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Technical Discussions at the AES 30th Annual Convention Victory Session

Technical Editor's Note: *The discussion begins with remarks by Chairman Maurice R. Caldwell after the presentation of the three papers.*

Chairman Caldwell: We have about ten minutes, or longer, if necessary, for a discussion period. Are there any questions?

Dr. K. Schumpelt (Baker & Company, Inc., Newark, NJ): The speakers we have heard today discussing materials which can be had and materials which should be replaced have not mentioned the one metal which today still is available and regarding which no government restrictions have been announced; this metal is palladium, one of the metals of the platinum group, and in its properties, very similar to nickel.
The color as well as the hardness of palladium are almost identical with that of nickel.

Mr. Anderson: How much palladium have you got?

Chairman Caldwell: Dr. Blum, can you officially answer that?

Dr. Blum: I would rather Dr. Schumpelt would tell us and add to the picture the availability and approximate price of plating.

Dr. Schumpelt: The price of palladium at present is about $24.00 per ounce. There is no reason to believe that the price should not be fairly stable because the amount of metal available is rather large. During the past ten or twenty years, palladium has been accumulating due to increased production of Canadian nickel ores which contain an appreciable amount of platinum metals, particularly platinum, palladium and rhodium. So far, no commercial or industrial applications for palladium have been found big enough to make a dent in the accumulated stock. I have no definite figures regarding the total amount available, but I can say it is rather large.

Mr. Anderson: I would like to say that I have had considerable experience with palladium in my position with the Bell Company; in precious metal welded contacts in telephones, we have found palladium a quite satisfactory substitute in a number of instances for gold-silver-platinum contacts. It is not as hard as some of the other platinum group metals and it does not have quite as good characteristics from a non-sparking standpoint for current carrying contacts, but it does have a lot of possibilities. I think the Bell System is one of the larger users of palladium for industrial purposes.

Dr. Schumpelt: Another thing about palladium which should be of interest to the plater is the fact that a palladium bath is available which can be operated on the same basis as for instance, a nickel or silver bath. Once the electrolyte is made up the metal is replenished from the palladium anode. Anode and cathode efficiencies are practically 100%.

Very recently a palladium bath has been put in operation to plate surgical instruments and parts of dental apparatus which up to now had been nickel and chromium plated. As far as these instruments were made of steel, a silver plate has been applied before the palladium.

Chairman Caldwell: Thank you for giving us that information. Are your questions answered properly? Do you wish any further answer on that?

Dr. Schumpelt: No, I don't want any. I just wanted to bring palladium to the general attention as a metal still available without restrictions.

Chairman Caldwell: Are there any further questions you would like to ask these gentlemen? Mr. Hogaboom, do you have something to add to this discussion?

Mr. George B. Hogaboom (War Production Board, Washington, DC): Mr. Anderson spoke about a new development - chromium plating on silver. I am pleased to report that such a process is now perfected and the plating is being done on a commercial basis.

The method of operation was developed at the research laboratory of Underwood Elliott Fisher, under the direction of R.M. Woodward and John G. Poor.

I have seen the process in operation and have had some surgical instruments made of steel silver plated, buffed and chromium plated. The silver is deposited directly on the steel and after the silver is buffed, the chromium is plated on it without any undercoat, that is, directly on the silver.

The final finish is identical in appearance to that of a nickel-chromium coating.

The salt spray life is equal to the nickel-chromium coatings when the two deposits are of the same thickness.

This process opens up a new field and will assist materially in the conservation of nickel which is one of the most strategic metals in production of war goods.

The Underwood Elliott Fisher Company and their research staff is to be congratulated upon developing the process and also especially for their offering this process to the government for the production of such important products as surgical instruments.

Chairman Caldwell: Thank you, George. I have one question in writing here, which I will read. It is presented by Mr. Oliver E. Auer, Engineer Board, Corps of Engineers, U.S. Army, Fort Belvoir, Virginia: "The Engineer Board, Specifications Section, Fort Belvoir, Virginia, is very desirous of finding out about the extent of facilities for plating of large threaded parts, also of pieces with interior threads, with openings of or more, with zinc or cadmium." Dr. Blum, could you answer that?

Dr. Blum: Yes, I think it is an example of the sort of contact that is needed and yet which has to be handled individually. In other words, at Fort Belvoir, in connection with the searchlight plant there, they want inside threading of bolts and nuts with zinc and cadmium. I think there must be many electroplating plants that could handle that work satisfactorily. The best way would be for the plants to direct inquiry to Fort Belvoir, Virginia, for details as to what is wanted.

Mr. W. M. Phillips (General Motors Corporation, Detroit, Michigan): I have a question of this sort to ask:
There are a great many plating solutions in the United States that have valuable metals in them. Along with others, we have been trying to get information as to what to do with them - whether to recover the metals, and if so, how, and how it is going to be paid for. I wonder if any of these gentlemen can tell us what to do with these solutions? In other words, we have 300,000 gallons of nickel containing about 10 ounces of nickel per gallon which makes about 200,000 pounds of nickel that is not helping to win the war.

