

PHYSICS

Chance Discovery May Yield Metal-Plating Method

"Electron Camera" Shows How Zinc Particles Dissolve Into Liquid Surface Layer of Polished Copper

THE DISCOVERY that the surface of polished metal is liquid promises to lead to a new method of metallic plating. This advance may result from a few seconds of startled watching of the picture thrown on a screen by an "electron microscope."

In a few fleeting moments, Prof. G. I. Finch and two young research students, Dr. A. G. Quarrell and J. S. Roebuck, at the Imperial College of Science, London, found definite proof of a hypothesis put forward many years ago by the late Sir George Beilby, the director of fuel research for the British Government during the World War.

Prof. Finch and his colleagues were working with a special type of science's new instrument called the electron-diffraction camera. This wonderful "camera," in which a stream of electrons throws an image on a fluorescent screen, in effect magnifies the object 30,000,000,000 times, compared with the 2,500 or 3,000 times of ordinary microscopes.

They were experimenting with a piece of polished copper which was being bombarded with particles of zinc emitted from a zinc wire rapidly heated in a vacuum by an electric current. Many times before similar experiments had been made, the scientists studying the shapes of crystals thus deposited on metal surfaces. But this happened to be the first time that the bombarded metal had been polished.

As usual a diffraction pattern was shown on the fluorescent screen—a score or more of bright circles. But to the intense surprise of the watchers this pattern gradually weakened, became less bright and within three seconds had completely disappeared. They tried again. A second, a third and a fourth film of zinc was projected onto the copper. Each disappeared in the same way as the first, but each diffraction pattern lasted longer than the preceding one, until the twelfth pattern remained—meaning that the twelfth layer had stood fast.

"What this means," Prof. Finch told

the Science Service correspondent, "is that the incoming crystals of zinc were being dissolved in the liquid layer of the polished copper. Like snowflakes falling on water, the crystals rest for a moment on the surface and then disappear."

"That this should happen at all is presumptive evidence that the top layer of the polished metal is liquid. But the real proof is that with this experiment we can only observe an electron pattern when the zinc crystals are on the top of the liquid surface, and not before they arrive or after they have disappeared. No pattern means no crystals—which is what physicists call the solid liquid' state.

"The twelfth layer of crystals standing fast simply means that the liquid copper has reached its saturation point, has dissolved all the zinc that it is capable of holding. This is supported by the fact that when the zinc bombardment was turned on polished iron the zinc layer stood fast at only the second attempt. Zinc is less soluble in iron than in copper, and so one would ex-

METEOROLOGY

Stratosphere Under Heavy Attack by Scientists

STRATOSPHERE weather secrets are being subjected to barrage attack by scientists of many countries.

In the United States and from a number of points in Europe sounding balloons are being released every day during January to carry instruments high into the rarefied atmosphere.

And now Director Carl G. Rossby of the Massachusetts Institute of Technology meteorological laboratory has announced an even more concentrated assault. Within the next few weeks, when conditions for this special study are right, forty balloons will be released



STRATOSPHERE CRAFT

Dr. Rossby, left, is holding the balloon which will carry into the stratosphere the bamboo frame and meteorological instruments held by Dr. Bjerknes. The delicate instruments are in the white container.

pect the liquid layer of iron to be saturated more quickly."

Prof. Finch has found that the films of zinc or other substances thus deposited on polished metal can never be completely removed without removing the metal itself. An alloy has, in fact, been formed. This process, which he terms "vacuum-plating," has, he believes, great commercial possibilities as a substitute for electroplating. A systematic investigation is now being started.

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from St. Louis at intervals of about two hours. The meteorological airplane of the Massachusetts Institute of Technology will make observations to 17,000 feet at the same time.

The balloons when inflated measure four feet in diameter. Each carries specially designed instruments weighing only a few ounces which automatically record temperature, humidity and atmospheric pressure. They will finally burst and the instruments do a parachute drop to earth, in shock-absorbing frames made of split bamboo. Each set of instruments bears an identification tag