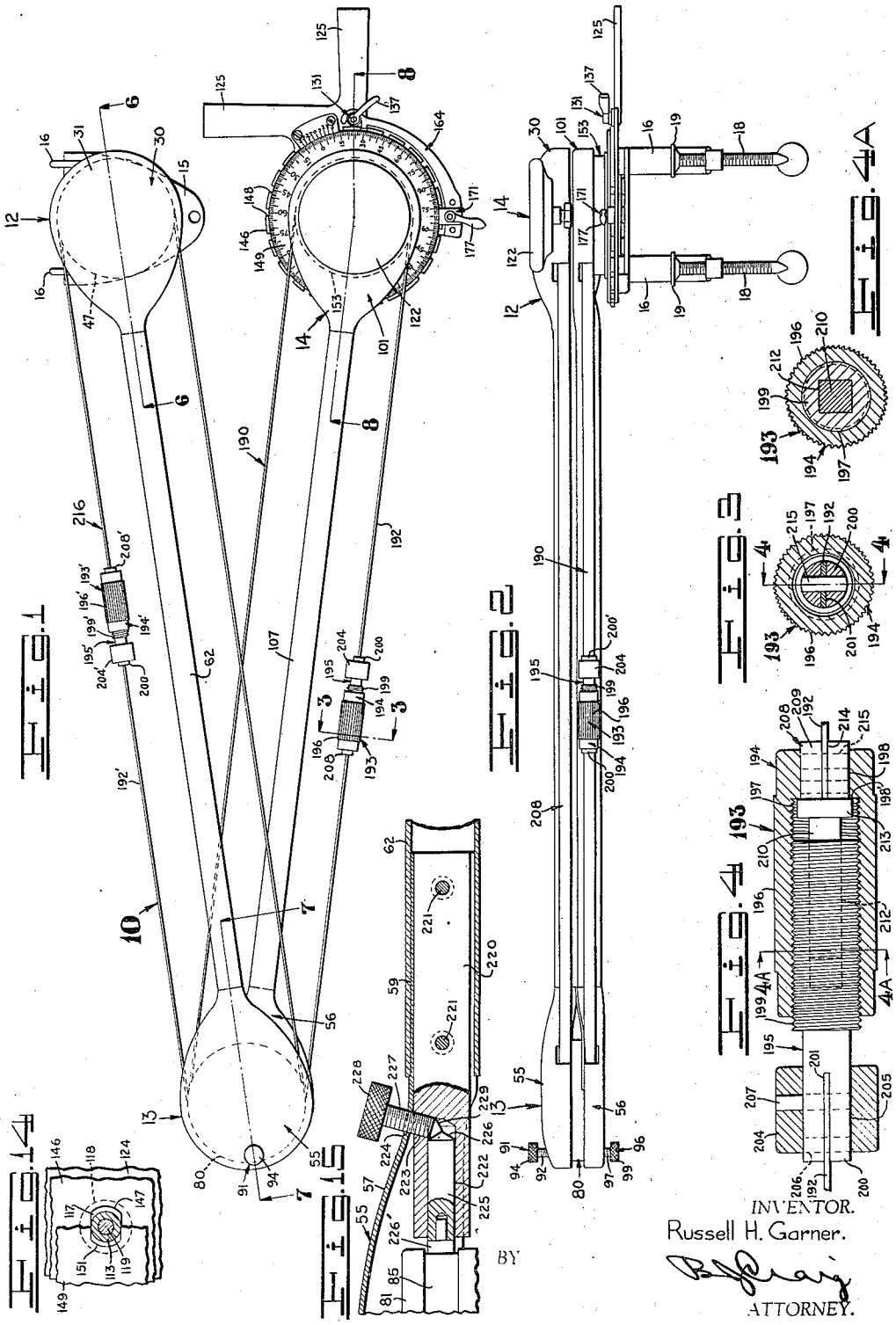
Oct. 8, 1940. R. H. GARNER 2,217,008

DRAFTING APPARATUS

Filed March 17, 1939 2 Sheets-Sheet 1



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DRAFTING APPARATUS

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FIG. 5

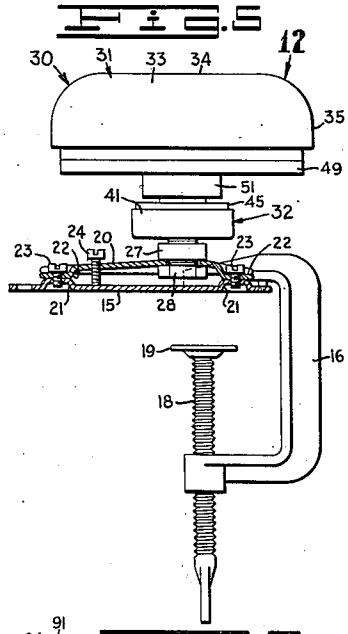


FIG. 6

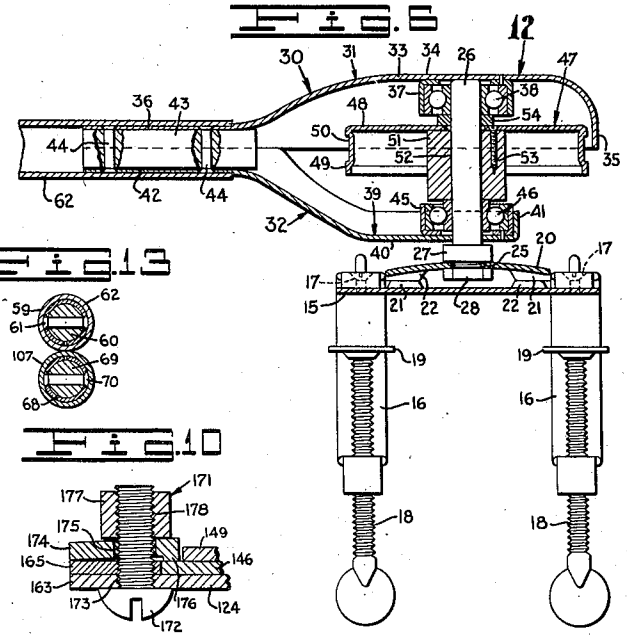


FIG. 13

FIG. 10

FIG. 7

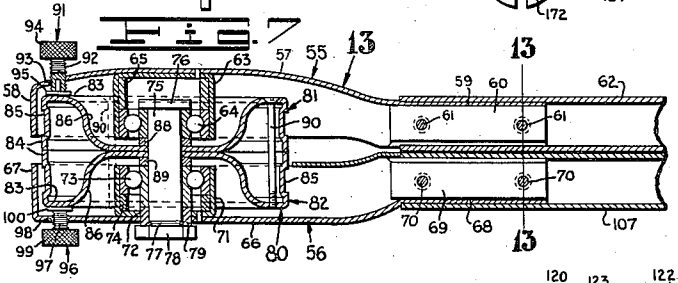


FIG. 11

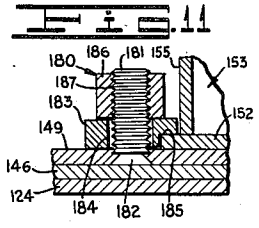


FIG. 8

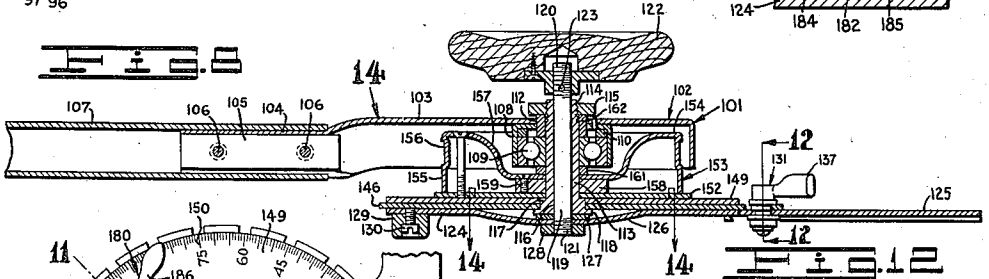


FIG. 9

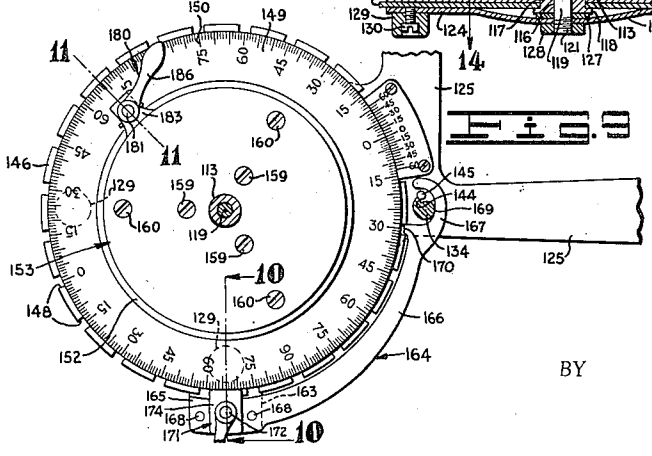
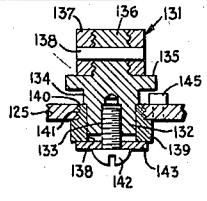


FIG. 12



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DRAFTING APPARATUS

Russell H. Garner, Pasadena, Calif.

Application March 17, 1939, Serial No. 262,392

6 Claims. (Cl. 33—79)

This invention relates to drafting instruments.

The general object of the invention is to provide an improved universal drafting machine.

Another object of the invention is to provide an improved drafting machine wherein parallel movements of the parts are provided by a novel pulley arm construction and wherein the parts may be made of metal stampings.

A further object of the invention is to provide a universal drafting machine including a novel protractor head assembly.

