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3,083,475

CONSTRUCTION KIT FOR THE REPRESENTATION OF TWO-DIMENSIONAL
FIGURES, MAINLY INTENDED FOR THE TUITION OF
MATHEMATICS AND SIMILAR PURPOSES

Filed Nov. 3, 1959

5 Sheets-Sheet 1

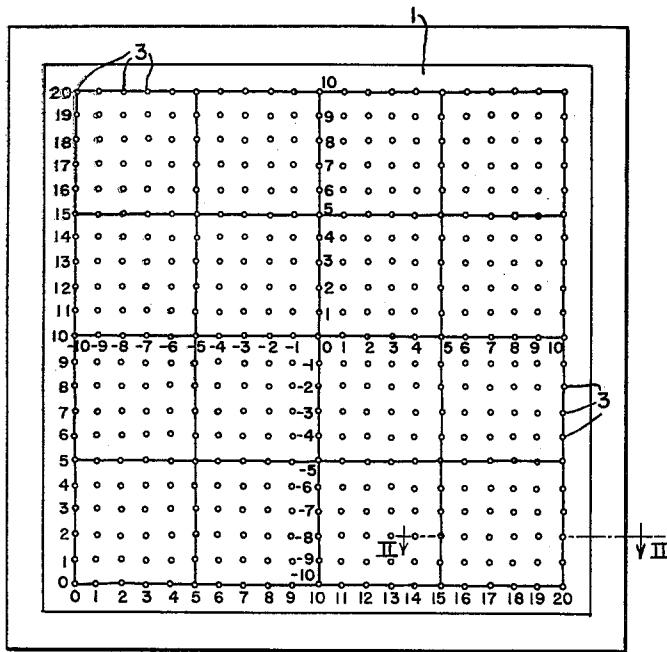


FIG. 1

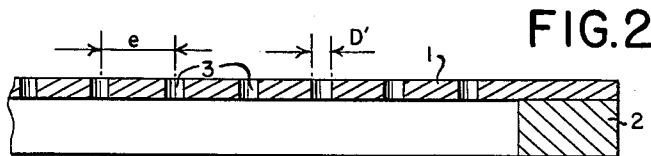


FIG. 2

FIG. 3

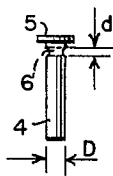


FIG. 4

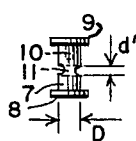


FIG. 5

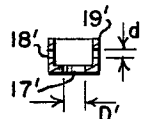


FIG. 6

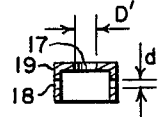


FIG. 7

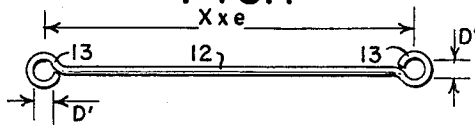


FIG. 8



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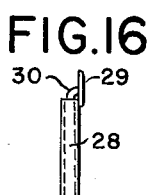
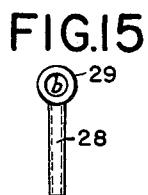
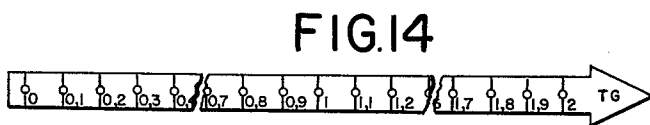
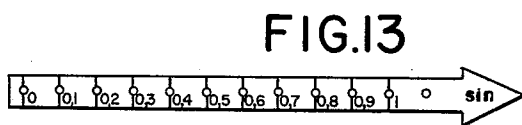
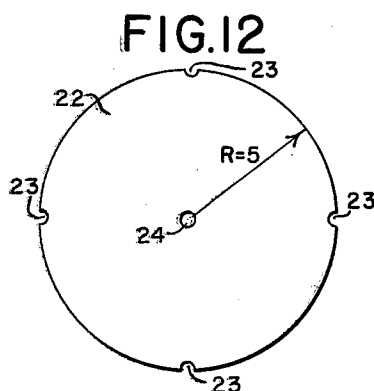
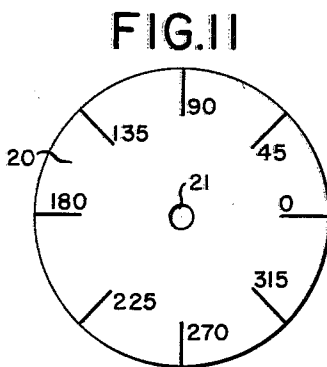
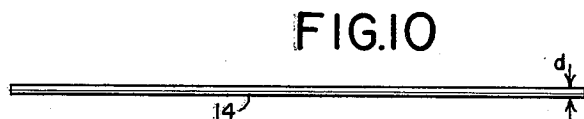
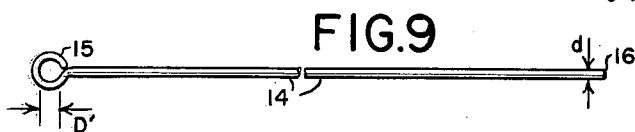
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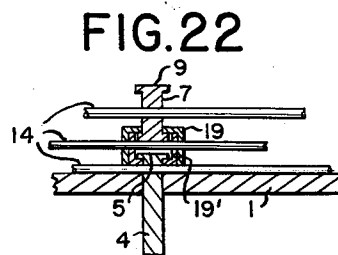
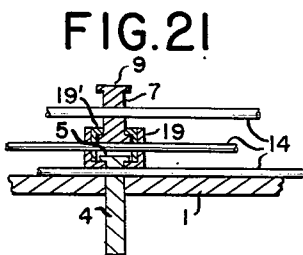
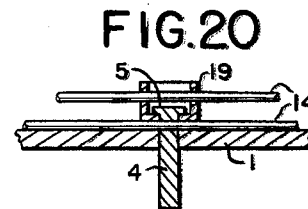
