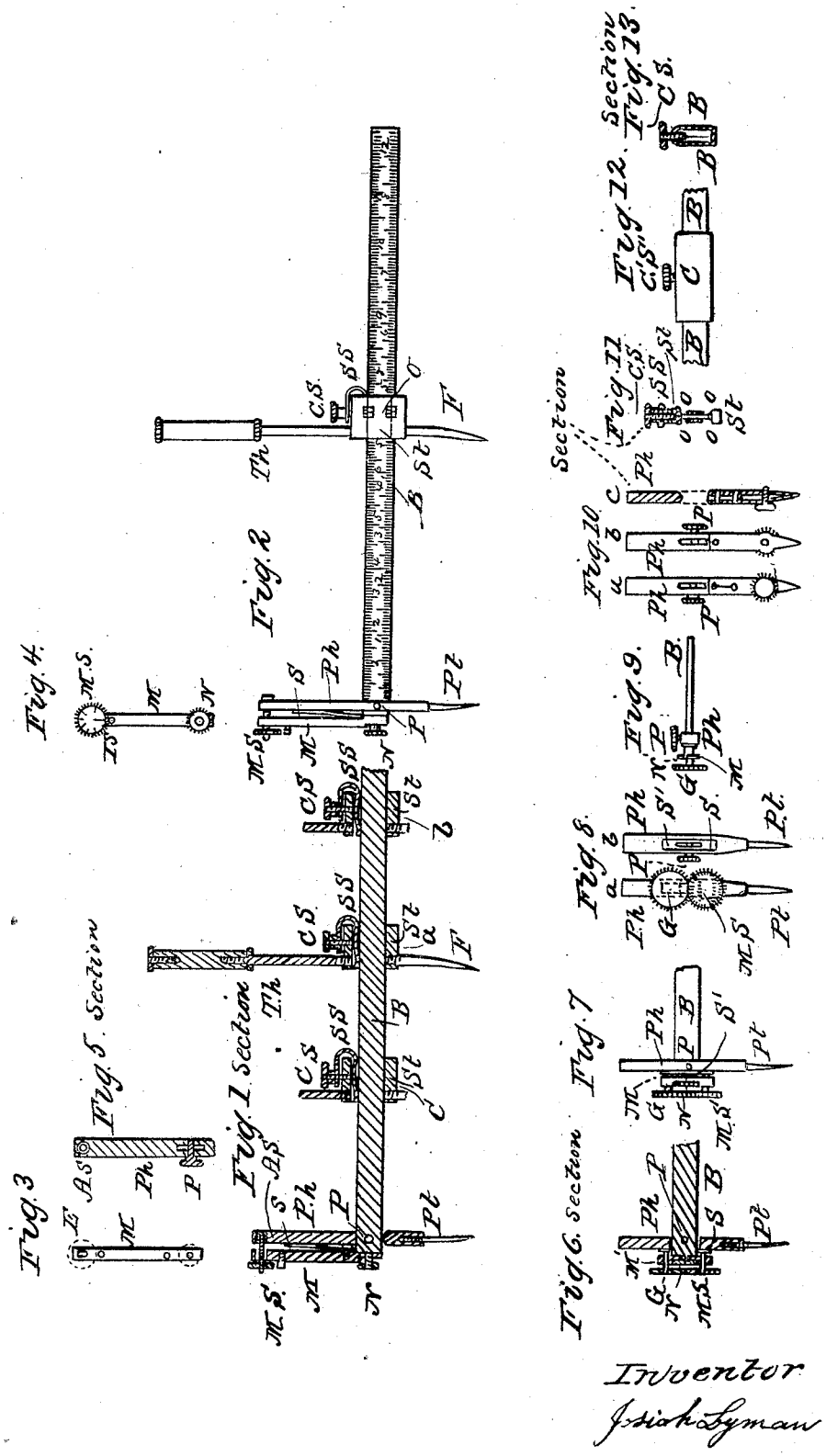
J. LYMAN.

Dividers.

No. 111,954. Patented Feb. 21, 1871.



Inventor
Josiah Lyman

United States Patent Office.

