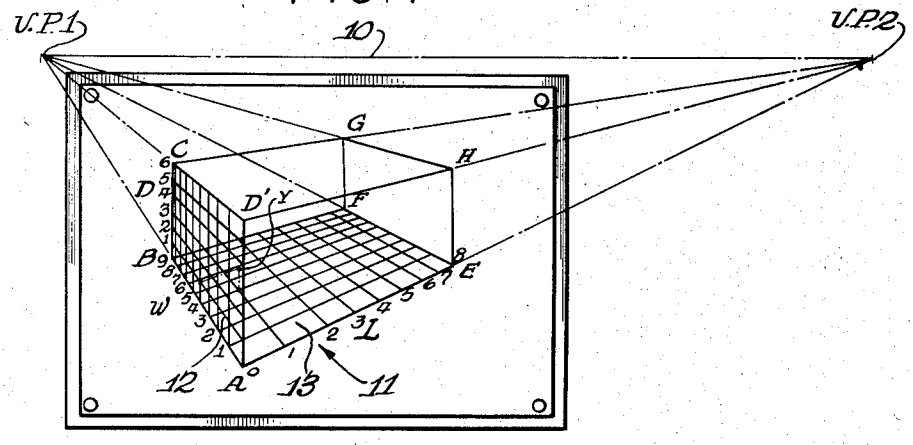
July 21, 1959 C. J. FIELDS 2,895,223

PERSPECTIVE DRAFTING MACHINE

Filed April 29, 1955 3 Sheets-Sheet 1

FIG. 1



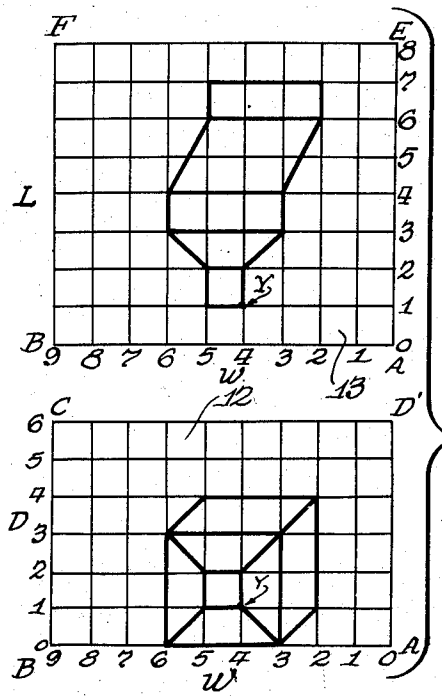


FIG. 2

FIG. 3

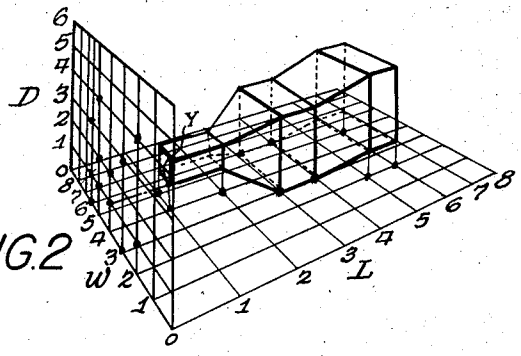


FIG. 6

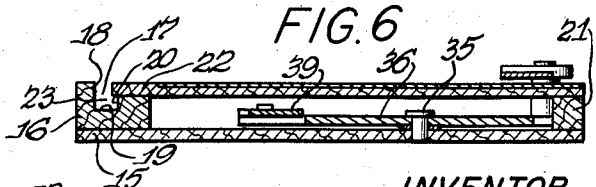
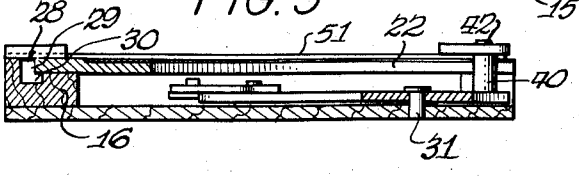