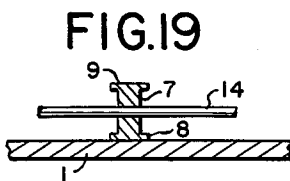
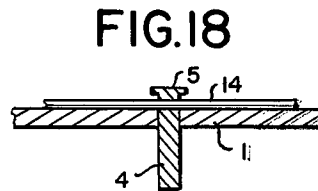
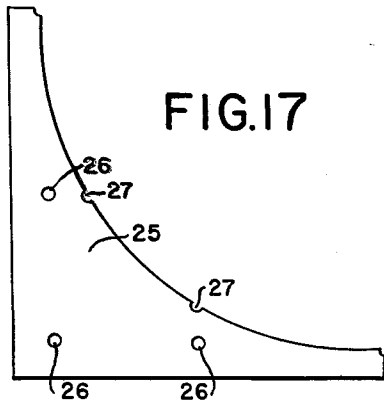
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FIG.24

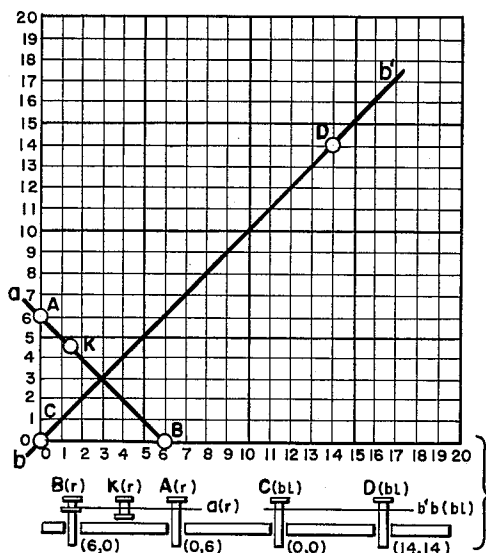
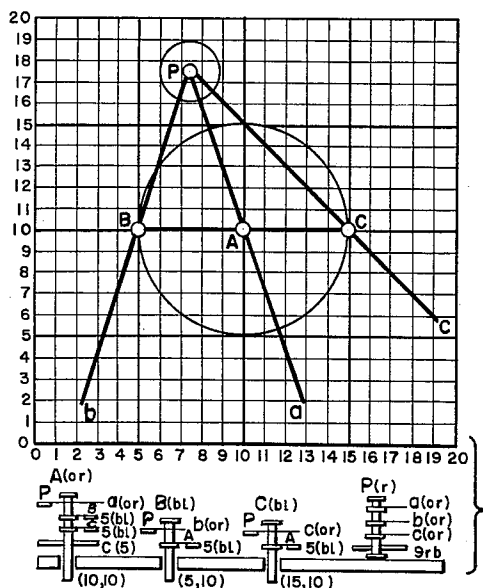


FIG.25



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CONSTRUCTION KIT FOR THE REPRESENTATION OF TWO-DIMENSIONAL FIGURES, MAINLY INTENDED FOR THE TUITION OF MATHEMATICS AND SIMILAR PURPOSES

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13 Claims. (Cl. 35—30)

The present invention concerns a new teaching device designed as a kit for geometrical construction by means of which it is possible to represent all kinds of geometrical figures. Mainly designed for helping the tuition of mathematical subjects, such as plane geometry, algebra, analytical geometry, kinematics, statics, etc. this construction kit can also be used in other provinces of science and technique, for advertising purposes, as well as for the presentation of all kinds of diagrams and graphs. Moreover, if accompanied by an explanatory notice, this material can also be given to children as an instructive toy.

