Letters to the Editor.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, nor to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Supposed Law of Flame Speeds.

AT the general discussion upon explosive reactions in gaseous media, held in London on June 14 under the auspices of the Faraday Society, Prof. R. V. Wheeler and Dr. W. Payman presented a paper on the uniform movement during the propagation of flame, in which they emphasised their supposed 'Law of Flame Speeds,' claiming it to be applicable to all conditions of flame propagation. They added that "there is a considerable amount of evidence available that the relative speeds of the uniform movement of flame obtained under the specified experimental conditions are directly proportional to the speeds under other conditions, except during the detonation wave"; also, that the law of speeds applies to the rate of development of pressure in complex mixtures of gas with air (*Trans. Faraday Soc.*, **22**, pp. 301-306).

In a written contribution to the general discussion (*ibid.* pp. 314-320) I expressed doubts as to the general validity of this supposed 'law,' and stated that for some time past experiments had been in progress in my laboratories to test it from the point of view of the behaviour of complex mixtures of certain hydrocarbons with hydrogen and oxygen, containing an excess of combustible gases, and that we hoped to be able to publish a detailed account of the results of these experiments before the end of the year, when we would discuss further their bearing upon the 'law.'

The basis of the experimental test to which we have subjected the 'law' is one which the authors of it themselves have accepted. For in their recent paper at the Faraday Society (*loc. cit.* pp. 304-305) they said: (1) "that if a complex mixture is made by blending a number of mixtures of air with simple combustible gases all of which have the same speed of uniform movement of flame, then this complex mixture will also have the same speed of flame provided that all the mixtures are of the same type, all containing excess of oxygen or all containing excess of inflammable gas," and that (2) "an important deduction from the law of speeds is that during the propagation of flame in a complex mixture of combustible gas and air mixtures of the type we have just considered (all with the same speed of uniform movement of flame), the combustion can be regarded as involving the simultaneous but independent burning of a number of simple mixtures of the individual gases with air, in which the proportions of inflammable gas and air are such that each mixture, if burning alone, would propagate flame with the same speed as does the complex mixture." They also reported having found experimentally that complex mixtures of methane-hydrogen-and-air, containing insufficient oxygen for complete combustion, fulfil such conditions.

The experiments which have been in progress in my laboratories during the past two years upon the behaviour at atmospheric temperature and pressure of such complex mixtures as those of acetylene-hydrogen-and-oxygen, and of ethylene-hydrogen-and-oxygen, containing an excess of combustible constituents, are now completed, and the results thereof will in due course be communicated to the Royal Society. Meanwhile, I desire it to be known that in neither case have the observed flame speeds fulfilled the requirements of the 'law.' In the case of the acetylene-hydrogen-oxygen mixtures they diverged from it considerably; and for the ethylene-hydrogen-oxygen mixtures they were entirely inconsistent with it. Indeed, we have arranged an experiment, which can be shown to any one who will come to see it, affording visual evidence that the behaviour of such complex mixtures of ethylene-hydrogen-and-oxygen are irreconcilable with the requirements of the 'law.'

I am, therefore, convinced from my own experiments that, whatever degree of validity there may be in the conclusions which Prof. Wheeler and Dr. Payman have drawn from theirs, they are not universally applicable to all explosive mixtures, and therefore they cannot be vested with the authority of a natural law.

WILLIAM A. BONE.

Imperial College of Science and Technology,
South Kensington, London, S.W.7,
November 29.

Rainfall Interception by Plants.

THE work of Marloth ("Results of Experiments on Table Mountain for ascertaining the Amount of Moisture deposited from the South-east Clouds": *Trans. S. A. Phil. Soc.*, **14**, 403-408, 1903, and "Results of Further Experiments on Table Mountain for ascertaining the Amount of Moisture deposited from the South-east Clouds": *ibid.*, **16**, 97-105, 1905) on the subject of deposition of moisture from the south-east clouds on Table Mountain, has attracted much interest in meteorological circles.

Marloth used two 5-in. gauges, one bearing a 12-in.-high frame of mesh wire and 4 vertical wire supports, through which seventeen Restionaceous stems were drawn, the other being an ordinary open gauge. In 56 days the control catch totalled nearly 4 in., the vegetation-screened catching nearly 80 in., representing an *interception gain* of about 1500 per cent. During ordinary precipitation the *interception gains* were 300-400 per cent., but during misty weather they rose to 1000-1200 per cent.

de Forest ("Rainfall Interception by Plants: An Experimental Note": *Ecology* 4 (4), 417-419, 1923), working in Maryland, employed three 3-in gauges: the first bore a wire-mesh frame 12 in. high; the second bore a similar frame and in addition ten 12-in.-long imitation (tin) reeds, standing about 1·5-3 mm. apart, bent lengthwise to form interior angles of about 135°; the third served as a control. In four months (26 days measurable rainfall) the reed-clad gauge registered an *interception gain* of nearly 30 per cent.

The writer, working at Deepwalls, Knysna, South Africa (1725 feet elevation; Lat. 33·9 S., Long. 23·16 E.), has employed two 5-in. gauges 4 ft. high, standing within three yards of one another on the level ridge of an exposed hill. The first gauge bore a 12-in.-high frame of wire mesh identical with that used by Marloth; through the mesh four single branchlets of the broad-leafed conifer, *Podocarpus Thunbergii* Hook., were drawn, about thirty leaves (of 2-3 in. × ⅓ in.) being borne by each branchlet. The branchlets were arranged so that the foliage was held firmly in position, and the apex of each branchlet was placed ¼ in. below the top rim of the frame; thus an evenly spread mosaic of leaves was exposed round the gauge. Care was taken to preserve the spread and density of the foliage-screen, the leathery, persistent nature of the latter necessitating very slight adjustment during the twelve months of the experiment.