United States Patent [19]

Rushin

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[54] **TRI-SQUARE DRAWING BOARD**

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[21] Appl. No.: **398,307**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 143,212, May 13, 1971, abandoned.

[52] **U.S. Cl.** ..... **33/76 R,** 33/80

[51] **Int. Cl.** **B43l 13/02**

[58] **Field of Search** 33/76, 80, 81, 99

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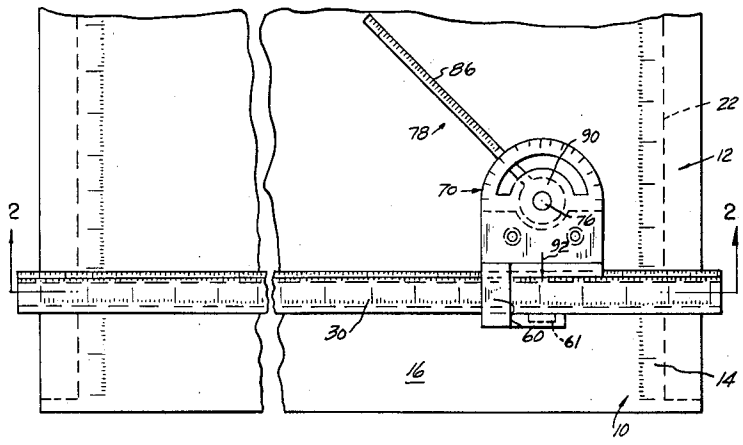
[57] **ABSTRACT**

This invention relates to new drawing board apparatus and drafting tools. A straight edge member slides within slots along the sides of a drawing board and is held in position selectively by magnets. The slideable member slides along the straight edge. A magnet holds this slideable member in position along the straight edge. A protractor is attached to the slideable member. An arm is rotated on the center of the protractor and held in place by magnets. Scales are provided on the drawing board, straight edge, and arms for measurement and drafting.