Apart from this latter purpose, the term "construction kit" as used in the present application, should be understood as comprising the complete set of construction elements by means of which it is possible to construct all kinds of geometrical figures.

In the modern methods of teaching mathematics, more and more stress is laid on the use of a well designed material which appeals to the eye; it is therefore surprising, considering the great importance of the exact sciences in the modern world, that mathematical subjects are still being taught with the help of most primitive means.

The means available to the teacher of mathematics in the class room are substantially restricted to the black-board and chalk. The disadvantages resulting from this limitation of means are known since a long time. If the drawing is made by hand, i.e. without any accessory appliances, the result very often lacks precision, so that geometrical constructions in which for instance, three straight lines must meet in a point, are practically always doomed to failure. Measurement of lines and angles is normally done by sight, because the handling of straight edges, set squares, dividers and protractors, all of large size, is so cumbersome that the teacher most of the time prefers to do without. Points, lines and angles are marked by letters or other symbols which very often render the drawing so confused that it becomes difficult, if not impossible, to distinguish the various relationships. And when the drawing has been completed at great pains, it is difficult to preserve it until the next lesson of mathematics, so that the whole thing has got to be done all over again.

If, when looking at a static drawing pupils must already give proof of a lot of imagination, conditions become very much worse when moving figures or systems have to be represented. For handling geometrical loci, such as conic sections and similar curves, it is very important to be able to show how these curves can be generated by the displacement of rectilinear figures.

With young pupils, the main obstacle is a deficiency in their power of abstraction. It may even be considered as one of the first tasks of the teaching of elementary mathematics, to prepare the pupil, and help him in bridging-over the transition between figurative or visual conception and abstraction. If a static geometrical figure is still fairly accessible to visual imagination, matters become much worse as soon as the notion of movement crops up, as the normal equipment available to the teacher is devoid of any means which will clearly demonstrate the facts.

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All these shortcomings are systematically eliminated by the device which is the object of the present invention. This device consists of a kit or set of constructional parts, comprising at least a support in the form of a plane panel, construction elements capable of representing elements of geometrical figures, and the necessary means for fixing aforesaid constructional elements in any required position onto aforesaid panel.

In one preferred embodiment of this design, the panel which acts as support, substantially consists of a rectangular or square board provided with regularly spaced means of attachment for fixing aforesaid constructional elements thereonto. Preferably, aforesaid rectangular or square board is provided with a regular network of perforations, the various elements for geometrical construction being fixed thereon by other elements, shaped as studs, which can be fixed in each one of the openings provided in the board.

In order to reinforce and support aforesaid board, the latter can be fastened to a rectangular or square frame which can moreover be fitted with appropriate means either for supporting the board freely in vertical position or for hanging it on the wall, whilst managing on its rear face sufficient room for allowing the stud-shaped elements introduced into the corresponding holes of aforesaid board, to project through the back of the latter.

The holes provided in the board can for instance be arranged in equally spaced horizontal and vertical rows, the spacing between centers of adjacent holes being equal to a predetermined unit length e . On the front face of aforesaid board, coordinate axes, which generally will be rectangular, can be drawn or provided in some other appropriate way, preferably along the straight lines running through the centers of the holes provided in a horizontal or a vertical row respectively.

Starting from the origin of these two axes, the holes lying on them can then be marked with ascending or descending numbers so as to form a system of orthogonal or Cartesian coordinates in which each hole of the network is characterized by two numbers.

For the construction of geometrical figures, various constructional elements are used which, on account of their special design, make it possible to represent all kinds of fixed or mobile configurations. According to one particular characteristic of the present invention, the means which are applied for fixing these constructional elements are such that they can at the same time act as fixed characteristic points of the geometrical figure which is to be represented.

Apart from these elements, which will henceforth be called "fixed points," and from similar elements which however are not fixed onto the panel ("movable points"), the construction kit conforming to the present invention comprises mainly different linear elements, and can comprise as well other plane elements such as circular or elliptical discs and/or segments of parabola and hyperbola.

The points and linear elements of the set are designed in such way that the latter can be fastened at the location of aforesaid points either so as to permit some angular displacement or an axial longitudinal displacement with respect to aforesaid points.

Moreover, the set can be supplemented by plane elements provided with scales and designed in such a way that they can be fixed in any required position onto the base panel, and by reference marks or elements for marking lines, made in such way that they can easily be fixed onto the corresponding linear elements.

