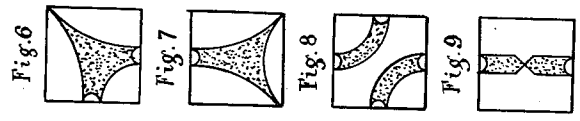
May 1, 1923.

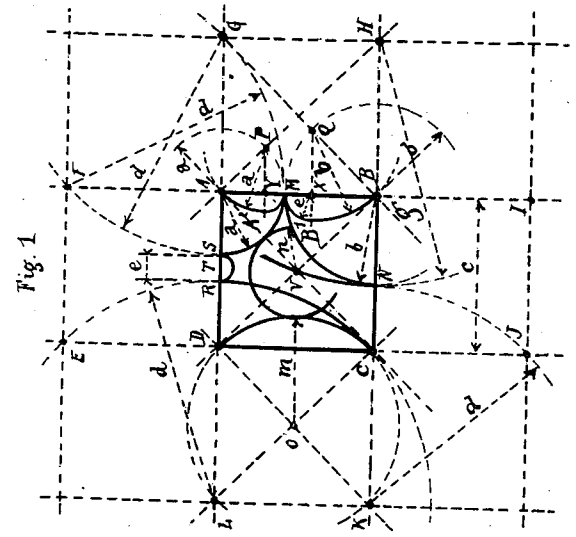
1,453,728

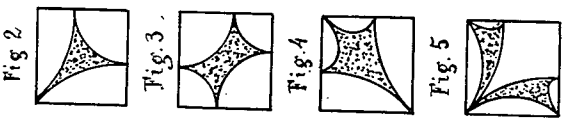
F. J. RHODES

MEANS FOR DEVISING ORNAMENTAL DESIGNS

Filed June 1, 1921 4 Sheets-Sheet 1







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MEANS FOR DEVISING ORNAMENTAL DESIGNS

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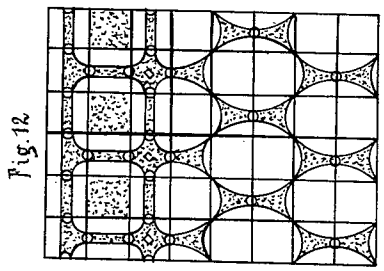

