

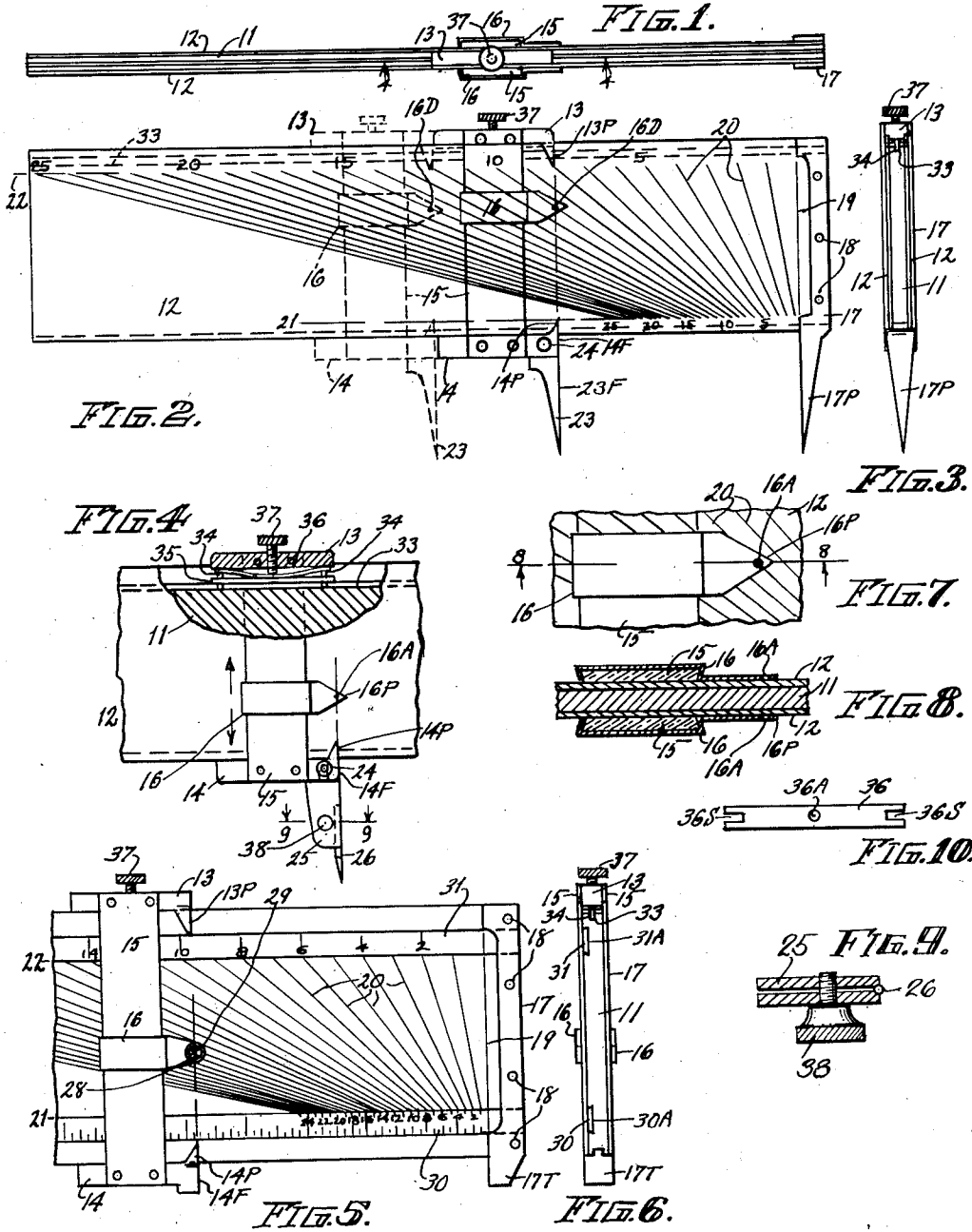
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PROPORTIONAL DIVIDER AND CALCULATOR

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PROPORTIONAL DIVIDER AND
CALCULATOR

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9 Claims. (Cl. 33—158)

My invention relates to a new and useful instrument for use in all fields of engineering and mechanics and is herein designated a proportional divider and calculator.

The main object of the invention is to provide a device for accurately and efficiently proportioning distances, as for example, locating contour lines in map plotting, measuring on odd scale maps, diversified spacing on drawings and shop layouts, etc. This instrument is further useful as a draftsman's compass. Further objects and the multiple utility of my device are hereinafter fully set forth, reference being had to the accompanying drawing in which:

Fig. 1 is a top view, Fig. 2 a front or face view of Fig. 1, and Fig. 3 is a right end elevation of Fig. 2, showing one embodiment of my device.