An additional object of the invention is to provide novel means for tightening the flexible coupling member used in a drafting machine.

Other objects and the advantages of this invention will be apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a top plan view of my improved universal drafting machine;

Fig. 2 is a side view of the drafting machine;

Fig. 3 is an enlarged section taken on line 3—3 of Fig. 1;

Fig. 4 is a section taken on line 4—4 of Fig. 3;

Fig. 4A is a section taken on line 4A—4A of Fig. 4;

Fig. 5 is an enlarged side elevation partly in section of the mast portion of the drafting machine;

Fig. 6 is an enlarged section taken on line 6—6 of Fig. 1;

Fig. 7 is an enlarged section taken on line 7—7 of Fig. 1, but with the arms vertically aligned;

Fig. 8 is an enlarged section taken on line 8—8 of Fig. 1;

Fig. 9 is a top plan view of the protractor member with the supporting arm removed;

Fig. 10 is an enlarged fragmentary section taken on line 10—10 of Fig. 9;

Fig. 11 is an enlarged fragmentary section taken on line 11—11 of Fig. 9;

Fig. 12 is an enlarged fragmentary section taken on line 12—12 of Fig. 8;

Fig. 13 is a section taken on line 13—13 of Fig. 7;

Fig. 14 is a fragmentary section taken on line 14—14 of Fig. 8; and

Fig. 15 is an enlarged fragmentary longitudinal sectional view of the upper section of the elbow portion showing a modified form of brake construction.

Referring to the drawings by reference characters I have indicated my improved drafting machine generally at 10. As shown the machine 10 includes a mast portion indicated generally at 12, an elbow portion indicated generally at 13 and a head portion indicated generally at 14.

The mast portion 12 is shown in detail in Figs. 5 and 6 and includes a substantially triangularly shaped base member 15 which is provided with a pair of clamps 16 secured to the base by screws 17. The clamps 16 include threaded members 18 having heads 19 thereon to engage a drawing table or other support to hold the drafting machine in an operative position.

On the base member 15 I provide a secondary base member 20. The base member 15 includes a plurality of upwardly directed protuberances 21 and the secondary base includes a plurality of downwardly directed protuberances 22 which engage the protuberances 21. The protuberances 21 each has a suitable threaded aperture therein and the protuberances 22 each has a suitable aperture therein to receive a screw 23 to secure the secondary base 20 to the base 15.