6 Claims, 15 Drawing Figures



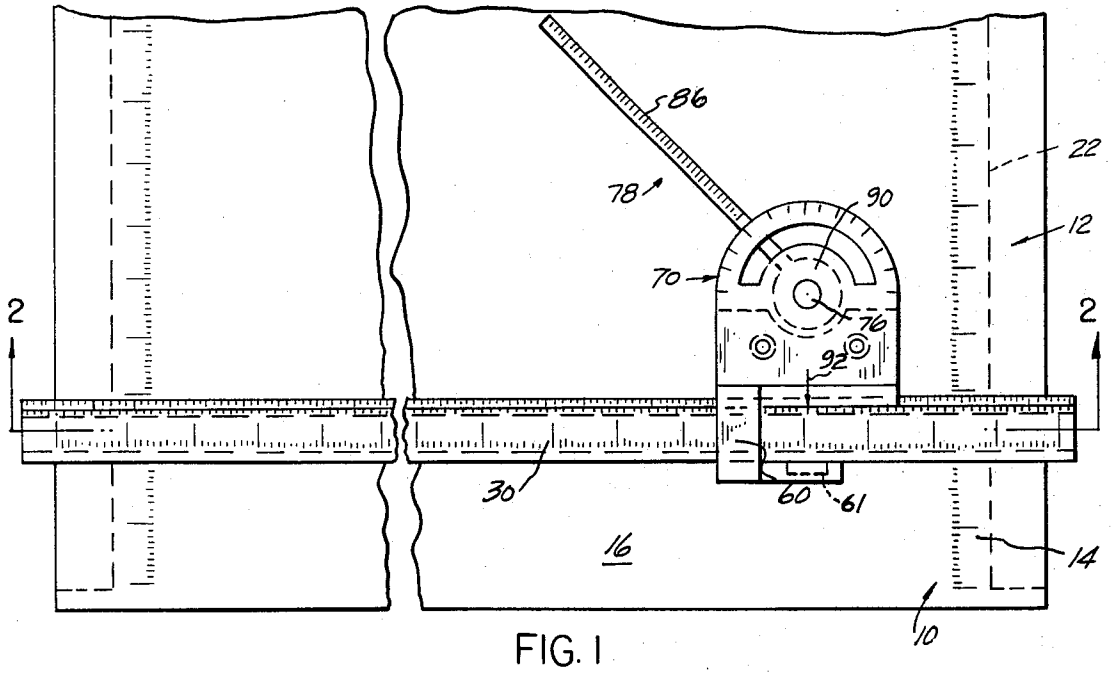


FIG. 1

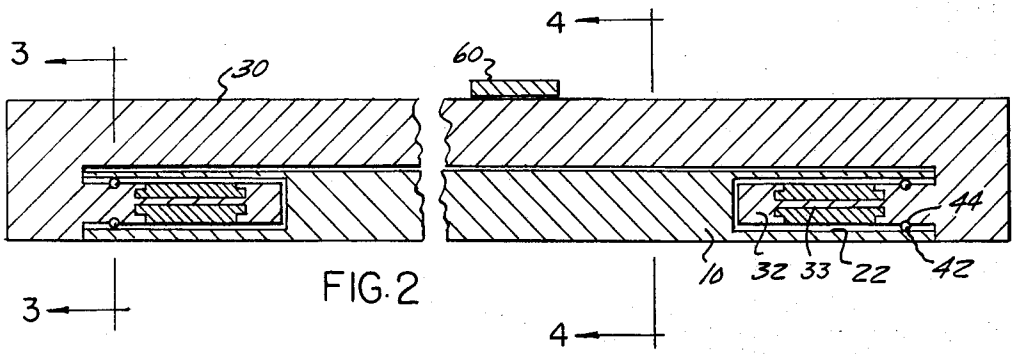


FIG. 2

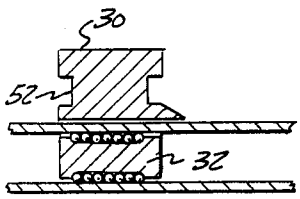


FIG. 3

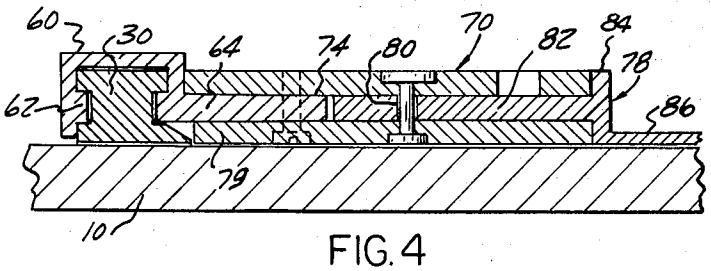


FIG. 4

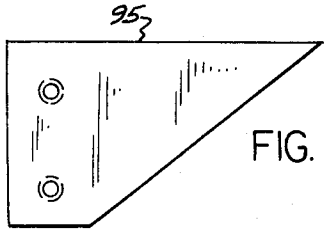


