only a few reflections. In this camera, a shutter in which two slits, *S*, are cut, is arranged to rotate with the specimen, so that diffracted beams only reach the film when they make a small angle with the specimen surface.

To make full use of the principle, as wide a parallel beam as can be obtained from the focus of the X-ray tube is utilised. Very good results are obtained by means of a multiple diaphragm system as shown in Fig. 3.

If only a few lines, for example, within a region of 12° to 15°, are desired, the specimen may be kept stationary or, perhaps, oscillated over the region.

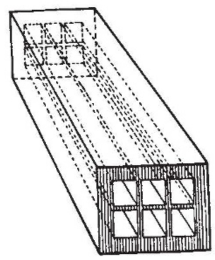

FIG. 3.

A useful application of the principle is to obtain a narrow intense beam of polarised monochromatic X-rays. A single crystal of copper cut with its plane surface at an angle of about 40° to the (311) plane is used as a polariser[1], and is irradiated by a wide beam of copper $K\alpha$ radiation (defined by a multiple diaphragm).

The advantages of the new method described above may be summarised as follows:

(*a*) a flat specimen such as is met with in metallurgical practice is used—this is an important point;

(*b*) the intensity of each line in the photograph can be calculated without difficulty—this is not so with the usual rod-shaped specimens;

(*c*) the sharpness of the lines can be controlled;

(*d*) in the case where the specimen is maintained stationary or oscillated over small angles, there is a much decreased time of exposure owing to the more efficient use of the available radiation.

Further details will be given elsewhere.

R. A. STEPHEN.
R. J. BARNES.

X-Ray Service Laboratories,
Philips Lamps, Ltd.,
6*a* Ridgmount Street, W.C.1.

[1] George, NATURE, **136**, 180, Aug. 3, 1935.

Negative Attenuation of Wireless Waves

WE are interested in the measurements which Khastgir, Chandhuri and Sen Gupta described in a recent letter to NATURE[1], apparently confirming the occurrence of 'negative attenuation' of wireless waves first noticed by Ratcliffe and Barnett[2]. Some years ago, we attempted to extend the measurements which Ratcliffe and Barnett had made on the 1,600-metre transmissions from the Daventry Station of the B.B.C., so as to include measurements on the same wave-length but with a shorter transmitting aerial[3]. The results of these further measurements led us to question the interpretation of Ratcliffe and Barnett's results. We began by using measuring apparatus similar to that used in the original investigation, and consisting of a tuned loop circuit with a Moullin voltmeter placed directly across the tuning condenser. With this apparatus we reproduced the curve of Ratcliffe and Barnett quite closely. We then had occasion to make measurements with an apparatus in which the signal produced a deflection in a galvanometer attached to the output of an amplifier, this deflection being matched by injecting a calibrated E.M.F. into the loop circuit. This method of measurement showed no sign of the 'negative attenuation' effect. Closer investigation of the disagreement led us to the conclusion that the measurements made by the Moullin voltmeter method were vitiated by the fact that, owing to the flow of grid current, the damping which the voltmeter produced in the loop circuit was a function of the signal amplitude. The increased damping for the larger signals caused the signal strength to be progressively underestimated as the apparatus approached nearer to the emitter, and gave the appearance of 'negative attenuation'.

We were able to show that the magnitude of the apparent 'negative attenuation' effect was accounted for by the measured values of the grid current. We now believe that the apparent 'negative attenuation' observed by Ratcliffe and Shaw[4] with a wave-length of 30 metres is due to the same cause.

In the discussion of a paper read to the Institution of Electrical Engineers[5], attention was directed to the possibility of errors of this kind when using the Moullin voltmeter method.

When measuring with the injected E.M.F. method we have not been able to observe any 'negative attenuation' on 1,600 m. wave-length from the Daventry emitter, on 360 m. from Brookman's Park, or on 1.600 m. from an experimental emitter at Cambridge. We are therefore surprised that Khastgir, Chandhuri and Sen Gupta have observed the effect, and we wonder whether they, too, can have been misled by using the Moullin voltmeter method. We consider that their curves would have been more convincing if they had observed more points on the all-important rising part of the curve. It is unfortunate that the only measurement shown on this part of the curve is that at the origin; if for any reason this was in error, the whole nature of the curve would be altered.

Cavendish Laboratory, Cambridge. — J. A. RATCLIFFE.

Halley Stewart Laboratory, King's College, London. — F. W. G. WHITE.

[1] NATURE, **136**, 605; Oct. 12, 1935.
[2] *Proc. Camb. Phil. Soc.*, **23**, 288; 1926.
[3] NATURE, **125**, 926; 1930.
[4] NATURE, **124**, 617; 1929.
[5] *J.I.E.E.*, **70**, 543; 1932.

Photochemical Reactions connected with the Quenching of Fluorescence of Dyestuffs by Ferrous Ions in Solution

IT has been found recently that ferrous ions exert a strong quenching effect on different fluorescent dyestuffs in solution[1]. According to previous theoretical discussions[2], in the elementary process of quenching, the light quantum ($h\nu$) is transferred from the excited dyestuff molecule ($D_S h\nu$) to the Fe^{++} ion by a collision of the second kind. Unlike the case of direct irradiation, when the Franck-Condon principle is observed, we can gain here some energy from the potential energy of the heavy particles. Thus in this case the hydration energy of the ions formed in the process and the binding energy between dyestuff and H-atom can be used according to:

$$(1)\quad Fe^{++}\,HOH + (D_S h\nu) = Fe^{+++} + OH^- + (D_S - H).$$

By irradiating different dyestuffs such as brilliant-cresylblue, methyleneblue, thionine, uranine (in water),