An adjusting screw 24 is provided so that when the screws 23 are loosened the screw 24 may be moved to shift the secondary base 15 to an adjusted position after which the screws 23 are tightened to firmly clamp the secondary base 20 to the base 15. The secondary base 15 is apertured as at 25 to receive a vertical post member 26 which is secured to the base 15 by a threaded washer 27 and a nut 28 engaging a threaded portion at the lower end of the post.

The mast portion 12 further includes an arm supporting bracket member 30 which comprises an upper member 31 and a lower member 32. The upper member 31 comprises a body portion 33 which includes a top wall 34 having depending side flanges 35 which at one end merge into a semi-cylindrical portion 36. Depending from the top wall 34 I provide an inverted cup-shaped member 37 which is secured to the wall 34 as by welding it thereto. Positioned in the cup-shaped member 37 I provide an anti-friction bearing member 38 which engages the post 26.

The lower member 32 comprises a body portion 39 which includes a bottom wall 40 having upturned side flanges 41 which at one end are directed upwardly and terminate in a horizontal semi-cylindrical portion 42 to match the semi-cylindrical portion 36 of the upper member 31. The two semi-cylindrical portions 36 and 42 of the bracket 30 surround a solid metal plug 43 to which they are secured by a pair of rivets 44.

Positioned on the bottom wall 40 of the member 32 I provide a cup-shaped member 45 which is secured to the bottom wall by welding it thereto. The member 45 is aligned with the upper cup-shaped member 37 and has an anti-friction

bearing member 46 therein surrounding the post 26.

Intermediate the bearing 38 and the bearing 46 I provide a pulley wheel 47 which is in the form of an inverted cup-shaped member including a top wall 48 having depending side flanges 49 which have a wide shallow groove 50 therein. The top wall 48 of the wheel 47 is suitably apertured to receive the post 26 and between the top wall 48 and the lower bearing 46 I provide a hub member 51 which engages the inner raceway of the bearing 46.

The hub 51 is apertured as at 52 to receive the post 26 and is secured to the wheel 47 by a screw 53. Between the upper wall 48 of the wheel 47 and the inner raceway of the upper bearing 38 I provide a washer 54. As shown in Fig. 7 the elbow portion 13 includes an upper arm supporting bracket 55 and a lower arm supporting bracket 56. The upper bracket 55 includes a top wall 57 having depending side flanges 58 which at one end merge into a hollow cylindrical portion 59. (See Fig. 13). Positioned in the cylindrical portion 59 I provide a metal plug 60 which is shown as secured to the bracket by rivets 61.

The upper elbow bracket 55 and the mast bracket 30 are connected by an arm member 62 which is formed of a predetermined length of seamless metal tubing. At one end of the arm the semi-cylindrical portions 36 and 42 of the mast bracket 30 are positioned within the arm 62 and at the opposite end the cylindrical portion 59 of the elbow bracket 55 is positioned within the arm 62.

Depending from the top wall 57 of the bracket 55 I provide an inverted cup-shaped member 63 which is secured to the bracket as by welding it thereto. Positioned in the member 63 I provide an anti-friction bearing member 64 which is spaced from the upper wall of the member by a sleeve 65 engaging the outer raceway.

The lower bracket 56 includes a bottom wall 66 having upturned side flanges 67 which at one end merge into a hollow cylindrical portion 68. (See Fig. 13). Positioned in the cylindrical portion 68 I provide a metal plug 69 which is secured to the bracket as by rivets 70. On the lower wall 66 I provide a cup-shaped member 71 which is aligned with the upper member 63 and is secured to the bracket 56 as by welding it thereto.

The lower wall 66 and the bottom wall of the member 71 are apertured as at 72. Positioned in the member 71 I provide an anti-friction bearing member 73 which is spaced from the bottom wall by a washer 74 engaging the outer raceway.

Journaled in the bearings 64 and 73 I provide a vertical shaft 75 having an enlarged head 76 at the upper end which engages the upper end of the inner raceway of the bearing 64. Adjacent the lower end the shaft includes a threaded portion 77 on which a nut 78 is positioned exteriorly of the bracket 56. Positioned in the aperture 72 and surrounding the shaft 75 I provide a sleeve member 79 which engages the lower end of the inner raceway of the bearing 73 and is engaged by the nut 78.

