An Improved Soldering Technic

JOHN H. PARKER, D.D.S.
Alameda, California

The history of the early form of soldering dates back as far as 2500 B.C. when records disclose that silver was probably first mined from the islands in the Aegean Sea. As the years passed, methods of working gold and silver became a separate art; much of it was secret and personal ornaments, utensils, vases, and decorative objects made of gold or silver with their various alloys became known as silversmiths' or goldsmiths' work.

The mechanical phase of dentistry would be sadly in want were it not for the ability of the operator to perform many acts of soldering which closely parallel the work of the goldsmith's and the silversmith's.

The technic of soldering, as taught over the past years to orthodontists, has been to fuse gold wire to gold bands by either silver or gold solder melted by fine flame from a gas torch. This is the universally accepted method and in good soldering it has always resulted in a firm well-bonded joint.

With the introduction of chrome alloys to orthodontics in the 1930's, high fusing soldering became an art all its own and, frequently, even the best chrome alloy technicians were forced to admit defeat in some phases of their soldering. Either the wire or the band material became annealed or the wire would corrode and break at the soldered joint.

This lack of a secure soldering method impeded the growth of chrome technic for many years until men who advocated the use of chrome, in an effort to overcome this deficiency, turned to lower fusing solders known as eutectic solder. This type of solder needs very little heat from a torch and for most technic work it has proven to be quite satisfactory; unfortunately, this low fusing solder does not always maintain its luster and requires considerable bulk for its strength.

Technicians have long been hopeful that we could find a simple soldering method for the higher fusing gold solders which would not discolor and at the same time afford a stronger bond between two pieces of chrome alloy. Partial success was achieved by good technicians in this direction when they used the high heat developed from an oxygen torch, but for the average operator this method is still slow and risky when the arch temper can suddenly be lost with one careless maneuver of the flame.

Chrome alloy soldering involves a different principle of adhesion from that of gold soldering. This metal, unlike gold, apparently does not unite with the solder to become an integral part of the chrome ore, but rather it fuses to the outer surface of the metal and its action resembles to a great extent the soldering process known as brazing.

If chrome alloy is heated by torch in an attempt to draw the high fusing solder to it with heat, there is a wall of oxide that develops on the metal which inhibits the union of the solder to the chrome ore and, even when the operator specifically attempts to heat the solder where it is placed on the metal, the radiating heat from the torch tends to partially anneal the wires thus

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causing oxidation. This is the prime objection to the use of the torch.

This paper is not written with the intent of settling the argument of which is better, gold technic or chrome technic, but rather to introduce a fast practical application of an orthodontic soldering technic for both gold and chrome.

When one who has been accustomed to fine technic work by torch flame for many years is suddenly confronted with a method of soldering that is nearly foolproof there is at first a feeling of complete disbelief; then the realization comes that, as we progress in all walks of life, some of our artistic skills must make room for the more advanced and practical applications just as the conventional gear shift, in most instances, has been replaced by the automatic gear shift in the automobile.

In 1952 one of the major orthodontic supply houses placed a welding and carbon solder machine on the market. This machine has variable heat controls for both the weld unit and the carbon copper electrodes which are separately connected with extension cords. At approximately the same time another major company, after experimenting for several years with the carbon soldering unit, finally discontinued any further tests because of the tedious job of keeping the electrodes clean. From the very beginning the carbon tip on all the manufacturers' machines tended to clog with the heated flux and frequently failed to make electrical contact at critical moments; therefore this added unit did not meet with the approval of most orthodontists. Experimenting with the Rocky Mountain model (in production since 1953) gradually led the author to find and develop a more positive soldering technic for chrome alloys that is relatively simple and fast.

The use of this technic will open the door for new and improved applications in both chrome alloy and gold; many soldering applications heretofore employed exclusively to gold may now be applied to the chrome alloys.