FIG. 16

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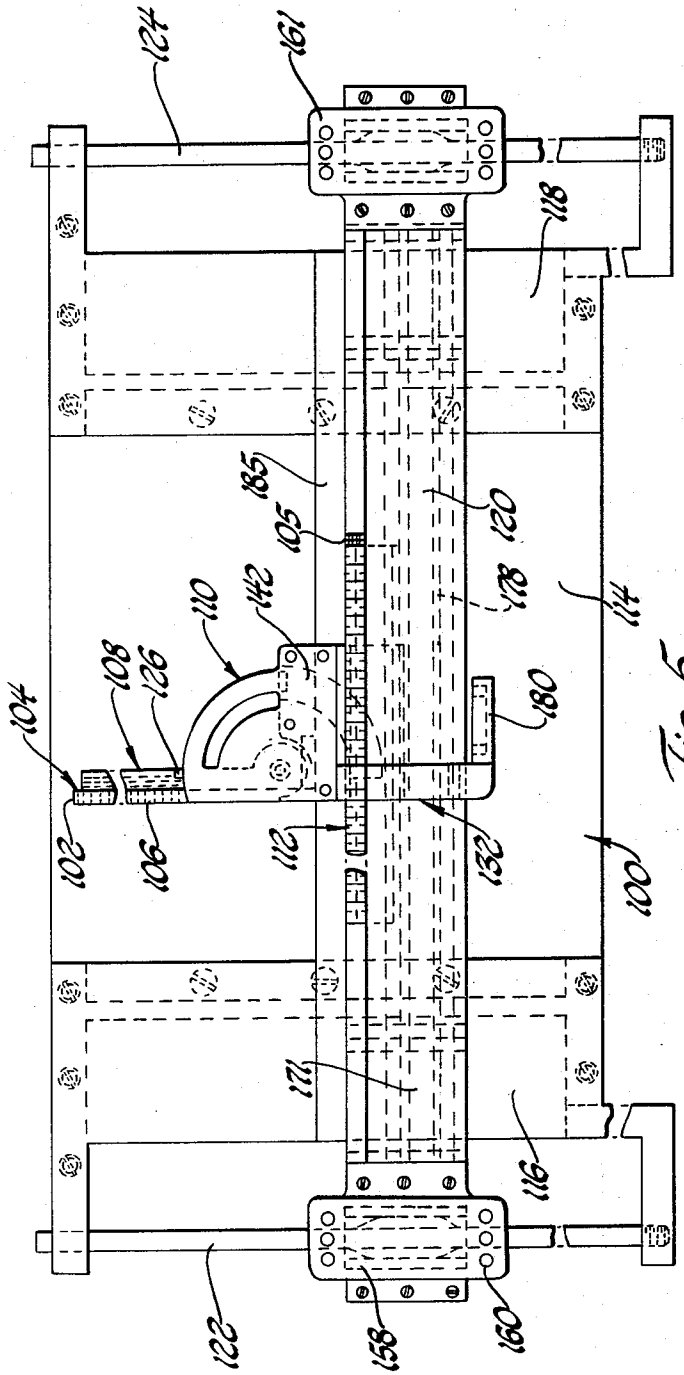
124
161
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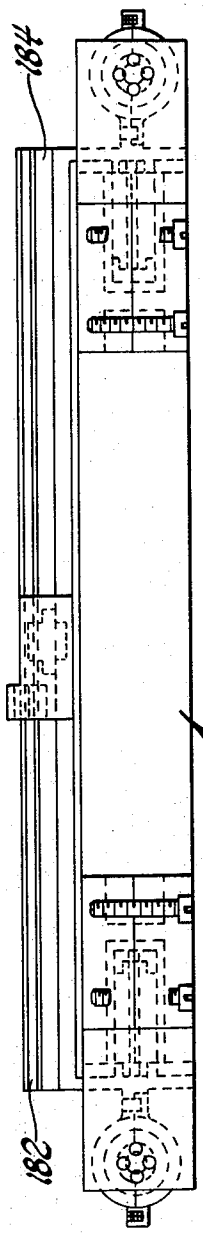
Fig. 5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182

