July 27, 1965 A. L. BAKER ETAL 3,196,544

DRAFTING MACHINE

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Fig. 1

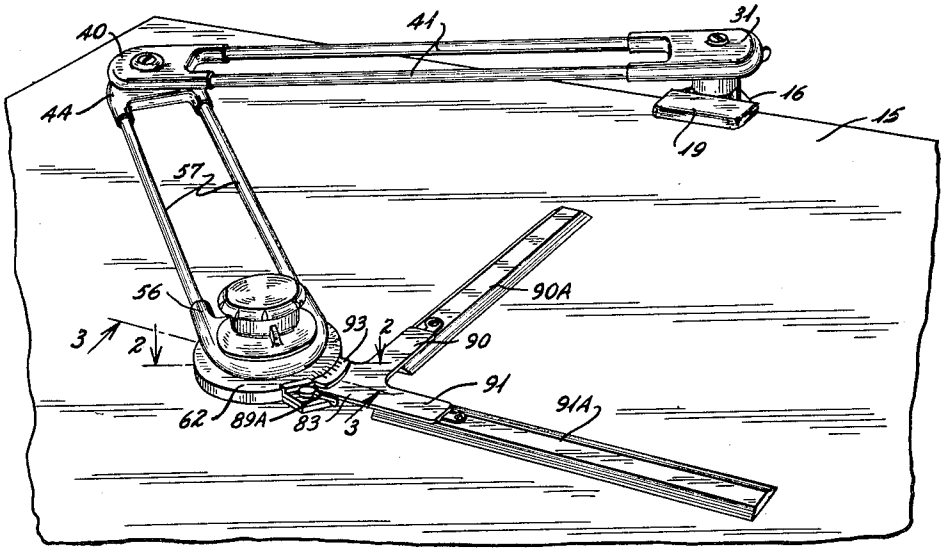


Fig. 2

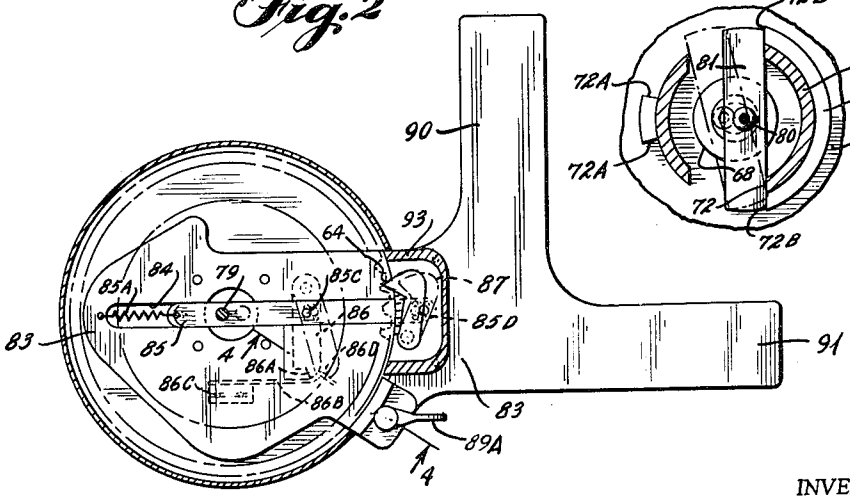


Fig. 3a

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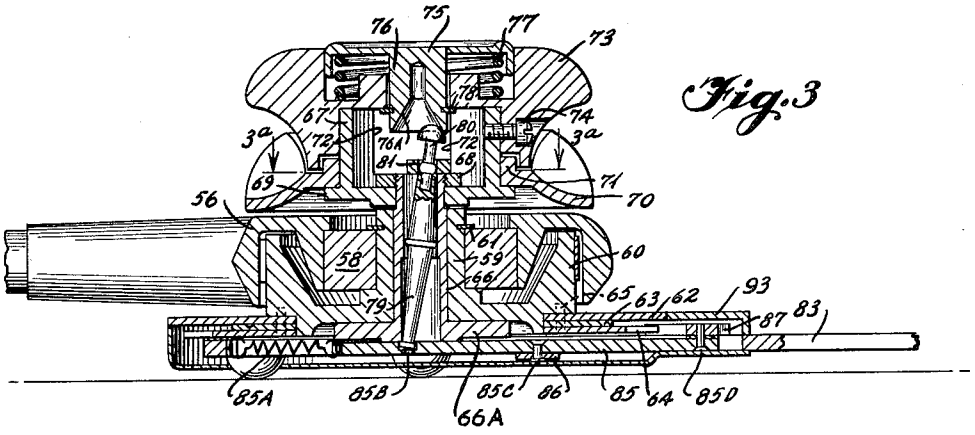