Finally, the set may comprise, by way of auxiliary elements, means co-operating with the fixed and/or movable

points, for permitting two linear, longitudinally displaceable elements to intersect.

By means of these constructional elements, an infinite variety of geometrical figures can be constructed, and an additional possibility is thus available for providing experimental proofs of all the main theorems of plane geometry and of goniometry.

It is obvious that the constructional elements mentioned above can be made in various ways, as far as their shape and their dimensions are concerned, as well as with respect to the material of which they are made, without departing from the scope of the fundamental design of this invention.

The aforementioned characteristics, as well as numerous further characteristic features of the constructional elements conforming to the present invention, will come out more clearly from the more detailed description of one preferred form of embodiment which is given below only by way of example and without implying any limitation of the scope of the invention, with reference to the appended drawings of which:

FIGURE 1 represents a face view of a panel according to the present invention, provided with a network of holes;

FIGURE 2 shows a partial section of the same panel along line II—II of FIGURE 1;

FIGURE 3 is a side view of a fixing device in stud form, which serves at the same time as a fixed point of the geometrical figure which is to be represented;

FIGURE 4 is a side view of a constructional element serving as mobile or movable point of the geometrical figure which is to be represented;

FIGURES 5 and 6 are axial sections of two auxiliary elements used either separately or together, in connection with the fixed and/or movable points;

FIGURES 7 and 8 show respectively a face view and a partial side view of a line segment or linear element terminated at both ends, used in the construction kit conforming to the present invention;

FIGURE 9 shows a "semi-segment" or linear element with only one termination, used in the construction kit conforming to the present invention;

FIGURE 10 represents a "straight line" or unlimited linear element used in the construction kit conforming to the present invention;

FIGURE 11 represents a divided circular disc to be used in the construction kit conforming to the present invention;

FIGURE 12 shows a circular disc to be used as a basic or standard circle in the construction kit conforming to the present invention;

FIGURES 13 and 14 represent two plane figures in the form of strips provided with a linear scale, which can be applied in the construction kit conforming to the present invention;

FIGURES 15 and 16 represent respectively a front view and a side view of a marker which is to be used for indicating the constituent lines of the geometrical figure which is to be represented;

FIGURE 17 represents a plane figure shaped as a segment of a rectangular hyperbola, to be used in the construction kit conforming to the present invention;

FIGURE 18 is a diagrammatic section of the sliding fit of a "straight line" on a "fixed point";

FIGURE 19 is a diagrammatic axial section of the sliding fit of a "fixed point" on a "straight line";

FIGURE 20 is a diagrammatic sectional representation of the sliding fit of two "straight lines" on a "fixed point";

FIGURES 21 and 22 show two possible ways of obtaining a sliding fit of three "straight lines" on a "fixed point";

FIGURES 23, 24 and 25 are three examples of geometrical figures made by means of the different elements of construction, with accompanying assembly plans which show diagrammatically the method of assembly which is being applied.

In this particular embodiment, as shown in FIGURE 1, the panel consists of a board 1 fastened to a square frame 2 and comprising a network of equidistant holes 3. These holes are arranged in horizontal and in vertical rows. As can clearly be seen in FIGURE 2, the spacing between centers of any two adjacent holes of each horizontal or vertical row is equal to the unit distance e adopted in the graph as unit of length; the diameter of each hole is equal to D' . The board as well as the frame can be made of any suitable material, such as cardboard, wood, metal, plastics, etc. . . ; it can be fastened to the frame by any appropriate means, but it can also be made integral with the frame by a moulding or pressing process. The frame can be provided with adequate devices by means of which the panel can either be made to stand freely upright, hung-up on the wall or suspended from another support.

The front face of the board has inscribed on it two pairs of co-ordinate axes, the origin of one of these pairs being the central hole of the panel, whereas the ordinate and abscissa of the other pair coincide with the first left-hand column of holes and the lower row of holes respectively. These pairs of co-ordinate axes of which one is intended for beginners and the other for more advanced students, can also be disposed in such way that they are never located on the same side. Each pair of co-ordinate axes thus refers to that part of the board to which it refers, which prevents any possibility of confusion between both pairs.

For the pair of axes which intersect at the center of the board, the holes disposed along them are numbered, starting from zero for the origin, in ascending numbers from the center to the right and to the top respectively, according to the series of positive integers 1, 2, 3, . . . , and from the center to the left and to the bottom respectively, according to the series of negative integers -1, -2, -3 For the other pair of axes which run along the left and bottom edges of the board and intersect at the lower left-hand corner of the latter, the origin lies at this corner and the holes located along each of these axes are numbered, starting again from zero for the origin, according to the series of positive integers 1, 2, 3, ... In this way, a double system of rectangular or Cartesian co-ordinates is obtained, by means of which each hole on the board can be characterized by two numerals.