Fig. 6

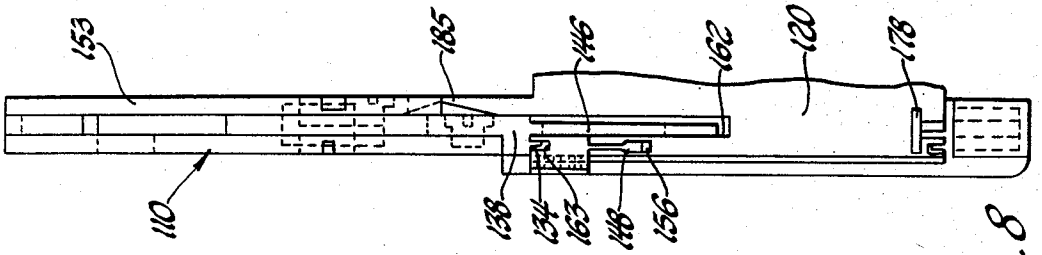
153
185
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Fig. 8

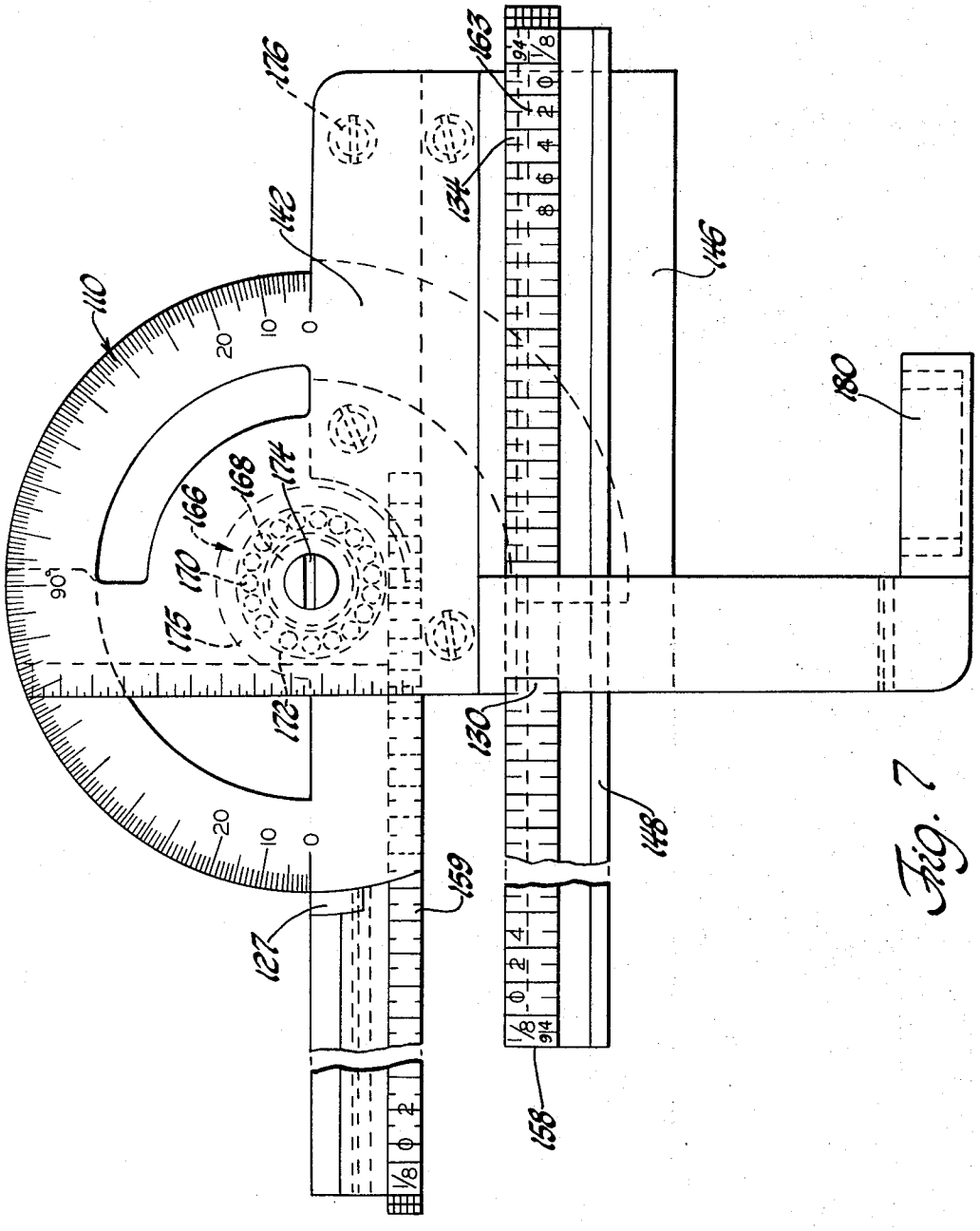
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Fig. 7

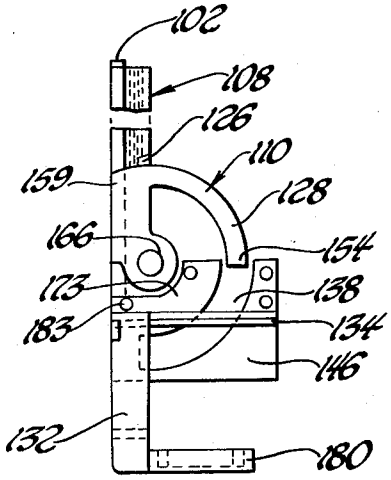

Fig. 9

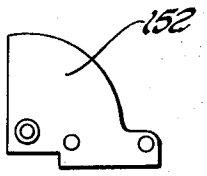

Fig. 10

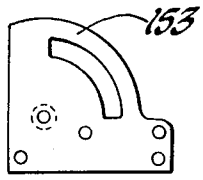

Fig. 11

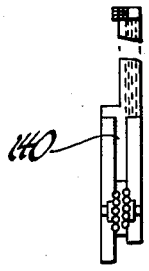

Fig. 12

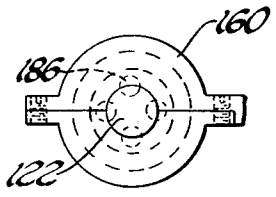

Fig. 13

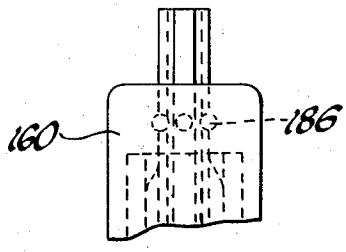

Fig. 14

Fig. 15

TRI-SQUARE DRAWING BOARD

This is a continuation in part of application Ser. No. 143,212 filed May 13, 1971, now abandoned.

