

Operative

DENTAL ROTARY AND HAND INSTRUMENTS

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The removal and shaping of tooth structure are essential aspects of restorative dentistry. Initially this was a difficult process accomplished entirely by the use of

- Hand instruments.
- Rotary, powered cutting instruments.

Hand instruments

Definition:

It is hand-powered dental instruments.

- G.V. Black is credited with the first acceptable nomenclature and classification of hand instruments. His classification system enabled both dentists and manufacturers to communicate more clearly and effectively in regard to instrument design and function.
- For many years, carbon steel was the primary material used in hand instruments because they were harder and maintained sharpness better than stainless steel.
- Stainless steel is now the preferred material because stainless steel instruments remain bright with steam or dry heat sterilization, and because the properties of stainless steel have improved by incorporating a significant amount of chromium imparts corrosion resistance and carbon imparts hardness.
- Hand instruments used in operative dentistry may be categorized as:
 1. Cutting instruments and,
 2. Non cutting instruments.

Cutting instruments

These instruments are used to cut hard or soft tissue of the mouth.

Hand cutting instruments are composed of three parts: handle, shank and blade (Fig 1).

For non cutting instrument; the part corresponding to the blade is termed the nib or working end.

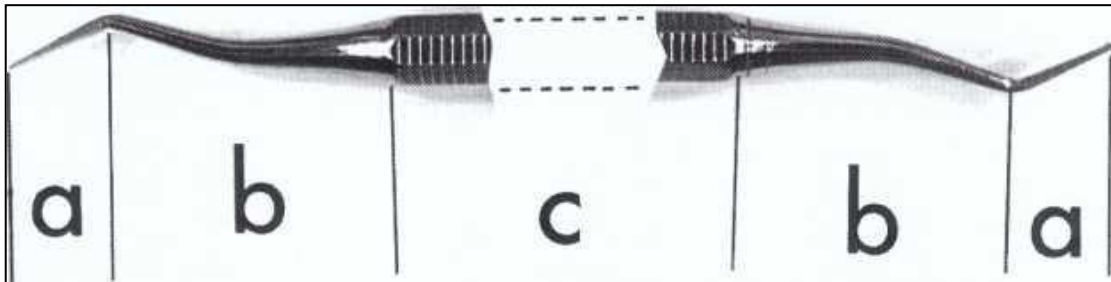


Fig. (1) Double-ended instrument illustrating three component parts of hand instruments: blade (a), shank (b), and handle (c)

- **The blade or nib;** is the working end of the instrument and is connected to the shank. Some instruments have a blade on both ends of the handle and are known as double ended instruments. The blades have many designs and sizes, depending on the function they are to perform.
- **The Shank;** serves to connect the handle to the blade of the instrument. The shank may be straight, monoangle(with one angle), biangle (with two angles) , triangle (three angles) , or quadangle (four angles) as in Fig(3&4&5).

The term contra-angle refers to shank in which two or more angles are present.

The angles in the shank are important to keep the blade edge within 1-2 mm to the long axis of the instruments. This is a basic factor to concentrate the force onto the blade for balancing the instrument during use and prevent its rotation

- **The Handle;** is the part that is grasped by the operator hand while he is using the instrument.

Instrument Formula Given by G.V.Black:

3 Number instrument formula: Cutting edge of the Instrument is at a right angle to the blade.

- a. First number- Width of the blade in tenths of a millimeter.
- b. Second number - Length of the blade in millimeter.
- c. Third number - Angle the blade forms with the axis of the handle in centigrade.

Example: Enamel hatchet. Fig2

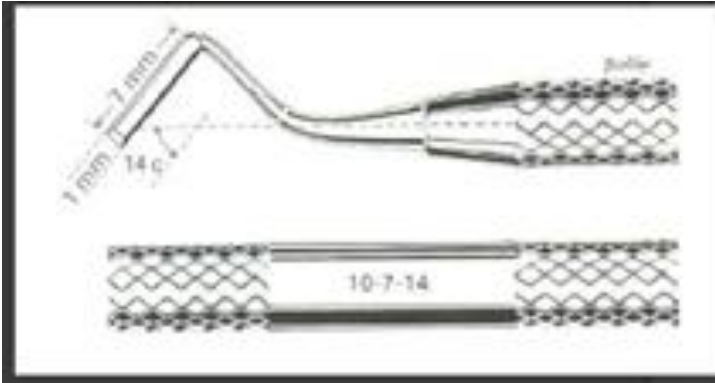


Fig2 Enamel hatchet formula

4 Number instrument formula: Cutting edge of the Instrument is at an angle other than a right angle to the blade.

- a. First number - Width of the blade in tenths of a millimeter.
- b. Second number - Angle the cutting edge forms with the axis of the handle in centigrade.
- c. Third number - Length of the blade in millimeter.
- d. Fourth number - Angle the blade forms with the axis of the handle in centigrade.