FIG. 3 shows a first constructional element which can serve both as fixed point of the geometrical figure to be formed, and as fastening element for mounting the other constructional elements on the board. This element consists mainly of an elongated cylindrical body 4 whose diameter D is slightly smaller than the diameter D' of the holes 3 of panel 1, aforesaid cylindrical body being provided on one of its ends, with a flat head 5 which can be marked in any convenient way, for instance with a capital letter for indicating a fixed point of the geometrical figure.

Slightly below aforesaid head 5, the cylindrical body 4 is provided with a bore 6 whose inner diameter is equal to d' . This studlike part can be introduced into any of the holes 3 provided in the board, whereas the head 5 serves as a stop.

The mobile or displaceable point in FIGURE 4 is made of two parts of which one is a cylindrical body 7 with a diameter D , provided with a flat head 8 at one of its ends, whereas the other end consists of a small circular disc 9 the size of which is practically the same as that of aforesaid flat head 8, aforesaid disc comprising a central rod 10 which can be screwed or fixed in any other way into a corresponding axial bore provided in the free end of aforesaid cylindrical body. The whole thing looks like a reel or small cylindrical roll with a flange on either side. Near the middle of this cylindrical body, another cross-bore 11, with diameter d' has been provided.

The linear elements which are to be used for forming the geometrical figure are represented in FIGURES 7 to

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10. FIGURE 7 shows a front view of a line segment, i.e. a linear element limited at both ends, formed by a thin rod 12, made for instance of steel or any other material which can be bent; this rod is provided at either end with a circular eyelet 13 obtained either by bending-over the end part of the rod or by any other means. Both eyelets lie in the same plane, and, as can be seen from the side view represented in FIGURE 8, these eyelets are flattened. Their inner diameter D' is equal to that of the hole 3 provided in the board 1, and is thus slightly larger than the diameter D of the cylindrical bodies 4 and 7 respectively of the fixed and displaceable points. The distance between centers of the two eyelets 13 is equal to an integral multiple of the unit distance e , which means that the kit comprises several line segments of different lengths. These linear segments act as fixed standard lengths in the geometrical figure to be constructed; being fitted with eyelets 13, they can easily be made to pivot on either a fixed or a displaceable point.

The "semi-segment" or linear element with only one termination is represented in FIGURE 9. It consists of a long thin rod 14 of circular cross-section with a diameter d slightly smaller than the diameter d' of the cross bore 6 and 11 provided respectively in the fixed and displaceable points. Aforesaid rod is terminated at one of its ends by a flattened eyelet 15, the shape and dimensions of which are the same as those of the eyelets 13 represented in FIGURE 7 and make it possible to swing aforesaid rod around a fixed or displaceable point. The free end 16 of this linear element can be passed through the cross-bores 6, 11 of a fixed or a displaceable point respectively, in such way that this linear element can be supported by aforesaid fixed or displaceable point while remaining free in axial direction as is clearly shown in FIGURES 18 and 19.

The "straight-line," or linear element of unlimited length, shown in FIGURE 10 is altogether similar to the "semi-segment" represented by FIGURE 9, except that either end is provided with an eyelet.

If two or more limited or unlimited "straightlines" must be passed through a fixed or displaceable point, use can be made of one or several auxiliary elements such as those represented in FIGURES 5 and 6. These auxiliary elements are both shaped as a hollow cylindrical box 19—19' open on one side, the bottom of which, opposite to the opening, is provided with a central circular opening 17—17' whose diameter is equal to the inner diameter of the eyelet 13—15 of the line segments and semi-segments respectively, aforesaid cylindrical box comprising moreover a bore 18—18' the diameter d' of which is equal to that of the crossbores 6—11 provided respectively in the fixed and displaceable points. As shown more particularly in FIGURE 20, these auxiliary elements represented diagrammatically in FIGURES 5 and 6 can be mounted loose onto a fixed point, whereas a straight-line or semi-segment 14 can be passed through the cross-bore 18 or 18' in such way that two of those linear elements can be connected to a same fixed point at a variable angle, whilst being free to slide longitudinally through aforesaid fixed point. The elements represented respectively in FIGURES 5 and 6 differ only by their diameters, the outside diameter of element 19' being slightly smaller than the inner diameter of the element 19, so that one of these elements can fit axially over the other in such way that the diametrical bores 18 and 18' are aligned, after which both elements can be fastened together by passing a straight-line or a semi-segment through aforesaid diametrical bores. In this way, these two elements 19 and 19' can be used as connecting elements between a fixed point and a displaceable point, or between two fixed points, thus making it possible to mount three or several straight-lines or semi-segments unto a same fixed or displaceable point, and this in such way that aforesaid linear elements can be separately set at various angles whilst remaining free to move along their axes, as has

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been shown in FIGURES 21 and 22 in a manner which is sufficiently clear to require no further comment.