Fig. 4 is a fragmentary detail view of the central part of Fig. 2 with the upper part thereof in section as between the arrows 4—4 in Fig. 1 and on the line indicated by the latter and showing a certain modification of detail.

Fig. 5 is a modification of Fig. 2 and Fig. 6 a right end elevation of Fig. 5.

Fig. 7 is an enlarged fragmentary view comprising mainly an elevation of the transversely movable indicator and a portion of the longitudinally movable cross bar and the main bar. Fig. 8 is a sectional view as on line 8—8 in Fig. 7.

Fig. 9 is an enlarged sectional detail as on line 9—9 in Fig. 4.

Fig. 10 is a top detail view of the flat metal compression spring used in a cross head guide of the device.

Referring to the drawing by reference numerals, with like characters designating corresponding parts in the various figures, I have illustrated my device in a preferred form resembling in general a well known so-called slide rule, of which the main body is an elongated quadrangular, laminated bar or plate. This bar or plate may comprise a center piece 11 with front and rear face plates 12 of relatively thin, preferably pure white, material. Said plates 12 are a little wider than the center piece 11 thus providing longitudinal recesses in both of the longer edges of the main bar for the purpose of retaining a pair of movable cross-head guides 13 and 14 of which 13 is the upper guide and 14 is the lower guide. Both said guides are firmly connected at both front and rear by a pair of transverse flat cross-bars 15, preferably of transparent material, as indicated in Figs. 2 and 8. These cross bars and guides are movable longitudinally of the main bar 11 and 12, always held in transverse

relation thereto by a spring 36, and one or both carries a removable pointer or indicator member 16, preferably of transparent material, movable transversely of main bar 11—12 and on its bar 15, with the inner face slightly clear of the adjacent face of plate 12 of the main bar. This pointer or indicator member 16, if made of a transparent material will have a round opaque dot, 16D, of a diameter approximately equal to the width of lines 20 on face plates 12. When transverse slide 16 and longitudinal slide 13—14—15 are moved and dot 16D coincides with any line 20 on the adjacent face of plate 12 readings are obtained, as will presently be described (see Fig. 2).

17 is a metal end piece, secured as with rivets 18 on the right hand end of the main bar 11—12, the said end piece bifurcated upwardly to straddle the bar 11—12 and below the latter may be pointed as 17P or have a short terminus as 17T (Fig. 5). In either case the point and inner face of prong 17P or terminus 17T is in alinement with the initial or first delineation 19 line 19 being transverse of the main bar.

On front and or rear face of the main bar 11—12, I provide a series of divergent lines 20, extending from a lower line designated 21 which is parallel to lower edge of the main bar, and spaced apart on said line on a predetermined spacing, say $\frac{1}{16}$ ", between them, starting from the first delineation 19. All said lines terminate on a line designated 22 near and parallel to the upper edge of the main bar, said upper termini spaced apart on said line on a predetermined spacing say $\frac{1}{4}$ ", between them. Thus the delineations 20 will present the fan like design shown in Figs. 2 and 5.

These divergent lines 20 may be placed on a flat face or surface as shown in Figs. 2 and 5, on a cylindrical surface with the lines 20 running divergently around the cylinder or on a flat surface with circular termini lines 21—22, all with the same result, that is a uniform proportioning or dividing of a given distance or measurement into any number of equal spaces.

The lower cross head member 14 is provided with a prong member 23, corresponding to and registering horizontally with prong 17P, having a vertical (right hand) face 23F arranged to be moved horizontally to and into contact with the inner face of prong 17P, and being of course also transverse to the main bar. Said prong 23 may be removably secured to the cross head by means of a set screw 24, and it may be replaced by a pencil lead holder 25 in which the lead point

26 is removably retained, said lead sharpened to a point in alinement with the inner face 14F of the cross head thus comprising means for drawing a circle or arc while using prong 17P as a center. In other words these latter means comprise, with the main bar, a beam compass. Point 26 herein described as a pencil lead may also represent a removable metal point.

The main use of the prongs 17P and 23 is not however for beam compass use but rather to get certain initial measurements or attain certain desired measurements by readings on the divergent lines 20 determined or attained by manipulation of the cross head and the pointer or indicator 16 thereon, an example of which will presently be fully set forth.