Fig. 12

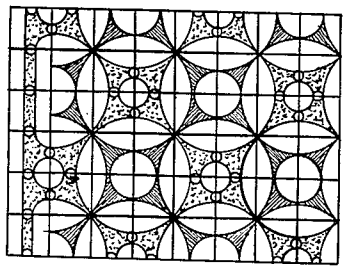

Fig. 11

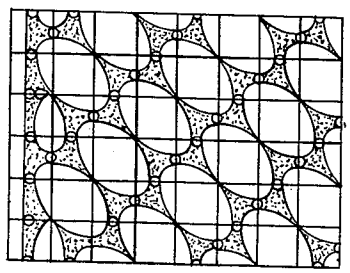

Fig. 10

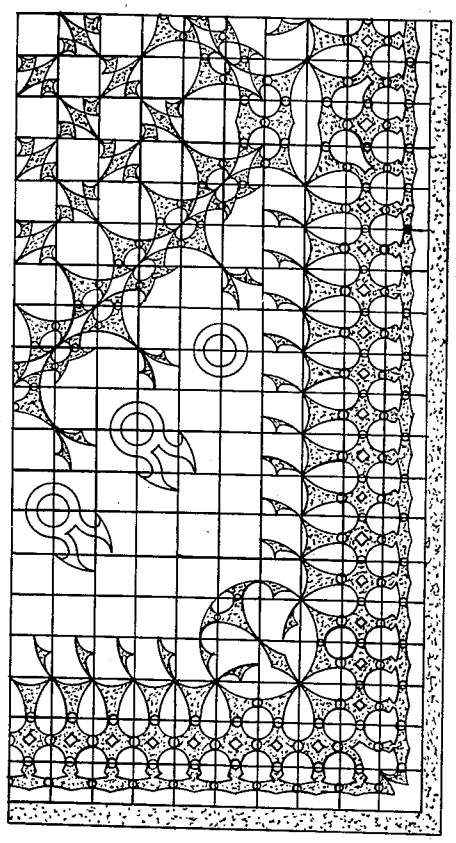

Fig. 13

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Fig. 14

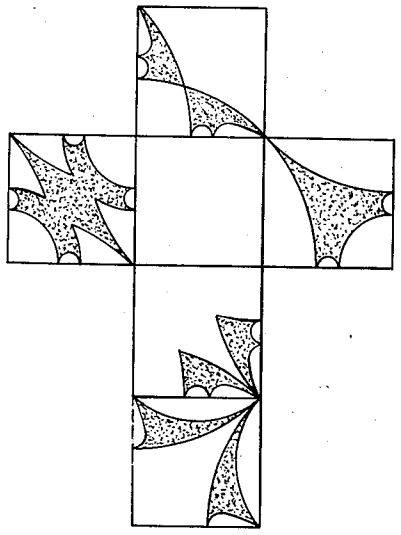


Fig. 15

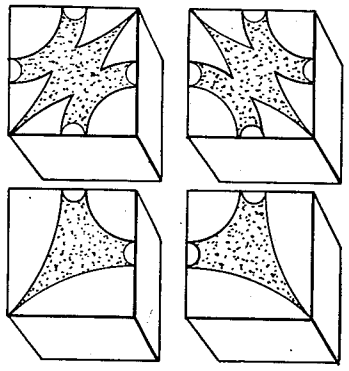
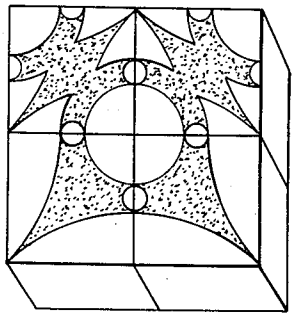


Fig. 16



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MEANS FOR DEVISING ORNAMENTAL DESIGNS

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Fig. 17

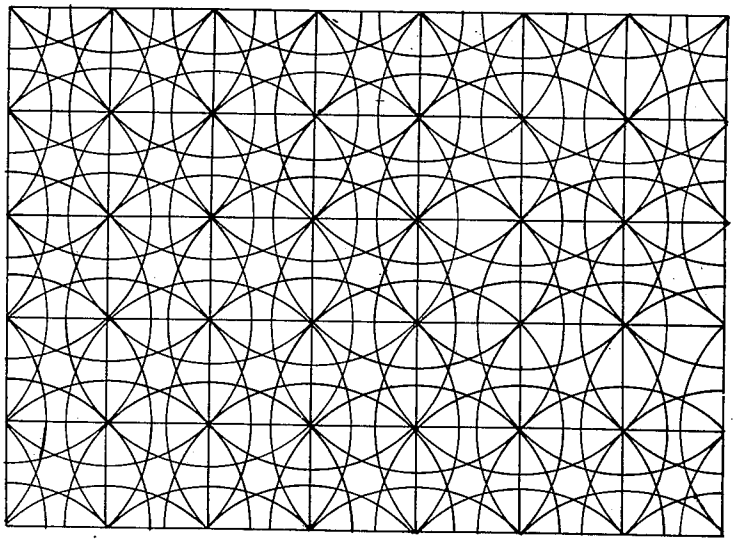
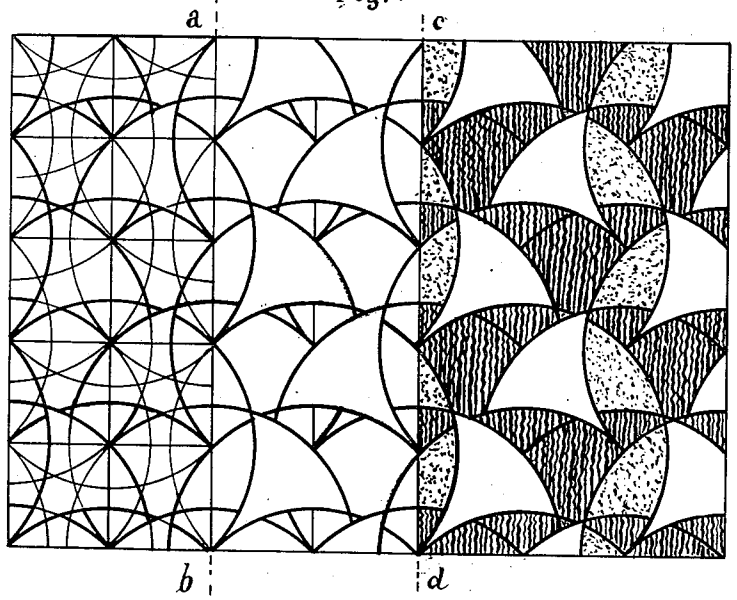


Fig. 18



Inventor.
Fernand Joseph Rhodes
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Patented May 1, 1923. 1,453,728

UNITED STATES PATENT OFFICE.

