f may be slid between the guides e^6 , and thus inserted in or removed from the sight-box. The sight-box is also provided with a pointer or index e^7 , that coöperates with the scale c^2 . Within the frame f is journaled a mirror-carrier f' in such manner that it may be rotated around its horizontal axis. The mirror-carrier is provided with a thumb-nut f^2 , which projects from the rear side of the sight-box and constitutes means by which the mirror-carrier may be rotated.

f^3 is a notched disk secured to the mirror-carrier and coöperating with a detent f^4 , which serves to arrest and hold the mirror-carrier in vertical position.

On each side of the mirror-carrier is a mirror f^5 , set at an inclination so as to properly present the images for comparison to the eye. The mirror-carrier f' is provided with a central aperture in which are mounted glass

disks f^6 , and between them a disk or disks F, having different degrees of translucence. Such a disk may be made of properly-prepared paper or parchment having an oil spot thereon. Wires f^7 , bent in the form of split rings, are used for holding these parts to place. Such wires by their own resiliency serve for the accomplishment of this result by engagement with a suitable flange.

From the foregoing description it will be obvious that the mirror-carrier and parts connected therewith may be turned through a half-revolution by means of the thumb-nut f^2 and without disturbing the rest of the instrument, which is advantageous, because it enables the operator to take a number of readings with the mirror-carrier turned to present its different sides to the respective lights, and by taking the mean of these readings accuracy is insured. Adjacent to the ends of the rails $c c'$, that constitute the photometer-bar and a little out of line therewith, are located gas-standards g and g' . These gas-standards are supported on the table a and are illustrated in Figs. 8, 9, and 10. In said figures, g^2 is a socket constructed as shown and secured to the table a . From this socket rises an exterior pipe g^3 and also an interior pipe g^4 , which conveys gas. Between these pipes g^3 and g^4 depends an intermediate pipe g^5 , which communicates at its top with a gas-bracket g^6 , adapted to receive either the standard-light or the burner which is to be tested, according to the work which the instrument is required to do. The space between the exterior and interior pipes g^3 and g^4 is filled with mercury or other suitable fluid—for example, to the height indicated by the dotted line g^7 —and a petcock g^8 may be provided for use in renewing the mercury or other fluid.

From the foregoing description it is obvious that the bracket g^6 , and with it the pipe g^5 , may be elevated and depressed and also rotated with respect to the other parts of the standard. This is advantageous, because it enables the operator to adjust the light properly in a vertical direction with respect to the sight-box and also to turn the light out of the way when he desires to use a candle-balance, as will be hereinafter described.

g^9 and g^{10} are collars fitted, respectively, to the pipes g^5 and g^3 . One of these collars is provided with a lug and the other with an offset, as shown at g^{11} , which serve to limit the rotary motion of the bracket g^6 . Each of these collars is detachably clamped to the part upon which it is mounted by means of set-screws g^{12} and g^{13} . In use the set-screw g^{12} may be withdrawn and the pipe g^5 and its bracket adjusted vertically into correct position through the collar g^9 , whereupon the latter is locked to place by turning up the set-screw g^{12} . Thus the bracket is held at a proper height from the table. The bracket may then be turned into proper position, which may be determined, for example, by reference to the

plumb-lines h and h' , the collar g^{10} being freed from the support g^5 by the release of its set-screw g^{13} during this operation. After the bracket g^6 has been turned into proper position the collar g^{10} is shifted so as to bring the notched parts g^{11} into contact with each other, as shown, whereupon the set-screw g^{13} is again set up. After this adjustment has once been made the bracket g^6 may be turned back out of the way and again turned into position for use, and this latter turning motion will be arrested at the proper time by the notched portions g^{11} .

