ONE KIND OF CAM.

BY A. D. PENTZ.

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The elements of this cam are: That it shall fit within the four sides of a square or rhombus and that it shall touch each of these four sides, at some point, at all positions. Of course, then, every point of contact is perpendicular to another point of contact on the opposite side of the inscribing parallelogram. These elements are well indicated in the preceding article on the practical applications of this cam.

The outlines of this cam (Fig. 1) are the abutting arcs F G, H H', and I I', and together they must aggregate exactly 360° of arc. These arcs are those of the sectors A D B', B D A', C E A, C' E B', B E C, and A' E' C'. These sectors equal four right angles of course. The inscribed portions of the secants A A', B B' and C C' are equal in length, and it is the intersection of these lines which determines the centers from which the arcs that constitute the outline of this cam are described. The whole difficulty in designing cams of this character lies in locating these points.

To design a cam of this kind that shall give the *longest* arc of rest possible under the circumstances is very simple, Fig. 2.

Having found the size of the shaft on which it is proposed to mount this cam, draw the circle A to represent it; then, if it be practical to have the hub G, the cam can be made as thin at B as strength will permit of; ⅛ the diameter of the shaft A will do. Describe a circle concentric to D, to represent this thickness B. Now the throw as C being known, then ½ A + B + C is the radius D H. Describe the arc K L 90° long or more, and then through one end of this arc and through the center D draw the secant E F. Next from L as a center, and with the radius L M, describe the arc N, touching the arc I at M, and cutting the arc H at K. Then with the same radius and from K as a center describe the arc J, touching the arc I, and ending in L. This completes a cam having the greatest rest possible with the dimensions given. No greater rest is possible without reducing the proportion of C to the radius D H, or elongating D H without elongating C. The angle of rest in any cam of this kind cannot reach 180°.

The corners, K and L, in this last construction being angles, are not desirable, because they soon are worn off, resulting in lost motion and noise. This angle becomes sharper as the proportion of C to D H increases, and as this proportion increases, the motion of a cam like this approaches the character of a blow. The arc, H, in a cam where the arcs, J and N, are struck from K and L, or points on the arc, H, cannot be shorter than 60°.

To overcome this effect of a blow, and at the same time to preserve the amount of throw in proportion to the size of a cam, it is necessary to sacrifice a part of the rest arc, and it always is desirable to reduce this arc as much as practical, for mechanical economy.

This arc is reducible to 0°. When it is so reduced, this cam becomes an eccentric cylinder. In reducing this arc at all in any case below 60° of angle, the corners, K and L, become arcs of circles, Fig. 3.

Fig. 2.

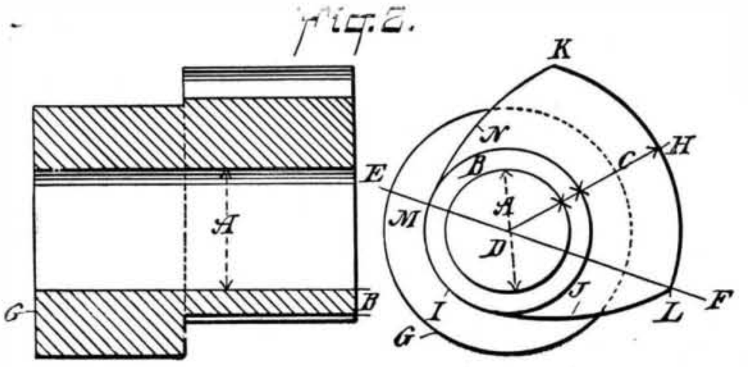


Fig. 3.

