5·8 and 16·6 per million. In the natural tobacco on which no work had been expended before the tests were applied, the amount varied from 25 to 250 parts per million. The data refer to tobacco grown in the Argentine and worked up in its factories, with the exception of some specimens which contained mixtures of imported tobacco, and all the data refer to the types of cigars and cigarettes which find their way into the market. The danger of arsenic poisoning from tobacco is obviously very small.

MAGNETO-STRICTION NOISE FROM TELEPHONE WIRES

WHEN magnetic material is subjected to a mechanical force, its magnetization is changed; and conversely, if its magnetization is changed, the material expands or contracts. There is thus a relationship between the stress and magnetization of magnetic materials which is called magneto-striction. According to an article by M. T. Dow (*Bell Lab. Rec.*, **22**, No. 10; June 1944), noise encountered some eight years ago on certain telephone lines was found to be caused by vibrations set up by wind in a long river-crossing consisting of steel conductors, and experiments indicated clearly that the noise was due to magneto-striction. The alternating stresses in the taut wires vibrating under the influence of wind, resulted in corresponding changes in the magnetization of the steel wires, and these magnetic fluctuations induced voltages in the wires that appeared as noise at the ends of the line.

Since the voltages induced by magneto-striction vary at rates which depend on the rates of change of stress in the wire, the noise frequencies are related to the frequencies of vibration of the wire, and these in turn are determined largely by the size of the wire and the velocity of the wind; wire tension, span-length, and other such factors also have some effect. It was found that practically all frequencies of the magneto-striction noise were in the voice range, and under certain conditions the dominant frequency was in the neighbourhood of 1,000 cycles/second, which is the range producing the greatest disturbing effect. The test results confirmed a simple relationship expressed as $f = 7(v/d)$, where f is the principal noise frequency in cycles/second, v is the wind velocity in m.p.h., and d is the diameter of the wire in inches. To produce a 1,000-cycle noise, therefore, the wind velocity is given by the expression $v = 143d$. Commonly used copper-steel wires are of 0·104 in. and 0·128 in. in diameter, and for these two sizes the wind velocities to give 1,000-cycle noise are about 15 and 18 m.p.h., respectively. These are velocities commonly encountered.

For the same velocity of wind, the greatest effect is experienced when the wind is approximately at right angles to the direction of the wires. Taut wires with sags of less than 8–10 in. in 130 ft. spans favour the generation of magneto-striction noise. Fairly steady winds with velocities around 20–35 m.p.h. produce the highest values of noise. Winds in this range of velocity favour the building up of resonance, which leads to high amplitudes, and also are likely to produce frequencies of the greatest disturbing effect. Turbulent winds, with velocities up to 64 m.p.h., seem to inhibit the building up of resonance, and thus are less effective in producing noise. The effect is greatest in all-steel wires, and becomes less the greater the relative amount of copper.

An estimate based on a study of the results obtained indicates that for tight wires, in an exposure of 25 miles or more in length where conditions favour magneto-striction noise, the unamplified noise generated during windy periods would probably average around 28 db. above reference noise. Occasionally, maxima might reach as high as 36 db. above reference noise. Both these figures are for tight, copper-clad wire of 40 per cent conductivity; the corresponding figures for wire of 30 per cent conductivity would be about 3 db. higher. Under similar conditions, the noise for all-steel wire is likely to be 10–25 db. higher. Actually, while magneto-striction noise has been experienced with steel wire, none has ever been reported on circuits employing copper-clad wire.

USE OF 'POLAROID' FOR THE MICROSCOPE

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FILMS of very strongly pleochroic material, usually mounted between glass plates, have been available during the past few years under the trade-name 'Polaroid'. For some purposes they can replace the nicol prism, but their use has been restricted because in a moderately strong light they transmit a noticeable reddish-violet colour at the position of extinction.

Disks of improved 'Polaroid' of high optical quality have since been made, and a British firm of instrument makers recently placed two of them at the disposal of H.M. Geological Survey for investigation of their possible use in the petrological microscope. The following is a brief report, communicated by permission of the Director, Geological Survey and Museum, on their properties, which rival those of the best nicol prisms.

Extinction. It has been understood that 'Polaroid' was prepared by the alignment of small pleochroic crystals in an artificial preparation. Consequently one might expect that the extinction would be less sharp than that for a nicol prism, and that a small proportion of the strongly absorbed ray would still be transmitted. For the pair of disks now to be described both these fears proved groundless.

Fig. 1 shows two examples from several curves that were measured by means of a visual microphotometer, similar in purpose to that of M. Berek, which I hope to describe shortly. One nicol (or 'Polaroid') was fixed in the usual position in the microscope, while the other was placed on the rotating stage, which could be read to 0·1°. Stray light was excluded by means of black paper tubes. With a strong beam it was possible to obtain a variation of 100 units on the photometer scale within a rotation of $\pm$ 2° from extinction. Curve A is the ordinary extinction curve for two nicol prisms; there is good agreement between the photometer readings (shown by circles) and the continuous curve calculated from the usual formula, indicating that the photometer scale is practically linear. The readings along curve B were obtained with two 'Polaroids'; they again show substantial agreement with the corresponding calculated curve, even for the range nearest extinction.