applying a suitable potential. The volume of this sound *decreased* sensibly and as far as could be judged, practically instantaneously on irradiation and *vice versa*.

This conclusion is supported by studies of the light-effect that were made with a cathode-ray oscillograph.[4] This was introduced in place of the loud-speaker in the previous arrangement. It is found that a large number of frequencies besides, and much higher than, that of the A.C. supply constitute *i*, the discharge current (Fig. 1*a*). The amplitudes of these frequencies are reduced to a very marked extent immediately on irradiation (Fig. 1*b*).[4] This reveals a significant factor in the mechanism of the light-effect. The change $a \underset{\text{dark}}{\overset{\text{light}}{\rightleftharpoons}} b$ is reversible; the corresponding dark period, *i.e.*, any time lag in its occurrence lies within the limits of visual persistence.

Chemistry Department,
Benares Hindu University,
September 17, 1944.
S. S. Joshi.

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SPECTROSCOPIC INVESTIGATION OF THE EFFECT OF MAGNETIC FIELD ON ELECTRICAL DISCHARGE IN GASES

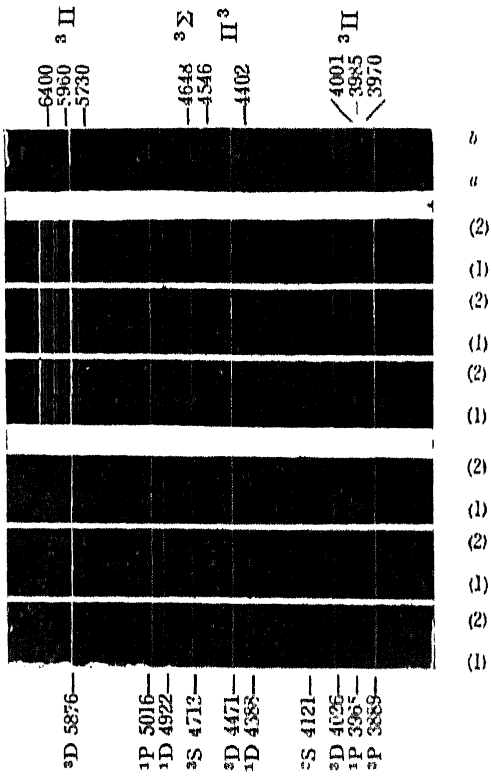
In the Zeeman Effect experiment usually performed in the laboratory with a neon tube, it is observed that the magnetic field, besides producing the well-known splitting of the lines, affects to a marked extent the intensity of the glow in the discharge tube. It was thought that a detailed spectroscopic investigation of the effect of magnetic field on the variation in the intensity distribution amongst the spectral lines, would give useful information about the collision processes involved in the mechanism of discharge of electricity in rarefied gases. Preliminary experiments with helium, neon and hydrogen have revealed some interesting facts which are set forth in this note. The experiments were performed with the ordinary capillary discharge tubes placed between the poles of an electro-magnet capable of giving a field upto 10,000 gauss. The tubes were worked between 10 and 15 kilovolts. The results of observations may be summarised as follows:—

(*i*) The intensity of the lines increases with the magnetic field, reaches a maximum and then decreases, the decrease being more rapid than the increase. This is shown in Fig. 1 (*a, b, c*) in the spectrum of helium, where the lower strips (1) give the spectra in zero field, and the upper strips (2) in fields of 4,000, 6,200 and 7,800 gauss respectively.

(*ii*) The field at which a line reaches its maximum intensity, the conditions of pressure and excitation remaining the same, depends on two factors (*a*) the wave-length and (*b*) the presence of foreign gas.

The dependence on wave-length was best exhibited with the Balmer series of hydrogen. $H\delta$ appeared as a weak line in zero field, reached a maximum intensity at 4,000 gauss, after which the intensity fell off rapidly and the line was not excited at all at higher fields. $H\gamma$ reached its maximum intensity at 6,000 gauss, whereas $H\beta$ and $H\alpha$ showed a continuous increase in intensity even upto 10,000 gauss, the maximum field obtainable in the experiment.

The effect of foreign gas on the intensity of the lines is shown in Fig. 2 which gives the spectra of a mixture of helium and neon. In the three strips the lower halves marked (1) are for zero field, and the upper halved marked



(2) are for fields of strength 4,900, 7,000 and 8,200 gauss respectively. It is to be noted here that, in contrast with Fig. 1, the lines continuously increase in intensity without showing a maximum. The effect of the foreign neon gas seems to be to increase the field strength at which the helium lines will have their maximum intensity.

(*iii*) For a given applied potential at the terminals there is what may be called a "critical" field at which the discharge stops altogether and the tube becomes non-conducting. As this critical field is approached, and just before what may be called the "throbbing" state of the tube, the intensity in the capillary portion (which is kept in the magnetic field) is considerably reduced and the intensity of the glow in the wider portions of the tube, near the electrodes, is correspondingly increased. Fig. 3 is the spectrum of helium from the *wider portion* of the tube in this state (*a*) without the field and (*b*) with the field which under the conditions of the experiment, is found to be 6,200 gauss. It will be observed that without the field only the weak atomic spectrum is produced, while with the field on,