Fig. 3

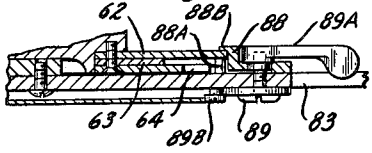


Fig. 4

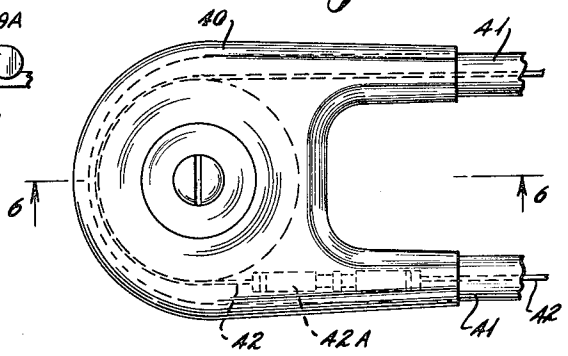


Fig. 5

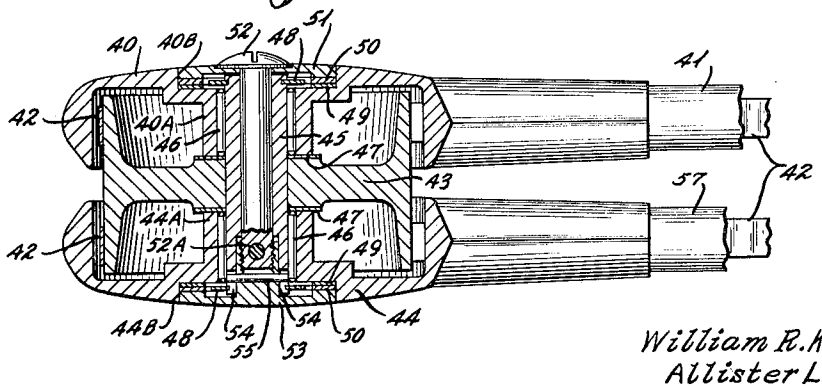


Fig. 6

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Fig. 7

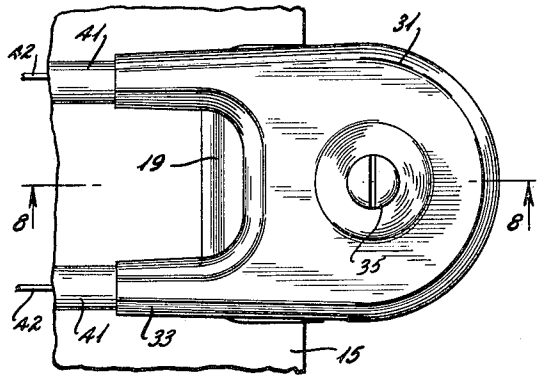


Fig. 9

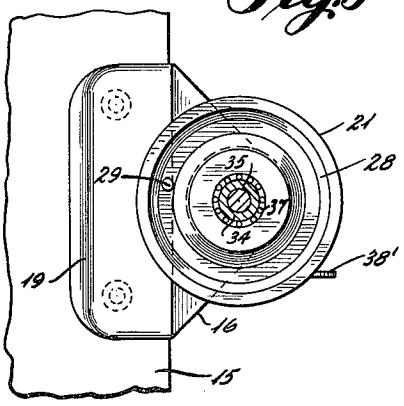


Fig. 8

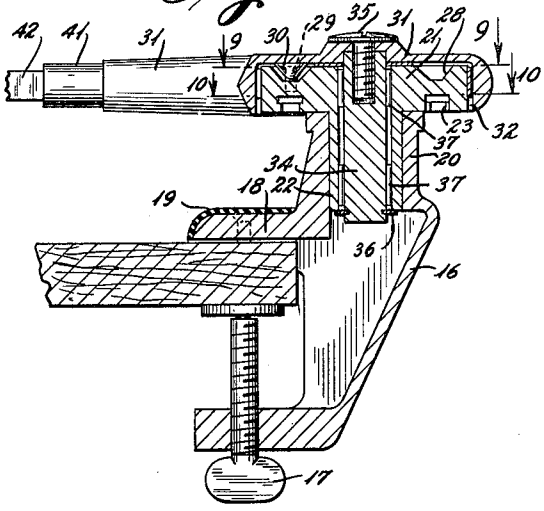


Fig. 10

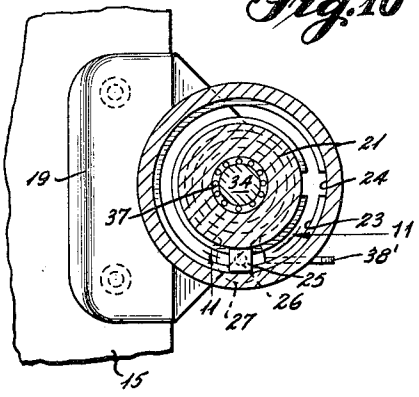
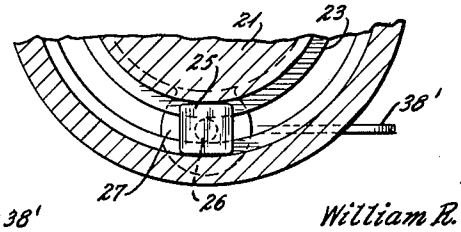


Fig. 12



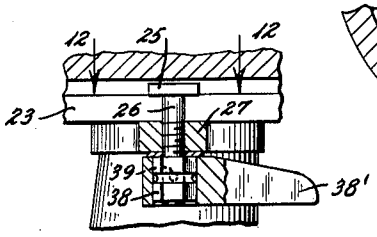


Fig. 11

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United States Patent Office 3,196,544 Patented July 27, 1965

3,196,544

DRAFTING MACHINE

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Filed Oct. 25, 1961, Ser. No. 147,680
4 Claims. (Cl. 33—79)

The present invention relates to a drafting machine and more particularly to a drafting machine having anchor and drafting head arms pivotally connected together at one end with the other end of the anchor arm pivotally mounted on an anchor support on the edge of a drafting board and a drafting head on the other end of the drafting head arm, carrying a protractor and line guides which are maintained in parallel relation by a pulley and belt system.

Heretofore drafting machines of this type have been provided but they have been expensive to manufacture making them unavailable to schools and to students and therefore the students have not been able to take advantage of the increased efficiency in learning and working resulting from the use of such drafting machines. One reason for the expense of manufacture was the skilled labor to obtain the accuracy required in the parts.

