

ever, the working on all lines continued troublesome. For about twenty minutes (between 10 and 11 p.m.) communication on the longer lines was altogether stopped.

21st, 22nd.—The ordinary tests, taken on the morning of the 21st and 22nd, showed that the lines were not yet free from earth currents, which, though slight, were distinctly observable.

Comparing the above-mentioned observations with those published in the *Telegraphic Journal* of the 25th November, we see that the electric storm in Japan occurred nearly at the same time as those in Europe and America; hence it would appear that the electric storm of November last prevailed all over the world.

(*Extracted from Notes made by Mr. M. Yoshida, Electrician to the Japanese Telegraph Department.*)

[NOTE.—The clock at Nagasaki is about 8 hours 39 minutes in advance of the clock at Greenwich.]

BATTERY POLARISATION.

By A. EDEN, Associate.

In the course of experiments undertaken with a view to lessen the effects of polarisation in galvanic batteries, the following arrangement was found to be advantageous, while admitting of approximately correct measurements of the opposing electro-motive force produced by the deposition of hydrogen on the negative plate of those cells which do not contain metallic solutions.

As I am not aware that the method referred to has been tried before, I trust that it will be found of sufficient interest to warrant my describing it to the members of this Society.

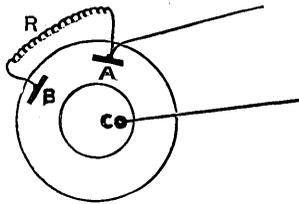
Any cell subject to polarisation is taken and furnished with a second negative plate of the same material as that previously in the cell, the two plates being free from contact in the liquid, but connected externally by a resistance, as shown in figure.

When the wires leading from A and C are connected by a wire of (say) 40 ω resistance, the path C B R A is traversed by a

very feeble current, while C A is the route taken by a current of much greater force, hydrogen being formed with more or less rapidity on A, while B is practically free from it.

As the current continues to flow, a galvanometer inserted in R indicates an increasing deflection (up to a certain maximum), while if the ordinary path, C A, is disconnected, the deflection in R gradually declines and ultimately ceases, indicating that A is no longer positive to B, or, in other words, that the hydrogen has been converted into electricity, and subsequently into heat or work.

It is obvious that, if the circuit A B R did not exist, the hydrogen would not be so expended, but would be dissipated very slowly.



The circles in the above sketch represent the outer and the porous pot respectively.

A, the usual negative plate.

B, an additional negative plate of the same material.

C, the positive rod or plate.

R, a resistance coil of 100 ω or more.

To illustrate this, I give the mean results of several tests made with a Fuller's bichromate cell, pint size—internal resistance, 1.5 ω ; E.M.F., 2.03 volts :—

	E.M.F.
1. Hydrogen circuit disconnected; battery short-circuited 1 minute	1.88
2. Force indicated in polarisation circuit when joined up at moment of disconnecting battery in No. 1... ..	.15
3. As No. 1 for 5 minutes	1.74
4. Force indicated as No. 2 after disconnecting in No. 329

	Hydrogen circuit disconnected. Volts.	Hydrogen circuit joined up. Volts.
5. After 5 minutes short-circuiting ...	1.74	1.82
6. Battery working through 1,070 ω after short-circuiting rose from 1.74 to 1.96 in 5 min.		2 min.
and to full force in	(Would not rise above 1.96)	2 m. 50 s.
7. After 5 minutes short-circuiting, battery disconnected, and rose to full force in	6 min.	2 m. 50 s.
8. Hydrogen circuit taken away; two negative plates joined together so as to act as one plate, short-circuited for 3 minutes		1.82 volts.
9. As No. 8, then disconnected, but did not rise from 1.82 to full force for ...		9 m. 15 s.
10. As No. 8; did not fall to 1.74 until end of 10 minutes, but took 10 minutes to rise to full force after being disconnected.		

Experimenting with different solutions and also different carbons, it appeared that—

1. The density of the plates influenced the rapidity of polarisation and depolarisation.
2. Polarisation and depolarisation seemed to occupy nearly equal periods when the polarisation circuit was not closed.
3. When the polarisation circuit was in action, polarisation was effected with much greater difficulty, and depolarisation took less than half the usual time.
4. The resistance of the hydrogen was not appreciable.

Practically, it would seem to be advisable to put two negative plates (arranged as described) in each cell liable to polarisation; and it seems conclusively proved that a single increase of negative surface, by placing the negative plate in fragments of the same material, or by using larger plates, tends to retard the fall of force produced by polarisation, but also retards recovery in the same degree.