The inner right hand end parts of the upper and lower cross head guides 13 and 14 preferably are made with inwardly directed integral pointers 13P and 14P (over the face of the main bar) in alinement with the face 14F or pencil point 26, the tip of said pointers extending to the graduations on the removable scales 30 and 31 whereon readings are taken separately from, or in conjunction with the divergent lines 20. The lower pointer 14P may also be used to facilitate reading of the lower termini of the divergent lines 20 or adjacent scale.

Referring now to the transversely movable pointer 16 (preferably of a transparent material), the same is movable across the face of main bar as from line 21 to 22 and at its point or thereabout is provided with a minute dot 16D (Fig. 2) or crossed so-called hair lines 29 (Fig. 5) on under side adjacent to face of main bar. Said pointer 16 if made of an opaque material may be provided with a minute aperture 16A, Fig. 7, through which is sighted any one of the lines 20 upon coinciding therewith or pointer 16 may have a tapered point 16P in line with face 14F and point 14P of lower cross head guide 14. Said pointer 16 with dot 16D, aperture 16A or point 16P may have an enlarging glass as 28 in Fig. 5 for more accurate reading and placement. The reading point 16D, 16A, or 16P is in alinement with points 13P and 14P and face 14F or 23F.

In Fig. 2 the diverging delineations 20 are designated progressively in multiples of 5 reading from right to left on both the lower and upper lines 21—22, said designated lines may be in other multiples as in Fig. 5, they may also be of a differentiating color to facilitate reading.

Referring to Figs. 5 and 6, removable scale bars 30 and 31 are inserted into the main bar 11—12, said scales may have graduation corresponding to the termini of the lines 20 and or the graduations of any common conventional scale for measurements such as full size, one inch equals one foot, one-quarter inch equals one foot, one inch equals ten feet, etc. These removable scales 30 and 31, any variety of which could be on hand, would facilitate laying out drawings, etc., to any desired scale, and when used in conjunction with the proportional feature of the lines 20, provide a means of dividing a measurement or distance into most any desired number of parts or the multiplying of a measurement or distance. The said scales 30 and 31 are retained frictionally in shallow recesses 30A—31A in the main bar and may be fixed by any suitable means, not shown.

As stated my device is highly satisfactory and efficient for a large number of uses, a simple example of its use being considered sufficient to

disclose its practical and diversified usefulness as follows:

Assuming for example, that a drawing is required to be reproduced accurately to a scale $\frac{1}{2}$ larger than the original. In Fig. 2 the distance between and as defined by the two spaced prongs 17P and 23 may be a certain measurement, say 2". The pointer 16 is then moved on cross bar 15 until dot 16D coincides with any line (20) of a number divisible by 2 and most convenient. In this case line "10" is used as being most easy to increase by $\frac{1}{2}$ namely 5 points. When dot of 16 has thus been made to coincide exactly with line "10" the cross head is moved to the left until the dot coincides with line "15" which of course is $\frac{1}{2}$ greater than "10". The latter position of the cross head will then be as indicated in dotted lines in Fig. 2 and its point or prong 23 will then be spaced exactly 3" from the stationary prong 17P, or the desired greater and proportionate distance with relation to the original measurement of the smaller drawing. Thus any distance originally measured between the points is easily enlarged linearly and accurately, or the process is equally useful for reduction of measurements or distances desired.

As previously described the cross head guide members 13—14 are guided in a shallow groove at both edges of the main bar. Further, the upper of said shallow grooves may also be recessed centrally as 33 (Figs. 3—4 and 6) for guiding a pair of pins 34 extending inwardly from cross head guide 13. 35 is a metal plate with apertures for said pins 34 to pass through, said plate normally pressed down in the groove to frictionally engage the bottom part thereof, a bow-type flat metal spring 36 being interposed between said plate and the guide 13 to maintain yieldable compression and friction contact. Said spring is slotted (as at 36S) the ends to straddle the pins 34 (see Fig. 10) and at the center is an aperture 36A, through which a thumb screw 37 extends downward to contact plate 35, the said thumb screw being accessible over the cross head guide 13 (see Fig. 4). Thus a simple yieldable spring action is provided to maintain proper tension in the entire cross head at all times, and thumb screw 37 can be used at any time to firmly hold the cross head in any desired fixed position.

In Fig. 9 the member 25, removably securable in the lower cross head, is shown as comprising a split body part with a clamping screw 38 to clamp the pencil-lead 26 in position in a plane such that its point coincides with the inner face 14F of the cross head guide and in alinement with the dot 16D, aperture 16A or point 16P on or in the movable indicator 16.

Referring again to the proportional finding means described it will be readily understood that the proportions may be varied to a very wide range. For example any enlargement from a given layout may be made as from 2 to 6, 1 to 5 etc.