FERNAND JOSEPH RHODES, OF PARIS, FRANCE.

MEANS FOR DEVISING ORNAMENTAL DESIGNS.

Application filed June 1, 1921. Serial No. 474,112.

To all whom it may concern:

Be it known that I, FERNAND JOSEPH RHODES, a citizen of the Republic of France, residing in Paris, France, have invented certain new and useful Improvements in Means for Devising Ornamental Designs; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention consists in drawing circular curved lines in a square whereby these lines may be so arranged as to produce multiple ornaments made up of square elements of such character that the said ornaments may be connected together and that a limited number of elementary square portions having different ornaments may be used to form decorative combinations having a very different appearance and susceptible of an infinite number of variations.

This invention is based upon the proper choice of the radii of the curves in function of $\sqrt{2}$ times the side of the square, and of the choice of centres situated either upon the sides of the square, upon the diagonals, or upon the prolongation of these lines.

My invention likewise relates to the manufacture of articles used for recreation purposes such as toys, puzzles and the like, or for designing such as cubes, diagrams, or charts, or the like, as will be described hereunder, in order to obtain decorative compositions, mechanical drawings, or ornamental or artistic effects of all kinds and with the greatest facility, by the use of a set of cubical blocks representing the synthetic elements of the design and by means of a diagram or chart whereby the said elements may be disposed together upon the same sheet, thus assembling the whole or a part of the lines drawn upon each of the same by the above-mentioned process.

Upon a sheet of paper is drawn a square network, or in other words, similar squares are juxtaposed, and in each of these squares there are drawn all the curves—or only a portion thereof—which may be obtained as hereinbefore mentioned, in such manner that the curves situated in each square shall be connected with the curves of the adjacent squares, thereby forming an assemblage composed of circular arcs and circumferences which extends throughout the entire sheet. The said assemblage of lines situated upon the portions of the network may likewise comprise the diagonals of the squares, and also as a general rule all the straight tangents which are common to the above-mentioned curves, or only one or a certain number of the said common tangents. The points of intersection of these lines will mark out a certain number of straight lines, arcs, segments, half-segments, sectors, and in general, various forms adapted to constitute decorative portions, either by considering only the surfaces bounded by such lines, or again by combining these two decorative elements, that is lines and surfaces.

The assemblage of lines thus obtained will constitute diagram or chart from which the artist may select such of the lines as are required to make the first draft of the designs, ornaments or decorative compositions which he has in view, and the said draft may be employed in this condition or may serve as a plan or outline for receiving any other ornaments or compositions which the artist may then embellish, by artistic lines, various subjects, filling in, or the like. It is obvious that when once the decorative lines have been produced and combined in view of the result to be obtained, means may be taken to remove from the composition the whole or a part of the square network as well as all the straight or curved lines which are not desired for use.

The diagram or chart above mentioned may be printed upon paper or like material, in one or more colours, and may include all the lines or only a few of the lines which are above indicated. This method, as likewise the preparation of cubes and sheets,

is clearly set forth in the following description together with the accompanying drawings, wherein:

Fig. 1 shows the principal geometrical lines which I have selected and wherein are given the circular lines in function of $\sqrt{2}$ times the side of the square, and whose combination gives rise to the ornaments of the square elements.

Figs. 2 to 8 show various ornaments or ornamental portions produced within the square by the combination of the circular lines drawn according to the method constituting this invention.

Fig. 9 shows an ornament produced by the combination of circular lines with straight lines perpendicular to a side of the square.

Figs. 10 to 13 represent decorative combinations obtained by employing a limited number of ornamental elementary square portions, either combined with each other or with the additional use of square elements without ornaments.

Fig. 14 shows the development of a cube which is constituted according to this invention.

Figs. 15 and 16 show an assemblage of four such cubes to constitute an ornamental element.

Fig. 17 represents a sheet having a network formed thereon.

Fig. 18 shows the diagram or chart in course of execution.

The circular lines used to obtain the ornamentation upon the elementary square portions are drawn in the following manner:

1. The circular arc CR is obtained by drawing the same with a radius d which is equal to $c\sqrt{2}$, that is, to the length of the diagonal of the square, with the point L as a centre, this point being located on the prolongation of the side DA of the square ABCD and at a distance equal to c from the side of the square. It will be observed that 8 similar arcs may be obtained by locating the centres at L, E, F, G, H, I, J, K.

