PREVENTION OF ELECTRIC DISTURBANCES IN THE OBSERVATORY NEAR NAGYCENK

Gy. März—J. Verő

1. In the Geophysical Observatory near Nagycenk some rather important disturbances appeared in the North-South earth current component since November 1968. The intensity of these disturbances was varying, but they appeared nearly all evenings, and sometimes they appeared even during the

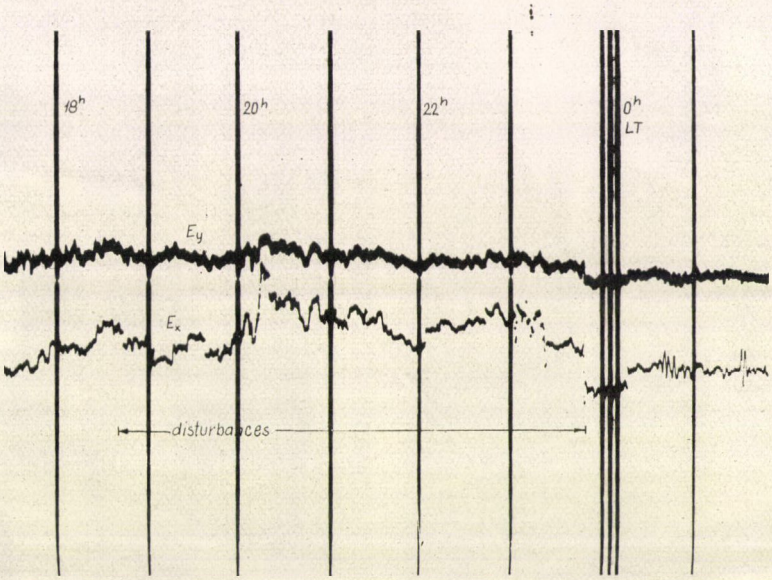

Fig. 1. The disturbance on the Nagycenk earth-current records

forenoon hours. With regard to the possible occurence of similar disturbances in other observatories, the method of their elimination may be of interest.

2. In the vicinity of the Nagycenk Observatory there are no important factories or other large electricity consumers. Only a smaller farm exists to the South of the Observatory (see the general plan of Fig. 2). Due to this advantageous situation and to a rather thick sedimentary layer, artificial disturbances are very seldom, and even these rare occasions were brought about through isolation or other failures in the Observatory itself. Thus it was very embarrassing, when in the last months of the year 1968 these disturbances

appeared. Unfortunately the beginning of the disturbances could not be exactly determined, as it occurred during the severe magnetic storm in early November.

The character of these disturbances can be seen on Fig. 1: their beginning appeared typically between 18 and 20 h LT, and they lasted till 22–24 h. In the component E_x (N–S) negative disturbances of a stepped structure were found, while in the component E_y, they were much smaller. Accordingly, the source of the disturbances had to be looked for in the line of the N–S electrodes. The

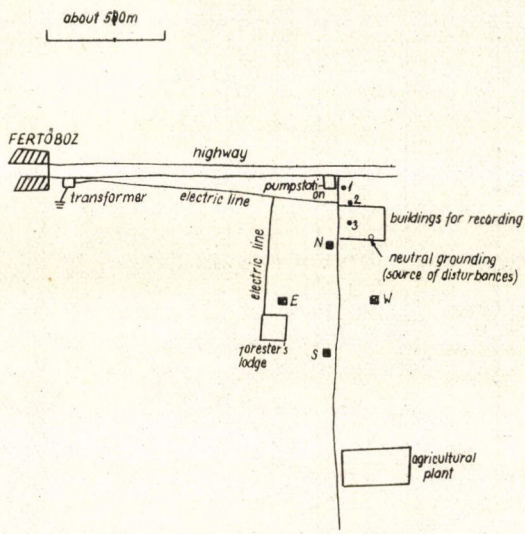

Fig. 2. General plan of the Nagycenk Observatory

general plan shows that there were two possible places: either the already mentioned farm to the South, or the establishments of the Observatory near the N-electrode. From the latter, the disturbances could come from the pump-station or from the recording houses. To decide this question, simultaneous measurements were carried out on the N–S electrodes, and between the N-electrode and points 1, 2, 3. The measurements have shown that the disturbances had about the some intensity, but inverse signs in case of the latter electrode-arrangements, so the disturbances could be originated in the southern part of the Observatory area only, consequently the farm and pump-station were excluded.