Example: Gingival marginal trimmer & angle former. Fig3

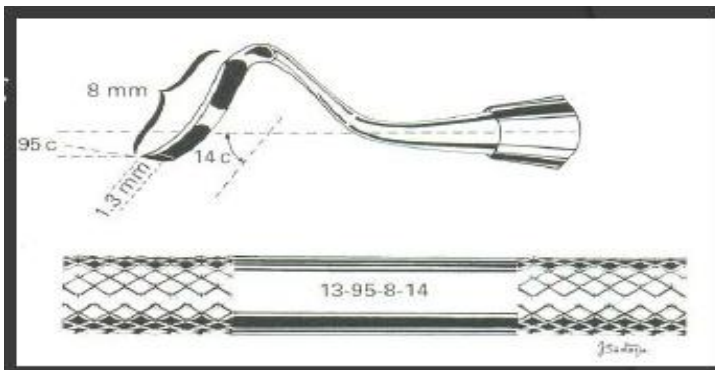


Fig3 Gingival marginal trimmer formula

Examples of the cutting instruments are:

1. Chisel: - either has a straight shank or with slight blade curvature or bin-angle chisel, and the blade has bevel only on one side of the edge. Its cutting edge is perpendicular to the axis of the handle. The chisels are used for cutting enamel and dentin with pushing motion The shank and blade of the chisel. (Fig. 4 A , B, C).

2. Hoe: - It is like chisel with cutting edge is perpendicular to the axis of the handle (Fig 4D), however its blade has a greater angle from the long axis of the handle than does that of the chisel. It has the same uses of the chisel.

3. Hatchet: - also called enamel hatchet. The cutting edge of the hatchet is parallel to the long axis of the handle and beveled only from one side (Fig. 5 A). It is used for cutting enamel and dentin and comes as right or left types for using on opposite sides of the preparation.

4. Gingival margin trimmer: - This instrument is used for beveling of the gingival enamel margin of proximo-occlusal preparations. Also it is using for beveling of axiopulpal line angle of two surface preparation as in class II cavities.

It is similar in design to the hatchet, except the blade is curved, and cutting edge is at an angle (other than parallel) to the long axis of the blade (Fig. 5, B and C). It is made as right and left types. Also it is made so a right and left pair is either a mesial pair or a distal pair. When the second number in the formula is 90 to 100, the pair is used on the distal gingival margin. When this number is 75 to 85, the pair is used to bevel the mesial margin.

5. Spoon excavator:- The blade is curved and the cutting edge at the end of the blade is in the form of a semicircle. This gives the instrument an outer convexity and inner concaving that makes it look like a spoon Fig. (6). Like the hatchet the cutting edge at the end of the blade is parallel to the handle, therefore there are left cutting and right cutting spoons. The shank of some spoons holds a small circular (disk blade) or claw – like blade at its end. The disk blade is known as a discoid, where the claw - like blade is termed a cleoid (Fig 7, A and B).

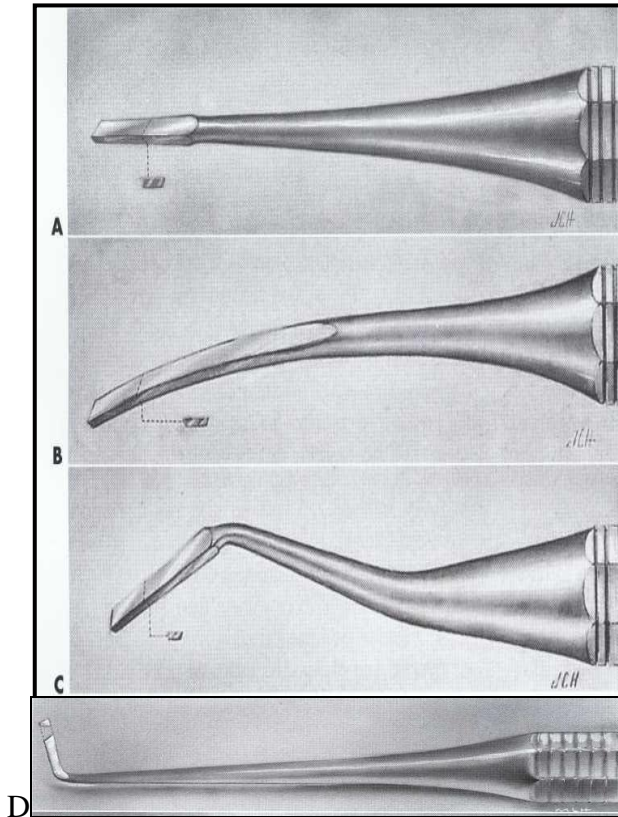


Fig . (4) Examples of hand instruments called chisels (with corresponding instrument formulas). A, Straight (12-7-0). B, Wedelstaedt (11¹/₂-15-3). C, Bin-angle (10-7-8) , D,Hoe.