FIGURES 11, 12, 13, 14 and 17 show several plane elements which can be successfully used in connection with the elements described above. These elements will preferably be made of some transparent material, such as polystyrene or other synthetic material, so that they might be fixed unto the board without hiding the lines, openings, numerals and other parts disposed thereon. The circular disc 20 represented in FIGURE 11 comprises a central opening 21 into which, in order to fasten aforesaid disc onto the board, a fixed point can be introduced, aforesaid disc comprising moreover, along its periphery, a scale divided in degrees, so that it might be used to measure angles.

The circular disc 22, represented in FIGURE 12, is provided with a central opening 24 and has a radius equal to 5 times the unit distance e ; it can be used as measuring or standard circle, for instance for guiding a displaceable point which must describe a given circular trajectory. A special note should be made of the fact that semi-circular notches have been provided in the periphery of disc 22, this having been done in order to clear the whole whose centers, when aforesaid disc is mounted onto the board, would coincide with the periphery of the latter, and thus not interfering with the accessibility of these holes at the fixed points. With the same object in view, notches 27 have been provided along the edge of the hyperbolic segment 25 represented in FIGURE 17, this segment having moreover been provided with holes 26 which can be brought into coincidence with corresponding holes of the board, so as to make it possible to fasten aforesaid hyperbolic segment to aforesaid board. Such segments, either hyperbolic or belonging to any other kind of curve can be used for a similar purpose to that which has been described in connection with the circular disc 22 of FIGURE 12.

The elements in strip form, represented by FIGURES 13 and 14, and which in this instance are shaped like arrows, are mainly intended to serve as support for decimal scales which can be used for measuring trigonometric ratios. More especially this element represented by FIGURE 13, which comprises a series of at least eleven holes separated by intervals equal to the unit distance, and marked successively 0, 0.1, 0.2 . . . 1, is used as a scale of sines and cosines, whereas the element represented by FIGURE 14, which comprises a series of at least 21 holes marked according to a similar series of numbers starting from 0 and going up to 2 by equal increments of 0.1, is used as a scale of tangents and cotangents.

In order to make it possible to mark in a clearly visible way the various lines of the geometric figures which are to be constructed, the invention also provides indicator elements or markers such as those which are shown in face view and in side view respectively in FIGURES 15 and 16. Each of these elements comprises a support consisting of a flat disc 29 provided with a central rod 30 bent at right-angles, as well as with a tubular element 28, made for instance of an insulating sleeve such as are used for insulating bare electric leads, and preferably of coloured plastics, by means of which the tubular elements can be made to slide, by one of its ends, over the end of the straight-line or semi-segment which is to be marked, whereas aforesaid support with its bent-over rod can be introduced into the other end of aforesaid tubular element 28. The flat disc or head 28 can be provided with any letter, or other mark in different colours.

In order to represent in a more vivid way, the image which has been formed, and to increase the visibility, the constructional elements described above will preferably be made in different vivid colours, these colours can moreover be used for introducing a certain classification of geometrical elements into fixed points, displaceable

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points, straight-lines, semi-segments and line-segments for instance. The elements used for indicating the linear elements may either be of the same colour as the elements themselves, or on the contrary, in a colour which makes a vivid contrast with that of the linear elements. The board is preferably painted in some neutral tone against which the figures which are to be formed will stand out clearly, whilst the actual working surface of the board could be edged by a black or coloured frame in order to attract attention.

The constructional elements can be made of any suitable material, the only conditions to be fulfilled being a resistance to reasonable efforts and to wear, as well as a fairly light weight, whereas the linear elements should moreover be made of some material which will easily regain its shape after bending, so as to avoid any permanent distortion.