To prepare for soldering, a 506 Rocky Mountain welder is used with the adapting cables that plug into the two outside annealing inserts. One of the cords has a special alligator clip attached to its terminus while the other cord ends in a sharply pointed carbon tip. The switch is turned to heat control No. 4 for nearly all wire soldering. Number 5 must never be used for soldering. With this machine the operator is at liberty to use either the lock nut to hold the current on or the foot switch which permits a remote control activation of the electrical circuit. The clip is used for a two fold purpose; (1) to conduct the current and (2) to act as a jig which grips the material to be soldered. A high fusing flux (R.M. Tru-chrome) is brushed into the welded joint and a small piece of .013 S. S. White 14K 490 gold solder (melting 1365-1435°F) cut in triangles approximately 1.5 mm on a side is placed directly over the weld area. The solder may be cut in different sizes and shapes according to the need. The actual soldering is almost instantaneous. First the carbon tip anode is dipped in water to insure electrical contact with the piece of solder; the carbon is placed directly on the small piece of solder, and to complete the operation the foot control is depressed for approximately four-tenths of a second. (Longer for .030 wire or larger and shorter for wire below .014 dimension). The operator will very quickly become adept with this technic by watching the solder melt.

Certain characteristics of direct current discovered in 1881 make this soldering method quite simple because it

was found that the current literally flows downhill from the anode to cathode allowing the carbon tip to heat bright red while the opposite pole hardly becomes warm. The clip must always be placed within one mm of the working area and even closer for very small .010 wires.*

For special type soldering, .012 dead soft wire is lightly welded to two separate pieces of chrome alloy. These pieces of chrome can be placed end to end and joined by the third wire, or the small wire can be used to unite a "T" joint thus avoiding overlapping. An important use of this application is in direct work (Fig. 1) for the alignment of larger wires as in cuspid to cuspid retention, in placement of a fixed lingual bar to molar bands or in repair of broken wires. This work can be quickly measured and withdrawn from the mouth without distortion and the cathode clip placed on either band "A" or wire "D" to form the electrical circuit. Soldering can be performed merely by following the procedure of (1) fluxing, (2) placing the solder and (3) completing the electrical circuit with the carbon tip touching the solder. The solder must not be placed beyond the bridge of .012 soft wire, or this will melt when the current is turned on.

To avoid flux contamination in all the procedures the hot carbon tip is plunged into water immediately after the solder has melted, thus washing away the remnants of the flux.

Occasionally when the carbon fails to make contact on the solder, it should be quickly preheated by placing it on top of the alligator clip (switch on) and shorting with the electric current. A moistened carbon tip is desirable for all soldering.

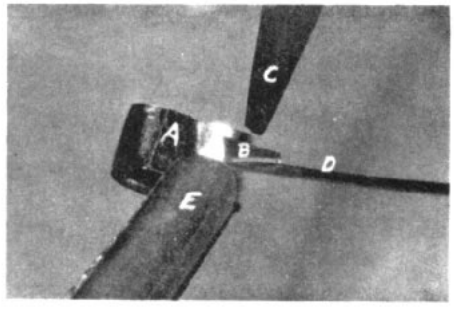

Fig. 1. Soldering cuspid to cuspid. A, band; B, solder; C, carbon tip; D. lingual wire; E, alligator clip.

This technic for orthodontics in soldering chrome wires or chrome to gold can best be performed when employing either of the following forms of welding: lap joints .010 up to .052 wire or butt joints — any size wire joined by flattened .012 bridge wire (dead soft).

The major uses in orthodontics of this type of soldering are: soldering of prewelded chrome wires or springs of any size (Fig. 2) directly to the archwire or band material of either gold or chrome, reinforcement of band

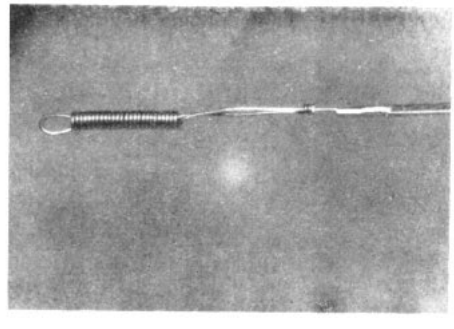

Fig. 2. .010 closing loop spring soldered to .020 square wire.

*A special coil and switch must be ordered with the 506 welder to do .010 tacking. The Unitec model "Unimatic Spotwelder model 1000" can tack weld if the charge is taken out of the transformer by turning the switch off and pressing the button, then quickly flipping the switch on, and then off. This produces a very light electrical charge. The same action can be obtained on "Lo Weld" in the RM Spot Welder No. 650.

material surfaces or ends of wire and repairing wires broken near acrylic on retainers (heat will not melt acrylic where procedures are correctly followed).

It is the author's belief that carbon tip soldering will be greatly enhanced if further experiments are conducted with various sizes of carbon tips and if a research program is developed which will offer an improved solder for this technic.

2241 Central Ave.