Mr. McCord: Have you been in touch with the Copper Section of the Inventory Requisition Branch?

Mr. Phillips: Yes.

Mr. McCord: What did they tell you?

Mr. Phillips: Nothing.

Mr. McCord: In general, I cannot answer it. That subject has been debated down there off and on now for about three months and I was hoping they had given the answer, because I am frank to say I do not have any. Of course, there have been a half-dozen methods suggested as to possible ways of getting part of the nickel out of the solution. Maybe you don't know this, but the Section is limited to what they can pay per pound. They have a distinct upper limit and I personally do not feel that nickel can be recovered at the price which is their upper limit - that is my own personal judgment on it - I don't know whether they have ever succeeded in getting a directive that would allow them to pay a price which I would feel would be necessary from your standpoint

in order to cover your cost. I don't know what you figure, but I know what I figure on the thing and any method that I can think of would be considerably above the price they would be empowered under their original directive to pay for that recovered nickel.

I think that is the basis of the whole trouble. I have not talked with them for several weeks, but the last I knew they were more or less stymied, and I wondered whether anything had happened in the meantime of which I was not informed.

Mr. Phillips: One idea that was suggested was to evaporate the solution and then roast the impure nickel sulphate to nickel oxide, then find some use for the oxide - I don't know what. The other one was to deposit as much of the nickel out of the solution as we could on anodes and then throw the rest of it down the drain. Those two methods seem to me to verge on the practical.

Mr. McCord: I think both of them are, but on the other hand, I still think that it is probably the price angle in there that is the deterrent factor, because they had a complete directive when they were set up that said they could not pay more than so much per pound and I don't think that so much per pound would, on either of those methods, get you out with a whole skin.

Mr. Phillips: All we are interested in is getting the nickel back into the war effort and what we want to do is, of course, just break even if we can.

Mr. McCord: Naturally, but you do want to break even.

Dr. Blum: A third possibility that has been discussed is the precipitation of the nickel from the solution by sodium carbonate. The nickel carbonate could then be converted to oxide or other forms. The statement has been made in one of the discussions that some of the processes of making synthetic rubber will demand an amount of nickel for catalysts that would use all of the nickel solutions and all of the nickel salts that are available in the country.

Dr. Edwin M. Baker (University of Michigan, Ann Arbor, Michigan): If you wish to recover all the nickel present in nickel plating solutions, I believe the best method is to evaporate the solutions to dryness, and to send the resulting crystallized salts to a central plant to be calcined to the oxide and reduced to nickel powder. The principal impurity in the nickel should be iron, which would not be objectionable if the nickel was used for making alloy steel.

However, the nickel present in plating solutions, purchased as salts, represents a cost of about 65¢ per pound of nickel. New electrolytic nickel is priced at something over 32¢ per pound. The cost of evaporating the solutions, of reducing the salts to metallic nickel, and of freight must be subtracted from the 32¢ figure to give the net return, which would be at most only a small fraction of the original 65¢ cost.

The recovery of this nickel in plating solutions must be justified almost wholly on the basis of contributing to the war effort, as the economics of the situation indicates that the plating plant would be better off financially to retain the solutions (or evaporated salts obtained from them) for post war plating.

Mr. Austin F. Fletcher (Brewer Titchener Corporation, Binghamton, New York): I would like to ask Dr. Blum if he would enlarge on the reference to embrittlement of chrome plated parts of airplanes when they come under stress. I was wondering just what he meant.

Dr. Blum: It is well established that when certain hardened heat-treated steel parts are chromium plated and then subjected to alternating stress, their strength in alternating stress, in other words, their resistance to fatigue, is decreased. The explanation of that behavior is not simple. The easiest explanation is that the chromium has a very hard surface, and therefore if in the bending or stressing of that part a crack starts in the chromium (and chromium is ordinarily brittle), then that crack is likely to extend through to the underlying metal. As an illustration, some years ago some paper manufacturers asked us about the chromium plating of the brass Foudrinier wire that is used in the paper mills. At that time, we tried chromium plating directly on the brass wire. When that wire had a fairly heavy coating of chromium on it, you could snap it in your fingers; but if you dissolved the chromium off, the brass was just as flexible and ductile as before. This shows that the chromium plating had not made the brass itself brittle but it had made the structure brittle. In other words, if a crack started on the surface, it was likely to extend through.

That is a very simple explanation of a much more complicated phenomenon. It is a fact that in aircraft engines they must be very careful about the application of chromium to certain parts, because it is likely to reduce the resistance to fatigue and cause fractures afterward in service.

Chairman Caldwell: If there are no further questions, let's give these three fellows from Washington a rising vote of thanks.

. . . The audience arose in a unanimous vote of thanks and appreciation.

. . . The meeting then adjourned, at twelve-ten o'clock.