Intermediate the bearings 64 and 73 I provide a double pulley member 80 which includes an upper pulley portion 81 and a lower pulley portion 82. Each of the portions 81 and 82 includes a central body portion 83 having side flanges 84 in which a wide shallow groove 85 is provided.

The central portions 83 are cupped as at 86 one to receive the member 63 and the other to receive the member 71. At the center the central portions 83 abut and are suitably apertured to receive the shaft 75. Surrounding the shaft 75 between the inner raceway of the bearing 64 and the body of the upper pulley portion 81 I provide a washer 88 and surrounding the shaft between the inner raceway of the bearing 73 and the body of the lower pulley portion 83 I provide a washer 89. The upper and lower pulley portions are secured together by screws 90.

Adapted to act upon the upper portion 81 of the pulley 80 I provide a brake member 91 which includes a threaded shank 92 positioned in a threaded aperture 93 in the top wall 57. The upper end of the shank 92 has an enlarged head 94 thereon and the lower end has a fiber disk 95 mounted thereon which is adapted to engage the body portion 83 of the pulley portion 81.

Opposite the brake member 91 I provide a similar brake member 96 which is adapted to act upon the lower portion 82 of the pulley 80. The brake member 96 includes a threaded shank 97 positioned in a threaded aperture 98 in the bottom wall 66 of the lower bracket 56. At the lower end the shank 97 has an enlarged head 99 thereon and the upper end is tipped with a fiber member 100 which is adapted to engage the wall 83 of the lower portion 82 of the pulley 80.

The head portion 14 of the device 10 includes an arm supporting bracket 101 which includes a body portion 102 having depending side flanges 103 which at one end merge into a hollow cylindrical portion 104. Positioned in the cylindrical portion 104 I provide a metal plug 105 which is secured to the bracket by rivets 106.

The head bracket 101 and the lower elbow bracket 56 are connected by an arm member 107 which is formed of a predetermined length of seamless metal tubing. At one end of the arm the cylindrical portion 68 of the elbow bracket 56 is positioned within the tubing and at the opposite end the cylindrical portion 104 of the head bracket 101 is positioned within the tubing.

Depending from the top wall 103 of the bracket 101 I provide an inverted cup-shaped member 108 which is secured to the bracket as by welding it thereto. Positioned in the member 108 I provide an anti-friction bearing member 109 which is spaced from the top wall by a washer 110 engaging the outer raceway. Coaxial with the bearing 109 the top wall 103 has an aperture 112 therein.

Journaled in the bearing 109 I provide a hub member 113 which at the upper end is threaded as at 114 to receive a nut 115. The hub 113 has an aperture 116 therethrough and adjacent the lower end includes an enlarged elongated shoulder 117 and an enlarged head 118. (See Fig. 14). Positioned in the hub aperture 116 I provide a stem 119 which adjacent the upper end includes a threaded portion 120 and adjacent the lower end a threaded portion 121. The threaded portion 120 of the stem receives a cylindrical handle portion 122 which is secured thereto by a pin 123.

The head portion 14 includes a circular base plate 124 which includes finger portions 125 which are arranged at right angles to each other and which are adapted to receive the usual scale members such as commonly used in connection with a universal drafting machine.

The central portion of the base plate 124 is cupped as at 126 and suitably apertured to receive the stem 119. A washer 127 is positioned between the inner surface of the cupped portion and the head 118 of the hub and the base plate is secured to the stem 119 by a nut 128 engaging the stem threads 121.

Depending from the base plate 124 I provide a plurality of foot bosses 129 which are secured to the base plate by screws 130.