Very accurate readings can be obtained as stated by the use of enlarging, lens, vernier adjustment with the proportional feature of the divergent lines 20 thereon, cross-hair lines and equivalent or other well known devices. For more or less approximate results the point 16P itself may be used moving it to coincide with any one of the divergent lines 20.

I claim:

1. In a proportional divider and calculator a surface containing thereon a group of diverging straight lines extending from regularly spaced

termini on one line to correspondingly regular but enlarged spacing of their other termini on another line, said termini lines parallel to each other and in predetermined angular relation to the first one of the diverging straight lines, a cross-head member slidably mounted over said surface and movable in a direction parallel to the termini lines, a pointer member with spot reading means slidably mounted on the cross-head member and movable over said surface in a direction at right angles to the direction of movement of the cross-head member.

2. In a proportional divider and calculator, a main plate provided on each of its two greater surfaces with a group of diverging straight lines extending from regularly spaced termini on a lower line adjacent the lower edge of the plate to correspondingly regular but enlarged spacing of their upper termini on an upper line adjacent the upper edge of the plate, said upper line in parallelism with said lower line and the first of the diverging straight lines on each surface being at right angles to said lower and upper termini lines, a fixed bar and prong member with a face and a point in alinement with the first diverging line, a cross-head member comprising a bar extending over each surface of the main plate with end guides at the lower and upper ends of said bars and a prong part on the lower end guide, and said cross-head member slidably mounted on the main plate and movable in a direction at right angles to the first diverging line and held in parallelism with the fixed bar and prong member, a pointer member slidably mounted on each bar of the cross-head member between the end guides and movable over the two greater surfaces of the plate in a direction at right angles to the direction of movement of the cross-head member, integral pointers one at each side of the lower and upper end guides of the cross-head member and directed inwardly over the greater surfaces of the main plate and extending to the lower and upper termini lines to facilitate reading the respective termini, spot reading means on the pointer members in alinement with the integral pointers on the end guides and the prong part of the lower end guide of the cross-head member to accurately position the pointer member in intersection with any selected one of the diverging lines on the surfaces of the main plate.

3. The structure specified in claim 2, in which the lower and upper edge of the main plate adjacent the termini lines are grooved longitudinally and parallel to the termini lines, each end guide of the cross-head member comprising an elongated piece, both movable simultaneously in their grooves, the bars of the cross-head member rigidly secured to said end guides and positioning the cross-head bars at right angles to the direction of the grooves and termini lines.

4. The structure specified in claim 2, in which the bars of the cross-head member comprise each a transparent flat bar retained in close par-

allel relation to the main plate surface containing the diverging lines.

5. The structure specified in claim 2, in which the pointer members each comprise a transparent bar slidably mounted on their respective bar of the cross-head member with the surface adjacent the main plate face held in close parallel relation to said face containing the diverging lines, and a spot reading mark on said surface of the pointer member adjacent the main plate face.

6. The structure specified in claim 2, in which the prong part of the lower end guide of the cross-head member comprises in part a removable dual purpose pointer for selectively retaining a pencil lead or metal point either of which is retained with its point coinciding with the point of the fixed bar and prong member when said cross-head member is moved into contact with the face of the fixed bar and prong member which is in alinement with the first diverging line, and said prong pointer in alinement with the integral pointers of the cross-head end guides and the spot reading means on the pointer member.

7. A proportional divider and calculator comprising an elongated quadrangular, laminated flat main plate the longer edges of which are grooved inwardly, the outer layers of said laminated plate comprising a white faced material, a transverse bifurcated member straddling and fixed on an end part of said main plate, each exposed main face of the plate provided with a group of diverging lines starting with an initial line exactly transverse of the main plate and successive lines starting from regularly spaced points on a line parallel to the bottom edge of the main plate and diverging on inclined planes to a line parallel to the top edge of the main plate and terminating thereon in predetermined regular but greater spacing than the lower termini of said diverging lines, a cross-head member comprising a pair of cross-head guides movable simultaneously in said grooved edges of the main plate and a transparent cross-head bar traversing each greater surface of the main plate and connecting said end guides, a pointer member slidably mounted on each cross-head bar and movable in a direction at right angles to the grooved edges of the main plate.

8. The structure specified in claim 7, in which said main plate is provided with a row of progressively arranged corresponding numerals adjacent each line of termini of the diverging lines and the latter lines corresponding to said numerals of a differentiating color to facilitate reading thereof.

9. The structure specified in claim 7, in which said main plate is provided with a longitudinal recess adjacent and parallel to each grooved edge and on each surface containing the diverging lines, and a selective scale member removably retained in each said recess.

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