2. The circular arc CD is drawn with a radius m equal to

$$\frac{c\sqrt{2}}{2}$$

with the point O as a centre, this latter being located at the intersection of the diagonals KD and LC of the adjacent square ADCK to the left of the central square ABCD. As will be observed, four circular arcs may be drawn, each passing through two end points of the square ABCD.

3. The arc NM is drawn with the point B as a centre, the radius being

$$BN = AR = b = c(2-\sqrt{2}).$$

In this manner, four similar arcs may be drawn in the square ABCD, by taking as centres the four end points of the square.

4. The arc SM is drawn with the point A as a centre, the radius being

$$DR = AM = a = c(\sqrt{2}-1).$$

Four similar arcs may therefore be drawn by taking as centres the four end points of the square.

5. The semicircle RS is drawn by taking the middle point T of the side AD as a centre, with the diameter

$$RS = e = c(3-2\sqrt{2}).$$

Four similar semicircles may thus be drawn by taking the middle points of each side of the square as centres.

6. The curve AM is composed of two arcs; the first arc AA^1 having a radius equal to a is drawn with the point P as a centre which is located on the diagonal AH of the square AGHB at a distance a from A, the second arc A^1M is a quarter-circle having as a centre the point Y which is the meeting point of the perpendicular drawn from P to AB, the radius being equal to

$$A^1Y = f = c\left(\frac{3\sqrt{2}}{2}-2\right).$$

These two circles will have a common tangent at A^1 and will therefore be joined at this point. Eight curves of this kind may be drawn in the square ABCD.

7. The circle BM is constituted by two circular arcs; the first arc BB^1 has for its centre the point Q located on the diagonal BG of the square AGHB and at a distance b from B, and is drawn with b as a radius; the second arc B^1M has for its centre the meeting point K of the perpendicular drawn from Q to AB, the radius being

$$B^1X = e = c(3-2\sqrt{2}).$$

These two circles have a common tangent at B^1.

8. The arc NV is drawn with H as a centre, the radius being

$$g = c(3-\sqrt{2}),$$

the point H being located by placing the same upon the prolongation of the side CB at a distance equal to c. In this manner eight arcs of this kind may be drawn in the square ABCD by taking as centres the points I, J, K, L, E, F, G, H.

9. The middle circle is drawn from the central point of the square as a centre, the radius being

$$n = c\left(1-\frac{\sqrt{2}}{2}\right);$$

it will be observed that it is tangent to the arcs MS and CD.

The following table gives the formulæ for the radii of the different arcs with ref-

erence to the side c of the square, and also the centres of the same.

	Arc.	Centre.	Radius.
1	CR	L	$d=c\sqrt{2}$
2	CD	O	$m=c\frac{\sqrt{2}}{2}$
3	MN	B	$b=c(2-\sqrt{2})$
4	SM	A	$a=c(\sqrt{2}-1)$
5	RS	T	$\frac{e}{2}=c\left(\frac{3}{2}-\sqrt{2}\right)$
6	AA¹	P	$a=c(\sqrt{2}-1)$
	A¹M	Y	$f=c\left(\frac{3}{\sqrt{2}}-2\right)$
7	BB¹	Q	$b=c(2-\sqrt{2})$
	B¹M	X	$e=c(3-2\sqrt{2})$
8	NV	H	$g=c(3-\sqrt{2})$
9		V	$n=c\left(1-\frac{\sqrt{2}}{2}\right)$

In Fig. 10 the decorative design is obtained by the juxtaposition of square elements having thereon the ornamental portion shown in Fig. 6, together with plain square elements. The border is formed of square elements having an ornamentation not shown in Figs. 2 to 9 but which is readily constituted.

In Fig. 11 the decorative design is formed by the combination of square elements having the ornamentation shown in Figs. 2 and 6, the border being made up of square elements which are easily constituted.

In Fig. 12 the decorative design is produced by means of the square elements shown in Fig, 7 combined with other square elements whose ornamentation is carried out by the use of the square elements Fig. 7 combined with other square elements whose ornamentation is produced by the drawing method according to my invention and is readily effected.

In Fig. 13 the decorative design is produced by means of the ornamented square elements Figs. 6 and 7 together with other easily-formed elements.

These few examples will serve to show the great variety of decoration and ornamentation which may be obtained by the use of ornamented elementary square portions which are formed according to my invention. The advantages of this method reside in the fact that manufacturers or artists are enabled to produce a great variety of ornamented square elements, and by means of a relatively small number of such elements they will have the facility of producing decorative combinations having the most varied appearance and possessing a highly artistic effect.

