

B. E. ELDRED.
METHOD OF MAKING CONTACT POINTS.
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1,130,077.

Patented Mar. 2, 1915.

Fig. 1.

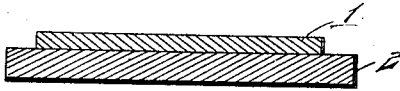


Fig. 2.



Fig. 3.

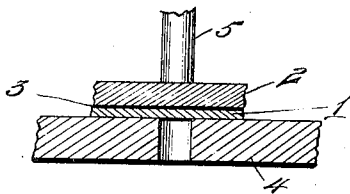


Fig. 4.

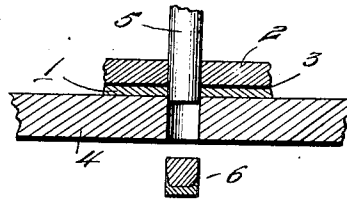


Fig. 5.

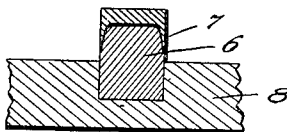


Fig. 6.



Witnesses

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METHOD OF MAKING CONTACT-POINTS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, BYRON E. ELDRED, a citizen of the United States, residing at Bronxville, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Methods of Making Contact-Points, of which the following is a specification.

This invention relates to methods of making contact points and it comprises a process of producing contact elements wherein a body of platinum is placed in contact with a body of stiff and strong metal comprising a metal of the iron group, a limited amount of molten high-melting metal is produced therebetween for a limited time to cause a liquid metallic union, the heat being lowered as soon as union is effected, the joined metals so united are preferably rolled or worked down to a smaller size to compact the platinum and then contact elements or points are stamped, cut, struck or punched out from the worked joined metals; all as more fully hereinafter set forth and as claimed.

For contact point and similar elements for electrical purposes, as for instance in spark points, spark plugs, key contacts, switches, etc., a surface of platinum offers many advantages, platinum being one of the few metals which will withstand the action of the gases, such as ozone, nitrous fumes, etc., generated by sparks or arcs passing through air and gaseous mixtures containing air. Platinum is, however, in its natural state, a comparatively weak, soft metal and not well adapted to withstand mechanical abrasion and the wear or the hammering action of many electrical devices, as in make-and-break devices; or to withstand the detaching action of the spark. And there are, furthermore, many mechanical difficulties in employing it in thin layers or small bodies, as considerations of economy dictate, partly because of its lack of strength and partly because of the extreme difficulty of attaching it to other stiffer and stronger metals by a firm and permanent joint such as the ordinary soldered or brazed point. Platinum readily unites and alloys with low melting metals, such as are employed in solders, to form low-melting alloys and soldering it to a backing and supporting element is therefore an operation requiring extreme care. In practice therefore brazing or the use of gold or silver solders is therefore generally resorted to, but this also requires great care

while the comparatively small platinum element necessarily becomes highly heated. In making a spark point, for example, a minute button or head of platinum is often brazed to a shank of copper or other metal; but the operation is difficult and expensive since it is necessary on the one hand to secure a firm joint and on the other to avoid injuring the small bit of platinum. The operation is difficult and requires skill. And, furthermore, in the heating incident to the operation the platinum is annealed and softened, giving it a soft, little resistant texture. Platinum may be given a comparatively hard texture by hammering, but this disappears in the heating.

In the present invention I have devised a new type of contact element comprising a layer of platinum of a peculiar hard texture firmly, permanently and metallically united to a supporting body of a stiff and strong metal of the iron class, such as nickel, iron, steel, alloy steels, cobalt, etc., but without the use of low-melting soldering metals. While it has hitherto been deemed difficult or impossible to produce any direct union between platinum and these iron class metals, I have found that it may nevertheless be accomplished provided certain expedients are adopted. It is, for instance, substantially impossible to produce any permanent and seamless union of a cohesive (as distinguished from adhesive) nature between metals as radically different as are these in chemical and physical nature by contacting the metals in a solid state and working together whatever be the heat and pressure employed. Platinum cannot be welded to iron in the same way that platinum can be welded to platinum or iron to iron.