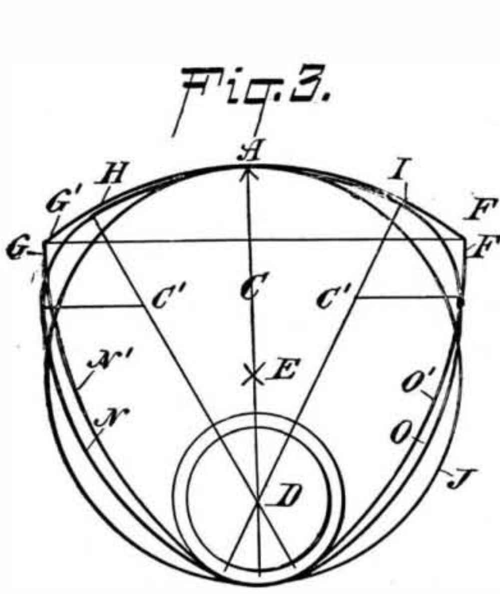
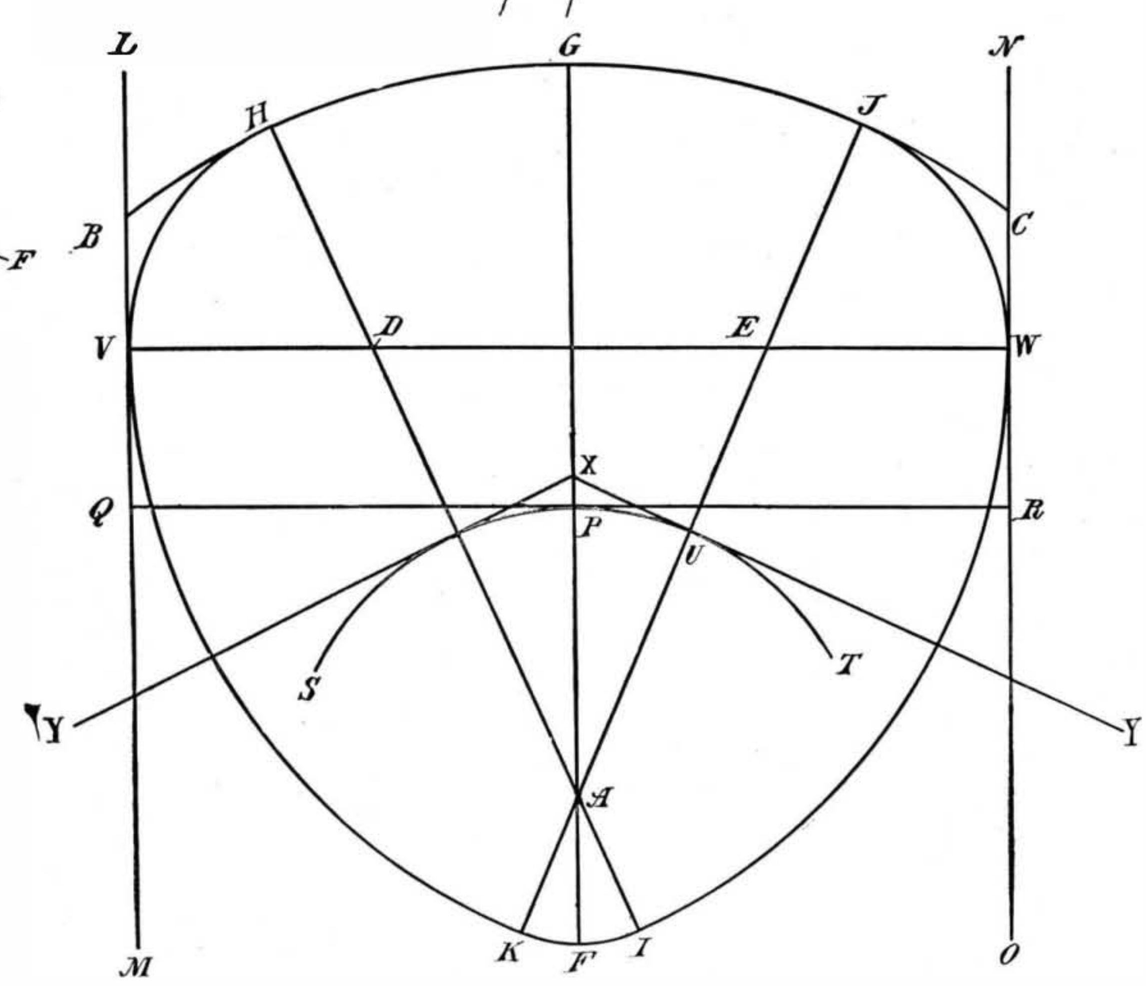
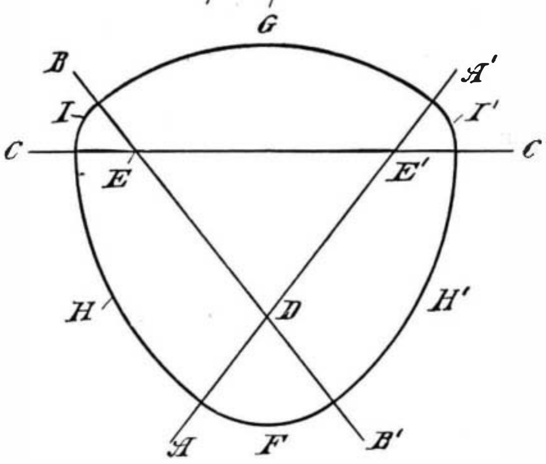


Fig. 4.



