

7-1941

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### Recommended Citation

Lovell, R. E. R. (1941) "BLACK'S REVISED SET OF FORTY-SIX CUTTING INSTRUMENTS.," *The Dentoscope*: Vol. 21: Iss. 2, Article 5.

Available at: <https://dh.howard.edu/dentoscope/vol21/iss2/5>

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## BLACK'S REVISED SET OF FORTY-SIX CUTTING INSTRUMENTS

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ALTHOUGH Black's Revised University set of forty-six cutting instruments was placed on the market in 1935 and adopted for use at Northwestern University, and other leading dental schools one or two years later, many who have used the former sets of Black's instruments have not familiarized themselves with the new set to the extent of more than topical interest. Fewer have taken practical advantage of the benefits and improvements of the set of forty-six, to the extent of adopting its use.

The essayist will attempt to indicate to readers the points of interest and the outstanding benefits of the new set, with the hope that ignorance and skepticism may be dissipated. The value of a good set of cutting instruments is beyond question. Far greater is the value, however, if the set of instruments is adaptable to the highest degree to the varieties of instrumentation. To this high office the set of forty-six ably measures up.

Black's original set of cutting instruments consisted of 102 pieces, which, although providing a wide variety of instrument forms, was too large to be of practical advantage to the dental office or the dental school. This large set gave ample scope for each operator to select the instruments best, suited to his particular desires. However, Arthur Black<sup>1</sup> pointed out that the important consideration is that each set shall have an ample range to enable the operator to prepare cavities in the best form with the least discomfort to the patient, and not to be burdened with unnecessary instruments.

The best concept of instrument sets has tended for ages to advocate the smallest number of instruments consistent with efficient work. The best operators have found that the greatest ease, accuracy and speed can be obtained with few instruments. This factor is even more important in designing or selecting a set of instruments for teaching purposes. In 1907, the University set of forty-eight instruments was chosen from the set of 102. The benefits of this were manifold, a testimony of which is borne out in the universal use of the set of forty-eight. The Revised Set of

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Forty-Six instruments, which is the chief subject of this work, was selected in 1935, after consultation, by Arthur Black, with many teachers and practitioners, many of whom had used the set of forty-eight for many years. The following table gives the comparative distribution of instrument types in the three sets referred to.

	SET OF 102	SET OF 48	SET OF 46
Chisels	6	6)	14
Hoes	24	9)	
Enamel Hatchets	6	6)	16
Hatchets	24	9)	
Special Hatchets	2	2	2
Spoons	18	6	4
Margin Trimmers	8	8	8
Discoids	3	1	1
Cleoids	2	1	1
Others	8	0	0

The detailed discussion of the instrument forms representative of the sets of instruments will involve a comparison, as to design and usefulness, of the various pieces of the sets of forty-eight and forty-six, and will follow below.

The decision to select the new set of forty-six instruments came as a result of the desirability of including certain new forms, which were suggested by many teachers and practitioners. The most important general advantages held by the set of forty-six over the set of forty-eight are:

- (a) The inclusion of chisels with reverse bevels. This will be enlarged upon under the heading of chisels.
- (b) The extension of the series of right and left beveled hatchets into smaller sizes.
- (c) The formula is simplified by classifying as chisels all cutting instruments the width of whose blades lies at right angles to the long axis of their shafts. This included all the chisels and hoes of the set of forty-eight. Conversely, all cutting instruments, the width of whose blades lies parallel to the long axis of their shafts are classified as hatchets. Since, in the set of forty-six, all, except four of the hatchets are in rights and lefts, the classification is greatly simplified. The four bibeveled hatchets are designed "bibeveled hatchets."