An object of the present invention is to provide a drafting machine of the pivoted arm type which is accurate in use and can be made at a cost to be available to students and to other draftsmen with limited resources.

Another object is to provide a means to maintain the pawl for the drafting head in an operative or inoperative position and to provide easily operable means to restore the operation of the pawl.

A further object is to provide means to change the drafting head in infinite angular positions.

Another object is to provide means to connect a drafting machine to a drafting table to prevent theft thereof.

Other and further objects will be apparent as the description proceeds and upon reference to the accompanying drawings wherein:

FIG. 1 is a perspective of a fragment of a drawing board with the two arm drafting machine of the present invention mounted thereon.

FIG. 2 is a horizontal plan view of the drafting head plate taken generally on line 2—2 of FIGURE 1 below the notched disc and above the position retaining pawl showing the position retaining pawl in full lines in one notch of the notched disc shown in phantom outline and showing in phantom outline the position retaining pawl in its inoperative position out of engagement with the notched disc and showing the clamp for setting intermediate angular adjustments and also showing the leaf spring detent operative on the control lever for the pawl operated slide for retaining the pawl in operative or inoperative positions.

FIG. 3 is a vertical section taken substantially on line 3—3 of FIG. 1 showing the drafting head plate adjustably mounted in the bore of the control pulley hub and showing the usual pawl releasing arrangement and the novel push button means to restore the pawl to operative position.