In each of the squares of the network represented in Fig. 17, and in all positions which it may assume with reference to a square, has been drawn a circular arc whose radius is a function of the square root of the side of the square (in this case,

$$r=\sqrt{2}),$$

and whose centre is located either on the sides of the square, on the diagonals thereof, or on the diagonals or the sides of the adjacent squares, or on the prolongations of these lines, or in other words, upon the lines of the network or the diagonals of the several squares constituting the same, or upon the prolongation of these lines beyond the said network. In the present case, the centre is located at the intersection of the prolongation of the side of the square and the diagonal of the adjacent square, or in other words, at one of the points of intersection of the lines of the right-angled network with the diagonals of this network.

Inasmuch as the arcs thus drawn in each square of the said network are susceptible of being joined together, these arcs will thereby constitute an assemblage of curves—in this case circumferences—which together with the straight lines of the network will produce a type of diagram or chart constituting the object of my invention. In the portion of Fig. 18 to the left of a b will be observed all the lines of the said diagram or chart among which the designer has clearly marked out the lines chosen in view of his composition. In the portion of Fig. 18 situated between the lines a b and c d there are only observed the lines chosen by the designer, all the remaining lines having been removed, or what amounts to the same thing, are considered by him as no longer existing. He may preserve the design either in its present state or may fill in the same by drawing or painting in order to bring it out as he shall see fit, thereby obtaining for instance a decorative composition such as is shown to the right of the line c—d Fig. 18. In this example it is observed that the designer has preserved a certain portion of the original network which serves to guide him in drawing the irregular lines forming the background or filling of his composition.

The above-mentioned diagram or chart is characterized by this that each square contains the original element or elements (otherwise termed abstract elements) which serve to produce the available decorative compositions, and therefore it will be possible to cut up such a decorative composition into squares having the same size as the original squares, in order to be enabled to discover the constitutive elements of the composition which has been obtained by means of the said plan or chart. But the said chart may also comprise one or more square networks or assemblages of networks of the same or different size which may be superposed in various manners, as follows:

The several networks may be superposed in such manner that the straight lines forming the said networks shall either coincide or shall be in parallel and perpendic-

ular disposition, or the networks may be crossed at one or a number of angles, or may be crossed at an angle of 45°, in which case the constitutive lines of one network may coincide or not with the diagonals of another network.

Again, the networks may be superposed by a suitable combination of the same, comprising the various positions above-mentioned, and in any desired manner. By thus superposing networks which are of the same or different size, each comprising an assemblage of straight or curved lines, a diagram or chart will be produced which affords decorative compositions having an entirely different appearance from those which are obtained with a chart having a single network.

My invention will thus afford a considerable saving of expense by reason of the reduction in the time employed in the composition of designs for industrial purposes.

Having now described my said invention and the best means I know of carrying the same into effect, I claim:

1. Units of square form presenting ornamental surfaces and capable of being grouped together having in each square curves or arcs for the purpose of producing a variety of ornamental designs, the said curves or arcs having their centres located on the sides or diagonals of the squares or upon prolongations of these lines and their radii being polynomial functions having integral coefficients of the side of the square and of the half-diagonal.

2. A diagram or chart formed by an assemblage of curved lines drawn upon a network obtained by the juxtaposition of great number of similar squares, the said curved lines being constituted by circular arcs whose radii are functions, in the form of polynomials with integral coefficients, of the half diagonal and the side of the square, and whose centres are located on the lines of the said network or on the diagonals of the squares composing the network, or again, on the prolongation of these lines beyond the limits of the network, the said assemblage being completed if desired by the addition of tangents which are common to these various curves.

3. Square-faced tiles each having on one of its square faces ornamental figures whose outlines are circular arcs the radii of which are polynomial functions of the side or the half diagonal of the square multiplied by integral coefficients.

4. Square faced tiles each having on one of its ornamental square faces figures whose outlines are circular arcs the radii of which are polynomial functions of the side or the half diagonal of the square multiplied by integers of sides of the rectangle.

5. Square faced tiles each having on one of its ornamental square faces figures whose outlines are circular arcs the radii of which are polynomial functions of the side or the half diagonal of the square multiplied by integral coefficients, the centers of said arcs lying in the sides of the tiles and on their diagonals.

In testimony that I claim the foregoing as my invention, I have signed my name.

FERNAND JOSEPH RHODES.