No. 783,568. PATENTED FEB. 28, 1905.

E. F. CHASE.

PLANIMETER.

APPLICATION FILED MAR. 5, 1904.

Fig. 1.

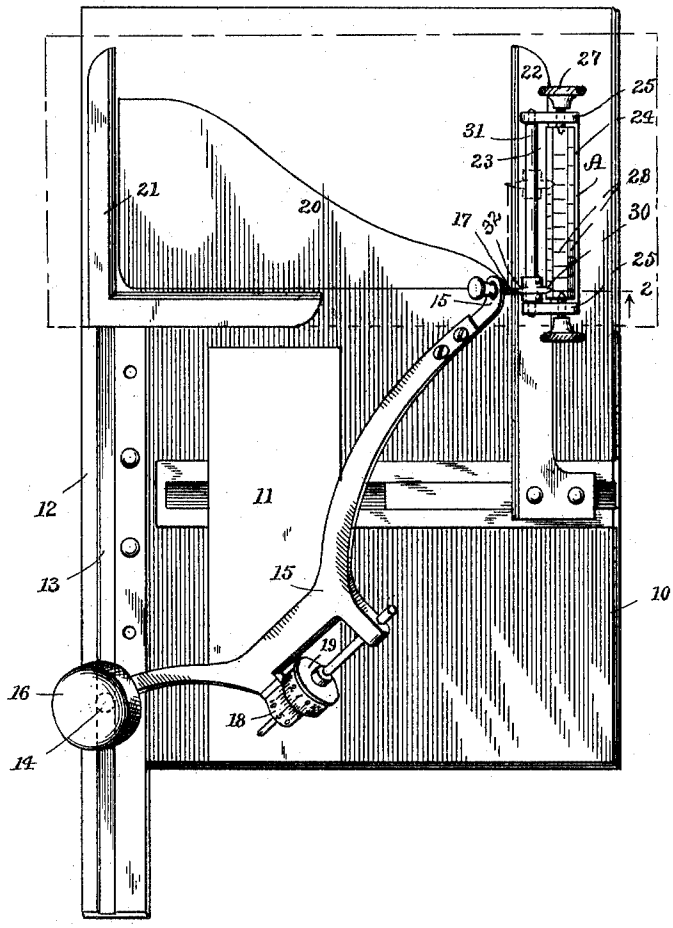


Fig. 2.

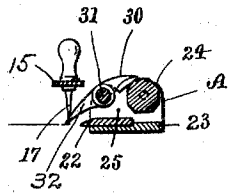


Fig. 3.

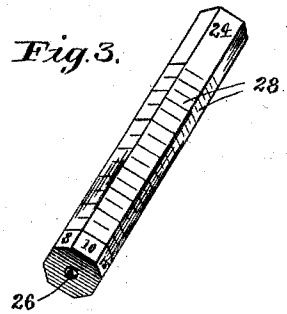


Fig. 4.

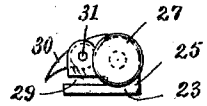
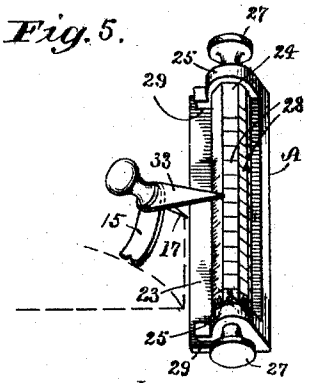


Fig. 5.



Witnesses.

L. E. Dishrow.

S. W. Atherton

Inventor.

Ernest F. Chase

By A. M. Wooster

Attorney.

No. 783,568. Patented February 28, 1905.

UNITED STATES PATENT OFFICE.

ERNEST F. CHASE, OF BRIDGEPORT, CONNECTICUT.

PLANIMETER.

SPECIFICATION forming part of Letters Patent No. 783,568, dated February 28, 1905.

Application filed March 5, 1904. Serial No. 196,651.

To all whom it may concern:

Be it known that I, ERNEST F. CHASE, a citizen of the United States, residing at Bridgeport, county of Fairfield, State of Connecticut, have invented a new and useful Planimeter, of which the following is a specification.

My invention has for its object to provide an attachment applicable to planimeters of the well-known Coffin type which will enable the operator to take instantly and without any computation whatever the mean effective pressure of an indicator-diagram.

With this and other objects in view I have devised the novel detachable planimeter-scale, of which the following description, in connection with the accompanying drawings, is a specification, reference characters being used to indicate the several parts.

Figure 1 is a plan view of a planimeter of the Coffin type with an indicator-diagram in place thereon illustrating the application thereto of my novel scale; Fig. 2, a section of the scale and the tracer-arm on the line indicated by 2 in Fig. 1; Fig. 3, a perspective of the scale-piece detached; Fig. 4, an end view of the scale detached, and Fig. 5 is a perspective illustrating a variant form of the invention in which the indicator-pointer is carried by the tracer-arm.

10 denotes the planimeter-base; 11, the usual soft-paper slip; 12, a plate secured to the base and having a groove 13 to receive the guide-pin 14 of the tracer-arm 15; 16, a removable weight by which the guide-pin is retained in the groove; 17, the tracing-point; 18, the vernier; 19, the measuring-wheel; 20, an indicator-diagram; 21, a fixed retaining-clamp, and 22 an adjustable retaining-clamp by which the indicator-diagram is retained upon the base. These parts are all in common use on planimeters of the Coffin type.