FIG. 3A is a fragmentary section on line 3*a*—3*a* of FIG. 3 showing the pawl control bar in the cup and the pawl operating wheel.

FIG. 4 is a section taken substantially on line 4—4 of FIG. 2 through the infinite position clamping control to retain the drafting head in adjusted positions.

FIG. 5 is a plan view of the pivotal connection joint between the arms which are assumed to be in superimposed position and showing the adjustment for tensioning the straps.

FIG. 6 is a vertical axial section of the two arms of the drafting machine taken substantially on line 6—6 of FIG. 5 showing the means for obtaining the frictional adjustment between the arms and illustrating the bearing structure.

FIG. 7 is a plan view of the anchor end of the anchor arm showing a portion of the anchor bracket mounted on a drawing board.

FIG. 8 is an axial section taken substantially on line 8—8 of FIG. 7 through the pivot connecting the anchor arm and the anchor bracket.

FIG. 9 is a horizontal section just above the anchor pulley taken on line 9—9 of FIG. 8 with the arm mounting fitting removed therefrom.

FIG. 10 is a horizontal section taken substantially on line 10—10 of FIG. 8 showing the shape of the T-groove which serves to retain the anchor pulley in fixed adjusted position.

FIG. 11 is an enlarged fragmentary circumferential section looking toward the axis taken along the pulley grooves of FIGS. 10 and 12 through the locking screw and nut of the anchor pulley retaining structure.

FIG. 12 is a fragmentary enlarged section taken substantially on line 12—12 of FIG. 11 showing the bolt head of the locking bolt in the T-groove.

Referring more particularly to the drawings, a drafting board 15 has mounted thereon an anchor clamping bracket 16 which is held in position by a clamping screw 17 and by one or more screws passing through countersunk screw receiving apertures in a flange 18 which anchor bracket flange is covered by a resilient rubber-like cover 19 secured thereto by adhesive or other means to prevent damage to line guides. The anchor bracket includes an upstanding bearing boss 20 which is perpendicular to the clamping surface of the flange 18 and an angularly adjustable anchor pulley 21 having an integral tubular shaft 22 which rotatably adjustable in the anchor bearing boss 20. The anchor pulley 21 is provided with a circumferential groove 23 of T-shape in radial cross-section with such groove having the flange portions removed at 24 to provide for the reception of a square head 25 of an angular position locking bolt 26, the shank of which bolt passes through an apereutre in a lug 27 extending radially from the upper end of the anchor bearing boss 20 as clearly shown in FIGS. 10, 11 and 12. The anchor pulley 21 is provided with a circumferential V-groove 28 on its upper surface while an Allen head stop screw 29 is threadedly received in a threaded aperture extending between grooves 23 and 28 and such stop screw 29 projects into the path of a stop lug 30 extending into a circular recess of a first fitting 31 which recess 32 receives the anchor pulley 21, said fitting having a pair of parallel tube receiving sockets 33 extending tangentially in one direction. A pivot shaft 34 is fixed to said first fitting 31 by means of one end of such pivot shaft 34 extending into a counter bore in the recess of fitting 31 and being held in position by a screw 35 passing through the fitting wall and into a threaded bore in said pivot shaft 34. The pivot shaft 34 is retained in the tubular shaft 22 of the anchor pulley 21 by a split ring 36 which also serves to retain needle bearings 37 and any suitable spacing elements in the circumferential space between the pivot shaft 34 and the anchor pulley tubular shaft 22 to assure ease of movement of the fitting 31 and of the anchor and drafting head arms of the drafting machine. The pulley 21 is retained in position by the locking bolt 26 and a peripherally grooved hexagonal nut 38 held in operative position in a broached hexagonal opening in wrench handle 38' having an Allen-head screw 39 threaded through the periphery of the wrench 38' and into the groove of the hexagonal nut 38 so that

the hexagonal nut may bear directly against a washer contacting the lug 27, thereby positively retaining the drafting machine on the anchor clamp and also maintaining the desired angular adjustment of the anchor pulley 21.

