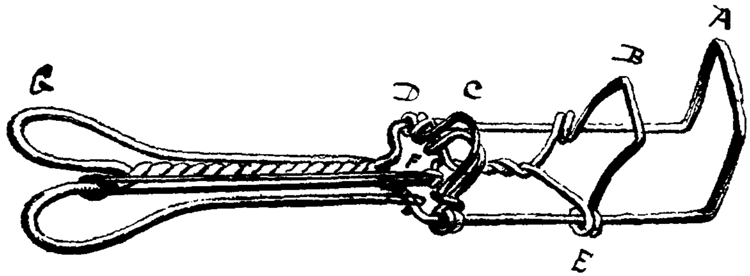
venient holder that should take from nothing up to a diameter of an inch and a half and yet allow a grasp which corresponds to the weight of the object held, and also not tire the hand, no matter how long it is held.



The clutch B slides on the parallel bars E, and is slightly smaller than the counter-clutch A. This, with its curvature, allows it to grasp any object, no matter how small, that is placed between B and A. A double bearing, to insure ease of movement, is effected by winding the wire at D. The double arch C allows the thumb to press easily and comfortably against it, and act as a knee-joint. The swell G keeps the handle in the grasp, and the rubber strap F brings the traveling clutch back and opens the clamp as soon as the pressure is removed from C.

To use the apparatus, the handle is securely grasped and the end of the thumb is placed against C. On straightening the thumb, in the manner of a knee-joint, the object is tightly held between the clutches. The hand does not tire on continued holding because the pressure is taken in a straight line on the bones of the thumb, and hence calls for so slight a muscular action as to be practically inappreciable.

The clamp is manufactured by Richards and Company.

CHEMICAL LABORATORY OF THE BROOKLYN POLYTECHNIC INSTITUTE.

[CONTRIBUTION FROM THE JOHN HARRISON LABORATORY OF CHEMISTRY. NO. 1.]

ELECTROLYTIC SEPARATIONS.

BY EDGAR F. SMITH AND DANIEL L. WALLACE.

Received April 22, 1895.

COMMUNICATIONS relating to the electrolytic separation of metals, present in solution as double cyanides, have appeared, from time to time, in this Journal and in other publications devoted to chemistry, during the past seven years. Thus it was found that in solutions, such as that mentioned, it was possible to separate *cadmium* from zinc, arsenic, tungsten, molybdenum, osmium, nickel, and cobalt; *mercury* from copper, zinc, nickel, cobalt, palladium, arsenic, tungsten, molybdenum, platinum, and osmium; *gold* from palladium, platinum, copper, cobalt, zinc, and nickel; and *silver* from copper, zinc, nickel, cobalt, arsenic, tungsten, molybdenum, platinum, and osmium. No difficulties were encountered in these separations. About the only objection that could be presented against them, and one that would in any manner postpone their immediate adoption into general analysis, was the fact that from twelve to fourteen hours were required for the deposition of the cadmium, mercury, gold, and silver.

Not more than a year ago Smith and Spencer (This Journal, **16**, 420) observed that the deposition of both mercury and silver was markedly accelerated when the electrolyte undergoing decomposition was heated from 65° to 70° C. It will be recalled that all the earlier separations noted above had been carried out at the ordinary temperature. It appeared, therefore, desirable to further extend the study, and in the lines which follow results are given which were obtained from this new point of view.

While cadmium can be completely separated from its double cyanide solution *in the cold*, the reverse occurs if the liquid be raised to 65°. Thus, in the communication of Smith and Spencer, evidence is given that in a warm solution silver can be fully separated from cadmium, and in the table below it will be observed that mercury and cadmium can be similarly separated. It was, therefore, impossible to review the separations of cadmium from the various metals from which it had been fully separated in the cold. The experiments were accordingly limited to mercury, gold, and silver with several typical metals, as the conditions under which their separation proved successful would doubtless serve for the remaining representatives of the various groups from which separations had been effected.

In the earlier communications it was customary to report the strength of the acting current in cubic centimeters of electrolytic gas per minute. In the present presentation the *normal density* (N. D.) of the current for 100 square centimeters of electrode surface will be given in ampere units. The reader will also bear in mind that the temperature of the solutions operated upon was, in all cases, 65° C.

MERCURY SEPARATIONS.

Mercury taken. Grams.	Mercury found. Grams.	N. D. of current in ampere units per minute.	Time required for precipitation.	Potassium cyanide in grams.	Cadmium present in grams. per cent.	Zinc present in grams. per cent.	Nickel present in grams. per cent.	Cobalt present in grams. per cent.
0.1901	0.1907	0.02	3 hours.	2	100	100	100	100
......	0.1903	0.02	3 "	2	100	...	...	...
......	0.1902	0.06	3½ "	2	...	100	...	...
......	0.1900	0.06	3½ "	2	...	100	...	..
......	0.1896	0.06	3½ "	2	...	100	...	...
......	0.1905	0.08	3½ "	3	...	...	100	...
......	0.1908	0.08	3½ "	3	...	...	100	...
......	0.1898	0.08	3½ "	2	...	...	...	100
......	0.1896	0.08	3½ "	2	...	...	...	100

In ordinary gravimetric analysis it would not be possible for the analyst to separate mercury from any one of the metals just given as completely nor as quickly as indicated in the table.

Gold was separated from cobalt, arsenic, copper, zinc, and nickel, the quantity of gold present in each trial being 0.1087 gram, and each of the other metals in equal amount. But one separation was made with each metal. The quantity of cyanide ranged from one to two grams; the period required for the precipitation of the gold varied from three to three and one-half hours. In all the trials, excepting that with copper, the current was $N. D._{100} = 0.1$ ampere. In the exceptional case it was reduced to 0.07 ampere. The quantities of gold obtained were:

1	0.1084 gram.
2	0.1080 "
3	0.1093 "
4	0.1088 "
5	0.1082 "

The separations of silver were limited to zinc, nickel, and cobalt. The quantity of silver was 0.1465 gram and the other metals in equal amount. The quantity of cyanide in all instances was two grams, while the current strength was $N. D._{100} = 0.04$ ampere. The time of deposition did not exceed three hours. The precipitated silver equaled:

1	0.1464 gram.
2	0.1464 "
3	0.1460 "
4	0.1464 "

The separation of silver from copper and from cadmium is just as rapid and complete as these last separations.

The deposits of mercury, gold, and silver, were carefully examined in the quantitative way for the various metals with which they had been associated; in every instance they showed themselves perfectly pure, so that these methods can be relied upon and trusted where accurate and rapid work is required.

The metallic deposits were washed and dried in the manner described in previous articles.

During the progress of the preceding experiments behaviors were observed pointing toward the separation of silver from gold, and mercury from gold and from silver in cyanide solution, but thus far expectations in these directions have not been realized. When conditions apparently favorable were obtained, traces of one or the other metal would be discovered in the metallic deposit, so that, at this moment, trustworthy and definite data cannot be given.

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ON THE VAPOR-TENSIONS OF MIXTURES OF VOLATILE LIQUIDS.

BY C. E. LINEBARGER.

Received May 3, 1895.

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