JOSIAH LYMAN, OF LENOX, MASSACHUSETTS.

Letters Patent No. 111,954, dated February 21, 1871.

IMPROVEMENT IN BEAM-COMPASSES.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, JOSIAH LYMAN, of Lenox, in the county of Berkshire, in the State of Massachusetts, have invented a new and Improved Draughting Instrument, which I call Scale-Dividers; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawing and to the letters of reference marked thereon.

My invention consists in making the beam of the dividers a finely divided scale, with the pen or point-holder permanently pivoted to one end, so as to constitute one leg nicely adjustable, whose motion is, at the same time, capable of the most accurate measurement, while the other leg, embracing a sliding index, a friction-clamp, and spring, with thumb and foot pieces, is susceptible of any desired degree of smoothness and delicacy of motion.

Thus each of the parts is rendered far more convenient, reliable, effective, and of greater variation than either can be by itself alone.

To enable others skilled in the art to comprehend and use my invention, I will describe in detail its construction and application.

Figure 1 represents a longitudinal section of the instrument, with the first form of the micrometer attachment, and the sliding leg in its several parts and positions.

Figure 2 shows a side elevation of the same, with the graduation of the visible side of the beam, with openings and index marks in the sliding leg for each of the scales.

Figure 3 gives a longitudinal section of the first form of the micrometer-piece M, with its elongated orifice, E, for the action and play of the micrometer-screw M S.

Figure 4 gives a side elevation of the same in the end view of the instrument.

Figure 5 gives a longitudinal section of both pen and point-holder, as far down as the under border of the beam, to which point the two are identical, including the manner of its attachment to the beam by means of the steel pivot P.

Figure 6 represents a longitudinal section of the instrument with the second form of the micrometer attachment, showing the form of the micrometer-piece M′, with its nut N′, gear-screw G, micrometer-screw M′ S′, and spring S′.

Figure 7 shows a side elevation of the same.

Figure 8, *a*, is an end view of the same, with the gear, and micrometer-screws, and nut, all in their normal positions.

Figure 8, *b*, is the same, with these parts removed.

Figure 9 is a bird's-eye view of the same.

Figure 10 gives side elevations of the pen P′ *n*; *a*, showing the micrometer side; *b*, the opposite side; and *c*, a longitudinal section of the same.

Figure 11 presents a transverse section of the sliding index, with its four orifices, *o o o o*, for reading the several scales.

Figure 12 exhibits a side elevation of the extension-clamp for joining two beams, so as to give the instrument any desired length.

Figure 13 gives a transverse section of the same.

The beam B, figs. 1 2 6 7 9, consists of a steel plate of any desired length, from two to twelve inches, three-tenths of an inch wide, and one-sixteenth of an inch thick, graduated accurately with four scales, viz., two on each side.

Near one end of this, by means of the steel pivot P, is attached the pen P′ *n*, or point-holder P *h*, figs. 1 2 5 6 7 9 10.

Close by its upper end, in the first form, figs. 1 5, is a very fine-threaded screw, made of bronze, for the adjustment of the micrometer-screw M S.

The axis of this screw and the point of the pen or holder are nearly equidistant from the center of the pivot P. Hence the threads of the former are made either to correspond in distance with the length of the divisions of the several scales, or to have a known and convenient ratio therewith. For instance, if the threads of the micrometer-screw are one-fortieth of an inch, the point of the pen or holder would vary one-fortieth of an inch, equivalent to five two-hundredths of an inch, at each revolution. Therefore, one-fifth of a revolution would give one two-hundredths of an inch; *i. e.*, if half an inch is taken as the unit, one one-hundredth thereof. Or, if the fourth of an inch is taken as the unit, one-tenth of a revolution would give one one-hundredth of the unit.

These divisions are shown in the milled-headed micrometer-screw M S, fig. 4.

But if the threads of the micrometer-screw are one-sixtieth of an inch, and the distance of its axis below the axis of the pivot is one-fifth of an inch, while the point of the pen or holder is six times this distance, as shown in the second form of the attachment, figs. 6 7 8, one revolution of the micrometer-screw would vary the point of the pen or holder one-tenth of an inch, or one-tenth of a revolution would vary the same one one-hundredth of an inch; and one-fortieth of a revolution would vary it one-fourth as much.