FIG. 5



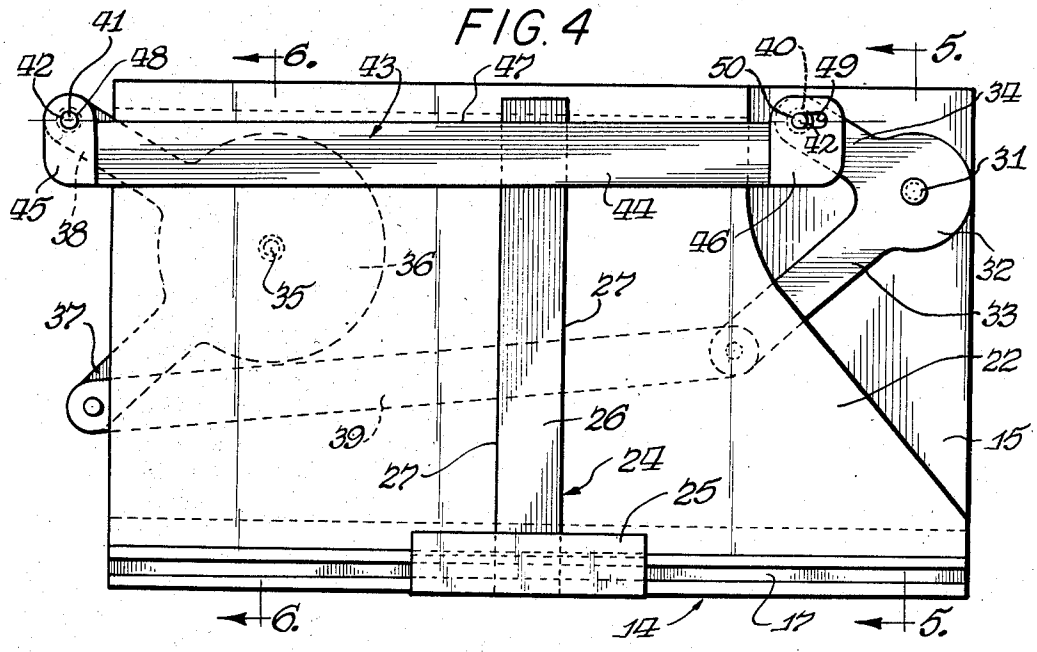
INVENTOR
CHRIS J. FIELDS
Paul O. Pippel
ATTORNEY

