

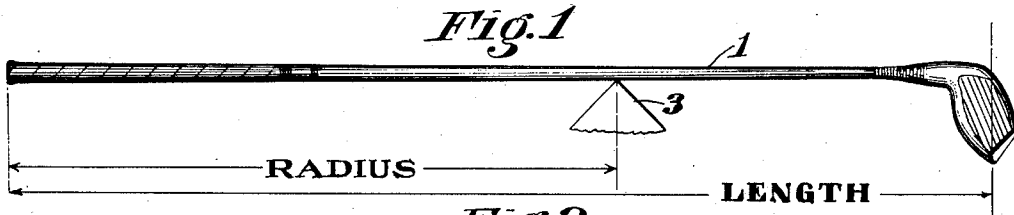
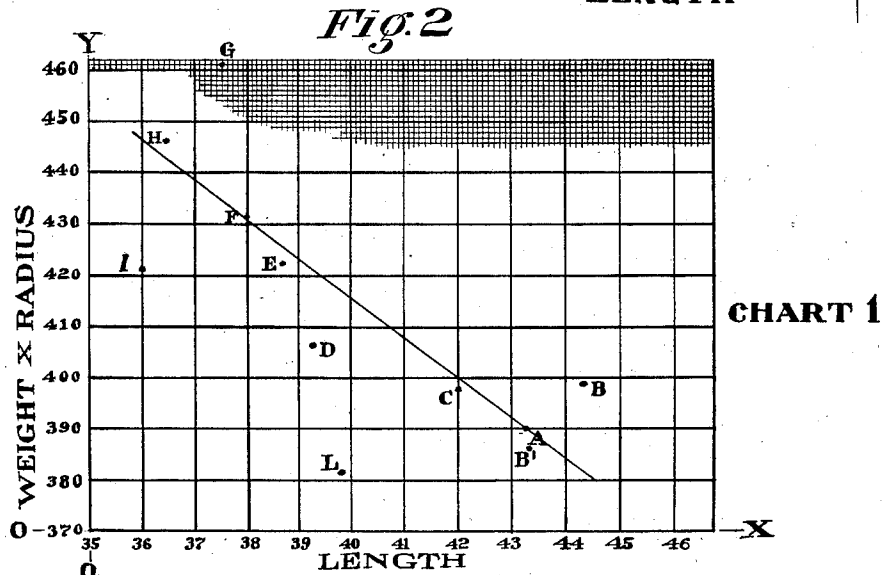
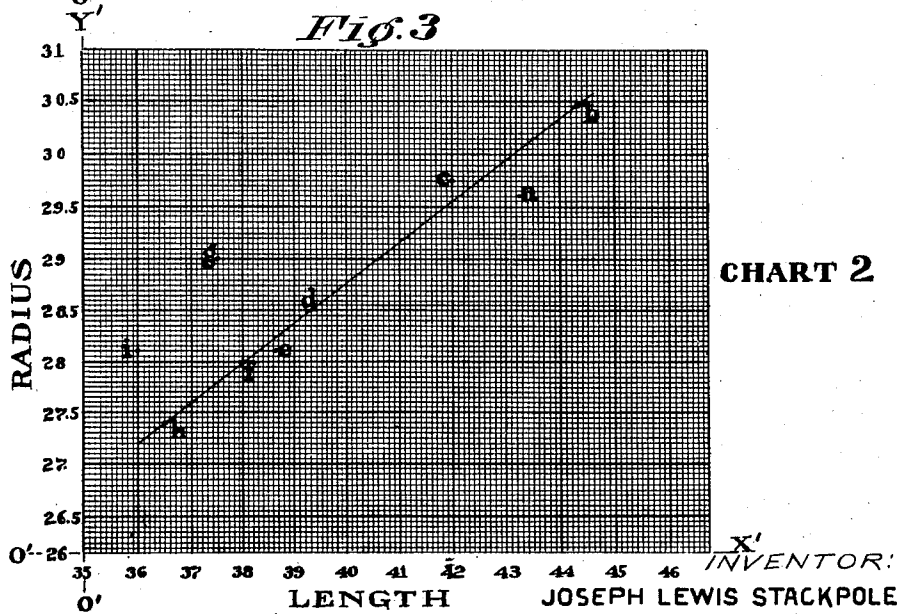
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J. L. STACKPOLE

METHOD OF HARMONIZING A SET OF GOLF CLUBS

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INVENTOR:
JOSEPH LEWIS STACKPOLE

BY *Henry T. Williams*
ATTORNEY

UNITED STATES PATENT OFFICE.