A second fitting 40 provided with a circular recess and a pair of sockets in alignment with the sockets of the first fitting is connetced by tubes 41 to the first fitting 31, said tubes being freely rotatable in their sockets and the structure being maintained in connected condition by the tension of the control strap 42 which engages the periphery of the anchor pulley 21 and the periphery of the upper portion of a double pulley 43. The tension of the control strap is adjusted by turnbuckle type device 42A.

A third fitting 44 similar to the second fitting 40 and having a circular recess and a pair of tangentially extending sockets is positioned with its reces facing the recess of the second fitting 40, said second and third fittings having bearing bosses 40A and 44A with coutner bores 40B and 44B respectively. Said second and third fittings are pivotally mounted on a tubular shaft 45 extending through the bosses and through a bore in the web of the double pulley 43 which provides for rotation of such double pulley 43, the fittings 40 and 44 being rotatable on the tubular shaft 45 by means of needle bearings 46 which are maintained in spaced relation and in operative position by washers 47 abutting the boss of double pulley 43 and by split rings 48 in grooves of shaft 45 which maintain the parts in assembled condition. Friction washers 49 of cork are positioned against wear washers 50 in each recess 40B and 44B.

A reaction washer 51 of smooth exterior curvature coresponding to the curvature of the fitting 40 is provided with a counterbore to freely receive the locking ring 48. A headed friction-producing bolt 52 passes through washer 51 and into the tubular shaft 45 and extending to adjacent the other end of such tubular shaft. A flanged tubular nut 53 having a circumferential groove receiving split ring 48 has internally threaded tubular portion thereof extending into a counterbore in the other end of tubular shaft 45 and is threaded onto the end threads of friction-producing bolt 52. To retain the nut 53 against rotation in the tubular shaft 45 the tubular shaft is provided with diametrically opposite pin receiving slots 54 and the nut is provided with a transverse bore which receives a pin 55 for preventing relative rotation of said nut with respect to said tubular shaft 45 whereby frictional force between the flanged head of nut 53 and washer 51 can be obtained, it being apparent that a suitable slot or spaced wrench-receiving apertures may be provided in nut 53 to prevent rotation of the nut assembly during adjustment. The bolt 52 is provided with a nylon insert 52A in a transverse bore and such nylon insert is sufficiently long to engage the threads of the nut 53 to retain the nut and bolt in adjusted condition.

In normal use the pulley 43 is fitted with sufficient tightness on tubular shaft 45 to prevent relative rotation therebetween and merely by holding the parts of the drafting machine in fixed relation the tubular shaft and the nut 53 will be prevented from rotation and frictional adjustment can be obtained by the use of a screwdriver in the slot of a friction-producing bolt 52.

A fourth fitting 56 having a downwardly opening circular recess and a pair of parallel tangentially extending sockets is connected by tubes 57 to the third fitting 44. The fourth fitting has a central boss with a bearing bushing 58 therein which receives a hollow shaft 59 of a third pulley 60 providing a drafting head support, which pulley is retained in position by a split ring 61 abutting the upper surface of bushing 58 with the web of pulley 60 lying beneath the bushing, said pulley being provided with a circumferential rabbet which receives an annular protractor 62, a spacing ring 63 and a notched disc 64 which are held in fixed position to the third pulley 60 by a plurality of screws 65. The web of the pulley 60 is spaced above the lower side of the pulley providing a recess for flange 66A of tubular flanged shaft 66, the flanged shaft being rotatable in the bore of the third pulley shaft 59. The flanged tubular shaft is provided with a shoulder providing clearance above the tubular pulley shaft by reducing the diameter of the shaft 66 and such reduced portion is received in a bore in the bottom of cup 67 which cup is secured to the shaft by a nut 68. The cup 67 has a radial flange 69 on the outer circumference of the cup 67 and rotatably supported on the cup 67 and engaging the flange 69 is a pawl-operating wheel 70 having a boss 71 extending along the periphery of the cup. The cup 67 of the pawl-operating wheel is provided with circumferential slots bounded by edges 72, 72. The boss 71 has circumferential slots defined by edges 72A and 72B spaced apart somewhat greater than edges 72. A drafting head rotating knob handle 73 is fixed to the cup 67 by a screw 74 and such knob is provided with a central bore and a counterbore which receives a flanged push button 75 having a boss 76 slidably mounted in the bore of the knob 73 and normally urged to the inoperative position shown in FIG. 3 by a coiled compression spring 77, the knob being held in assembled relation by a split ring 78. A double tapered lever 79 having a fulcrum flange intermediate its ends is positioned in the passage of the flanged hollow shaft 66, one end of said double tapered lever having a bore therein and the other end having an enlargement. A pin 80 having a head at one end and an intermediate enlargement is mounted in the bore of said one end of said double tapered lever 79. A control bar 81 having a central aperture is positioned in the cup 67 and extends into the slots in boss 71 and cup 67 with the ends of such control bar in the path of the abutment surfaces 72 of the cup and abutment surfaces 72B of boss 71 of the control wheel 70 whereby rotation of the control wheel 70 causes displacement of one end of the control bar 72 while the other end of the control bar remains in engagement with the abutment edge 72 as a fulcrum thereby moving the aperture in control bar 81 from the position shown in FIG. 3 to a displaced position as shown in phantom by dash-dot line in FIG. 3A and moving double tapered lever 79 from the position shown to a position in which the angle extends from the upper left to the lower right as viewed in FIG. 3. This dotted line position of FIG. 3A corresponds to the phantom dash-dot line of the pawl in FIG. 2. The boss 76 of the push button 75 is provided with a conical downwardly flaring bore 76A which in the inoperative position shown permits the double tapered lever 79 to oscillate from the full line pawl engaging position shown to a pawl releasing position.