Mounted on the horizontal finger 125 of the base plate 124 I provide a release device 131 which is shown in detail in Fig. 12. As shown the device 131 includes a hub portion 132 having a threaded recess 133 opening through the bottom thereof. Above the hub 132 the device includes an enlarged cam portion 134 (see Fig. 9) and above the cam portion an enlarged flange 135. Above the flange 135 the device includes a threaded hub 136 on which a handle member 137 is secured by a pin 138. The hub 132 of the device 131 is positioned in an aperture 138 of a bolt member 139 which includes a threaded shank 140 positioned in a threaded aperture 141 in the horizontal finger portion 125. The device 131 is retained in position by a screw 142 which engages the hub threads 133 and the head of the screw engages a washer 143 which in turn engages the bottom of the bolt 139. At the large portion thereof the cam 134 includes a shoulder 144 which in one position is adapted to engage a stop pin 145 (see Fig. 9).

Above the base plate 124 I provide a stop plate 146 which has an elongated central aperture 147 therein to receive the shoulder 117 of the hub 113. The outer periphery of the plate 146 is notched as at 148 which notches are spaced fifteen degrees apart completely around the periphery.

Above the stop plate 146 I provide a protractor scale plate 149 the upper surface of which is graduated as at 150. The scale plate 149 has a central elongated aperture 151 therein to receive the shoulder 117 of the hub 113. (See Fig. 14.) Above the scale plate 149 I provide a smaller disk 152 which has a central aperture therein to receive the hub 113.

Positioned on the disk 152 I provide a pulley member 153 which includes a body portion 154 having depending side flanges 155 the lower edges of which engage the disk 152. The upper portion of the side flanges 155 have a shallow groove 156 therein. The body 154 includes a central dished portion 157 to receive the member 108 of the bracket 101. The central dished portion 157 has a disk 158 secured thereto by screws 159 and which engages the disk 152 and has a central aperture therein to receive the hub 113. The pulley 153 is secured to the disk 152 by a plurality of screws 160.

Surrounding the hub 113 between the upper surface of the dished portion 157 and the inner raceway of the bearing 109 I provide a washer 161. Surrounding the hub 113 and positioned in the aperture 112 I provide a sleeve member 162 the lower end of which engages the inner raceway of the bearing 109 and the upper end is adapted to be engaged by the nut 115. When the nut 115 is tightened against the sleeve 162 the protractor head assembly is firmly held in an operative position.

Mounted on a projecting portion 163 of the base plate 124 I provide a latch member 164 which includes a body portion 165, an elongated arcuate neck portion 166 and a head portion 167. The body portion 165 is positioned on the base plate protuberance 163 and is secured thereto by rivets 168. The head portion 167 has a recess 169 therein the surface of which is engaged by the cam 134 of the device 131. The head portion 167 further includes a protruding foot portion 170 which is adapted to be positioned in one of the notches 148 of the stop plate 147 to prevent rotation of the plates 146 and 149 relative to the base plate 124.

When the device 131 is rotated in one direction the cam 134 thereof forces the head 167 of the member 164 outward and the foot 170 out of the notch 148 whereupon the plates 146 and 149 are free to rotate relative to the base plate 124.

For rigidly clamping the plate 146 to the plate 124 I provide a clamping device 171 which is shown in detail in Fig. 10. As shown the device 171 includes a vertical screw 172 the shank of which is positioned in threaded apertures 173 in the base plate protuberance 163 and in the body portion 165 of the latch 164 with the head engaging the under surface of the protuberance. Above the body 165 I provide a clamp plate 174 which has an aperture 175 therein to receive the screw 172 and includes a depending foot portion 176 adapted to engage the upper surface of the disk 146 adjacent the periphery thereof. Above the plate 174 I provide a handle member 177 which has a threaded aperture 178 therein to receive the screw 172.

When the handle 177 is turned to move downward it forces the plate 174 downward and the foot 176 into firm engagement with the plate 146 thereby preventing rotation of the plates 146 and 149 relative to the base plate 124.

For preventing rotation of the pulley 153 relative to the scale disk 149 I provide a clamping device 180 which is shown in detail in Fig. 11. As shown the device 180 includes a threaded vertical stud 181 which is secured to the scale plate 149 by riveting as indicated at 182. On the upper surface of the scale plate 149 I provide a clamp plate 183 which has an aperture 184 therein to receive the stud 181 and includes an undercut portion 184 which is of less depth than the thickness of the disk 152 a peripheral portion of which is positioned therein. Above the clamp plate 183 I provide a handle member 186 which has a threaded aperture 187 therein to receive the threaded stud 181.