3. Before describing the detection of the source it should be discussed why the disturbances were restricted to the evening hours. The Observatory gets the electric current from the village Fertőboz, about 2 km-s to the W. This excludes the possibility of the direct source of the disturbances being in the village, since in that case they would be of larger amplitudes in the component E_y. The indirect source of the disturbances, however, lies in the village. Namely the overhead cable has rather small cross-section. In the village there is a rather

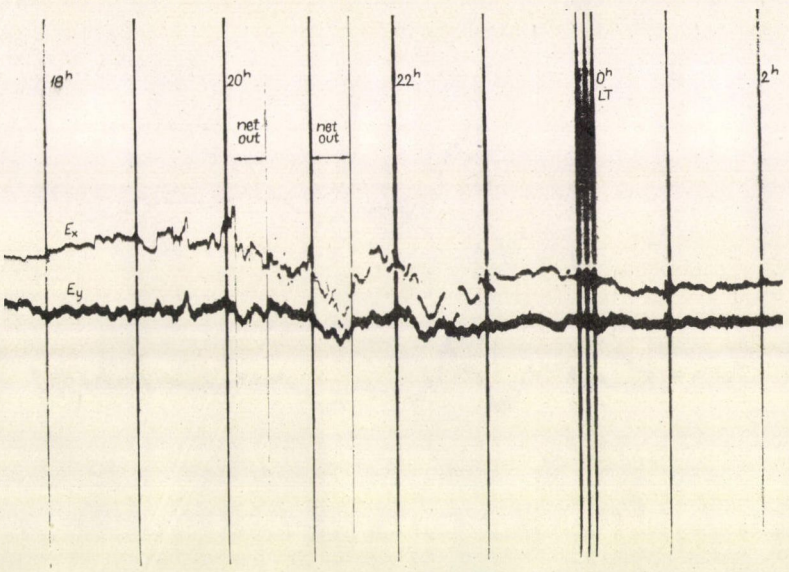

Fig. 3. Disturbances with net out

large number of TV-sets. Thus in the evening hours current flows through the neutral wire in the direction of the ground in the Observatory due to a shift of the neutral point, brought about by the unequal loading of the phases. This voltage reached peak values of about 6—8 V with respect to the earth, and its current intensity was rather high, too. Thus, if the neutral line is grounded somewhere in the Observatory, leakage currents flow through it. Under normal conditions the neutral line is not grounded in the Observatory.

It must be further remarked that the connection between the operation of TV-sets and the disturbances is proved by the fact that during winter and spring the time of their beginning did not change, so it was independent from illumination, further the disturbances were less intensive during the Monday

pause of the Budapest TV, and they appeared sometimes Sunday a. m. during TV transmissions.

4. After determining the source in the Observatory area, the different establishments of the Observatory were switched off for an evening. The disturbance did not ceased (Fig. 3). Special experiments were carried out in connection with switching. Significant effect was found only in case of a mercury vapour lamp installed in November 1968. The switching off of this lamp from the net, however, did not cease the disturbances.

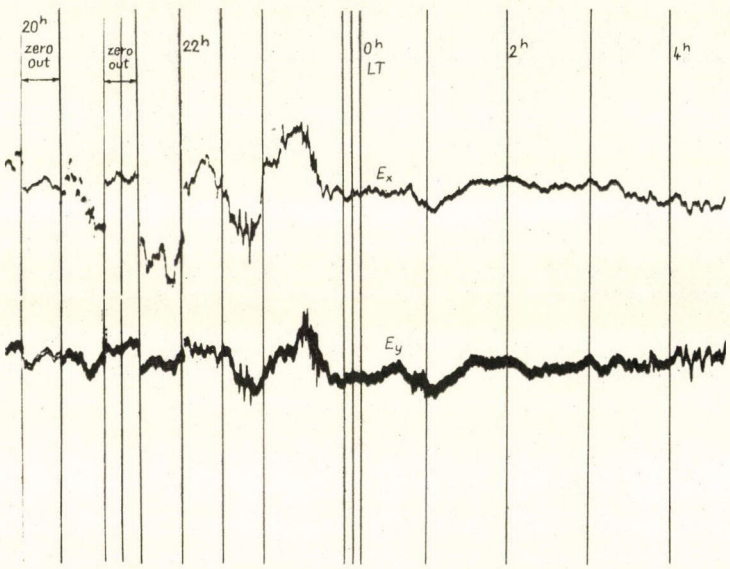

Fig. 4. Disappearance of the disturbances with zero out

As the experiments described earlier did not bring the effect waited, the neutral line was suspected to be the source of the disturbances. An evening the neutral line was cut several times. The effect was that the disturbance existed only during the neutral line was switched on (Fig. 4). Now only the search for the grounding of the neutral line must be carried out, and after its elimination the disturbances ceased, too. The neutral line was grounded by an outsider electrician in November 1968 for safeguarding.

5. As a conclusion, it can be stated that a rather big part of the disturbances are caused by leakage currents through neutral lines. Thus, if no obvious explanation can be found for these disturbances (electrified railways, greater plants), then superfluous groundings can be looked for in order to eliminate electric disturbances in geomagnetic observatories.