It being desired to make a cam of this character to throw as C, and to have a radius as D A, the designer, if he desires the greatest possible rest, produces the arcs A and B, and from the points, G' and F', describes the arcs N' and O', which by contact and together with the arcs B and A describe the full cam. If he desires to have no rest at all, he describes the circle, J, from the center, E, which circle has the same size as the cam, A N' B, and O', and will fill the same parallel spaces as that cam. But if he desires a rest, but less rest than the extreme, he shortens the arc, A, to the intermediate length, H I, and from C' C' as centers describes the arcs, G and F, and N and O, connecting the arc, A, with the arc, B. Each of these figures will fill the same square or rhombus and operate one as well as the other, but in different times. It is evident, because the circle, J, is described from E, which point E bisects the combined radii of the arc, B, and the arc A, that no cam can be described which has an arc whose center of construction lies between E and D, or further from the arc, A, than the point, E, and not be D. Again, because the chord, G' F', equals the radii of A and B combined, no arc can be described that has its center on the arc, A, beyond the points, G' and F'. Therefore in this cam all centers of arcs except the center, D, shall lie between the point, E, and the points G' and F', as C'.

Fig. 1.



In this Fig. 4 it is shown how every cam may have its centers properly located, whether the angle of rest be large or small. I believe this rule to be new, and while it is here indicated by lines, the distances and localities are easily reducible by mathematics. The centers here formed are those of the eccentric arcs. The center of the concentric arcs requires no calculation to locate it.

The radii, A F, and A G, being known, describe the arcs, K I, and B C. Then through the center, A, and bisecting B C, draw the line, G F, and bisect it at P. Then parallel to G F make the perpendiculars, L M, and N O, each a distance from G F equal to the length, P G; thus making the length of the line, Q R, equal to that of G F. Now knowing the desired arc of rest, locate it on the arc, B C, and draw the lines, H I and J K, through A, equidistant in angle from the line, G F. Now we know that the centers we seek are on the lines, H I and J K, that the one on H I is as far from the arc, B G, as it is from the line, L M, and the one on J K is as far from the arc, G C, as from the line, N O. Again, that these centers are as far from the arc, K I, as they are respectively from the lines, N O and L M. To simplify the problem, we draw the arc, S T, intermediate, through the center A, between the arcs, K I and B C. Then we know that these centers are as far on H I and J K, from the arc, S T, as they are perpendicularly from the line, G F. Now, if we draw the tangents, X Y, we know, because we know the centers we seek are a distance from the line, G F, equal to their distance from the arc, S T, that they are on the line, V W, drawn perpendicular to the line, G F, and intersecting G F at Z, as far from the point X as the intersection, U, of the tangent, X Y, is from that point, X. Now, therefore, if the centers we seek be on the lines, H I and J K, and also on the line, V W, then they shall be at the intersections D and E where V W crosses H I and J K.

From the points, D and E, therefore, it is possible to draw the arcs, V H, J W, V K, and W I, which completes the cam.

Orexin.

Dr. John Gordon reports in the *Lancet* on his results in the use of hydrochlorate of orexin, as an appetizer. From these he concludes that, in the loss of appetite concurrent with tubercular disease, orexin is a valuable stimulant. The power of stimulating absorption of the products of digestion claimed for it seems to be merited, for under its use, as a rule, the tongue becomes less furred, and constipation relieved. It is worthy of receiving an unbiased trial in suitable cases. It may be given, he says, either well diluted in water or made into pill form with any of the ordinary excipients, and can also be given between thin slices of bread and butter or in the form of wafers. The cases in which he tried it were those of children, to whom the drug was given in small doses and simply dissolved in water. Little or no objection was offered by the children to its administration.

Shikimic Acid.

Shikimic acid is the name of a new non-poisonous acid found in the *Illicium religiosum*. It has been isolated by Mr. J. F. Eykman, who describes it as a crystalline powder consisting of fine needles, which melt at 184° C. and have a specific gravity of 1 599 at 14° C. It is soluble in water (about 18 parts in 100), but almost insoluble in absolute alcohol, ether, chloroform, and benzene. It decolorizes potassium permangate in the presence of Na_2CO_3 and decomposes carbonates. Its probable formula is $C_7H_{10}O_5$ and is monobasic. Heated with hydrochloric acid, it decomposes, giving hydroxybenzoic acid. Judging from the nature of its decompositions it is thought to be a trihydroxytetrahydrobenzene mono-carboxylic acid, but the position of one or two hydroxyl groups requires further confirmation.