July 21, 1959 C. J. FIELDS 2,895,223

PERSPECTIVE DRAFTING MACHINE

Filed April 29, 1955 3 Sheets-Sheet 2

FIG. 4



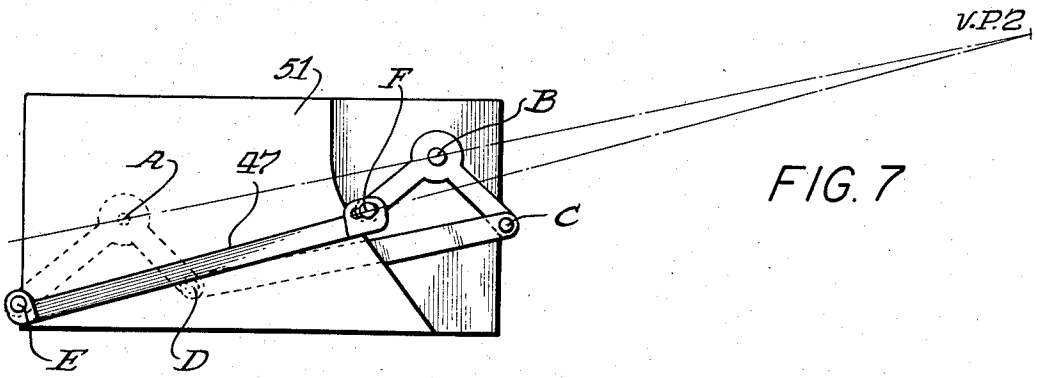


FIG. 7

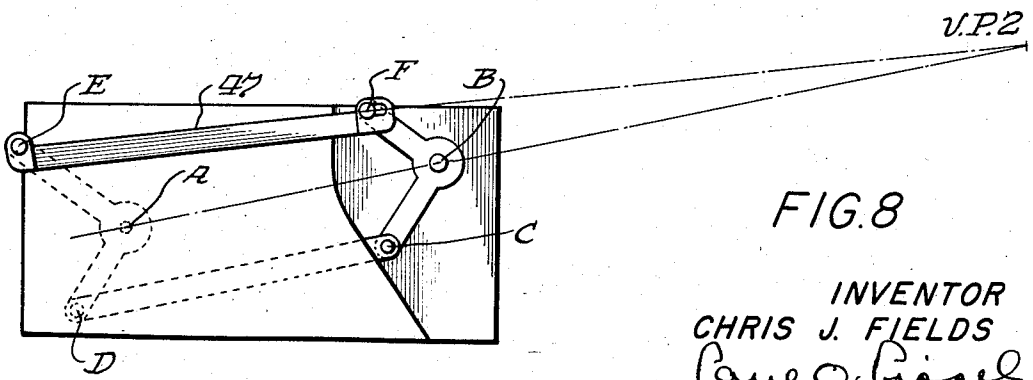


FIG. 8

INVENTOR
CHRIS J. FIELDS
Paul O. Pippel
ATTORNEY

July 21, 1959 C. J. FIELDS 2,895,223

PERSPECTIVE DRAFTING MACHINE

Filed April 29, 1955 3 Sheets-Sheet 3

FIG. 9

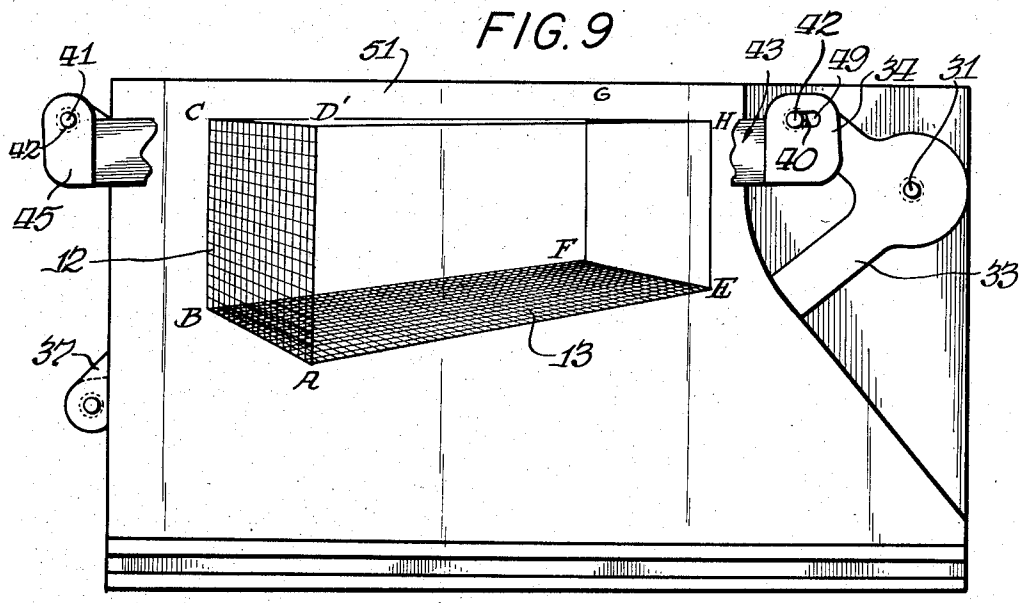
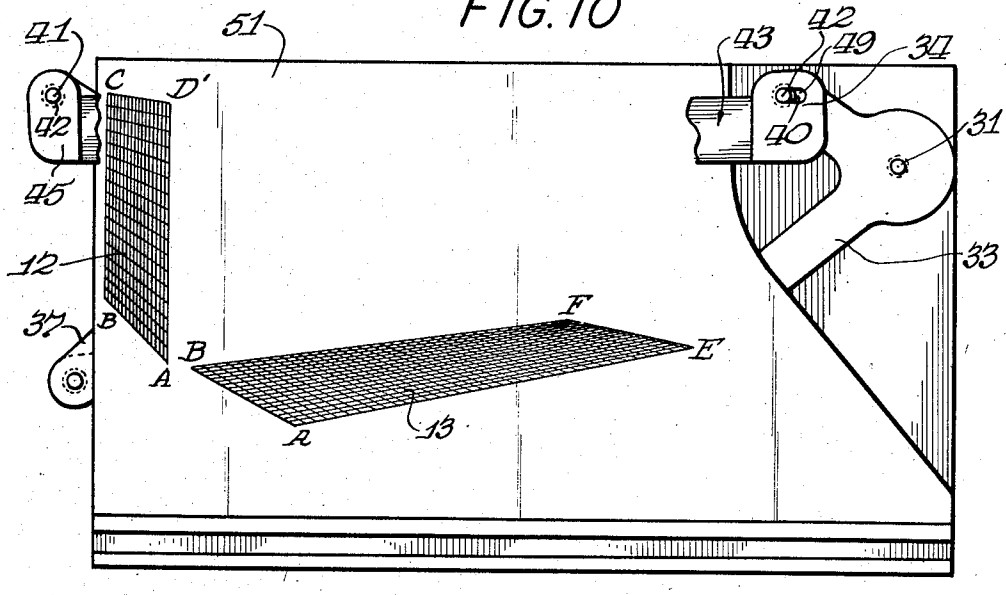


FIG. 10



INVENTOR
CHRIS J. FIELDS
Paul O. Pippel
ATTORNEY

United States Patent Office 2,895,223 Patented July 21, 1959

2,895,223

PERSPECTIVE DRAFTING MACHINE

Chris J. Fields, Allen County, Ind.