If, therefore, the units of the scale be fourths of an inch, and the head of the micrometer-screw be divided into forty equal spaces, as shown in *a*, fig. 8, a portion of a revolution equal to one of them would give one one-hundredth of the unit; and the eye will readily divide these spaces into five equal parts. In a similar manner may the fractional parts of any other unit be indicated by the graduated marks on the head of the micrometer-screw.

Thus, it appears, that in laying down or measuring distances on paper, the units and tenths may be read directly on the scale, while the hundredths and thousandths are read on the head of the micrometer-screw.

In using the first form of the micrometer the

fine groove or slot in the head of the index-screw I S, fig. 4, is taken as a reading mark or index, and in the second form a mark on the pen *a*, fig. 10, or point-holder, fig. 8, serves the same purpose. In the former the micrometer-spring S, figs. 1 2, acts steadily and constantly against the micrometer-screw, so as to produce a smooth, steady, uniform motion. In the latter the spring merely produces a gentle, constant pressure against the pen or point-holder, so as to prevent all play between them and the screws G and M' S'.

The slide, with its thumb-piece, T *h*, of ivory and iron wire, clamp-screw, C S, friction-spring, S S, sliding index, S *l*, (all of German silver,) and foot-point, F, of steel, constitutes the moving leg, though in drawing circles it is always stationary.

The gear-screw G is a thumb-screw, acting upon and turning backward or forward the micrometer-screw M' S', as occasion may require. The two are milled with the same number of teeth, placed with their axes at equal distances from the pivot-axis.

In both forms of the micrometer the pen and point-holder are adjustable. In the second form, however, not only is their nicety of adjustment extreme, being limited simply by a portion of a revolution equal to half a tooth of the gear-screw head, but they can also be turned to any desired degree of obliquity; thus allowing the foot-point of the slide to be brought within the fiftieth of an inch or less of the point of the pen or holder, and superadding to its other qualities those of the bow-pen. The second form has also the advantage over the other in simplicity, lightness, and cost of construction.

Whenever the use of the micrometer as such is not required, it may be used simply for adjustment, and distances may be measured on the scale directly, thus saving time in obtaining them.

One of the prime excellencies of this invention consists in the susceptibility which the sliding index possesses, by means of its friction-clamp C S and friction-spring S S, of any desired degree of friction, smooth and steady, with reliability and firmness of position. This is seen in *a b c*, fig. 1.

In position *c* there is no friction, the clamp C S being left loose, and the German-silver spring S S touching the steel beam in only one point.

At *a* the friction is medium, the spring touching the beam at two points with nearly equal force. At *b* it is the greatest, the clamp being tightly turned.

Another essential peculiarity is the constant parallelism of the two legs, so that their axes are always at right angles, or nearly so, to the plane of the paper. For these causes there is with this instrument a certainty in the position of the points and a neatness in the execution of circles and arcs unattainable in nearly all varieties of dividers.

But for convenience, certainty, and accuracy in its application as a scale for measuring and laying down distances I know of nothing that can claim equality with it.

The same is true of its capacity both as dividers and as a scale for great variation in length, extending from the minutest to the greatest requisite distances. With a short beam of two inches length, for instance, figs. 6 7, a circle of one-fiftieth of an inch radius may be readily drawn, and yet in a moment's time it can be exchanged for one six times as long. And, by connecting two together by the extension-clamp, figs. 12 13, two feet may be reached, if desired.

Finally, if one of the scales graduated on the beam be a scale of chords, or, which is far better, if, instead, a table of chords be used in connection with one of the scales, all angles as well as distances may be laid down upon paper or measured with the greatest precision.

Hence, with the aid of a metallic straight-edge, the instrument answers all the purposes of the nicest protractor.

I claim—

The manner of attacning a permanently-pivoted adjustable pen or point-holder, P *h*, to the end of beam-dividers, as shown and described.

JOSIAH LYMAN.

Witnesses:

WM. S. TUCKER,

GEO. I. TUCKER.