- (d) The widths of instruments of the set of forty-six are more adaptable to the problems of cavity preparation, particularly when working in small, restricted cavities.
- (e) The instruments of the set of forty-six are easily distinguishable one class from the other, and rights from lefts, by the identification system of plain rings cut in the shank ends of the shafts. Distal bevel chisels have three rings, mesial bevel chisels four, right hatchets one ring, and left hatchets two. The instruments of nine tenths millimeter width have rings somewhat wider than those on the instruments of other widths, but the number of rings on the instruments designating the types are the same as for the other instruments. Instruments whose identity is clear have no rings. This system of speedy identification of instruments is a modification of one suggested and used by D. E. M. Fernandez.<sup>2</sup>

In order to include all the foregoing beneficial features in designing the set of forty-six instruments and still maintain the the desirable small number of instruments, the instrument widths of the chisels and hatchets were revised. The widths of 18, 12, and 9 were selected to replace those of 20, 15, 10, and 8.\*

Let us now examine the details of the various classes of instruments in the two sets, laying greater stress upon some of the increased advantages to cavity preparation and other procedures, provided by the set of forty-six.

### CHISELS

The outstanding benefit conferred upon operative technique is the introduction of reverse bevels into the series of binangled chisels. In the set of forty-eight, the bevel on the blade of all the chisels and hoes is on the side away from the angle formed between the shank and the blade, i. e., the distal side of the blade. In the set of forty-six, however, the chisels of 18 and 12 widths (not the straight 18 and 12 chisels) have bevels on the mesial side of the blade, i. e., on the side of the angle formed between blade and the shank of the instrument. The mesial bevel chisels are distinguished from the distal bevel ones by the use of the complementary reflex angle of 94° Centigrade. The distal bevel formula uses the acute

\*All widths given are in tenths of a millimeter.

angle of 6° C. for its identity. Thus, the two distal bevel chisels have the formulae 18-9-6 and 12-6-6 while the corresponding mesial bevel chisels have the formulae 18-9-94 and 12-6-94.

Every operator who has used or is using the set of forty-eight, will admit of increasing difficulty in cutting buccal walls on the upper left side, and lingual walls on the upper right side, with straight and distal bevel chisels, as he attempted to deal with those parts of cavities, the more posteriorly in the mouth he operated. The problem is not as acute in the lower arch since the major part of hand instrumentation can be done with binangled hatchets, of the 12° C. angulation. The mesial or reverse bevel chisels have solved this problem. The preparation of distal walls in all cavities in posterior teeth is simplified, as is the planing or sloping of axial walls in mesial Class II cavities. Instrumentation on the lingual surfaces of anterior teeth is greatly facilitated.

Indeed, the mesial bevels on binangled chisels in the set of forty-six have produced the final stroke in the comprehension of the adaptability of cutting instruments to the box type of cavity—the very essence of cavity preparation both in the days of G. V. Black and in our day. A Class I, occlusal cavity in a lower right molar, can be almost completely prepared with four cutting instruments, viz., the distal bevel binangle chisel for the mesial wall, the left binangled hatchet for the buccal wall, the mesial bevel binangled chisels for the distal wall and the right binangled hatchet for the buccal, all of the 18 width.

There is no outstanding advantage afforded by the chisels of the smaller width series. The widths, however, are more in accordance with cavity size in the various teeth and their smaller number reduces confusion.

## HATCHETS

The hatchets present very important improvements. In the first place, the different widths of the hatchet series are fewer and lend themselves more nearly to cavity size. The "Ordinary Hatchets" of the set of forty-eight are all bibeveled. Bibeveled hatchets are best adapted to scraping and are least useful for cutting dentin and cleaning enamel, the major useful role of any hatchet. Further, a bibeveled hatchet is difficult to sharpen and easy to become dull. I shall never forget how I ruined my first 3-1-28 bibeveled hatchet when I failed to reproduce the manufacturer's bevel, despite a number of heroic attempts. Inexperience

was not the only factor in that case. In the set of forty-six, the eleven bibeveled hatchets, of the set of forty-eight, are replaced with four pairs of right and left beveled hatchets and four bibeveled ones. Of the four bibeveled hatchets, two are of the 23° C. angle and two of the 28° C. angle.

The small right and left hatchets are very useful in breaking down overhanging or undermined enamel in obtaining the outline form in Classes III, IV, and V cavities for any type of restoration. The squaring up of those cavities, in obtaining the resistance and retention forms, can be well accomplished almost wholly with these hatchets. The enamel wall can be easily and well finished. The salient reasons for the transcendence of right and left small hatchets over the correspondent bibeveled hatchets are their ability to cut well, as a result of their mechanism (one bevel) and the ease with which they can be sharpened and kept sharp.