It has been a practice among draftsmen in the past to utilize various drafting components and measuring devices in the course of their work. When the various instruments and implements are not connected together in such a way as to provide a uniform and precise fixing and movement of these implements and instruments from one location to another, various problems arise. One of these problems is that when the drafting board is tilted, the draftsman must be careful to hold one or more of these implements in place while drawing or making measurements. Depending on the angle of tilt, he must hold with varying pressures. This provides an unnecessary strain during the process of drafting. Another problem that arises is that because of different coefficients of friction between different materials, the draftsman must be careful to move his instruments with different pressures in order to maintain uniform lines on his drawings. Another problem that arises when the various instruments and implements are not connected together is a predetermined manner so as to provide for uniform fixing and movement of the various implements, is a problem of parallax when unconnected instruments are used for measurement. This problem is particularly acute when several scales are placed in a parallel or nomograph fashion.

The above problems are substantially alleviated, if not eliminated, by the practice of this invention. In a preferred embodiment of this invention, a drafting board is provided with magnets on a straight edge. Male and female corresponding guide members provide a track for a straight-edge to move up and down on the drafting board. Ball bearings with slots to provide translation of the ball bearings reduce the friction between the straight-edge and the drawing board in an alternative embodiment. The electromagnets may be selectively energized to fix the straight-edge at any predetermined position. Male and female guide members provide a track for a member to slide across the straight-edge member. This slideable member is provided with rotatable means for holding an arm or drawing member. A protractor may also be fixed to a slideable member. When the drawing member or arm is rotated with respect to the slideable member, the angle of movement of the arm can be determined from the protractor. Scales are provided horizontally on the straight-edge member. Vertical scales are provided on the surface of the drawing board. Scales may also be provided on the arm member. A wheel concentric with the center of rotation of the arm member with respect to the slideable member is provided. This wheel may be selectively magnetized to hold a predetermined position.

It is the object of this invention to provide a uniform means of fixing and translating and rotating drafting implements from one location to another on a drafting board for the measurement of distances and directions and to assist the drawing thereof. It is another object of this invention to provide means for predetermining the upper limit of friction between drafting implements on the drawing board and means of uniformly overcoming such friction in order to provide more uniform and accurate drawings. These and other objects of this invention will appear in the following description and appended claims, referring to the accompanying drawings forming a part of this specification.

ON THE DRAWINGS

FIG. **1** is a partial top plan view of the preferred embodiment of this invention;

FIG. **2** is a cross-sectional view of the apparatus illustrated in FIG. **1**;

FIG. **3** is a transverse sectional view of the apparatus illustrated in FIG. **1**; and

FIG. **4** is a view of the apparatus shown in FIG. **1.**

FIG. **5** is a plan view of an alternative embodiment of this invention;

FIG. **6** is a transverse sectional view of the apparatus shown in FIG. **5** taken along the lines **6—6** thereof;

FIG. **7** is an enlarged plan view of a portion of the apparatus shown in FIG. **5**;

FIG. **8** is a transverse sectional view of the apparatus shown in FIG. **7** taken along the lines **8—8** thereof;

FIG. **9** is a top plan view of a portion of the apparatus shown in FIG. **5**;

FIG. **10** is a top plan view of a portion of the apparatus shown in FIG. **5**;

FIG. **11** is a top plan view of a portion of the apparatus shown in FIG. **5**;

FIG. **12** is a transverse sectional view of a portion of the apparatus shown in FIG. **9** taken along the lines **12—12** thereof;

FIG. **13** is a cross-sectional view of a portion of the apparatus shown in FIG. **5** taken along the lines **13—13** thereof;

FIG. **14** is a partial transverse sectional view of a portion of the apparatus shown in FIG. **5**; and

FIG. **15** is a cross-sectional view of a portion of the apparatus shown in FIG. **14** taken along the lines **15—15** thereof.

FIG. **16** shows a drafting triangle useable with the projection **64** of FIG. **1.**

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details in construction and arrangement of parts illustrated in the accompanying drawings since the invention is capable of other embodiments and of being practiced or carried out in various ways.

Also it is to be understood that the phraseology and terminology employed herein are for the purpose of description and not of limitation.

AS SHOWN ON THE DRAWINGS

In the preferred embodiment of this invention, there is a metal drawing board member **10.** This drawing board member may be tilted at any angle with respect to a base (not shown). On the right hand side **12** of this drawing board member, are a plurality of scales **14.** The surface **16** of the drawing board member **10** is any surface suitable for both the holding of drawing paper and sufficiently hard to allow drawing on the drawing paper when it rests on the surface. The surface **16** may be wooden.