JOSEPH LEWIS STACKPOLE, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE PEOPLE OF THE UNITED STATES.

METHOD OF HARMONIZING A SET OF GOLF CLUBS.

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The invention to be hereinafter described relates to a method of harmonizing a set of golf clubs of a player.

There are three fundamental characteristics of a golf club, namely its length, weight and the location of its center of gravity. The last factor determines its point of balance. The distance from the end of the handle to the center of gravity or point of balance may be termed its radius. When a golf club is swung, the weight may be regarded as concentrated at the center of gravity, and therefore, the "feel" of the club as it is swung depends upon the weight and the radius. If the weight and the radius are multiplied, the product is the "moment" of the golf club.

For each player there is a best relation among these four factors, length (L), weight (W), radius (R) and moment ($W \times R$). This relation can be determined and all of the clubs of the player may be made to conform and harmonize by suitable modifications of their lengths and the weights of their heads and of their handles. A change of the weight of the head or of the handle of a club will alter the distance of the center of gravity from the end of the handle, and therefore, change the value of the factor R. This method deals only with clubs which are really swung in ordinary play, and therefore, excludes heavy niblicks with which abnormal force is required, and also putters and putting cleeks with which the stroke is not a swing in the sense in which this term is employed in the present application. It is also assumed that the player grips his club at the end of the handle, and does not compensate for a too heavy feel by gripping the club further down on the handle.

The aim and purpose of the present invention is to provide a method whereby the four factors of each club can be charted in such a manner as to readily indicate whether or not the clubs of the set harmonize with one another and if any alterations are required, to enable ready determination of the nature of the alterations.

The character of the invention may be best understood from the following description of the method taken in connection with the accompanying drawing, wherein:

Fig. 1 is a view of a golf club in a position of balance to determine the location of

its center of gravity and the length of its radius; and

Figs. 2 and 3 are views of charts employed in the practice of the method.

Referring to the drawing, a driver 1 (Fig. 1) selected as typical of a golf club of a set, is shown in balanced position on a fulcrum 3 which may be a pencil or other convenient means. The distance from the point of balance or center of gravity of the club to the end of the club is its radius R. The length L as shown in Fig. 1 is the distance from the end of the club handle to the point on the sole in line with the center of the shaft. The radius and the length of the club are measured accurately to $\frac{1}{16}$ of an inch, and the weight of the club is measured on a balance scale in ounces accurately to $\frac{2}{100}$ of an ounce. When $W \times R$ is obtained, the decimal fractions may be disregarded. Having determined these factors for a set of clubs, they may be tabulated, an example thereof being as follows:

	L.	W.	R.	$W \times R$.
A. Driver.....	43.25	13.18	29.6	390
B. Brasseys.....	44.3	13.12	30.45	399
C. Spoon.....	42.	13.38	29.75	398
D. Cleek.....	39.25	14.38	28.5	407
E. Mid iron.....	38.65	15.03	28.1	422
F. Mashie.....	38.	15.4	28.	431
G. Mashie.....	37.5	15.9	29.	461
H. Ma. niblick.....	36.5	16.3	27.4	446
I. Ma. niblick.....	36.	15.	28.1	421

The results may be charted by Cartesian coordinates on chart 1 (Fig. 2), in which lines OX and OY are the axes of coordinates to which all points are referred. The numbers 35 to 46 along the axis OX represent length, and the numbers 370 to 460 along the axis OY, represent the moment or $W \times R$. The point for each club is plotted on the chart with reference to these axes. For example, the length of the driver A of the above table is 43.25 inches and its $W \times R$ is 390. Measuring these on the axes OX and OY respectively locates the point A on the chart. Similarly, the length of the mashie F of the above chart is 38 inches and its $W \times R$ is 431. Measuring these along the axes OX and OY respectively locates the point F on the chart. By a similar method the points for the other clubs of the above table are plotted on the chart.