Mounted on the flange 66A of the flanged hollow shaft 66 is the drafting head plate 83 which is fixed to such flange 66A by suitable screws and such plate 83 is provided with a slot 84 in which a slide 85 is mounted, such slide being urged to a retracted position by a tension spring 85A and being under the control of double tapered lever 79 of which the enlarged lower end is received in an aperture 85B in the slide. The aperture 85B is provided with an inwardly extending flange at its lower end thereby retaining double tapered lever 79 in operative position between control bar 81 and slide 85. The slide 85 is retained in the slot 84 by a control lever 86 pivotally mounted on one side of the slot 84 on the drafting head plate 83 and extending underneath the drafting head plate and under slide 85 and operatively connected to the slide 85 by a rivet 85C fixed to the slide and extending downwardly into a radial slot in the control lever 86. Additional means such as a strut between the walls of the slot 84 may assist in retaining the slide. The other end of the slide 85 is operatively connected by a rivet 85D fixed to and extending upwardly from the slide 85 and received in a slot of a pawl 87 which pawl is piv-

otally mounted on the upper surface of drafting head plate 83. The projection tip of such pawl 87 is receivable in any one of the notches of the notched disk 64 thereby retaining the drafting head plate in fixed position with relation to the notched disk 64 and the protractor. The control lever 86 projects beyond the other side of slot 84 and has a tooth 86A which engages a wedge-shaped cam portion of a leaf spring 86B, which leaf spring is adjustably secured to the under surface of the plate 83 by suitable screws 86C passing through slots in a flange fixed to the leaf spring 86B whereby the control lever 86 will be retained in either of the positions shown in FIG. 2 in which the projection of the pawl 87 is in engagement with a notch in the notched disk 64 as shown in full lines holding the drafting head in one of the 15° adjusted positions or the pawl is in the other position as shown in dash-dot lines in which the pawl is released. In the released position the left edge of the tooth 86A of control lever engages the right edge 86D of the wedge-shaped cam portion of the leaf spring 86B thereby retaining the slide 85 against the tension of the spring 85A corresponding to the dash-dot line position of the parts in FIG. 3A whereby the drafting head plate 83 is free to move to any azimuth position relative to the protractor 62.