A straight-edge member **30** is provided to slide up and down the surface of the drafting board or drawing board. This straight-edge member has a transverse tab or projection **32** that fits into the slot **22.** This tab or projection **32** may be regarded as a male component, and the slot **22** may be regarded as a female component of means for guiding the straight-edge member in a

straight translational path up and down the drawing board and constraining the straight-edge from moving at an angle other than 90° with respect to the edge **12** of the drawing board.

The ball bearings **42** are placed in groove seats **44** in the male extending projection **32** of the straight-edge member. These ball bearings provide a uniform means of reducing the friction between the straight-edge member and the drawing board so that the force necessary to uniformly move the straight-edge from one position to another with respect to the drawing board can be predetermined.

The straight-edge member has slots **52** in its forward and rearward sides. These slots extend across the straight-edge member. They provide a track for translation of a slideable member **60** across the straight-edge member. Just as the sides of the drawing board with its slot **22** provides a track for a vertical translation of the straight edge member, the slots **52** in the straight edge member provide a track for horizontal translation of the slideable member **60** across the drawing board. The forward and rearward sides of the slideable member **60** have projections **62** which correspond with and fit into the slots **52.** The projections **62** can be regarded as a male component, and the slots **52** may be regarded as the female components of guiding portions for the horizontal translation of the slideable member **60.**

In an alternative embodiment of this invention, the guiding portions for the translation of the slideable member **60** can be provided with ball bearing seats, grooves, and ball bearings for the uniform reduction of friction between these members. However, the provision of this ball bearing means is not as necessary as such provision for the sliding of the straight-edge member with respect to the drawing board. The reason for this is that while the friction between the drawing board and the straight-edge member may vary substantially at various angles of tilting of the drawing board, this is not so true in the case of the friction between the straight edge and the sliding member **60** because the latter translate horizontally and not vertically. Consequently, the control of friction between the elements to provide uniform sliding is not as difficult.

In the preferred embodiment of this invention, the slideable member **60** has a projection **64** extending away from the straight-edge member **30** and towards the forward end of the drawing board member **10.** A protractor **70** is rigidly secured to this projection **64.** This can be done by means of bolts and wing nuts. The bottom surface **74** of the protractor **70** has a portion that rests on the top surface of the projection **64.** The protractor has a center **76** for arcuate scale **78** laid out on the top of the protractor. A magnetic member **79** is secured underneath the projection **64.**

Concentric with the center **76** of the protractor, and journaled to the projection **64** of the slideable member **60,** is an arm **78.** The journaling of the arm **78** to the projection **64** is accomplished by means of a bushing or bearing **80.** The arm **78** has a portion **82** that traverses or rotates underneath the protractor **70** and has a thickness less than the thickness of the projection **64.**

Another portion **84** of the arm **78** is thicker than the portion **82** and extends beyond the protractor **70.** This arm or drawing member **78** may have scales on its top surface. It can be used in conjunction with the protractor to measure and draw lines and angles with respect to the center **76** of the protractor.

In the preferred embodiment of this invention, a circular disc or wheel **90** is journaled on the projection **64** of the slideable member **60,** and is concentric with the journaling of the arm **78** and the center **76** of the protractor **70.** The wheel **90** contains a permanent magnet forming lines of magnetic force with the magnetic member **79.** The slideable member **60** is composed of ferrous or other magnetizable material. The magnetic field set up between the wheel **90** and the magnetic member **79** assist in providing a predetermined level of force that can be selectively overcome by the draftsman. This force helps to hold the arm **78** in a predetermined position and yet is small enough to allow selective movement from one location to another by the draftsman.

In the preferred embodiment of this invention, horizontal scales are provided on the top surface of the straight-edge member **30.** An index in the form of a groove is provided on the slideable member to the scales. This index or groove **92** is in the line of sight with the center **76** of the protractor such that the line of sight is perpendicular to the straight-edge member. In this manner, the center of the protractor can be precisely located with minimum error due to parallax.

The straight-edge member **30** can be precisely located with respect to the scale **14** on the drawing board. Since the center of the protractor **76** can be precisely located with respect to scales on the straight-edge member, and the extended portion **86** of the arm **78** can be moved to an angle that intercepts the scales **14,** precise location of directions and distances can be measured and drawn with the above described apparatus. It can be appreciated that nomographs and nomographic calculations can be derived efficiently, expeditiously, and accurately with this invention.

In an alternative embodiment, the protractor **70** and arm **78** and wheel **90** can be replaced with drafting triangles secured to the projection **64** and the slideable member **60.** In this manner directions and distances can be efficiently mapped and drawn with projections at specified angles. For example, if it is desired to make a 30° projection from an orthographic set of projections, a 30°–60°–90° triangle can be secured to the projection **64** on the slideable member **60,** and the 30° projection can be made with precise measurement of distances.