Practically every player has at least one wooden club that is his favorite, and also

one iron club that is a favorite. For example, suppose the driver A and the mashie F are the respective favorites as they may well be in fact. A line is drawn through their plotted points A and F on the chart, and this is the player's line of harmoniously balanced clubs which may be called briefly the "player's balance line."

It will be seen that the plotted points of the other clubs C, E, F and H, lie fairly close to this line, but that the points B, D, G and I are rather remote from this line. The closer the points lie to this line, the more nearly harmonious in balance and feel will be the corresponding clubs, and each such club will feel well. It may be that this line is not straight for every player, but it may be a line of slight curvature. It depends on the individual player.

It will be observed that the brassey point B is well above the line, and the cleek point D is below the line. The mashie point G is above the line, and the mashie niblick point I is below the line. The chart shows that for this particular player these clubs are out of harmony with the other clubs of the set, and that the brassey B and mashie G would feel too heavy and that the cleek D and mashie niblick I would feel too light. As a consequence, these clubs are difficult to play with, and they have the unharmonious feel shown thus graphically on the chart.

The player's balance lines vary considerably for different players. No two players have exactly the same swing or like exactly the same weight, feel and length of clubs. For different players the lines may be higher or lower than shown on the chart, or may have a different inclination. They may be flatter or steeper, but there should be a line best adapted to each individual player which is determined by the location of the points of his clubs which are his favorites in actual play. A player having plotted on the chart the points corresponding to his clubs and having drawn his balance line through the points of his favorite clubs, can determine how or to what extent the factors,—length, weight and radius of each individual club which is off that line may be altered to bring the point of that club on or near that line. If he does this to all his clubs, he will obtain a harmonious set of clubs, all of which will feel well to him in actual play.

For example, the point of brassey B on the chart is above the line. This club is 44.3 inches long, and its $W \times R$ is 399. Obviously if the driver A which is 43.25 inches long is a favorite, the brassey is too long. By cutting an inch off the handle of the brassey, its length is reduced to 43.3 inches, its weight to 12.87 ounces, and its radius to 30.1 inches. Therefore, its $W \times R$ is 387 and its new point B' on the chart is slightly below the line, which shows that a club 43.3

inches long should have a $W \times R$ of 390 for this particular player. If it were desired to bring the point of brassey B exactly on the line, a very slight amount of lead added to the head would increase both its weight and its radius and bring its point onto that line.

On the other hand, in the case of the cleek D whose point is below the line and which feels too light, the weight of the head could be increased by adding solder to its back. In the case of the mashie G whose point is above the line, by cutting a short length off its handle, its $W \times R$ could be brought down fairly close to the line.

In order to harmonize properly the clubs of a set, it is necessary that the clubs shall also be charted with reference to radius and length. These may be charted by Cartesian coordinates on chart 2 (Fig. 3), in which lines O'X' and O'Y' are the axes of coordinates to which all points are referred. The numbers 35 to 46 along the axis O'X' represent length, and the numbers 26 to 31 along the axis O'Y' represent radius. The point for each club is plotted on this chart with reference to these axes. For example, the length of the brassey B is 44.3 inches and its radius is 30.45 inches. Measuring these on the axes O'X' and O'Y', determines the location of the point B on the chart. Similarly, the points for the other clubs may be charted. These points are marked respectively *a, b, c, d, e, f, g, h* and *i*. The line determined by the plotted points is not far from straight for the clubs B', B, C, D, E, F and H. This shows that each of these clubs has a good individual balance. The location of point *a* for the driver A shows that although it is a favorite club, its radius is not as long as it should be to give the best results. The problem is to lengthen R by moving the center of gravity toward the head without changing the $W \times R$. If weight were added to the head, that would increase both W and R and hence also $W \times R$, and the point *a* of the driver would go up above the player's balance line on chart 1, and the harmonizing of the club with the rest of the set would be destroyed. However, removal of weight from the handle, as by boring a hole therein, does not materially alter the $W \times R$, for it decreases W and increases R. Hence, if it were desired to bring the point *a* of the driver more in alinement with a fair continuation of the line of chart 2, the proper thing to do would be simply to take weight from the handle.

