the midst of which there was no regular effect to be seen; but as the experiment went on, and the medium improved, the expected effect came out distinctly: a quick downward jump of the fringes at or immediately after the instant of the spark. Under good optical conditions, and at potentials high and low, the effect was perfectly regular, and was distinct and pure as that in oil of colza, though apparently not quite so large.

(2.) Plane of polarisation of the pencil BF horizontal: Rise of fringes indicates relative retardation of BF. The disturbance of the fringes was greatly reduced as the experiment went on, till at last there was nothing left but a set of slow movements, very irregular and very small, sometimes invisible. In the midst of these, as in their absence, and in a long set of observations, taken at different potentials, from low to highest, there was no trace ever seen of a jump of the fringes at the instant of the spark. It appears, therefore, that in this negative dielectric, as in oil of colza, the total optical effect of electric strain is an acceleration of the vibration which is directed along the line of force.

The conclusion to be drawn from the preceding experiments has been stated already by anticipation; but I repeat it finally in other terms as follows:—

*If light pass through an electrostatically-strained medium at right angles to the lines of force, and be represented by two component lights whose planes of polarisation are respectively parallel to the lines of force and perpendicular, then the proper and immediate optical effect of the electric strain is a change of velocity of the latter component.**

The use of the words *proper and immediate* in this statement may be thought objectionable; but some such words are required for the purpose here chiefly intended, which is to exclude those undoubtedly remote effects of electric action that appeared as disturbances in all the experiments.

IV. "On the Liquation of Silver-Copper Alloys." By Edward Matthey, F.C.S., Assoc. Roy. Sch. Mines. Communicated by Sir G. G. Stokes, F.R.S. Received February 16, 1894.

It is a well-known fact that during the solidification of certain alloys groups of the constituent metals fall out of solution, giving rise to the phenomenon called "liquation." The molecular arrangement which results from this behaviour of alloys has been investigated by many experimenters, notably by Devol, Roberts-Austen, and Guthrie. The author has also studied the behaviour of a large

* The change of velocity in the case of any positive dielectric is of course a decrease.

series of the alloys of the precious metals and metals of the platinum group, and the results have been published in the 'Philosophical Transactions' for 1892, and in other papers to which reference may be made.* It is, however, in the case of alloys of silver and copper that liquation is most marked, and gives rise to results of much interest and industrial importance. It is, for instance, often a matter of great importance to obtain a plate of standard silver (925 parts of silver in 1000) of *uniform standard*. The great difficulty of effecting this has been shown by Roberts-Austen†, and, as the results of an elaborate series of experiments, he was led to the conclusion that slow and uniform cooling of the mass was most effective in obtaining uniformity of standard. He informs me of a fact of which I was not aware until the present experiments were concluded, viz., that he also tried the effect of the rapid cooling of a thin casting in a large mould which was no less than 45·7 cm. long. He found, however, that castings made in this mould were comparative failures as regards uniformity of standard, and that, as in the case of other published results given by castings in thicker moulds, it was not possible, either by rapid or by slow cooling, to obtain masses of alloys which did not give points of local richness.

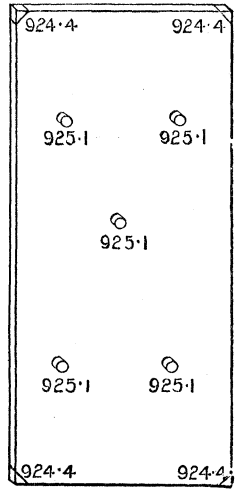
During the last few years I have returned to the investigation of the silver-copper alloys, and as the results of a series of some hundreds of experiments, only the final ones of which must be referred to here, I find that it is preferable to cast the alloy very thin, and to promote the uniformity of cooling.

A bar of this alloy was cast into a "skillet" mould to produce a casting 30 cm. in length, 13 cm. in width, and 6 mm. in thickness, weighing 5 kilos. Punchings were taken through its thickness at the points marked, and the assays which were made of these punchings showed the composition at the respective points to be as follows:—

* 'Phil. Trans.,' 1892, A, pp. 629—652, and 'Roy. Soc. Proc.,' vol. 47, 1890, pp. 180—186.

† 'Roy. Soc. Proc.,' vol. 23, 1875, p. 481, and 'Chem. Soc. Journ.,' vol. 27, 1874, p. 197.

RESULT A.