Application April 29, 1955, Serial No. 504,987

5 Claims. (Cl. 33—77)

This invention relates to drafting machines and more particularly to a new and improved apparatus or device that will enable perspective drawings or the like to be produced in a simple, efficient and accurate manner without the need of employing construction lines in geometrical work ordinarily required in producing these drawings.

It is an important object of the present invention to provide a drafting machine for producing angular or two-point perspective drawings with a minimum of effort, but with a high degree of accuracy.

It is a further object of the invention to remove the front or end and bottom or plan grid from the picture field where they were heretofore disposed to thus simplify the making of perspective drawings.

Heretofore when locating a particular point in the picture field it was necessary to first locate the point in the front grid and then draw a target line from the point in the front grid to one of the vanishing points. Obviously such target line extended through the picture field. The particular point was then located in the plan grid and projected vertically through the picture field. The intersection of the target line and the projection line was the particular point in the picture field. Thus heretofore it is obvious that to locate a single point it was necessary to draw two lines through the picture field which was partially obscured by the front and plan grids. The performance of the procedure briefly noted above was repeated to find all the remaining points contained in the object necessary to illustrate and complete the picture. Hence, the object was shot through with target and projection lines and when a more complex object was illustrated the target and projection lines became so numerous that it was difficult to match any target line aimed at a particular vanishing point with its intersecting vertical projection line rising from the plan grid. Furthermore all of the target and projection lines had to be removed from the picture field as they were not part of the picture and consequently the draftsman had to either laboriously erase all of the target and projection lines or trace the picture in its entirety omitting the target and projection lines.

Still another object is the provision of a novel centro-linead or straight edge which is mechanically aligned toward a vanishing point which is disposed without confines of the drafting machine so that the centro-linead can be readily rotated about the remote vanishing point without the necessity of making the straight edge long enough to reach the remote point. By employing this centro-linead which is pivoted about a remote vanishing point without the need of mechanical means connecting such straight lines to the pivot point in combination with a vertically disposed straight edge the need for drawing target and projection lines in the picture field is eliminated.

The foregoing and other important objects and desirable features inherent in and encompassed by the invention, together with many of the purposes and uses thereof will become readily apparent from reading of the ensuing description in conjuction with the annexed drawings, in which:

Figure 1 is a plan view of a drawing board showing a front or end perspective grid and a plan or bottom perspective grid drawn thereon together with the vanishing points for producing a two-point or angular perspective drawing;

Figure 2 illustrates a plan grid and an end grid with an object superimposed thereon;

Figure 3 discloses the object shown in Figure 2 as it would appear in perspective;

Figure 4 is a plan view of a perspective drafting appliance embodying the invention;

Figure 5 is a sectional view take substantially along line **5—5** of Figure 4;

Figure 6 is a sectional view taken substantially along line **6—6** of Figure 4;

Figures 7 and 8 are plan views of the centro-linead in two different positions of adjustment;

Figure 9 is a plan view of a perspective drafting machine in which the end and bottom perspective grids are disposed in the picture field; and

Figure 10 is a plan view of a drafting machine in which the perspective grids are projected out of the picture field; certain parts of the drafting machine are broken away to better illustrate the invention.

In order to better understand the merits of the invention a brief resume of the art of angular or two-point perspective drawing and the problems and difficulties heretofore encountered by draftsman is believed desirable. Referring to Figure 1, a drawing board is represented in outline, VP–1 and VP–2 are vanishing point **1** and vanishing point **2**, respectively, and, as is generally the case, are shown outside the area of the drawing board or base. A horizontally extending line **10** commonly called the horizon extends through VP–1 and VP–2. Once the point of sight and the vanishing points are established a grid designated generally by numeral **11** is drawn on the drawing board. It is to be understood that grid **11** with its horizon **10** and its vanishing point VP–1 and VP–2 is constructed in the conventional manner and the manner in which it is constructed is not essential to the invention. The area of the drawing board bounded by A, B, C, D′, E, F, G and H is commonly called the "picture field" and the object or body to be illustrated in perspective will be contained within the picture field area. It will be noted that area A, B, C, D′ which is called the front perspective grid **12** is "gridded" with two groups of lines, those which are vertical and parallel to A, D′ and others pointed toward VP–1. The plan or bottom perspective grid **13** is outlined by a line extending through A, B, F and E is also gridded in a similar manner except that the two sets of grid lines are lines are aimed respectively at VP–1 and VP–2. Thus the grid lines in the front and plan perspective grids **12** and **13** respectively extend in two directions at right angles to each other as they would appear in perspective and divide the grids **12** and **13** into little squares which represent units of measurement such as inches, centimeters or any other unit. The grid lines may be numbered as shown for convenience.

