

of the older North-Eastern States, the cause is not far to seek—viz., in the complicated, unconforming, intricate, and necessarily inaccurate plots and plans, which must have created confusion, litigation and loss to the settlers. At the same time I must remark that I have not been able to detect any such excessive intricacies of selection as we have in New Zealand, in the Provincial District of Canterbury, for instance. I am therefore led to conclude that the rigidly simple and unmistakable method of laying out allotments for settlement was owing to the experience of the tardiness of unsystematic surveys, combined with confusion and litigation: further, because no unmethodical mode would have administered to the wants and requirements of such volumes of population from Europe pouring over the waste lands of such extensive regions.

The map of Manitoba, Canada, is the best example of the system of survey in my possession, but anyone who has a large map of the United States will see the principle displayed now over half the continent.

Referring to the map, we find the Province of Manitoba extending between 49° and 51° north latitude and 96° and 101° west longitude. The Survey is primarily astronomical based in longitude on a principal meridian $97^{\circ} 26' 50''$ west, and a first base line in latitude 49° north. The standard lines are carried northwards from the 49th parallel on the meridian at 12-mile intervals; or strictly speaking, allowing for roads, at intervals of 978 chains. As these lines are on true meridian of each separate longitude, they converge, so that in order to maintain 12-mile intervals corrections have to be made; these are technically called "jogs." Fig. I. illustrates the system of standard lines, and the mode in which the townships* and sections rest on these.

Thus, while in these countries, it has been enacted that the territories shall be cut up into square miles—multiples or divisions of these—this is only theoretically; strictly speaking they cannot practically be so, owing to the sphericity of the globe; hence the actual work is done with correction, into the precise manner of applying which I need not here enter. However many faults may be ascribed to the system, and however many insufficiencies, yet its having stood the test of ninety years and more, is proof of its adaptability. And if I may venture an opinion on a system of operations that I have never seen, I would hazard the remark that none could be more appropriate in the conditions of a wide, level, featureless expanse of country in process of rapid appropriation by an immigrant people. Thus, these great countries proceeding on the principle of unalterableness of original boundaries—independent of all European precedent—have devised for themselves a system of national settlement survey, comprehensive and enduring, also unequalled in certainty of record, and not to be excelled in giving security of tenure to the millions of selectors.

But the conditions of America are not the conditions of the narrow, hilly, and mountainous islands which comprise our colony of New Zealand; thus our survey measures cannot be entirely analagous. If we look to Europe, as naturally we would look for the highest perfection attainable, neither can we have direction; for there we see only such operations as are suited to a country already possessed and divided. But in the British Empire of India we have the example of a system, matured under the highest authority and in successful operation for half a century—and which I, from personal acquaintance of the same—dating thirty-eight years back, have no hesitation in recommending. Gale's method, which is the foundation of the Bengal system pursued in the revenue and settlement surveys of India, has further, with modifications and additions, been in operation for twenty-one years in the Southern Districts of New Zealand, and with, we believe, satisfaction to the Government and the public. It is also now the officially-authorised system in the colonies of Victoria and Western Australia. Like the American, its governing processes are astronomical and electric, but owing to the diversity of conditions above stated in detail, it diverges.

The existence of a North Pole Star, it may be suggested, naturally led to the adoption of standard converging meridian lines as a radical portion of the American Settlement Survey Scheme. In the Southern Hemisphere our pole is devoid of such an object, perceptible by the common theodolite. The tracing of meridians, closely and constantly, at twelve and six-mile distances, is, therefore, not an easy task for the actual surveyor; it was consequently decided that a meridian should, as in the Revenue and Settlement Surveys of India, only be observed (and that carefully with large instruments) for each geographical area on an initial station near its centre. Fig. 2 illustrates the principle.

Our method of blocking out the country for settlement survey will be seen to nearly coincide with the American; their 12-mile blocks, containing four townships six miles square; our $12\frac{1}{2}$ miles square survey districts, containing sixteen blocks $3\frac{1}{2}$ miles square. But the nature of the respective surfaces of the countries require us to again diverge. After this the American township is cut up into thirty-six square miles, called sections, which sections are again cut up into sixteen quarter-quarter sections of forty acres each. The country being for the most part plain and prairie; this is done irrespective of features and communications. Our blocks, which are $3\frac{1}{2}$ miles square, are first intersected by roads according to the proper direction required by the valleys, ridges, and mountains which intersect the surface of the country; after which sections are surveyed of sizes from twenty acres up to two hundred acres—more or less—as may be suitable for settlement (this, of course, where sale before survey does not take place). Figs. 3 and 4 will show at a glance the practical mode of the sectionizing in the two systems.

To sum up the principles thus shortly brought in juxtaposition, they may be specified as follows:—Primarily, both are astronomical and electric. Secondly, the American by convergencies and lesser circles; ours, by true bearing and distance on the meridian and perpendicular of initial station of circuits. Thirdly, both by squares; the American 12 and 6 miles; ours $12\frac{1}{2}$ and $3\frac{1}{2}$ miles, or 1,000 and 250 chains square respectively. Fourthly, the American still in squares of 1, $\frac{1}{4}$, and $\frac{1}{16}$ miles; ours principally quadrilateral and polygonal, whose elements are mathematically reduced on the meridian and perpendicular of trigonometrical stations. Then the Americans, by their system, are compelled to eliminate, on the ground, the differences arising from sphericity, by the jog or correction already alluded to; we do not require to do this, but we mathematically calculate and allow for convergencies and curves of lesser circles in our geographical and geodesical maps only. The main feature of the American system

* Townships in America are 36 square miles, and are analogous in meaning to our term Survey Districts.