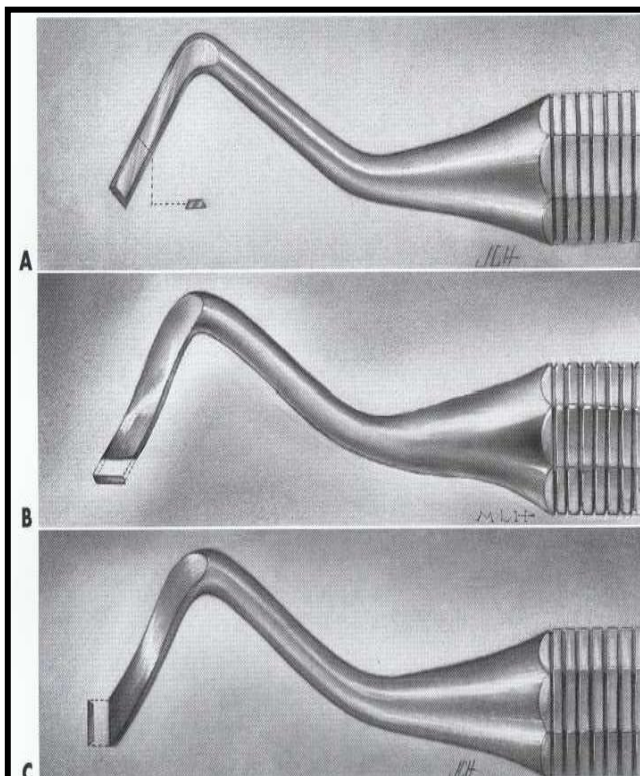


Fig .(5) Examples of hand cutting instruments (with corresponding instrument formulas). A, Enamel hatchet (10-7-14). B, Gingival margin trimmer (12 1/2-100-7-14). C, Gingival margin trimmer (12¹/₂-75-7-14).

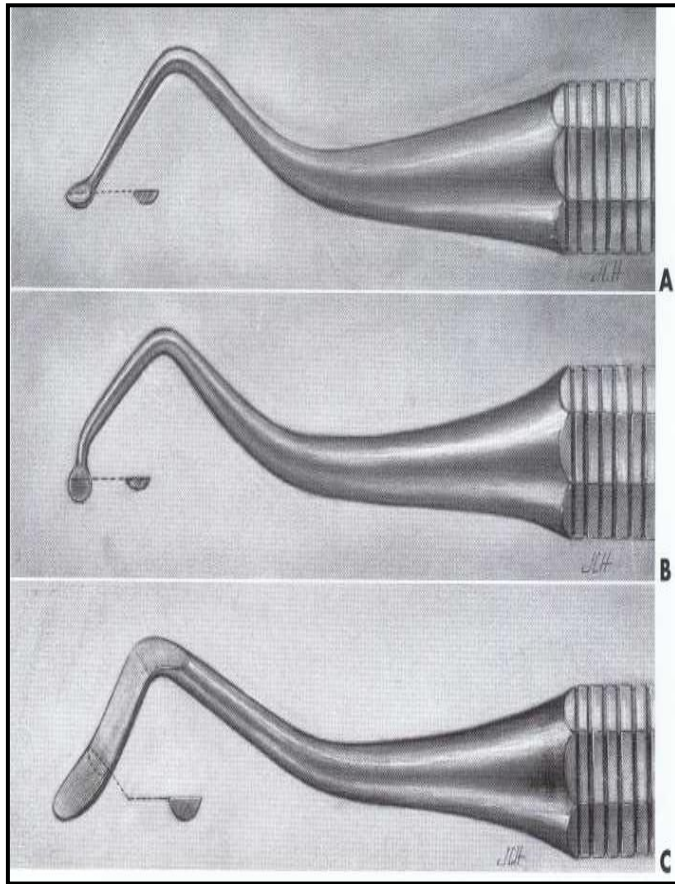


Fig. (6) Examples of hand instruments called spoon excavators (with corresponding instrument formulas). A, Binangle spoon (13-7-14). B, Triple-angle spoon (13-7-14). C, Spoon (15-7-14).

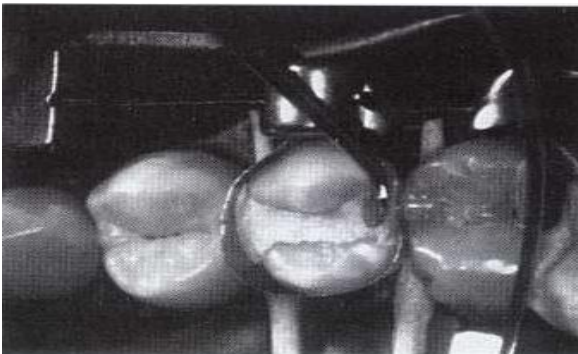
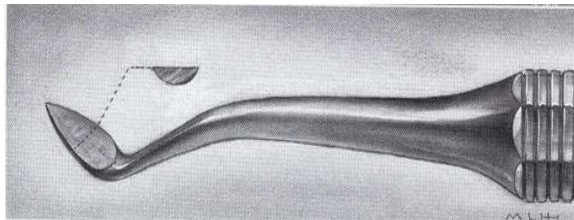


Fig . (7) Examples of other hand instruments for cutting (spoons) 1st picture is Cleoid blade. 2nd picture is Discoid blade carving amalgam.