The next step to produce a perspective drawing of an object was to superimpose on the front elevational and plan views of the object, the front and plan grids **12** and **13**, respectively, as is shown in Figure 2. It will be noted that instead of looking at the front and plan grids **12** and **13** obliquely as we do in Figure 1 we look at them squarely. It will also be noted that the two grids are numbered in the same manner as in Figure 1. A

particular point on the object has been indicated by the letter Y in the end elevational and the plan view of the object.

The series of numbers appearing on the side edges of the front and plan grids 12 and 13, respectively, have been marked L, W and D for length, width and depth, respectively. Point Y is located at the inter-section of W–4 and D–1 in the front grid of Figure 2 and a target line is directed from the inter-section of W–4 and D–1 of the front grid 12 of Figure 1 toward VP–2. In the plan grid illustrated in Figure 2 point Y is located at the inter-section of L–1 and W–4 and a target line or projection line is directed vertically from the inter-section L–1 and W–4 of the plan grid 13 of Figure 1. The intersection of the two target lines is point Y in the picture field and is the beginning of a perspective picture of the object shown in Figure 2.

The picture area would appear as shown in Figure 3 after the above steps were repeated in order to find all of the remaining points contained in the object necessary to illustrate the object and complete the picture. Once all the necessary points are located in the picture field, lines are drawn between properly related points and the picture is complete. It will be noted that the object is shot through with target lines and is somewhat obliterated thereby. When a more complex object is to be illustrated, the target lines become so numerous that it is difficult and a tedious task to match any target line aimed at vanishing point 2 with a corresponding intersecting vertical target line rising from the plan grid 13. Furthermore, since the grids 12 and 13 are disposed in the picture field of the object is further confused by the grid lines. Hence, all of the target lines as well as the grid lines must be removed from the picture field as they are not a part of the picture and the draftsman must either laboriously erase all the target and grid lines or trace the picture in its entirety, omitting the target and grid lines.

Thus the draftsman heretofore had the choice of one of three different methods of making angular or two-point perspective drawings. He could either illustrate the object on a sheet of drawing paper previously being provided with front and plan grids in the picture field area thereof and then erase all of the grid and target lines. The draftsman could in lieu of erasing all of the lines necessary for the production of a perspective drawing place a piece of tracing paper over the object and transfer the same to the tracing paper, eliminating the target and grid lines. In the third method a sheet having grids drawn there is first placed on the drawing board and a transparent drawing paper is superimposed thereon and the picture is illustrated directly on the transparent paper. Thus in the third method while the need for erasing the grid lines is eliminated, the draftsman must still erase the target and projection lines. From the foregoing it will be appreciated that while each of the three conventional methods has certain advantages with respect to the other methods, all of the methods require skilled draftsmen to practice the methods and a consumption of a great deal of time and effort to produce a picture of an object in its entirety unobliterated by target and grid lines which are not a part of the picture.

The problem of practicing either of the above three methods of producing perspective drawings is further complicated when it is realized that vanishing point number two as well as vanishing point number one may be forty feet away from the drafting board. At any rate, it is common practice in two-point perspective drafting to have the vanishing points disposed without the confines of the drawing board proper. Obviously to establish vanishing points physically when the same are forty feet away from a conventional size drawing board would require a drafting table more than forty feet long and to use such a vanishing point for drawing target lines would require a straight edge more than forty feet long. In other words, referring to the example given above, when point Y is found in the front grid a projection line must be drawn from such point to VP–2 and since VP–2 may be forty feet away from the drawing board, it is obvious that such projection line cannot be easily, quickly and accurately drawn without physically locating the vanishing point and providing a straight edge capable of extending between such point Y and the vanishing point. With the drafting machine or appliance which is the subject of the present invention, an unskilled draftsman with very little instruction can produce accurate perspective drawings directly upon a single sheet of drawing papers unobscured by projection, target and grid lines.

Referring to Figure 4, reference character 14 designates the two-point perspective drafting appliance or machine. The drafting appliance 14 includes a rectangular flat plate 15 which may be of any suitable dimensions and serves as the mounting means for the other components of the drafting appliance 14 to be described hereinafter. A rail 16 is suitably secured to the top surface of the flat plate 15 along one edge thereof. The rail 16, as best shown in Figures 5 and 6, is provided with an upwardly facing groove 17 defined by a vertical wall 18, a horizontal wall 19 and a vertical wall 20 parallel to but of a shorter height than the vertical wall 18. A second rail 21 having a substantially square cross section, as best shown in Figure 6, is secured to the top surface of the flat plate 15 along the normally upper end of the drafting appliance 14. The groove 17 extends longitudinally the entire length of the drafting appliance 14 and is provided for a purpose which will be explained hereinafter.