A club might have its balance point such as A on the player's balance line of chart 1, and yet be a poorly balanced club, because its radius is too short. For example, the factors of a driver may be assumed to be as follows,—length 43.5 inches, radius 29.2 inches, W 13.4 ounces and $W \times R$ 291. It will be

seen that the balance point determined by the abscissa 43.5 and the ordinate 391, comes very close to the player's balance line of chart 1, but that its R is far too short, as may be seen by comparing it with the line of chart 2. To cure the defects of this club, a hole can be bored in the handle sufficiently large to remove $\frac{1}{10}$ of an ounce from the weight of the club, thereby lengthening the radius $\frac{1}{10}$ of an inch and reducing the weight of the club to 12.7 ounces, and making the $W \times R$ 378, but chart 1 shows that for a club 43.5 inches long, the $W \times R$ should be 388. Therefore, weight can be added to the head of the club to increase both W and R until the $W \times R$ becomes 388, R being equal to 30 and W to 12.93. The radius of 30 inches is long enough for a well balanced club. The club is thus changed from an ineffective to a very effective one by taking out weight from the handle and slightly modifying the weight in the head so as to bring the balance point of the club onto the player's balance line.

By this method of charting golf clubs, it is shown that a great deal of the lack of proper balance, particularly in wooden clubs, is due to too much weight in the handle. A great amount of study has been given to the designing of club heads and shafts, but practically none has been given to the effect of the weight of the handle, yet it seems that all the benefits of a well designed head and a well designed and thoroughly good shaft may be entirely lost by a very slight excess of weight in the handle.

If a player will chart his golf clubs as above explained, he will be able by proper modifications thereof to harmonize the feel of the clubs in his set and cure the deficiencies of individual balance. He will also have data which will enable him to buy new clubs which, even without actual playing, he can be reasonably sure will suit him, and he can have his old favorites readily duplicated.

It is difficult to pick out a satisfactory club in a shop, and even if a club seems satisfactory when played by itself a number of times, it may have an unharmonious feel when played in the course of a round when the shots are intermingled with the shots made with other clubs, but by thus charting the clubs, reading the charts and modifying the clubs, both the difficulty in lack of har-

mony in the feel and the lack of proper balance in each individual club can be readily overcome.

What is claimed is:—

1. A method of harmonizing a set of golf clubs, characterized by plotting on a chart a point for each club determined by Cartesian coordinates, one representing the length and the other the moment of the club, and drawing a line through such points for two favorite clubs of the player for comparison with the plotted points for the other clubs of the set, thereby to indicate whether or not the other clubs with reference to moment and length are in harmony with the favorite clubs.

2. A method of harmonizing a set of golf clubs, characterized by plotting on a chart a point for each club determined by Cartesian coordinates, one representing the length and the other the radius of the club, and drawing a line determined by the plotted points to show a comparison of the clubs with reference to radius and length and thereby indicate whether or not the center of gravity of any club should be moved toward or from the head of the club to harmonize with the other clubs.

3. A method of harmonizing a set of golf clubs, characterized by charting each club with reference to the length and moment of the club, and with reference to the length and radius of the club, thereby to indicate whether or not the clubs of the set are in harmony with one another with reference to length, weight and radius characteristics.

4. A method of harmonizing a set of golf clubs, characterized by charting each club with reference to the length and moment of the club to determine whether or not the clubs are in harmony with one another, and altering the length or weight or radius of any club or clubs indicated out of harmony by the charting.

5. A method of harmonizing a set of golf clubs, characterized by charting each club with reference to the length and moment of the club, and with reference to the length and radius of the club, and altering the length or weight or radius of any club or clubs indicated out of harmony by the charting.

JOSEPH LEWIS STACKPOLE.