4.10 p.m. and continuing until 4.30 p.m. On January 17 no outstanding events were observed on our records, but on January 18 a large burst was recorded during 3.57–4.10 p.m. The January 19 records also showed a large outburst during 8.36–9.30 a.m. In all cases the magnitude was not determined as the recording meter was driven off scale.

A study of the vertical-incidence ionospheric recorder records for Ottawa for the corresponding days indicated that an intense ionospheric storm followed the noise outbursts. The storm started about 9.00 a.m. on January 17 with spread echoes from the *F*2 region and absorption conditions, followed by a sequence of low *F*2 critical frequencies, blackout and sporadic *E* conditions. During the afternoon of that day, the ionosphere returned to near normal conditions, but during the evening very disturbed conditions were again observed. A succession of spread *F*2 echoes, lower *F*2 critical frequencies, increased absorption and sporadic *E* echoes from lower heights was observed, followed by a blackout. This storm continued through the night, and with the return of daylight a tendency towards normal was observed. By early afternoon of January 18, the ionospheric records indicated normal conditions for that time of year. On the evening of January 18 there was another ionospheric storm, but not so intense as that of the previous night. The disturbed conditions persisted into the following day, and a more severe ionospheric storm was recorded during the evening and night of January 19 than that observed on January 17. Normal conditions returned during the morning hours of January 20.

During the evening and night of January 17 a very intense auroral display was observed at several points in Canada and the United States. Observers in Churchill, Manitoba, reported a type *A* red aurora on that occasion. Intense auroral displays were also observed on the nights of January 18 and January 19.

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Low-voltage, Short-duration Arcs between Separating Contacts in Low-voltage, substantially Non-inductive Circuits

It was originally supposed that separating contacts in low-voltage, low-inductance circuits interrupted the current without arcing provided the supply voltage was lower than the ionization potential of the contact metal, and that the circuit inductance was not greater than about a microhenry. However, inconsistencies in the values of the measured 'fine transfer' obtained under these so-called arc-free conditions led to the supposition that arcs might be present[1], and this was confirmed by Lander[2], who published an oscillographic record of an arc obtained between separating gold contacts in a 6-volt, 1 microhenry circuit carrying a current of 1 ampere.

The existence of low-voltage 'short arcs' during contact closure has also been deduced from transfer and voltage measurements[3], and oscillographic records of these arcs have been published[4].

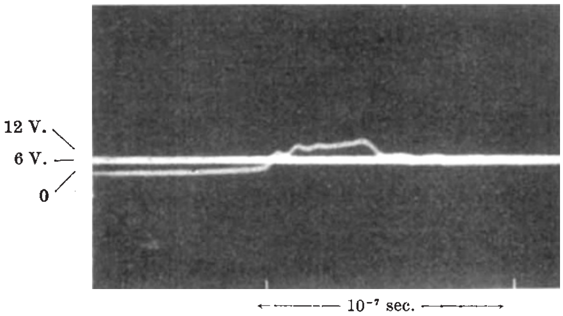

Fig. 1. Arc voltage record of separation of platinum contacts. Inductance, 0·09 μH.; break current, 3·3 amp.; supply voltage, 6 V.

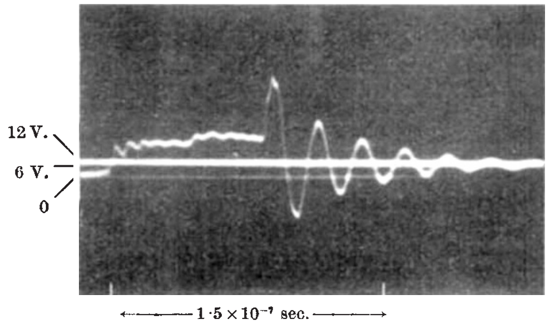

Fig. 2. Arc voltage record of separation of platinum contacts. Inductance, 0·34 μH.; break current, 3·3 amp.; supply voltage, 6 V.

Investigations carried out by the Electrical Research Association[5] on platinum contacts breaking a 6-volt circuit have shown that the amount of metal transfer is very dependent on the effective circuit inductance L and the current I at break for inductances between 0·06 and 117 microhenrys and currents between 1·3 and 5·6 amperes. These have led to the theory that the transfer is at least partly due to a form of 'short arc' in metal vapour between the contacts. The amount of transfer depends on the metal vapour and the available energy, $\frac{1}{2} LI^2$.

It has been possible to obtain single-sweep records of the voltage across the contacts immediately after break with the E.R.A. ultra-high-speed oscillograph and so to confirm the existence of the short arcs. Two of the records are shown in Figs. 1 and 2. It is seen that low-voltage arcs of very short duration exist even when the circuit inductance is as small as 0·09 microhenry. An attempt is being made to relate them to the measurements on the transfer.

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