

months, and in some cases even twelve months beforehand. The facts brought forward in that paper were of such a nature that, as will be readily understood, I wished very much they could be found to occur generally. But it was undoubtedly better to restrict their application to the area and period dealt with in the paper. It having been shown, however, that at one period and over a certain area quantitative relations had existed between previous and subsequent barometric variations, it is natural to suppose that quantitative relations may be found to exist at other periods and over other areas also. The question arises, Can the facts brought forward in the above-mentioned paper serve as a guide to future investigation? I think to a certain extent they can.

The paper pointed out that there was a remarkable approach to an annual symmetry in the abnormal variations of the barometer in Western India during many of the years under observation. It supposed that this symmetry would have occurred every year during that period had it not been masked by larger variations of another character; and it was mainly by acting on this supposition and noting the departure from symmetry in any given year, and by considering that departure as being an index of the variation that was about to come, that the position of the barometer in the subsequent year was calculated. The paper attempted to explain the occurrence of this annual symmetry in two ways: (1) By supposing it to be a constant phenomenon connected with the annual double oscillation known to be present in the normal barometric curve; and (2) by supposing it to be a chance phenomenon, characterising a phase in the march of barometric variations, and persistent during the period dealt with, but not necessarily to be found in any other period. After further reflection I am inclined to believe that the latter is the correct explanation.

And here I think may be a guide to future investigation. It seems very likely that barometric variations may always be passing through phases which are persistent for several years. And, during the continuance of each phase the abnormal barometric curve will necessarily approach more or less to a certain annual type. In the cases dealt with in my paper that type chanced to be of a symmetrical form, sufficiently remarkable to strike the eye at once. The regularity of its form made it comparatively easy to be dealt with. An irregular type would of course be less easy to recognise and less easy to be dealt with. But it is obvious that if such types do exist and persist for several years in succession, then, by catching the type as the barometric phase comes in and by noting the departures from it each year, in a manner similar to that adopted with the symmetrical type I had to deal with, these departures may serve also in a similar manner as indices of the coming variations. Of course the methods of calculation would have to be purely arbitrary and specially devised for each barometric phase. If barometrical curves would yield to strictly mathematical methods, the problem of season-forecasting could be regarded as in a fair way of being solved. But it has never yet been found possible to resolve them entirely into regular periodical oscillations; and I believe they will always have to be arbitrarily dealt with.

Melbourne, July 21

A. N. PEARSON

#### Transmission of Sound

IN connection with the subject of mechanical telephones, which has been occupying public attention lately, there is a note by Mr. Miller in a recent number of *NATURE*, regarding certain experiments made in 1878 on the propagation of sound. With reference to this, Prof. Wernhold, of Chemnitz, writes to me, saying that as early as 1870 he had shown that human speech could be transmitted very distinctly through stretched wires or threads, and mentions that the results of his researches were published in an article on "The Transmission of Human Speech through an Iron Wire," in Carl's "Repertorium für Experimental Physik," Band vi., Serie 168. As your correspondent will probably like to refer to this, may I ask you to kindly publish this letter?

W. E. AYRTON

Central Institution, Exhibition Road, London, October 12

#### Are there Rabbits in the Western Islands?

PROF. THOROLD ROGERS in his interesting book on "Work and Wages" mentions the relatively high value of rabbits in the thirteenth century, and suggests that they were then a recent introduction to England. It is well known that several islands on the west coast of Scotland have no rabbits upon them—for

instance, Kerrera, which seems to point to the same conclusion. It would be interesting to know whether this is really the fact or not?

HERBERT ELLIS

112, Regent Road, Leicester, October 4

#### THE HELL-GATE EXPLOSION

PROBABLY the largest chemical mechanical experiment ever thought of was successfully performed last week in New York Harbour by the removal of the obstruction known as Hell Gate, or Flood Rock, a considerable-sized island, as stated by the papers, about nine acres in extent, in Long Island Sound. The agent employed for this immense engineering work is a preparation or preparations of nitro-glycerine, and there is no doubt that this is the only explosive compound which could have been used for the purpose on account of the very enormous quantity required and the peculiar nature of the explosion of this substance. All the compounds or preparations of nitro-glycerine produce by explosion what are known as local effects only, as distinguished from gunpowder, the effects of which are much more gradually developed on ignition, but extend, owing to the slower and larger wave of disturbance, to a much greater distance. The legitimate use of nitro-glycerine is for purposes such as this, where a disruptive action is required.

The operations leading up to the final explosion have been some years in progress. They have consisted in forming a system of tunnels at a considerable depth under low-water level in the solid rock, and the charging of these tunnels with dynamite and mixtures known as rackarock, of nitro-glycerine with compressed gun-cotton. Twenty-four galleries were driven through this island, some of them 1200 feet long, and these were intersected by some forty-six others. These tunnels were about 10 feet high and 8 feet wide, and the roof of rock above them varied from 10 to 25 feet in thickness. The quantity of rock to be removed by the explosive was about 275,000 cubic yards, the quantity removed by tunnelling being about 80,000 cubic yards. A good deal of trouble has been occasioned during the course of the mining work by fissures, which have had to be stopped by wooden plugs in most instances. The explosive was charged into holes drilled into the roof and supporting walls and pillars at different angles, with a view to disrupt the strata of rock as much as possible.

The holes to be charged were about 9 feet in length and 2½ inches in diameter. The holes were charged first with the blasting gelatine or rackarock and filled to the ends with a dynamite cartridge, to which the detonator and electric wire were attached. In all fourteen thousand cartridges of a total weight of fourteen tons were employed. Near observers describe the explosion as being accompanied by a dull roar, but with only the slightest shaking of the ground, even at a moderate distance. An immense quantity of water was bodily raised up to heights estimated variously at 150 to 200 feet.

The results, as far as can be ascertained, are very satisfactory, the rock having been very thoroughly broken up, so that it can easily be dredged away.

After the example of an experiment on this scale, carried out without the least accident, perhaps it may occur to those in authority that we have on our own coasts dangerous rocks, not of the extent of Flood Rock, which might with immense advantage be similarly "chemically" removed.

Had gunpowder been the only explosive available, at least five times the quantity by weight of the nitro-glycerine preparations used in this experiment, would have been necessary and the results would not have been by any means so local or perhaps so satisfactory.

After this the engineer may find it to his advantage to cultivate more the acquaintance of the chemist and his products than has been hitherto the case.