In order to produce a cohesive union between any two bodies of metal, the abutting molecules must be in contact in the same sense that molecules contact with molecules in the integral body of either metal; and in practice this type of contact or union cannot be produced with both metals in a rigid, non-fluent condition. And with metals as unlike as platinum and the iron group metals, one metal must be in a liquid condition to obtain such a contact as will form a cohesive union; there must be a wetting contact. Where a fluid wets a solid, the abutting molecules are in cohesive relation; and this relation does not disappear upon solidification of the fluid metal. In uniting

platinum with iron-group metals in order to secure a good and permanent union which is, or is equivalent to, a weld union, the iron group metal must be, at least locally, in a fluid condition and form a wetting contact. But since platinum alloys freely with most other metals forming comparatively low melting alloys, the amount and the time of contact with such metals in a liquid state must be restricted since otherwise the two metals will intermingle to an undue extent along the line of intended union. But by performing the joining operation under proper conditions, good and permanent unions having all the properties of a weld union may be secured, the joined metals being thereafter incapable of separation, a cleaving tool, such as a cold chisel, being unable to discover the line of joiner and heating and sudden quenching being unable to break the union. When well made the union is, as a matter of fact, superior to the ordinary weld as found in welded iron since the joined and abutting surfaces are in cohesive contact at all points instead of being merely united at intervals as is apt to be the case with iron welds. The joined metals may be coextended indefinitely by ordinary working methods, such as rolling, hammering, drawing, etc. And in such coextension, the platinum acquires new and valuable properties for the present purposes. Being compacted between the working tool on the one hand and the relatively stiff iron group metal on the other while held against lateral yielding by the existence of the basal weld union it acquires throughout its mass a peculiar hard, firm and dense texture comparable with the surface texture of hard drawn wire, with a great increase in strength and resistance to abrasion and wear. This fact is of great value for the present purposes since it permits the union of comparatively large masses of platinum and stiff and strong metal and their subsequent coextension to form comparatively thin plates carrying a surface layer of dense and hard platinum, from which plates or sheets the finished contact elements may be cut, stamped or punched out, each then consisting of a stiff and strong shank or body carrying a capping layer of hard, dense platinum. The shape of the contact element will depend upon the cutting tool. A punch giving cylindrical compound elements may be used. Obviously no heating which would anneal and weaken the platinum is necessary in the present operation. This mode of procedure is not only advantageous as permitting cheaper work than where each separate contact element must be separately made but as giving a much better article than where the platinum is heated and brazed to a holding element.

In practice, a bar or sheet of platinum

may be laid on a bar or sheet of stiff and strong metal, or the latter upon the former, and the assembled metals quickly and cautiously heated to a temperature where the stiff and strong metal assumes a peculiar surface appearance indicative of superficial fusion but before the main body of such metal actually begins to melt. At this point the fluid layer of metal wets the platinum and positively fills up all spaces between the two metals, entering capillarily between them. In assembling the metals, opportunity must of course be afforded for ready extrication of any gases between them. In this operation probably there is more or less superficial alloying along the line of union between the metal bodies, but this is not disadvantageous where the operation is properly conducted and the intermixture or alloying confined to a very narrow zone between the two metals; and is probably advantageous as adding to the strength of the union. As soon as the surface of the lower melting metal assumes the indicated appearance of superficial liquidity, the heating is quickly arrested. As stated, it is not desirable that too much of the stiff and strong metal be fused. The heating is preferably from above and, as stated, an opportunity should be afforded for ready extrication of gases. With a comparatively wide, thin sheet of platinum, for example, lying upon a sheet of nickel, it is desirable that it be perforated in the middle to allow exit of gases there as peripheral cooling and solidification of the fused metal takes place. If for any reason a body of stiff and strong metal faced on two sides with platinum be required it is better to attach platinum first to one side and then to the other rather than apply platinum to two sides simultaneously. But there is no difficulty in so attaching an annular tube or shell of platinum to a core of stiff and strong metal in the described manner. Where flame heating is employed, as is best, the flame should usually be run rather reducing to prevent oxidation of the stiff and strong metal but not so reducing as to allow sooting or deposition of carbon. A blast gas flame or an oxyhydrogen flame may be employed. Using nickel, which is a metal of high fusing point, the oxyhydrogen flame is well adapted. Electric heating may be employed but since it is a matter of uniting major faces of two bodies of metal it is usually less convenient and manageable than flame heating.