My present invention consists of the detachable scale, which I have indicated as a whole by A and which slides over the adjustable retaining-clamp.

The scale consists, essentially, of a frame or carrier 23 and a scale-piece 24, rotatably mounted thereon. The frame is shown as provided with end pieces 25 and the scale-piece as provided in its ends with central conical recesses 26, which are engaged by the points of set-screws 27, which engage the end pieces, thus making the scale-pieces interchangeable and providing for scales of any character that may be required. The set-screws are tightened up sufficiently to hold the scale-piece against rotation under the ordinary conditions of use, but at the same time permitting it to be rotated in setting. I have shown the scale-piece as adapted to receive eight scales, which are indicated by 28. These scales are graduated to correspond with the strength of the various pressure-springs used in indicators, as eight, ten, fifteen, thirty pounds, &c. The end pieces are shown as provided with slots 29, which receive the adjustable clamp, as clearly indicated in Fig. 1, my novel scale being applied to a planimeter by simply sliding it over the free end of the adjustable clamp which is received in the slots. Coacting with the scales upon the scale-piece is a pointer 30. In the form illustrated in Figs. 1, 2, and 4 this pointer is mounted to slide on a rod 31, the ends of which are rigidly secured in end pieces 25. This form of pointer is provided with an arm 32, which is adapted to be engaged by the tracing-point upon the tracer-arm, as will be more fully explained. In the form illustrated in Fig. 5 the pointer, which in this form I have indicated by 33, is secured to and is carried by the tracer-arm.

The operation is as follows: In order to determine the mean effective pressure of steam in a cylinder during a stroke of the piston by means of my novel scale, the operator first uses the planimeter in the usual manner. The zero-mark in the scale upon the measuring-wheel is caused to register with the zero-mark in the vernier when the tracing-point is at the extreme right end of the diagram, as in Fig. 1. The diagram is then traced by the tracing-point in the usual manner. After tracing the diagram and when the tracing-point is again at the starting-point the mean effective pressure is obtained as follows: If the diagram is made by an indicator having an eight-pound spring, the scale-piece is turned to place the corresponding scale thereon in po-

sition to register with the pointer, as in Figs. 1 and 5, the scale being of course located on the sliding clamp so that the zero-line of the scales will coincide with the starting position of the tracing-point. In the form illustrated in Figs. 1, 2, and 4 the arm of the pointer is then placed in engagement with the tracing-point and the latter is moved upward along the inner face of the sliding clamp, as in Fig. 1, until the zero-mark upon the measuring-wheel again registers with the zero-mark of the vernier.

In the form illustrated in Fig. 5, in which the pointer is carried by the tracer-arm instead of there being an independent pointer on the scale, the operation is precisely the same, as indicated in Fig. 5, in which the scale is shown as taking the mean effective pressure of a diagram from an indicator having an eight-pound spring. The full lines upon the scale indicate pounds of pressure. It will be noted, therefore, that the mean effective pressure indicated in Fig. 5 is six and one-half pounds.

Having thus described my invention, I claim—

1. A scale for taking the mean effective pressure of indicator-diagrams comprising a planimeter having a tracer-arm, a removable rotatable scale-piece having scales corresponding with the pressure-springs of indicators, a pointer carried by said tracer-arm and adjacent to but separate from the tracing-point thereof, said pointer overlapping the scale-piece.

2. A scale for taking the mean effective pressure of indicator-diagrams comprising a frame adapted for attachment to a planimeter, a rotatable scale-piece having scales corresponding with the pressure-springs of indicators and a pointer mounted to slide upon the frame which coacts with the scales upon the scale-piece and is provided with an arm adapted to be engaged by the tracing-point of a planimeter, the said scale-piece being mounted in position to coact with said pointer.

3. A scale for taking the mean effective pressure of indicator-diagrams, comprising a frame having slots to receive the sliding clamp of a planimeter by which it is carried, a rotatable scale-piece having scales corresponding with the pressure-springs of indicators and a coacting pointer which is operated by the tracer-arm of a planimeter, the said scale-piece being mounted in position to coact with said pointer.

4. The combination with the tracer-arm and adjustable clamp of a planimeter, of a frame adapted to engage the adjustable clamp, a rotatable scale-piece removably supported by the frame and having scales corresponding with the pressure-springs of indicators and a coacting pointer operated by the tracer-arm, said pointer being separate from but adjacent to the tracing-point of said arm and overlapping the scale-piece.

5. A planimeter having a scale adjacent to the end of the tracer-arm, and a pointer movable along and overlapping said scale and adapted to be controlled in its movements by the said tracer-arm, said pointer being separate from but adjacent to the tracing-point of said arm.

6. A planimeter having a series of scales adjacent to the end of the tracer-arm, and a pointer separate from but adjacent to the tracing-point of said arm and movable along and overlapping said series of scales and adapted to be controlled in its movements by the said tracer-arm, either one of said scales being adapted to be placed in operative position to coact with said pointer.

In testimony whereof I affix my signature in presence of two witnesses.

ERNEST F. CHASE.

Witnesses:

A. M. WOOSTER,

S. W. ATHERTON.