biased scientific basis. Dr. Coffin, to bring out the importance of the air-temperature correction, assumes two cases, both with identically perfect barographs, with no instrumental errors, one ascent in summer and the other in winter to an altitude that both read 8 in. of mercury as the minimum pressure. He assumes that in the summer case the average temperature of the air is 10° C., and in the winter −30° C., which values correspond closely to actually observed figures. The true altitudes of these are 33,475 ft. (10,203 m.) for the summer instance and 30,929 ft. (9427 m.) for the winter, although the altitude uncorrected for air temperature is 36,020 ft. (10,979 m.) for both. Dr. Coffin states that the flight made by Roland Rohlfs, the test pilot of the Curtiss Engineering Corporation, on September 18, 1919, attained an altitude of 34,910 ft. (10,640 m.), partially corrected, but uncorrected for the average temperature of the air column; the true altitude was 32,450 ft. (9890 m.) corrected for air temperature. The altitude attained by Major Schroeder, similarly corrected for temperature, is 30,751 ft. (9373 m.).

In *Science* of April 30, Prof. McAdie gives as approximate values, corrected for mean air column temperature, vapour pressure, gravity, altitude, and latitude: Rohlfs, 32,418 ft. (9880·5 m.), and Schroeder, 31,184 ft. (9505 m.).

The *Meteorological Magazine* for March, in an article "The Highest Aeroplane Ascent," mentions Major Schroeder's ascent on February 27 last referred to above, and expresses the hope that it will be authenticated in due course. The record of Berson and Süring, who, it is stated, reached 35,400 ft. (10,789 m.) in a balloon on July 31, 1901, is mentioned as being generally accepted as the greatest height hitherto attained by aeronauts. The article seems to throw some doubt on the lowest temperature observed in the ascent by Glaisher and Coxwell.

Physical Problems in Soil Cultivation.[1]

UP to the outbreak of the war the farmer could generally rely upon an adequate supply of cheap labour. He had no great necessity to introduce labour-saving machinery into the routine of the farm. But the increasing demands of the Army for men and the menace of the submarine campaign brought him face to face with the difficult problem of growing more food with a greatly reduced staff. In such conditions the employment of machinery was the only solution, and although at the time it was introduced mainly as a temporary measure, it is now quite evident that economic conditions will cause it to be retained permanently. During the war the rate of progress in the industry of agriculture was necessarily forced above the normal, and the urgent need at the present time is to take stock of the position, so that future developments may be guided along the right lines. In this connection the report of the Departmental Committee of the Ministry of Agriculture on Agricultural Machinery appears at an opportune moment. The report deals with "the further steps which should be taken to promote the development of agricultural machinery," and, so far as tillage implements are concerned, falls naturally into two sections, dealing with (1) fundamental research on the physical properties of soil as affected by cultivation operations, and (2) the application of the knowledge thus gained to the design of new implements and the improvement of old ones.

[1] Report of the Departmental Committee of the Ministry of Agriculture on Agricultural Machinery. (H.M. Stationery Office.) Price 1s. net.

Taking the second section first, the Committee lays great stress on the fact that all development in the design of machinery has proceeded on empirical lines. "Although searching questions were addressed to several witnesses, we could not discover that any real attempt had been made in the past to determine the principles which underlie the design of the variety of implements in use in modern farming." As a result an enormous number of patterns of the same implement are made, one manufacturer alone having more than two hundred and fifty patterns of plough. The Committee considers that much of this overlapping and wasted effort will be avoided when the Ministry of Agriculture sets up its projected Research Institute in Agricultural Machinery.

The first section—research into the physical properties of soil—is regarded, rightly, as of primary importance. "Progress in research as regards tillage implements must depend largely upon the results of investigations into soil physics and the problem of tilth." It is clearly pointed out that this research must not be pursued with the immediate object of obtaining "practical" results. A sound theory of the interesting but complicated physical phenomena shown by soil must first be built up. Once this is achieved, the practical deductions will follow almost automatically. The very nature of this work precludes the possibility of forcing the pace, but it is suggested that, as the work has been in progress for some time at Rothamsted, it should be further developed by the appointment of additional scientific assistants.

If this were done it would be possible to pay more attention to those physical problems concerned with the soil tilth than is practicable at present. Tilth is related to the production of compound particles or aggregates in the soil, and to the factors causing plasticity, cohesion, etc. At the same time a study of the mechanical action of the plough could be started having as its aim the specification of the design of mould-board to meet different soil conditions. This is an unsurveyed field and full of promise.

The report also deals with the educational and research work which should be carried out at the projected Research Institute in Agricultural Machinery, especially from the engineering point of view. It also advocates the appointment of an Advisory Committee, composed of representatives from the research institutions, implement-makers, and agriculturists, to co-ordinate the whole of the work.

In the present article attention has been confined mainly to the sections dealing with the physical questions involved. The report covers a much wider field. It is closely reasoned and convincing, and can be cordially recommended to all concerned in the industry of agriculture.

B. A. KEEN.

The Anomaly of the Nickel Iron Alloys: Its Causes and its Applications.[1]

THE lecturer began by a reference to the work of John Hopkinson, and to his own early work on the perfecting of standards of length. His first experiments were on nickel, which had two great advantages over brass for metrological work, viz. its smaller coefficient of expansion and its greater freedom from corrosion. He would probably not have looked further but for the difficulty at the time of getting large bars of the material free from flaws. In investigating the

[1] Abstract of the Fourth Guthrie Lecture delivered before the Physical Society on April 23 by Dr. C. E. Guillaume.