When the handle 186 is rotated to move downward it forces the clamp plate 183 downward which firmly clamps the disk 152 to the scale plate 149.

The pulley 153 of the head portion 14 is connected to the lower pulley portion of the elbow pulley 80 by an endless strap member 190. The strap 190 includes a length of metal which is positioned in the groove 85 of the pulley 80 and in the groove 156 of the pulley 153. The ends of the strap are joined by an adjustable coupling device indicated generally at 193 and shown in detail in Figs. 3 and 4.

The coupling 193 includes a body member 194 and a cylindrical member 195. The body 194 includes a knurled central portion 196 and has a threaded recess 197 opening through one end with a reduced aperture 198 opening through the opposite end and communicating with the threaded recess 197 and forming a shoulder 198'.

The cylindrical member 195 includes an externally threaded portion 199 which is positioned in the threaded recess 197 of the body 194 and a reduced end hub 200 having a slot 201 therein in which one end of the strap 192 is positioned.

A head member 204 having an aperture 205 therein is positioned on the hub 200. The strap 192 is secured to the hub by a pin 207. Positioned in the body 194 I provide a core member 208 which includes a cylindrical portion 209 positioned in the body aperture 198 and polygonal portion 210 which fits within a similarly shaped recess 212 of the threaded portion 199. Intermediate the cylindrical portion 209 and the polygon-

al portion 210 the core includes an enlarged collar 213. The cylindrical portion 199 has a slot 214 therein in which the other end of the strap 192 is positioned and secured thereto by pins 215.

When the body 194 is rotated all the slack in the strap 190 is taken up. By holding the head 204 stationary and rotating the body 194 the strap will not twist as it is being tightened.

The upper pulley portion of the pulley 80 of the elbow portion 13 is connected to the pulley 47 of the mast portion 12 by an endless strap 215. The strap 215 is similar in all respects to the previously described strap 190 and like portions thereof are indicated by similarly primed reference numerals. The band 192' of the strap 215 is positioned in the groove 85 of the pulley 80 and in the groove 50 of the pulley 47.

In Fig. 15 I have shown a modified form of brake applied to the upper section 55 of the elbow portion 13. When this type of brake is used the rod 60 is replaced by a longer rod 220 which extends inward to adjacent the pulley 81 and is secured to the arm 62 by rivets 221. The inner portion of the rod 220 has an axial recess 222 therein opening through the inner end thereof. Adjacent the bottom of the recess 222 the rod 220 has an angular transverse threaded aperture 223 therein which intersects the recess 222. Coaxial with the threaded rod aperture 223 the top 57 of the upper section 55 has a similar threaded aperture 224 therein.

Positioned in the rod recess 222 I provide a metal plunger 225 the inner end of which is conically tapered as indicated at 226. The outer end of the plunger 225 has a fiber disk 226' mounted thereon the end of which is shaped to engage the surface of the band recess 85 of the pulley 81.

Positioned in the threaded apertures 223 and 224 I provide a threaded stem 227 the outer end of which has an enlarged knurled head 228 thereon. The inner end of the stem 227 is conically tapered as at 229 to match the taper 226 of the plunger 225.

To apply braking friction to the pulley 81 the stem 227 is rotated to move downward and as it does it forces the plunger 225 outward towards the pulley 81 and the disc 226' into engagement with the pulley.

From the foregoing description it will be apparent that I have provided an improved universal drafting machine which may be economically manufactured and which is highly efficient in use.

