is a variation of very long period or a secular change we must in the next few years experience a preponderance of summers with more than the average number of "hot" days.

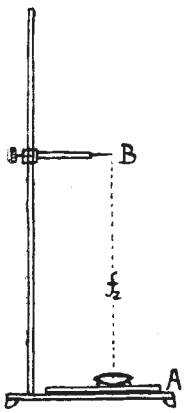
E. GOLD.

Hampstead Garden Suburb, N.W., October 23.

### Determination of Refractive Index of a Liquid.

THE following simple method of finding the refractive index of a liquid available in small quantities may be of interest.

A plane mirror A is placed on the base of the stand, and on it is put the double convex lens in such a position that its centre is beneath the needle point B. With the eye directly above B, the observer adjusts the sliding arm until the needle point and its image just coincide, as found by parallax. The distance from B to the centre of the lens is then accurately found—let it be $f_1$. The experiment is then repeated, after first placing a drop of the liquid upon the mirror, when it will be spread out to a plano-convex lens between the glass lens and the mirror—let the new focal distance be $f_2$; then evidently the focal length $f$ of the liquid lens will be given by $1/f=1/f_2-1/f_1$.




But since the focal length of the liquid lens is also given by the relation $1/f=(\mu-1)/r$, where $r$ is the radius of curvature of the surface of the glass lens, it is evident that from a knowledge of $r$ the index of refraction of the liquid can be at once found.

If $r$ is not known it can be found by putting a sheet of paper between the lens and mirror, and again obtaining an image of B coincident with itself by reflection in the lower surface of the lens. If this new distance from the lens be called $d$, we have, since reflection is now only at the upper surface of the lens, $\mu/r-1/d=(\mu-1)/-r$, or $r=(2\mu-1)d$, where $\mu$ now, of course, refers to the glass, and can, if necessary, be calculated.

The apparatus is thus complete in itself, and three readings of the position of B give all the data required.

G. N. PINGRIFF.

Market Bosworth Grammar School.

### The Nematodes of the Thames.

IN a recent letter to NATURE on the "Ooze of the Thames," I alluded to the number of nematodes which I had observed. I found as I continued my researches at least three different species were present. I have since been working on some ooze from near the Tower Bridge, and again find three different species, some of which are quite distinct from the forms taken at Kew. Thus the two localities yield at least four, if not five, different kinds. They range from about 3 mm. to 20 mm. or more in length. Considering the important part which some of these lowly creatures play in human and animal pathology, it would seem that the Thames mud offers a wide field for investigation. May we hope that this note will direct the attention of London naturalists to a subject of great importance lying close to hand?

Swadlincote. HILDERIC FRIEND.

### Miniature Rainbows.

WITH reference to the recent correspondence on miniature rainbows, there is, or was, a most perfect example at the beautiful waterfall known as "Stock Gill Force," situate half a mile outside the little town of Ambleside, near the head of Lake Windermere, County Westmorland.

About five o'clock in the evening is the best time to see it, and, of course, the sun must be shining.

RICHD. COULSON.

4 Waltham Terrace, Blackrock, Co. Dublin,
October 15.

### Olive Trees.

IN this part of the world when an olive plantation is being made trees of more than 6 inches in diameter in the stem are put in, with all roots cut off short. In the hole where they are planted about two handfuls of barley are also put in.

Considering the age of the trees and the way the roots are cut away, it would seem impossible that the tree would ever grow.

These facts may be of interest; and I should like to know what useful purpose is served by the barley.

Smyrna, Asia Minor. DORA BARFIELD.

## *EXPLOSIVES ON BOARD BATTLESHIPS.*

SOME people have been tempted of late to look back to the old days when black powder held its sway, indifferent to the effects of temperature, and always to be trusted so long as it was kept dry. "Villainous saltpetre" it was called, with a rough affection, and after storing it on shore in magazines plumed with lightning conductors, or comfortably near the boilers on board ship, we never gave it a thought until it was fed, in its flannel bag, into the gun. Then came armour and the long and hard contested duel between protection and penetration. The velocity of the projectile had to be increased. The old black powder, treat it as we would, could only deliver its rather clumsy blow which, while it imparted but a low velocity to the shell, gave an unpleasant, percussive strain to the gun. It was a push that these heavier projectiles required, not a blow.

This state of things led to the introduction of slow-burning powders, and they progressed very slowly. First, the size of grain of black powder was increased until it attained the dimensions of a two-inch cube. The improvement, however, was slight, and the internal stresses on the bore of the gun were still too great. The next step towards real progress was the introduction of what was known as cocoa, or brown powder, in which materials other than dogwood or alder furnished the carbon. This had but a short reign, its place being taken by various propellants which were frankly chemical compounds. To give a list of all this class of propellant, with which experiments and lengthy trials have been carried out with more or less success, would be far beyond the scope of this article; but the interest of the scientific world gradually focussed itself on compounds having nitrocellulose as their chief constituent, especially after the wonderful discovery that two high explosives, gun-cotton and nitroglycerine, when chemically compounded, tamed and restrained each other, so that a propellant resulted of which the speed of burning could be regulated at will by increasing or diminishing the size of the grain or cord, and also by adjusting the proportions of its constituents. Thus came to man's hand a propellant which far outstripped black powder even in its improved forms, and threw into shade the cocoa powder which, after all, remained in the category to which the French artillerists contemptuously alluded as *poudre brutale*.

"Now," triumphantly exclaimed the gunmakers, "here is a propellant which will enable us to increase the striking velocity of our armour-piercing projectiles, and also to flatten our trajectories to an extent never before contemplated. The cemented steel plates will no longer confer invulnerability on the battleship, and our chances of hitting her will be vastly enhanced." So, to suit the new powders, guns were lengthened and charges increased, and the muzzle velocities rose by leaps and bounds, while the destructive stresses on chamber and bore were minimised by the employment of a propellant the characteristics