The Spacing of Young Trees.

FOR some time past there has been a certain amount of dissatisfaction amongst a section of members of the Royal Scottish Arboricultural Society with the *Transactions*, it being held that the publication was behind the times, both in appearance, arrangement of material, and so forth. In the recently issued number for March 1927 the Council has taken the step of rechristening this conservative magazine as *The Scottish Forestry Journal*, though otherwise it remains unchanged. Amongst the chief matters of interest in the present number is the attention given to spacing in planting in Great Britain, a point of vital importance. The matter was given a prominent place in the presidential address of Sir Hugh Shaw Stewart to the Society last February (which is reproduced in this number), and was commented upon by partisans of both wide and close spacing during the ensuing discussion. It was touched upon by Lord Lovat in an address, also printed, and forms the theme of other writers.

It might appear, from some of the opinions expressed, that this question as to whether better results can be obtained by planting the young trees in the first instance at a closer or wider interval was a new problem. If it is new in Britain, it is merely due to the fact that when we commenced to plant conifers last century, we did so in ignorance of the methods in force on the Continent of Europe and knew nothing of that necessary concomitant—scientific thinning. The advocates of wide spacing, which, chiefly on account of the far heavier costs of planting since the War, is being practised both by the Forestry Commission and others, have, it must be confessed, few proofs to support their contention that they will obtain as good a quality of timber. That, in other words, they are not risking the reproduction of the inferior article which brought British timber into such disrepute that foreign conifer timbers were always preferred, if not demanded, even by the British Government Departments. This question cannot be divorced from a consideration of the manner of growth of the larger area of the forests of the globe, which are of natural origin. In a naturally regenerated forest the young plants come up densely, and with proper attention are gradually thinned out. It would appear that those who advocate closer planting based on this analogy have a strong case.

The problem has to some extent become involved owing to the so-far-observed development of young plantations of Douglas fir. In many parts of Britain there has been an extraordinary variation in development of individuals in young Douglas woods in which the young trees were all of the same age and size when planted. It may be agreed that the ordinary British planting distance of 4 ft. by 4 ft. or thereabouts, at first adopted for Douglas, was too close. This is true, and, moreover, remains true for most exotic trees in any part of the world when introduced into a climate and under conditions which result in their growing very much faster in their early years than in their own habitats. A forester going to the tropics has to revise all the ideas as to planting distances with which he became acquainted in temperate Europe. But because 7 ft. or 8 ft. spacing may be correct for Douglas in Britain or parts of Britain, to apply the same spacing or anything near it to Scots pine, the spruces, and some other species is, in the opinion of many, to court disaster; or, at any rate, to reproduce an inferior British timber.

Experiments are in existence in the form of sample plots and so forth, the object of which is to endeavour to provide rule-of-thumb information on this matter. But as we shall have to wait some thirty years or more ere results of any value are obtainable from them, it would conceivably be a wiser policy to imitate Nature as closely as possible, and not to hurry the planting campaign forward at the expense of the future quality of the marketable timber.

Properties of Nickel- and Nickel-Chrome Steels.

EXTENSIVE researches on the nickel- and the nickel-chromium steels are described in a recent publication from the Bureau des Poids et Mesures.[1] The memoir deals with work commenced in 1896 and continued consistently during the intervening years. Certain of the results have already been published in part from time to time, but the present collection serves a very useful purpose in bringing together in one volume work which has been spread over many years and published in very different places. Further, the results are now available in greater detail than has hitherto been the case.

Detailed descriptions are given of the apparatus and the methods used in the measurements, the majority of which, however, are by now fairly widely known. The properties chiefly investigated are magnetic—the Curie point, the dilatation and the torsional modulus of elasticity. The account of the work on the nickel steels by M. Guillaume deals in the main with changes in these properties over a relatively small temperature range, but M. Chevenard considers the changes in the nickel-chromium steels up to quite high temperatures.

One of the most interesting aspects of the work is the interpretation offered of the well-known but curious properties of 'invar' and the less generally known, but equally interesting, constancy of the modulus of elasticity with temperature of the nickel-chrome steel to which the name 'elinvar' has been given. In each case the presence of an intermetallic compound is invoked in order to explain the results, compounds which are not believed by all metallographers to have any real existence. Regarding the one which is believed by the authors to occur in 'invar,' it is stated that "this compound Fe_2Ni is formed with expansion, and its magnetic transformation is accompanied by an anomalous negative dilatation and by an exceptionally large positive thermo-elastic anomaly. Its presence explains the appearance of the minimum in the curves of density and modulus of elasticity with composition at the ordinary temperature." The ferro-nickels which contain chromium show a reversible magnetic transformation just as do the pure iron-nickel alloys. The higher the content of chromium for the same amount of nickel, the lower is the Curie point and the less pronounced are the anomalies of dilatation and elasticity. This intense diluent effect of chromium appears to point to the presence of a compound Ni_3Cr_3, and one may obtain alloys either of a determined dilatability or of constant elastic properties as in 'elinvar.' The latter alloy, in addition to nickel and chromium, actually contains carbon, manganese, and tungsten.

So far as more directly important practical applica-

[1] "Travaux et Mémoires du Bureau des Poids et Mesures." Publiés sous les auspices du Comité International, par le Directeur du Bureau. Paris, 1927.