In connection with the special hatchets of the 28° C. angle series, any operator who has used members of the set of forty-eight, for the preparation of Class III cavities for gold foil, particularly those smaller cavities (and gold foil is contraindicated if they are too large) will admit that his attempt to make the incisal retention was not often devoid of predicament. In fact, unless the labial wall was greatly sacrificed for so-called convenience, even the 3-2-28 could not be used except in cases where the access is particularly good, the proximating tooth being absent or badly broken down. One constant result of the use of a bibeveled hatchet with too long a blade is the breaking out of the lingual wall. In the set of forty-six, the 5-3-28 is dispensed with and a new instrument of the formula 3-1-28 is substituted. In restricted Class III gold foil cavities, even the 3-1-28 is difficult or hazardous to use. The careful operator has several 3-1-28 and 3-2-28 instruments, at different stages of wear, so that he has a set of 28° C. bibeveled hatchets with blades ranging from ½ to 2 mm. long.

### SPOONS

There is no substantial change in the series of spoons. The 20 width spoons of the set of forty-eight have been discarded by reason of their limited use because of their large size.

The cleoid and discoïd remain the same. The design is excellent and their usefulness considerable for a large variety of locations.

## MARGIN TRIMMERS

These instruments are called "gingival margin trimmers" in the set of forty-eight, perhaps because G. V. Black designed them for the chief or exclusive purpose of trimming gingival margins. As we will see, these instruments have a multitude of uses. There is no change in the design of the margin trimmers in the set of forty-six. The important modification was to dispense with the 20 width pairs and to substitute them with instruments half their width. The usefulness of this measure cannot be too greatly stressed.

Gingival margins are frequently not beveled, but they should be in all cases, with, perhaps, the exception of those existing in deciduous teeth. It was impossible to bevel all gingival margins with the facilities offered by the set of forty-eight, because there are many cases (the majority) in which small space precludes the use of even the 15 width margin trimmers. Therefore, the 10 width margin trimmers of the set of forty-six are efficient in all cases and in all types of cavities. Some of the important uses of the 10 width margin trimmers are:

- (a) Beveling of gingival cavo-surface angles.
- (b) Beveling of other cavo-surface angles where a chisel or hatchet is not as efficient.
- (c) Planing and flaring of the enamel walls in Class III cavities for gold foil—the acute angle of the cutting edge is placed into the cavity from the labial or lingual approach and if the cutting edge is sharp, as it should be, the planing and flaring of the enamel walls, to equal the direction of the direction of the enamel rods becomes an easy matter.
- (d) Making vertical grooves in the axio-buccal and axio-lingual line angles on the proximals of Class II amalgam cavity preparations, for the necessary increase in retention of the amalgam.
- (e) Sharpening the line angles of all classes of cavities for any type of restoration with the sole exception of the inlay. The exception is based on the danger of production of undercuts, which would, of course, hamper the procedure of inlay work.
- (f) As a subsidiary instrument in carving amalgam or inlay wax in developing the contour of the occlusal embrasure.

Although the set of forty-six is such a vastly improved edition of the set of forty-eight, some further improvements are not beyond conception. It is true that the two pairs of spoons are not always adequate for removing caries. In some restricted locations, e.g., up under cusps, in small pit cavities, in proximal cavities on anterior teeth. The introduction of a spoon into the set whose width is ten, but the length of whose blade is considerably less than six mm. perhaps, 1 mm., with a shorter, (for strength) narrower shank, will be a measure of improvement.

The extension of the reverse bevel to the 9-3-6 chisel will be a further improvement, for this chisel is in great demand in making lingual dovetails and the need for the reverse bevel is constantly felt. To off-set the increase in the number of instruments, these improved numbers may be introduced at the expense of the little used 12-6-6 hatchets and the 9-3-23 bibeveled hatchet, in order to prevent an increase in the size of the set. These are future prospects, but the present Black's Revised University set of forty-six cutting instruments we have in dentistry, and every dentist will do well to possess one.

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I don't think much of a man who is not wiser today than he was yesterday—Abraham Lincoln