Having thus described my invention I claim:

1. In a drafting machine, a base, an arm on the base, an elbow member including an upper and a lower bracket, said arm engaging one of the brackets, an anti-friction bearing supported by said upper bracket and an anti-friction bearing supported by said lower bracket, a shaft journaled in said anti-friction bearings, a double pulley member surrounding said shaft, the upper and lower faces of said pulley being recessed to provide space for said bearings, said upper bracket including a body having depending side flanges spaced beyond said pulley, said body and side flanges at one end merging into a reduced cylindrical portion, said lower bracket including a body having upturned side flanges spaced beyond said pulley, said lower body and side flanges at one end merging into a reduced cylindrical portion, the top wall of said upper bracket body having a threaded aperture, a threaded stem positioned in said aperture, an enlarged head on said stem above said body and a tip member on the opposite end of said stem adapted to engage the upper face of said pulley, the bottom wall of said lower bracket body having a threaded aperture, a threaded stem positioned in said lower aperture, an enlarged head on said lower stem below said lower body, a tip member on the opposite end adapted to engage the lower face of said pulley and a second arm on the other bracket.

2. In a drafting machine, a base, a pulley fixed on said base, an arm rotatable on the base, an elbow on the first arm, a second arm on the elbow, said second arm including a pulley, a strap passing over said pulleys and a coupling member for the ends of said strap, said coupling member including a hollow cylindrical internally threaded body member, a core member rotatable on the body member and including a portion projecting from the body member, means to secure one end of said strap to said projecting portion, and a threaded core member in the body, means permitting sliding engagement and preventing relative rotation between the two core members, means to secure the other end of the strap to the outer end of the threaded core member and a grip member upon the outer end portion of the threaded core member.

3. In a drafting machine, a base, a pulley fixed on said base, an arm rotatable on the base, an elbow on the first arm, a second arm on the elbow, said second arm including a pulley, a strap passing over said pulleys and a coupling member for the ends of said strap, said coupling member including a hollow cylindrical internally threaded body member having a shoulder at one end, a core member having a collar thereon engaging said shoulder and including a portion projecting from the body member, means to secure one end of said strap to said projecting portion, said core member including a polygonal portion disposed within the body member and a threaded core member in the body and having a recess securing the portion on the first core member, means to secure the other end of the strap to the outer end of the threaded core member and a collar member secured upon the outer end of the threaded core member.

4. In a drafting machine, a base, a bracket rotatable on said base, an arm on said bracket, an elbow member support on said arm, said elbow member including a pair of pulleys, one of said pulleys having a grooved periphery, a rod mounted on said arm and extending to a point adjacent said one pulley, said rod having a recess adjacent the pulley, a plunger slidable in said recess and adapted to engage in said groove, said rod having a threaded lateral recess intersecting said first mentioned recess, a threaded member in said lateral recess, said threaded member having a cam at its inner end and said plunger having a cam engaging said threaded member cam.

5. In a drafting machine, a base, an arm on the base, an elbow member, said elbow including an upper bracket and a lower bracket, opposed cup members on each bracket, spacing sleeves in said cup members, said arm engaging one of said brackets, an anti-friction bearing supported in each cup member and engaging the spacing sleeves, a shaft journaled in said anti-friction bearings, a double pulley member surrounding said shaft, said double pulley including two contacting disk-like central portions and offset strap engaging portions, the offset portions providing spaces for said bearings, means to clamp said

pulley central portions between the upper and lower bearings, and a second arm engaging the other bracket.

6. In a drafting machine, a base, an arm on the base, an elbow member including an upper and a lower bracket, said arm engaging one of the brackets, an anti-friction bearing supported by said upper bracket and an anti-friction bearing supported by said lower bracket, a shaft journaled in said anti-friction bearings, a double pulley member surrounding said shaft, said upper bracket including a body having depending side flanges spaced beyond said pulley, said body and side flanges at one end merging into a reduced cylindrical portion, said lower bracket including a body having upturned side flanges spaced beyond said pulley, said lower body and side flanges at one end merging into a reduced cylindrical portion, the top wall of said upper bracket body having an aperture, a stem positioned in said aperture, an enlarged head on said stem above said body and a tip member on the opposite end of said stem adapted to engage the upper face of said pulley, the bottom wall of said lower bracket body having an aperture, a stem positioned in said last mentioned aperture, an enlarged head on said lower stem below said lower body, a tip member on the opposite end adapted to engage the lower face of said pulley and a second arm on the other bracket.

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