To retain the drafting head plate in fixed position relative to the protractor when the pawl is out of engagement with the notched disk, a flanged Z-shaped clamp element 88 (FIG. 2 and 4) is positioned on the drafting head plate 83 with one end of the base of the Z-shaped clamp element against the palte 83 and a flanged screw 89 passes through an aperture in the drawing head plate 83 and projects thereabove, passing through an enlarged aperture in the stem of the Z-shaped clamp element 88 and threaded into the threaded bore of a lever 89A whereby motion of the lever will cause movement of the Z-shaped clamp 88. Precise adjustment is obtained by a locking screw 89B threaded into the drafting head plate with its head engaging the flange of flanged screw 89 to hold the flanged screw 89 in a position so that limited movement of lever 89A will produce the desired clamping action. Mounted on the drafting head plate 83 is an abutment 88A underlying the protractor 62 beneath the flange 88B of the flanged Z-shaped clamp 88 whereby the clamping action produced will react on the abutment 88A and avoid objectionable distortion.

When it is desired to restore pawl 87 to operative position depression of bottom 76 causes double tapered lever 79 to be restored to the full line position so pawl 87 engages one of the notches in notched disk 64. It will be apparent that the movement of the push-button 75 downwardly when the pawl is in the full line position of FIGURE 2 causes the lever 79 to move to a central position thereby moving the pawl 87 to an intermediate position in which the pawl is disengaged from the notches of the notched disc 64 and the drafting head plate 83 can then be turned to any desired angle to position the scale carrying lugs 90 and 91 in the desired position, and upon release of the push-button 75 the pawl will engage the adjacent notch of the notched disc 64.

It will be apparent that the various pulleys are connected by straps 42 tensioned sufficiently by turnbuckle type tension elements 42A to maintain the fittings in secure assembled relation and also to assure that there is no slipping between the straps 42 and the pulleys cooperating therewith.

From the above description it will be apparent that the present invention provides means to maintain the line guide scale carrying lugs 90 and 91 of drafting head plate 83 in proper relation so that line guide scales 90A and 91A carried thereby will be maintained in their parallel relation or in a definite angular relation in accordance with the adjustment obtained between the protractor 62 and an index 93 fixed to the drafting head plate 83 which index also serves as a housing for the pawl 87.

It will be apparent that various changes may be made within the spirit and scope of the invention as defined in the valid scope of the appended claims.

What is claimed is:

1. A drafting head structure comprising a drafting head support movable in all directions on the surface of a drawing board while maintaining a line of said support in parallel relation at all times, a shaft having a bore rotatably mounted on said support, a drafting head plate fixed to said shaft, a cup having a bore in the bottom thereof mounted on said shaft in fixed relation, a pawl-operating wheel having a boss projecting therefrom rotatably mounted on said cup, said cup and said boss of said pawl-operating wheel being provided with slots therein, a drafting head rotating knob mounted on said cup, a control bar positioned in said cup and extending diametrically into the slots of said cup and boss of said pawl-operating wheel, a lever pivotally mounted in said bore of said shaft and being connected to said control bar, a link mounted in said drafting head plate and connected to said lever, and a pawl operatively connected to said link whereby said pawl can be operated by rotation of said pawl-operating wheel, a disc mounted on said drafting head support for cooperation with said pawl to retain said drafting head in fixed relation to said drafting head support, a cam push-button mounted on said drafting head operating knob and having its cam surface cooperable with said lever in one direction, and a spring operable to move said pawl into operative position with respect to said disc.

2. The invention according to claim 1 in which the cam push button is mounted for axial movement in a central bore of said drafting head rotating knob and the cam surface is concave conical embracing the said lever pivotally mounted in said flanged shaft.

3. The invention according to claim 2 in which a yieldable detent cooperates with said pawl to retain said pawl out of engagement with said notched disk to permit infinite angular adjustment of said head and said cam push button will release said yieldable detent so that said pawl can enter a notch of said notched disk.

4. A drafting head structure comprising a drafting head support movable in all directions on the surface of a drawing board while maintaining a line of said support in parallel relation to all times, a shaft having a bore rotatably mounted on said support, a drafting head plate fixed to said shaft, a lever pivotally mounted in the bore of said shaft, a link mounted on said drafting head plate and connected to said lever, a pawl mounted on said drafting head plate and connected to said link, a disc fixed to said drafting head support and cooperable with said pawl to retain said drafting head in fixed relation to said support, a cam push-button mounted for axial movement relative to said shaft and having a cam surface cooperable with said lever to move said lever in one direction, and yieldable means operable to move said pawl into operative position with respect to said disc.

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