In the preferred embodiment of this invention, the structure on the right hand side of the drawing board member and the straight edge member is duplicated on the left hand side of the drawing board member and straight edge member. Thus, there are male projection-female slot means for guiding the straight edge member along the drawing board; ball bearing means for reducing friction; and magnets for selectively controlling the movement or fixing of the straight edge on the drawing board on the left hand side as well as the right hand side of these members.

The male projection or tab **32** on the right hand side of the straight edge member, that fits into and cooperates with the female slot **22** in the right hand side of the drawing board member, is duplicated in mirror image fashion on the left hand side. The male tab or projection or tab on the right hand side, and the corresponding tab on the left hand side, both contain magnets **33** that cooperate with ferrous or other magnetizable ma-

terial within the drawing board to hold the straight edge member at a selected position. In an alternative embodiment circuits (not shown) are contained within the drawing board to carry electrical energy to the electromagnets when a switch (not shown) is thrown by the draftsman. These circuits can be alternatively located below the drawing board rather than intregally within its, provided that they have shielded leads to the electromagnets in the board.

A magnet **61** is also provided in the slideable member **60** to help hold the slideable member **60** in a selected position and yet be weak enough to move easily by hand to another selected position. This magnet **61** has magnetic force attracting it to the metal in the straight edge.

From the foregoing description of preferred and alternative embodiments of this invention, it can be appreciated that a plurality of drafting components can be constructed according to the teaching of this invention such that friction between them can be uniformly controlled, positions firmly held without undue strain on the draftsman, and accurate measurement and drawing of distances and directions can be readily obtained.

An additional alternative embodiment of the invention is shown in FIGS. **5** through **15.** In general, in this alternative embodiment of the invention, a cylindrical apparatus holding the straight-edge is shown as having ball bearings in a circular array around a horizontally displaced rod that is circular in its outside surface. In addition, magnets are circularly arrayed around the rod in those members holding the straight-edge. A variation from the first preferred embodiment of the invention is exhibited in this alternative embodiment. This variation relates to means holding the protractor on a member connecting to the straight-edge. This additional means comprises a bushing and a circular array of ball bearings. Another variation relates to the fact that the protractor can slide horizontally on the straight-edge as can the rulers.

Referring directly to the drawings in FIGS. **5** through **15,** the drawing apparatus is referred to generally as numeral **100.** A knurled handle **102** is provided which is fixed to the top of the protractor rule **104** to allow easy grasping and manipulation. A ruler **106** is provided. This ruler slides up and down for making measurements. The ruler **106** is attached to an arm **108.** The right side of the arm **108** can be used to indicate an angle with respect to the protractor **110** as will be described more fully below.

The assembly containing the protractor **110** and arm **108** is attached to an aluminum straight-edge **112.**

The drawing board apparatus **100** comprises a central portion **114** and end portion assemblies **116, 118** located on the right and left hand sides of the central board portion **114** respectively. A straight-edge member **120** is provided on the aluminum straight-edge assembly **112.** A Vernier scale can be provided on the side of the ruler.

Rod portions **122, 124** are substantially right circular cylindrical rods located on the left and right hand extremities of the left and right hand portions **116** and **118** of the board **100** respectively.

A notch **126** is provided in the arm **108** of the protractor in meeting the angular measurements graduated along the edge of the surface of the protractor **110.** This portion of the protractor indicated at numeral **128** is the top portion of the protractor **110.** An aperture **130** of an indicator member for determining straight edge measurements from the ruler is provided.

The arm of the protractor slides with respect to the straight-edge, or the ruler of the straight-edge, from an inner magnet to the straight-edge.

The straight-edge indicator member **132** is connected to the protractor, and points out measurements on the scales on the straight-edge. A male projecting flange **134** extends upwardly and outwardly from a protractor containing member and is designed to engage a surface of the straight-edge for sliding thereon.

A projection of the protractor carrying member projects into a corresponding female portion of the straight-edge for sliding therewithin in a horizontal direction.

A metal portion **138** of the protractor carrying portion has an arc portion that engages a wheel. The wheel rotates with respect to the portion **138** and portion **138** has an outer arc portion that corresponds to a corresponding inner arc of the protractor portion **140.**

A space **142** within the portion **138, 146,** wherein the movement of the protractor projecting arc portion **128** is confined. A flange is provided in the central part of the downward exterior portion of the ruler that acts as a male member in projecting in a corresponding female bevel within the straight-edge for sliding engagement therewith. A bottom portion **152** of a three part portion of the protractor is provided. This bottom portion **152** is on the bottom surface of this three part portion.