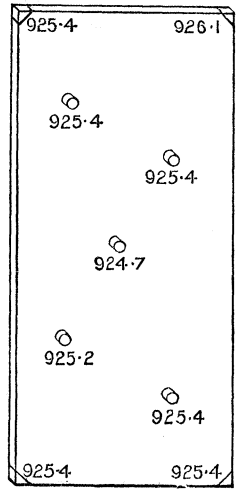


Average, 924·78.
Maximum Variation, 0·7 per mille.

Showing a very slight tendency to liquation of silver to the centre here.

And another bar cast at a higher temperature in the same mould showed the qualities indicated at the points given.

RESULT B.

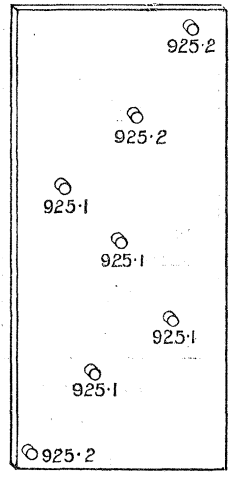


Average, 925·37.

No liquation of silver to the centre.

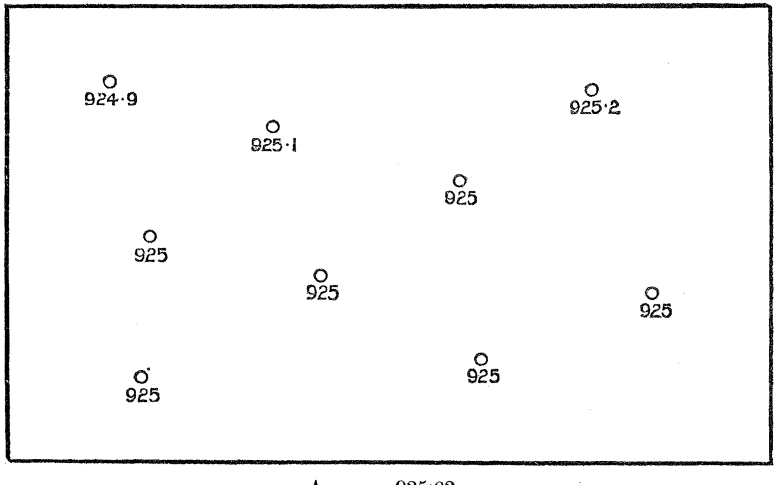
I ultimately reduced the thickness of the mould to 4 mm., and cast a bar into this, with the results shown in diagrams C and C′.

RESULT C.



Average, 925·14.
Maximum variation, 0·1 per mille.

RESULT C′.
(C rolled laterally to one mm. thickness.)



Average, 925·02.

These results will, I think, be considered sufficiently remarkable by metallurgists who have been accustomed to deal with castings of standard silver. It must not be supposed, however, that liquation has been entirely prevented; *it has, however, practically disappeared.*

The excellent results now submitted to the Society have been obtained by limiting the possibilities of re-arrangement as much as may be, and by ensuring that the conditions of cooling shall be as uniform as possible. The need of obtaining uniform alloys is met with in other branches of industry than those which involve the use of silver-copper alloys, so that the conclusions to which the present experiments point are somewhat far-reaching.

V. "A Contribution to the Study of Descending Degenerations in the Brain and Spinal Cord, and of the Seat of Origin and Paths of Conduction of the Fits in Absinthe Epilepsy." By RUBERT BOYCE, M.B., Assistant Professor of Pathology, University College, London. Communicated by Professor V. HORSLEY, F.R.S. Received February 8, 1894.

(From the Pathological Laboratory of University College, London.)

(Abstract.)

For the purposes of this research, the following are the experiments which have been performed in the cat:—

I. *Lesions after which Animal was Kept Alive.*

1. Removal of one complete cerebral hemisphere in 40 cats.
2. Removal of motor area only in 4 cats.
3. Division of the crus cerebri in 2 cats.
4. Removal of a lobe of the cerebellum in 10 cats.
5. Hemisection of the spinal cord in 4 cats.
6. Complete section of the spinal cord in 2 cats.

II. *Lesions after which Animals were not Kept Alive for any Length of Time.*

1. The preceding operations.
2. Removal of both cerebral hemispheres.
3. Removal of the cerebellum.
4. Removal of one cerebral hemisphere and opposite lobe of cerebellum and *vice versâ*.
5. Removal of one hemisphere and division of opposite half of the spinal cord.