The gas to be tested enters by way of pipe i , which leads to the meter i' , mounted upon the table a and in plain sight of the operator. From the meter there are two valved outlet-pipes i^2 and i^3 . The outlet-pipe i^2 conducts the gas through the double dry governor i^4 and thence past the micrometer-cock i^5 to the gas-standard g' . The other pipe i^3 conducts gas through the governor i^6 past the micrometer-cock i^7 to the gas-standard g , so that by the proper manipulation of the valves the gas to be tested may be led to either end of the instrument and all the gas connections, as well as the other accessories of the instrument, may be supported by the table a . The valved standard gas-inlet pipe k is tapped into the pipe i^3 , as shown, so that by the appropriate manipulation of the described valves it is possible to lead the standard gas to either of the gas-standards, as desired.

l are drip valves and outlets which are provided at suitable locations on the gas-pipes.

m are posts or pins suitably mounted on the table a and adapted for the reception of a removable candle-balance n . The candle-balance comprises a pivotal scale-beam that carries one or more candles in proper position with respect to the sight-box and is provided with a weight and scale n' . The standard n^2 of the candle-balance is made in two parts, adjustable in respect to each other and provided with a strap and binding-screw, as has been described with reference to Fig. 4, and to the standards b and b' . This construction permits of the convenient adjustment of the candle or candles into proper position.

The described photometer may be used in the way usual with so-called "Bunsen" photometers. However, I will add a brief description of one way of operating it. The Argand burner shown at the left-hand end of Fig. 1 is brought into the position indicated in Fig. 2 and is standardized by comparison with the light of a standard candle burning in the balance n . For this purpose the supply and pressure of gas delivered to the Argand burner are properly adjusted by the means and adjustments described. The required comparison of the lights is effected by reference to the disk F, more particularly to the spot thereon as reflected in the mirror f^5 and to the position of the sight-box e in respect to the lights. The candle-balance is

then removed and the light to be measured is mounted on the right-hand bracket g^6 . The latter is then turned into the position indicated in Fig. 2 and adjusted with respect to the standard light and to the center of the light-box by means of the adjustments herein fully described. Comparison of the lights is then made by reference to the images upon the mirror f^5 and to the distance of the lights from the sight-box. The candle-powers corresponding to various distances are ascertained usually by reference to tables prepared for this purpose. By turning the knob or thumb-nut f^2 the disk F and mirror are turned or reversed with respect to the lights, so that error on the part of the operator is obviated and accuracy is insured.

It will be obvious to those skilled in the art to which my invention appertains that modifications may be made in details without departing from the spirit thereof. Hence I do not limit myself to the precise construction and arrangement of parts hereinabove set forth and illustrated in the accompanying drawings; but,

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a photometer the combination with parallel elevated tracks having a space between them of a sight-box provided with a light-inlet aperture arranged between the tracks, whereby reflected light is excluded from the sight-box, substantially as described.

2. In a photometer the combination of parallel tracks having an open space between them, adjustable standards provided with arms for supporting said tracks in elevated position, and a sight-box provided with wheels adapted to said tracks and with a light-inlet aperture arranged between said tracks, substantially as described.

3. In a photometer the combination of standards provided with diverging arms, tracks applied to the ends of said arms whereby a space is afforded between said tracks, lights arranged between said tracks, and a

sight-box movable on said tracks and provided with a light-inlet aperture located between the tracks, substantially as described.

4. In a photometer the combination of a photometer-bar, a gas-standard provided with a rotatable bracket, and adjustable interlocking collars, substantially as described, for arresting the rotation of the bracket in position for use, substantially as specified.

5. In a photometer the combination of an interior gas-pipe, a fixed exterior pipe constituting with the gas-pipe a chamber for a fluid seal, an intermediate pipe depending between the two first-mentioned pipes, a bracket attached to the intermediate pipe, and interlocking collars provided with set-screws and constructed to limit the motion of the gas-bracket, substantially as described.

6. In a photometer the combination of a sight-box, a frame removably fitted to the interior of the sight-box, and a mirror-carrier revolubly fitted to said frame and provided with mirrors and disks, substantially as described.

7. The combination in a photometer of a sight-box, a mirror-carrier revolubly mounted therein and provided with mirrors and disks, and a notched wheel and detent for arresting rotary motion of the carrier, substantially as described.

8. The combination in a photometer of a sight-box, a mirror-carrier revolubly mounted therein, and means accessible from the outside of the box for rotating the mirror-carrier, substantially as described.

9. The combination in a photometer of a sight-box provided with a detachable cover and with guides, a frame adapted to said guides, and a mirror-carrier and its accessories pivotally supported in said frame, substantially as described.

In testimony whereof I have hereunto signed my name.

ALONZO GARTLEY.

Witnesses:

F. H. MACMORRIS,
THOS. A. JAMES.