The flat underside of a top plate 22 is adapted to be supported by and secured to the bottom and top rails 16 and 21, respectively. The lowermost edge portion of the top plate 22 has a thickness substantially equal to the difference between the heights of the vertical walls 18 and 20, respectively, and a portion thereof extends downwardly, as viewed in Figure 4, beyond the vertical wall 20 to form an L-shaped guide or track designated generally by numeral 23 and as illustrated in Figure 6.

A T-square 24 is provided and includes a rectangular base 25 having a slot formed in the underside thereof midway between its ends and an arm or blade 26. One end of the arm 26 is disposed within the slot and is rigidly secured to the rectangular base 25 such that the bottom surfaces of the rectangular base and the portion of the arm 26 disposed within the slot are in substantially the same plane. The bottom surfaces of the arm portion disposed within the slot and the base 25 are adapted to abut the upwardly facing surfaces of the bottom rail 16 and the lower edge of the top plate 22. The arm 26 is of a length sufficient to extend substantially to the top of the plate 22 and is provided with a pair of parallel working surfaces or straight edges 27 which are contained in parallel planes disposed at an angle of 90° from the longitudinal axis of the base 25. A slide member 28 extends the full length of the base 25 and is suitably secured to the underside thereof. The slide member 28 is L-shaped, as viewed in Figure 5, the length of one leg 29 being substantially equal to the thickness of the top plate 22 and the other leg 30 integrally formed with leg 29 having a length substantially equal to the length of the horizontal wall 19 whereby the slide member 28 is snugly confined within the track 23 for sliding movement along the longitudinal axis thereof. Thus, the arm 26 can be moved across substantially the entire top plate 22 and the straight edges 27 are continually maintained perpendicular to the longitudinal axis of the track 23 which is parallel to the lower edge of the top plate during such sliding movement.

Referring to Figure 4 a pivot pin 31 is secured to the bottom plate 15 adjacent the upper right-hand corner thereof. The pivot pin 31 projects normally from the plane of the plate 15 and serves as a pivot support for

a circular plate 32. The circular plate 32 has a pair of arms 33, 34 integrally formed therewith and extending radially from the periphery of the plate 32. One arm 33 is substantially longer than the other arm 34 and is angularly disposed with respect thereto. The end of the short arm 34 carries an upright pin 40. A pivot pin 35 similar to pivot pin 31 is rigidly fastened to the bottom plate 15 at a point spaced from the top marginal edge and the left-hand marginal edge of the top plate 22 as viewed in Figure 4. A circular plate 36 is rotatably mounted on the pivot pin 35 and is provided with a pair of integrally-formed, angulated arms 37, 38 having substantially the same length which is equal to the length of arm 33. A link 39 disposed between the bottom plate 15 and the top plate 22 has one end pivotally connected to arm 37 and its opposite end similarly pivotally connected to arm 33. The outer end of each arm 34 and 38 is provided with a pin 40, 41 respectively which pins have their normally upper end, as viewed in Figure 5, defined by a reduced-diameter section 42.

Reference character 43 designates a second link which includes a relatively thin body portion 44 having its opposite ends respectively secured to enlarged blocks 45 and 46. The body portion 44 has a longitudinally extending marginal edge 47 thereof contained in a plane disposed normally to the plane of the paper, as viewed in Figure 4, which plane contains the vertical axis of an aperture 48 extending through the enlarged block 45. The reduced diameter section 42 of the pin 41 is adapted to extend through the aperture 48 and suitable means are provided for preventing disengagement of the pin from the block 45 but permitting pivotal movement between the block 45 and the arm 38. The block 46 secured to the opposite end of the body portion 44 is provided with an elongated slot 49 therethrough. The ends of the slot 49 as viewed in plan are defined by semi-cylindrical surfaces 50 having radii of curvature equal to the radius of the circular aperture 48 which is sufficient to prevent undue play between the reduced-diameter section 42 and the block 45 without hampering pivotal movement therebetween. The reduced-diameter section 42 of the pin 40 has a diameter substantially equal to the diameter of the reduced-diameter section 42 of the pin 41 and is adapted to extend through the elongated slot 49. It will be noted that the longitudinal axis of the slot 49, as viewed in Figure 4, lies in the vertical plane containing the straight edge surface 47 and the vertical axis of the circular aperture 48. Thus it will be appreciated that the reduced-diameter section 42 of the pin 40 slides relatively to the enlarged block 46 along the longitudinal axis of the slot 49 but is prevented from moving transversely with respect thereto. By virtue of the above described structure straight edge 47 if extended will always pass through a particular vanishing point regardless of the position of the body portion 44 on the top plate 22 as will be pointed out hereinafter.