Platinum clad stiff and strong metal bodies under the present invention may also be produced by the use of another expedient allowing the employment of somewhat lower temperatures. In this modification in lieu of using an autogenously produced film of liquid metal a third or linking metal may be employed. This metal is preferably

copper though gold or silver may be used. All three metals are comparatively high melting and do not tend to injure the platinum as do lower-melting metals. Copper has the advantage of uniting readily with platinum and of being so high melting that little danger attends the operation and particularly where, as is preferably the case in the present invention, the amount of copper is restricted to the lowest possible amount. Being ductile and malleable at all temperatures, the presence of a film of linking copper does not prevent or hamper the working down of the joined metals. While it has long been regarded as substantially impracticable to unite copper with steel and ironlike metals by any firm and permanent union, such unions have recently been produced by the use of a number of expedients, such as the employing of superheated molten copper, or "supermolten" copper (see Patent 853,716). Under these circumstances the fused copper will wet the steel and cohere firmly and permanently thereto. Ordinarily, the steel is first filmed with superheated copper and then a further quantity of copper cast or otherwise contacted with the filmed surface to produce a substantial coating. It is material of this character which may be employed in the present invention. Having a plate or bar carrying a coat of welded-on copper, the copper is turned or shaved off until but a limited amount remains, say a layer of one or two thousandths of an inch. The coated metal is next placed in contact with the platinum as before and the temperature cautiously but quickly raised to the melting point of copper, when the heating is arrested. The copper, being already in wetting union with the steel, now forms a similar intimate, molecular union with the platinum and serves as a linking means therebetween. Probably most of the minimal amount present disappears by absorption into the other metals. The linked metals are next rolled or otherwise worked down as before to compact and harden the platinum when the contact elements are stamped or punched out as before.

For making contact elements, the stiff and strong metal is preferably faced on one side only with platinum. For most purposes nickel is a suitable metal to employ, being strong and giving strong platinum headed contact elements or rivets. Being stiff and hard also, the nickel acts as a very efficient backing sheet in producing the described hard texture of the platinum. The union between the nickel and the platinum under the described conditions is also very ready. However the various steels and alloy steels may also be employed. Commercial nickel containing cobalt, or cobalt itself, may be used. After stamping out

the contact element, if desired the metal may be turned down to give a rivet shaped element. This is often convenient in assembling the contact element with the elements with which it may be used. In punching, the platinum may be flowed or arched some distance down the shank of stiff and strong metal, giving what may be described as a depending coating. This is useful in preventing arcing around the top and may be utilized in preventing corrosion of the base metal where the point is set in insulating material extending up to the depending coating. Similarly the nickel or like metal may be arched down around the platinum, forming a sort of surrounding cup. This gives a little additional strength against lateral stresses, but ordinarily is not necessary since the platinum is very firmly united to the shank and can rely on it for full strength. This is particularly the case where the platinum layer is, as is desirable, of relatively little thickness as compared with the area of the weld union. A comparatively thin layer of platinum is desirable both for the reason that it takes better advantage of the strength of the metal to which it is welded and for reasons of economy. The compacting action in rolling is also better with a thin layer of platinum than with a thicker.

It is better that the thin layer of linking metal between the stiff and strong metal and the platinum be autogenously produced in the manner described rather than by first attaching a coating of copper to the stiff and strong metal, reducing the thickness of the coating and then using it in the described manner as the latter operation requires more manipulation. Linking copper however gives a good type of metal for the present purposes. Gold and silver are not better. The use of lower melting alloys, such as brasses, bronzes and the like is not as desirable as that of copper since they do not roll as well and furthermore in the linking operation much more care is requisite since these alloys contain low melting metals like tin and zinc which are apt to be injurious to platinum. Tin, lead and zinc should not be used in any event and alloys containing these metals are apt to be dangerous without great care and skill.

The compound metals should be produced in comparatively large bodies and then worked down to comparatively thin compound sheets or plates, each of a thickness corresponding substantially to the length of the contact element to be produced, any difference between the two being due to slight compression of the metals of the contact element incidental to the cutting, or punching operation. In working a plate down from a large to a smaller size the described compacting effect is produced.

In the accompanying illustration I have shown, more or less diagrammatically, means and materials within the present invention.