Finally, and with reference to FIGURES 23, 24 and 25, a few applications of the construction kit conforming to the present invention will be illustrated. The construction represented in FIGURE 23, makes it possible to measure the sine and the cosine of an angle, and thus to provide an experimental proof of certain theorems of trigonometry. To this effect, a fixed point or fixing peg is pushed into hole A whose co-ordinates are $(-5, -5)$. This fixing peg A supports four semi-segments a , b , c and d , each one of which can swing about aforesaid peg by means of its eyelet. The semi-segments a and d are, on the other hand, fastened respectively by the fixing pegs B (co-ordinates $6, -5$) and C (co-ordinates $-5, 6$) in such way that they are respectively horizontal and vertical. Moreover, two more elements of the kind which is represented by FIGURE 13, are fastened between the fixed points A and B, respectively A and C where they serve as scales for the cosine and the sine respectively. A further element is fastened onto peg A, this element being a divided circle calibrated in degrees such as is shown in FIGURE 11, and whose zero division is adjusted so as to lie in the direction of straight-line A—B. Displaceable points Q and P are slid respectively over the semi-segments a and d , whereas two displaceable points M—K and N—L are slid respectively over the semi-segments b and c . Moreover, line segments such as those represented in FIGURE 7, each five units long, are fitted between the pairs of points A—M, M—Q, M—K, as well as between the pairs A—N, N—P, N—L, so that the distance between points of each pair is kept constant and equal to five units of length. It is easy to understand that, whatever be the angular position of the semi-segments b and c , the points K and Q will always lie on a common vertical and that the points L and P will always be on a common horizontal. As the distances A—K and A—L are both equal to 10 units of length, and as the basic length of the sine and cosine scales is also equal to 10 units, it follows that the position of Q on the horizontal scale will be a measure of the cosine of angle bAa and that the position of P on the vertical scale will be a measure of the sine of angle cAa . By means of the protractor fastened in A, the semi-segments b and c can also be placed in such way that the angles bAa and cAa are complementary which will give a visual illustration of the fact that the cosine of an angle is equal to the sine of its complement.

In the lower part of FIGURE 23, the set-up which has to be resorted to for obtaining the figure represented on top, is indicated by means of a symbolic notation. Following the description which has been given above, the symbolism used to this effect can be easily deduced and requires no detailed explanation. So for instance, the panel is indicated by 31, the fixing pegs A, B and C respectively by 32, 33 and 34, the displaceable points: N, M, L, K, P and Q respectively by 35, 36, 37, 38, 39 and 40; 41 represents a line segment of 5 units of length connecting A and N; 42 indicates a semi-segment rotatable about the point A and going through N and L; 43

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indicates a scale of sines; 44 a scale of cosines; 45 a protractor or divided circle, etc. . . . In this way the diagram expresses the fact that A is a fixing peg onto which must be superposed in the given order: a line segment of 5 units of length ending at N, a semi-segment c , a line segment of 5 units of length ending at M, the semi-segments ba and d , a scale of sines pointing toward C, a scale of cosines pointing toward B and a protractor, after which said fixing peg A is inserted into the hole $-5, -5$ of the board. Onto the displaceable point N, must be slid in succession a line segment of 5 units of length extending to L and the second eyelet of the line segment 42 extending from A, after which aforesaid displaceable point must be slid by means of its diametrical bore over the semi-segment $c42$ extending from A, etc. . . . etc.

FIGURE 24 shows a simple construction comprising a straight line bb' going through the fixed point C, co-ordinates $0, 0$ and D, co-ordinates $14, 14$ and a semi-segment hinged to a fixing peg B, co-ordinates $6, 0$, going through the fixed points A, co-ordinates $0, 6$ and carrying moreover a displaceable point K which can move along aforesaid semi-segment. This construction may for instance be used for visualizing the elementary principles of analytical geometry such as the following: whatever the position of point K on the semi-segment, the sum of its co-ordinates is always equal to 6. For any other point located above or below the straight-line A—B, the sum of the co-ordinates is respectively larger or smaller than 6; for any point located on the line bb' , both co-ordinates are equal. The constructional set-up requires no further comment.

The configuration represented in FIGURE 25 comprises the fixing pegs B, 5, 10, A 10, 10 and C 15, 10; line segments of 5 units of length each, extending respectively between B and A and between A and C; a circular disc the radius of which is equal to 5 units of length, mounted concentrically with A; a displaceable point P carrying a protractor; three semi-segments b , a and c , all hinged about aforesaid displaceable point P and going respectively through the fixed points B, A and C. The reading of the protractor surrounding P gives the size of the angle BPC, and it will be found that this angle is either larger than 90° if P lies inside the circle, or smaller than 90° if P lies outside, whereas this angle is exactly equal to 90° when P is located anywhere on aforesaid circle. This illustrates the theorem which says that the circle whose diameter is equal to a line segment is the locus of all points from which aforesaid line segment subtends a right angle.

It is thus obvious that the construction kit conforming to the present invention makes it possible to construct an infinite variety of figures, which provides a novel means of inestimable value for the figurative teaching of mathematics.