The top plate 22 is undercut slightly except for the lower marginal edge portion thereof on which the slide member 28 slides. An aluminum plate 51 having an outline conforming substantially to the undercut surface of the top plate 22 is suitably secured thereto. The aluminum plate is covered with a coating of white paint for a purpose which will be apparent hereinafter.

While the actual construction of the centro-linead has been given above, it is thought a brief example of the construction and operation of a centro-linead of the type forming part of the invention will clarify the geometric principles involved. Assume that a particular size drawing board is chosen and the vanishing points 1 and 2 are located in the same plane as the board but not thereon. Thus the problem is to swing the straight edge 47 across a flat plate about VP2 as viewed in Figure 7 without the need of mechanical means connecting the straight edge to vanishing point 2. In order to accomplish this object point A near the center of the left half of the plate is arbitrarily chosen and a line AVP2 is drawn. A point B is marked on the line AVP2 adjacent the right edge of the plate 32. Points A and B are now regarded as fixed pivots and correspond to the pivot pins 35 and 31, respectively, secured to a bottom plate 15. A parallelogram such as A, B, C, D is drawn below line AVP2. A triangle such as VP2 AE is also constructed and from point B a line BF parallel to line AE and intersecting line VP2E is drawn. Points E, F and VP2 lie in a straight line because triangles VP2AE and VP2BF have a common angle at VP2. It will also be apparent that line EFVP2 can only be a straight line as long as triangles VP2AE and VP2BF remain similar triangles having their respective sides proportional, their respective angles equal and having side BF of one triangle parallel to side AE of the other triangle. It will also be apparent that since BC and AD are parallel and BF and AE are parallel it follows that angle FBC equals angle EAD. Now if angles FBC and EAD are regarded as being fixed and if a rocker arm FDC, each having a pair of portions angulated with respect thereto the same as lines EA and AD and lines FD and DC, respectively, are placed on fixed center pins A and B, respectively, and a link is pivotally connected at points D and C, it will be appreciated that if rocker arm EAD is rotated about center A rocker arm FBC will be forced to rotate in the same direction through the same number of degrees because of the connecting link DC which maintains AACB as a parallelogram. Referring to Figure 8 it will be noted that the rocker arms EAD and FBC have been rotated clockwise from the position shown in Figure 7. It will be noted that AB is still parallel to DC and AE is still parallel to BF. Triangles VP2 AL and VP2 BF are still similar and still have a common angle at VP2. From the foregoing, it will be clear that points E, F and VP2 will constantly lie on a straight line as point E is rotated about center A and point F is forced, by link DC, to rotate equally about center B. A straight edge 47 is mounted on the ends of AE and BF, respectively, and such ends are defined by pins E and F, respectively, and since the center of the circular aperture 48 and the longitudinal axis of the slot 49 are constructed to lie in a vertical plane containing the marginal edge 47 of the body portion 44, the marginal edge 47 will always be in line with the vanishing point 2 regardless of the adjusted position of the straight edge on the top surface of the plate 51. By virtue of the above-described centro-linead it will be appreciated that it is not necessary to physically locate VP2 on the drafting table which would require a drafting table of an impractical size nor is it required that a straight edge be provided which extends from the working area of the drafting table to a remote VP2.

As shown in Figure 9, the area of the aluminum plate 51 bounded by the letters A, B, C, D', E, F, G and H is the picture field and the object or body to be illustrated in perspective is contained within the picture field area. It will be noted that one area A, B, C and D' which is called a front grid 12 overlaps the plan or bottom grid 13 outlined by the letters A, B, F, and E, and both grids 12 and 13 are disposed within the picture field area. To simplify the drawing of the object in perspective within the picture field both grids 12 and 13 are projected therefrom. The plan or bottom grid 13 is projected vertically downwardly from the position shown in Figure 9 to the position shown in Figure 10 and in a similar manner the front or end grid 12 is projected to the left with reference to vanishing point 2 to the position shown in Figure 10 which is without the confines of the picture field area. The projected plan and end grids 13 and 12, respectively, are suitably scribed in the coating of white paint on the aluminum plate 51. It will be obvious that in order to locate a particular point in a picture field in perspective it is merely necessary to locate the point first in the projective plan grid 13 and line up one of the straight edges 27 of the T-square 24 therewith. Thereafter the same point is

located in the projective plan grid **13** and in a similar manner the straight edge **47** is moved to be in alignment therewith. The straight edge **47** and one of the straight edges **27** aligned with the point in the plan grid **13** intersect in the picture field and the particular point in perspective is located at the intersection of such straight edges. All of the remaining points necessary to illustrate the object in perspective are projected to the picture field in a like manner and then corresponding lines are interconnected in order to illustrate the complete object in perspective. Thus it will be appreciated that the perspective drawing can be illustrated correctly upon a sheet of paper secured to the plate **51** which covers the picture field directly without the need of having grid lines drawn thereon and further without the need of drawing target and projection lines thereon. Furthermore, such perspective illustration is possible even though the vanishing points are not actually physically located within the confines of the drafting appliance.