In this showing:—Figure 1 represents a sheet of platinum and a sheet of stiff and strong metal assembled ready for union; Fig. 2 represents the united metals after rolling down to a thickness suitable for making contact points; Fig. 3 represents the compound sheet and a punching tool in position ready for making a contact element; Fig. 4 represents the same after punching out the contact point; Fig. 5 shows a contact element in position in a holding element, as for instance a key base, an igniter for engines, etc.; Fig. 6 shows a contact point having the shank turned off somewhat.

In the views the contact point is shown as somewhat larger than its usual dimensions for the sake of clearness of illustration.

In Fig. 1, 1 represents the platinum sheet and 2 a layer of hard and strong metal such as, for instance, nickel. The former is somewhat the smaller so as to leave projecting edges of the latter to permit optical observation of the influence of the heating. The two metals thus assembled may be heated in any suitable manner (not shown) as for instance by a blast flame projected downward upon the platinum, until the surface of the nickel shows the appearance indicative of superficial fusion. The heating is arrested at this point and the assembled metals rolled down to form the compound plate shown in Fig. 2. The heating operation is exactly the same if the nickel or other metal body 2 has been previously provided with a cohering coating of copper or the like, though the temperatures required are markedly less. In the showing of Fig. 2, black line 3 may be taken as representing a layer of linking metal which has been fused and has alloyed more or less with the metal on each side.

In Fig. 3, the compound metal sheet is shown laid on a die face, 4, platinum side down, under a punch member 5 adapted to make round elements; and in Fig. 4, the punched-out contact member 6 is seen dropping away.

In Fig. 5, the contact member is shown as carrying an arched down depending layer of platinum 7 and as held in a holding member 8.

In Fig. 6, the contact member is shown with the shank turned off at 9.

While I regard my invention as particularly applicable to contact elements having a layer of commercially pure platinum, since such platinum is well compacted and hardened in the process and is of more fibrous character than other platinum group metals, yet such other metals may be used in the

same way as may their alloys with platinum. Iridium may be alloyed with the platinum to still further increase its hardness and resistance to wear and abrasion. Other and additional methods of working, such as hammering and the like, may be adopted for compacting the platinum; and there is a good compacting action in the operation of stamping or punching out the contact elements. But in rolling out joined comparatively large masses of noble metal and strong metal to thinner gages as an intermediate step a good compaction is obtained. Heat may be used during the rolling. With rolled metal, the fibers of course lie transversely of the welded cap of the contact element which makes such contact element more durable.

What I claim is:—

1. The process of producing platinum capped contact elements which comprises producing an integral union between a layer of platinum and a layer of a stiff and strong metal by means of a fused layer of linking metal, rolling down the joined metals to a greater thinness to compact the platinum and produce a compound plate having a thickness substantially equal to the length of a contact point and cutting contact elements therefrom by a vertical cut.

2. The process of producing platinum capped elements which comprises producing an integral union between a layer of platinum and a layer of a stiff and strong metal by means of a fused layer of autogenously produced linking metal, rolling down the joined metals to a greater thinness to compact the platinum and produce a compound plate having a thickness substantially equal to the length of a contact point and cutting contact elements therefrom by a vertical cut.

3. The process of producing platinum capped contact elements which comprises producing an integral union between a layer of platinum and a layer of nickel by means of a fused layer of linking metal, rolling down the joined metals to a greater thinness to compact the platinum and produce a compound plate having a thickness substantially equal to the length of a contact point and cutting contact elements therefrom by a vertical cut.

4. The process of producing platinum capped contact elements which comprises producing an integral union between a layer of platinum and a layer of nickel by means of a fused layer of autogenously produced linking metal, rolling down the joined metals to a greater thinness to compact the platinum and produce a compound plate having a thickness substantially equal to the length of a contact point and cutting contact elements therefrom by a vertical cut.

5. The process of producing platinum

capped contact elements which comprises
producing an integral union between a layer
of metal comprising a platinum group metal
and a layer of a stiff and strong metal by
5 means of an intermediate layer of fused
metal, working down the joined metals to
compact the first stated layer and form a
compound plate having a thickness sub-
stantially equal to the length of a contact
10 point and punching contact elements there-

from in such a manner as to arch down the
platinum layer forming the cap over the
shank of the other metal.

In testimony whereof, I affix my signature
in the presence of witnesses.

BYRON E. ELDRED.

Witnesses:

JOHN M. RILEY,
A. M. SENIOR.