A magnet **154** is located on the protractor which attracts to corresponding portions of the protractor. A female part **156** is located on the upper part of the sliding ruler.

The end **158** of the ruler is located in the inner cylinder magnets. The cylinder block itself is designated by numeral **160** which is attached to the straight-edge. The female receiving portion of the ruler is designated by numeral **162.** The corresponding male part of the protractor bearing portion is provided at numeral **164.**

A wheel **166** is provided on the arm of the protractor. A bushing **168** is provided radially inward and concentric with the wheel **166.** Ball bearings **170** are provided radially inward of a race **172** for the ball bearings. A connector **174** connects the upper and lower part of the protractor and the arm of the protractor in a corresponding coaxial rotational engagement. A fastener **176** holds the upper and lower part of the protractor carrying member together.

A strip of metal **178** is fixed to the straight-edge and is attracted by a magnet **180** on the indicator or protractor carrying portions. Female receiving portions **182** and **184** are carried on the straight-edge for receiving portions of the indicator or protractor carrying portions. Ball bearings **186** are carried within the housings **160** for sliding engagement with the rods **122.**

It can be appreciated from the foregoing description of the alternative embodiment of the invention that a drafting apparatus has been provided that has a plurality of ball bearings and magnetic arrangements whereby an optimum precision can be achieved in utilizing the apparatus for drafting in holding the appropriate draft instruments in the correct position for drawing and also providing relative ease in moving such instruments to a different location in an efficient manner to expedite drawings made with this apparatus.

I claim:

1. In drafting apparatus, the improvements comprising:
a metal drafting board having a slot on its edge;
a straight-edge having a projection extending into said slot;
magnets fixed in said projection forming lines of magnetic force with said metal drafting board;
ball bearings seated in said projection and rolling in said slots;
a member slideable along said straight-edge;
a plurality of parallel scales on said drawing board and said straight-edge;
and means attached to said member for drafting on said board and making arithmetic and nomographic calculations with said scales;
said slideable member having a projection extending from said straight-edge and spaced at a distance from said board;
a protractor fixed on top of said projection;
a magnetic entity secured underneath said projection;
a wheel of magnetic material journaled on said projection;
an arm extending from said wheel between said protractor and said entity;
and scales on said arm and said protractor.

2. The apparatus in claim 1 and a plurality of scales on said member.

3. The apparatus of claim 1 wherein said straight-edge has a sloping projection extending downward toward the board and said member has an indexing groove denoting position on said sloping projection.

4. The apparatus of claim 1 and grooves in said straight-edge, and projections on said slideable member sliding in said grooves.

5. The apparatus of claim 4 and ball bearings seated in said slideable member and rolling in the grooves of said straight-edge.

6. In drafting apparatus, the improvements comprising:
a drafting board having a central planar portion and right and left hand corresponding portions attached to the central portion and having top planar surfaces co-planar with the top surface of said central portion;
rod-like portions on each of said end portions having grooves extending along the transverse length thereof;
a straight-edge member having bearing and magnet housings on the right and left hand sides thereof;
said bearing and magnet housings on said straight-edge having central axis corresponding with the central axis of said rods and surrounding said rods and having ball bearing portions engaging the grooves in said rods and having magnetic portions being attracted to the metal in said rods whereby said straight-edge is operable to translate with respect to said rods within a plane parallel to the plane of the top surface of said drafting board;
a plurality of scales on said straight-edge member;
a protractor carrying member operable to slide and engage the edges of said straight-edge member in corresponding male-female relationship;
a magnet located on said protractor carrying member operable to exert magnetic lines of force for attraction to metal within said straight-edge member;
a protractor member fixed on said protractor carrying member;
an arm journaled on the center of said protractor member by means of ball bearings;
said arm carrying a scale;
an arc-like scale on the external edges of a semicircular portion of said protractor;
said scale on said arm operable to intercept the exterior edge of said protractor member;
an additional scale on said protractor member in parallel with the aforesaid scale on said straight-edge member and arranged with respect thereto to provide Vernier-like computations with respect to the aforesaid scale on said straight-edge member;
said magnets being permanent magnets and exerting magnetic force with respect to adjacent metal sufficient to hold one part of the aforesaid apparatus with respect to another up to a predetermined threshold of force for overcoming said magnetic force and being inoperable to hold above that predetermined threshhold.

* * * * *