The embodiment of the invention chosen for the purposes of description and illustration herein is that preferred for achieving the objects of the invention in a most desirable manner, due regard being added to existing factors of economy, simplicity of design and construction and the improvement sought to be effected. It will be appreciated, therefore, that the particular structural and functional aspects of the invention emphasized herein are not intended to exclude, but rather to suggest, such other modifications and adaptations of the invention as fall within the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. A perspective drafting machine comprising a plate having a pair of parallel marginal edges, said plate providing a plane working surface, an area of said surface being adapted to receive a perspective view of the object to be illustrated; a first straight edge mounted on said plate and extending substantially between said parallel marginal edges of said plate and slidable across said surface area adapted to receive the perspective view in a direction parallel to said parallel marginal edges; a centro-linead including an elongated member having a second straight edge intersecting said first straight edge; and means for mounting said second straight edge on said plate for sliding movement across said surface area adapted to receive the perspective view wherein a line containing said second straight edge continually intersects through a particular point, said means for mounting said second straight edge on said plate including a supporting member spaced below said plane working surface, a pair of spaced arms pivotally connected to said supporting member, said arms being of unequal length and parallel, said arms further being disposed below said plate and above said supporting member, means interconnecting said arms whereby they are constrained to pivot in unison, means pivotally connecting one of said arms and said second straight edge, and means operatively connecting the other of said arms and said second straight edge including pivot connecting means for connecting said other of said arms and said second straight edge for relative pivotal movement about an axis, said pivotal axis being movable along a straight line relative to said second straight edge.

2. A perspective drafting machine substantially as set forth in claim 1, in which, an end perspective grid and a plan perspective grid are permanently scribed on the top surface of said plate, said grids being disposed out of the area of said surface adapted to receive the perspective view of the object to be illustrated.

3. A perspective drafting machine comprising a plate having a pair of parallel marginal edges, said plate providing a plane working surface, an area of said surface being adapted to receive a perspective view of the object to be illustrated; a first straight edge mounted on said plate and extending substantially between said parallel marginal edges of said plate and slidable across said surface area adapted to receive the perspective view in a direction parallel to said parallel marginal edges; a centro-linead including an elongated member having a second straight edge intersecting said first straight edge; and means for mounting said second straight edge on said plate for sliding movement across said surface area adapted to receive the perspective view wherein a line containing said second straight edge continually extends through a particular point including a supporting plate spaced below said plane working surface, a parallelogram-type structure including a portion of said supporting plate, a pair of parallel arms of equal length, and a link, each arm having one end pivotally connected to said supporting plate for pivotal movement with respect thereto and its opposite end pivotally connected to a respective end of said link, a second pair of parallel arms of unequal length, each of said arms having one end fixed to a respective arm of said first-mentioned pair of arms, pivot connecting means for pivotally connecting one of said arms of said second pair of arms and said elongated member, and means operatively connecting the other arm of said second pair of arms and said elongated member.

4. A perspective drafting means substantially as set forth in claim 3, in which, said means operatively connecting said other arm of said second pair of arms and said elongated member includes an elongated slot formed in said elongated member having its longitudinal axis in longitudinal alignment with said second straight edge, and a pin carried by said other arm of said second pair of arms, said pin having a cylindrical head portion adapted to extend through said slot whereby said pin is capable of rotating and sliding longitudinally along the longitudinal axis of said slot with respect to said elongated member and is incapable of moving transversely with respect to the longitudinal axis of said slot.

5. A perspective drafting machine substantially as set forth in claim 4, in which, an end perspective grid and a plan perspective grid are permanently scribed on the top surface of said plate, said grids being disposed out of the area of said surface adapted to receive the perspective view of the object to be illustrated.

References Cited in the file of this patent

UNITED STATES PATENTS

329,392	Jordan	Oct. 27, 1885
495,157	Johnson	Apr. 11, 1893
1,591,380	Harmer	July 6, 1926
2,484,361	Upton	Oct. 11, 1949
2,495,694	Cain	Jan. 31, 1950
2,553,026	Williams	May 15, 1951
2,723,456	Salner	Nov. 15, 1955

FOREIGN PATENTS

1,553	Great Britain	June 12, 1871
411,582	Italy	Feb. 12, 1945
410,050	Italy	Mar. 20, 1945