The present invention concerns as well the constructional kit as a whole, as the panel or board and all and sundry accessory elements used thereby and taken separately, in all shapes, dimensions and general construction, as long as they are intended and suitable for materializing within aforesaid construction kit, geometric figures, graphs, diagrams or the like, and provided that they are characterized as such.

The invention also concerns the process which consists in setting-up geometric or other representations by means of an integral or partial application of the construction kit conforming to the present invention.

What I claim is:

1. A construction kit for representing plane figures in the study of mathematics and related subjects, comprising, in combination, a supporting board having a plurality of uniformly disposed similar holes; a plurality of elements serving as fixed points of the geometrical figure to be formed upon the board, a plurality of elements serving as movable points of the geometrical figure to be formed upon the board, auxiliary connecting ele-

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ments and rod-shaped linear elements for interconnecting said fixed-point elements, said auxiliary connecting elements and said movable-point elements, each of said fixed-point elements comprising means fixing it in one of said holes and means receiving one of said linear elements, each of said movable-point elements comprising a portion adapted to slide upon said board and means enclosing one of said linear elements for guiding movement along the linear element, each of said auxiliary connecting elements comprising means receiving one of said linear elements and means for mounting it upon a fixed-point or movable-point element.

2. A construction kit in accordance with claim 1, wherein each of said rod-shaped linear elements is straight over its entire length.

3. A construction kit in accordance with claim 1, wherein each of said auxiliary connecting elements consists of two interfitting cylindrical members adapted to be mounted upon a fixed-point or movable-point element, said cylindrical members having aligned bores adapted to receive one of said linear elements.

4. A construction kit for representing plane figures in the study of mathematics and related subjects, comprising, in combination, a supporting board having a plurality of uniformly disposed similar holes; a plurality of elements serving as fixed points of the geometrical figure to be formed upon the board, a plurality of elements serving as movable points of the geometrical figure to be formed upon the board, auxiliary connecting elements and rod-shaped linear elements for interconnecting said fixed-point elements, said auxiliary connecting elements and said movable-point elements, each of said fixed-point elements comprising an elongated cylindrical body having an end portion fitting into any one of said holes, and a flat round head carried by said body and having a larger diameter than said body, said body having a diametrical bore located adjacent said head and having a diameter which is somewhat larger than the diameter of said rod-shaped linear elements, each of said movable-point elements comprising a portion adapted to slide upon said board and means receiving one of said linear elements, each of said auxiliary connecting elements comprising means receiving one of said linear elements.

5. A construction kit in accordance with claim 4, wherein each of said rod-shaped linear elements comprises an elongated body portion and a flattened circular eyelet upon each end of said body portion, the internal diameter of each eyelet being greater than the diameter of the body of the fixed-point element and being smaller than the diameter of the head of the fixed-point element, the distance between the centers of the eyelets being an integral multiple of the distance between two adjacent holes of said board.

6. A construction kit in accordance with claim 4 wherein each of said rod-shaped linear elements comprises an elongated body portion and a flattened circular

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eyelet upon one end of said body portion, the internal diameter of said eyelet being greater than the diameter of the body of the fixed-point element and being smaller than the diameter of the head of the fixed-point element.

7. A construction kit in accordance with claim 6, wherein each of said auxiliary connecting elements consists of a cylindrical box open on one end and having a base with a central opening, the diameter of said central opening being greater than the diameter of the body of the fixed-point element and being smaller than the diameter of the head of the fixed-point element, said box further having a diametrical bore in which said rod-shaped linear element can slide.

8. Construction kit according to claim 1 characterized by the fact that it includes further plane elements, comprising discs, and segments of curves, said elements having fixing pegs.

9. Construction kit according to claim 1, characterized by the fact it includes plane calibrated elements, comprising protractors and striplike scales, each of said elements having means for attaching it to said board.

10. Construction kit according to claim 1, characterized by the fact that it comprises indicator elements, each of said elements having means for attaching it to said board.

11. Construction kit according to claim 1, characterized by the fact that the movable-point elements are substantially made of two flat-headed cylindrical parts, coaxially connected by screwing, so as to constitute together a spoollike element with a cylindrical body provided at either end with a flat head, aforesaid cylindrical body having a transversal bore for receiving said rod-shaped linear members.

12. Construction kit according to claim 1, characterized by the fact that the linear elements substantially consist of a long and straight thin rod, made of material whose elasticity is sufficient restoring it to its original shape after flexion, without permanent deformation, said rod being adapted to be inserted into said fixed point and movable-point elements.

13. Construction kit according to claim 1, comprising plane elements provided with scales, plane elements devoid of scales and indicator elements, in order to materialize geometric, graphic and other representations, said elements being characterized as such representations.

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